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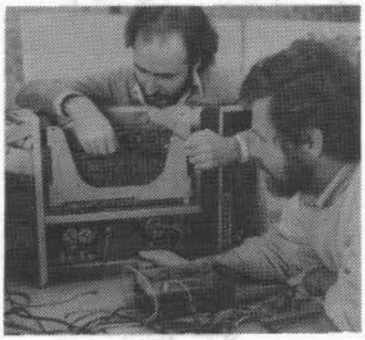

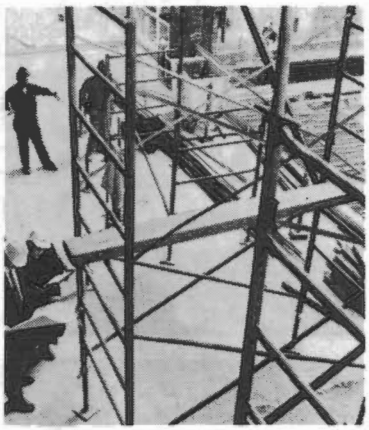

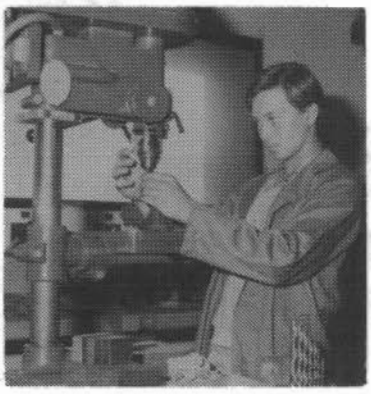

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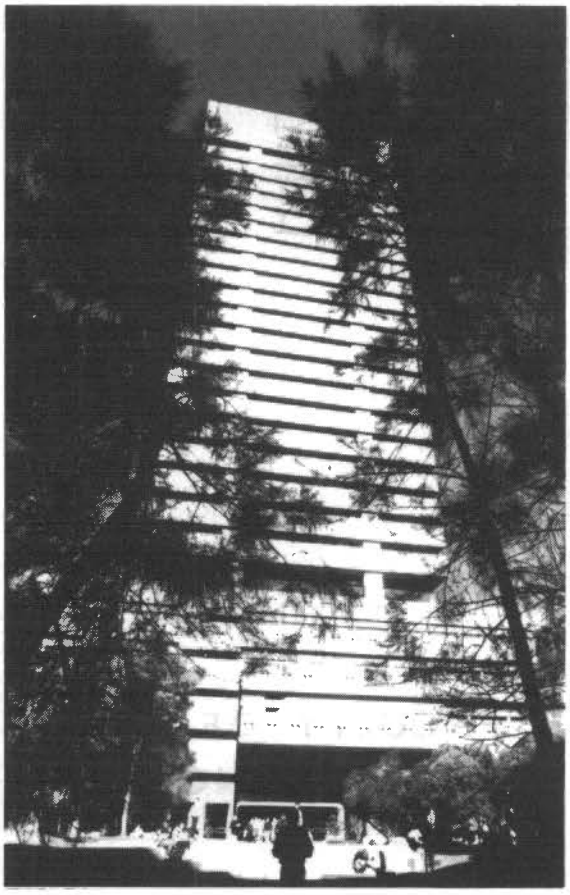
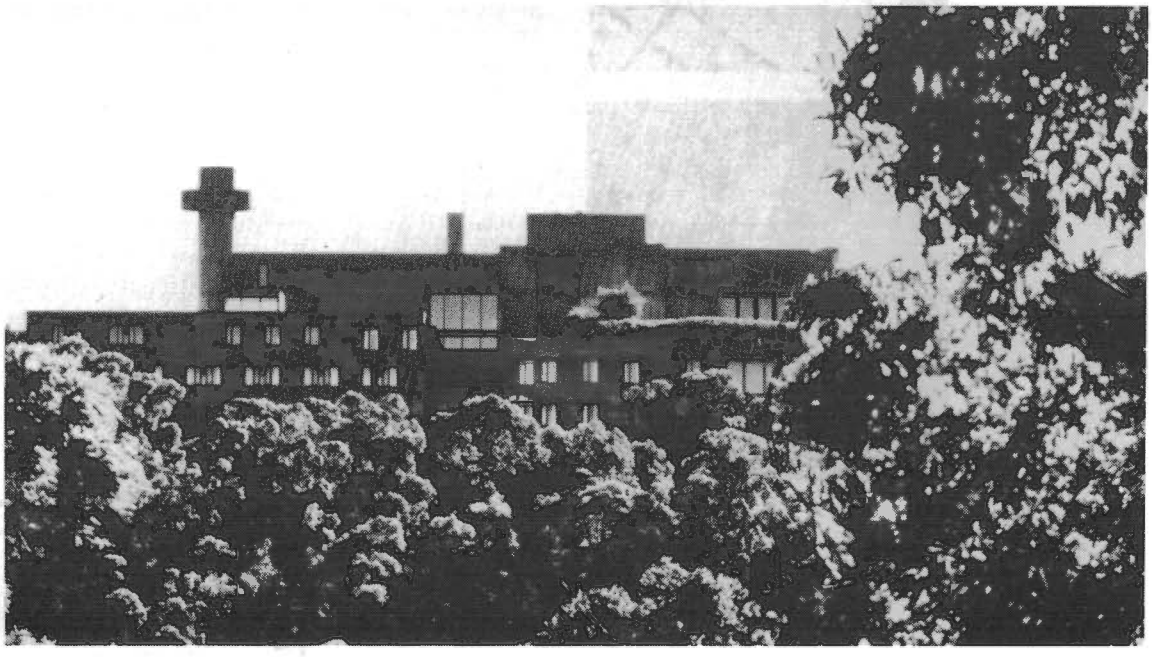




UNIVERSITY OF TECHNOLOGY, SYDNEY

UTS has nine Faculties and each one has a separate Handbook which provides a detailed introduction to the Faculty's Undergraduate Courses.

Each Faculty also has a separate Postgraduate Studies Guide.

Reading these publications will show you how all courses at UTS aim to equip graduates for their professional career. Most courses can be undertaken with part-time attendance. Some are also offered with full-time and sandwich attendance. You do not have to be employed at the time you enrol in a sandwich pattern. And you can usually transfer from one attendance pattern to another at the end of a stage, provided the Head of School approves and there is space available in the class.

UTS does not offer external or correspondence Courses.

Further information

The UTS Information Service is open all year in the Tower building at 15-73 Broadway (near Central Railway). If you can't visit them, write to PO Box 123 Broadway 2007 Australia or telephone (02) 20930.

Representatives of UTS attend Careers Days held in the Sydney region through the year.

The University Open Days - on 24 & 25 May 1991 - are your chance to visit the campus and discuss your career plans and Course preferences with members of the Academic staff.

At Kuring-gai campus there is an Inquiries Desk in the main foyer.

Applications for admission

If you want to be admitted or readmitted to a UTS Undergraduate course, apply to the Universities Admissions Centre by 27 September.

(There are some courses for which you can apply direct to UTS - the deadlines for these are advertised separately.)

If you want to enrol in a Doctoral programme or a Masters by Thesis, UTS will generally accept your application at any time.

For a Master of Arts, Master of Business or other higher degree by Coursework, you should lodge your application with the University by 31 October.

UNIVERSITY E.E.O. POLICY

It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of race, sex, marital status, physical disability or homosexuality.

MISSION

The mission of the University of Technology, Sydney is to provide higher education for professional practice which anticipates and responds to community needs and the effects of social and technological change. The University offers access to its human, physical and technological resources for the advancement of society. It is committed to freedom of enquiry and the pursuit of excellence in teaching, scholarship and research, and to interaction with the practising professions.

The University seeks to accomplish its mission in the following ways:

- by teaching an appropriate range of undergraduate, postgraduate and other educational programmes in a variety of attendance patterns for students wishing to enter the workforce at a professional level, those already employed at that level and those in employment who wish to attain that level.
- by ensuring that its courses are designed to enable graduates to carry out full professional practice in their chosen field. The courses aim to develop students' ability to learn, to solve problems, to adapt to change, and to communicate. Students should gain a broad understanding of social as well as technological issues, and acquire a greater perception of the nature and needs of modern society and of their responsibility to play a leading part in shaping it.
- by recognising that it has been established to serve the community as a major resource in vocational higher education. It therefore makes its technological expertise and facilities available to industry, commerce, government, and professional and community organisations. The means by which this is achieved include co-operative education, continuing education, pure and applied research and development, consulting, technology transfer and management, and contribution to national and regional policy development in education and technology.
- by promoting effective teaching and scholarship, professional activity and research by members of the University community to ensure the maintenance of high educational standards and their recognition at national and international levels.
- by continuing to develop and promote policies that ensure equality of opportunity in all its aspects.
- by seeking effective support for its educational activities
- by conducting regular consultative reviews of its mission and objectives.

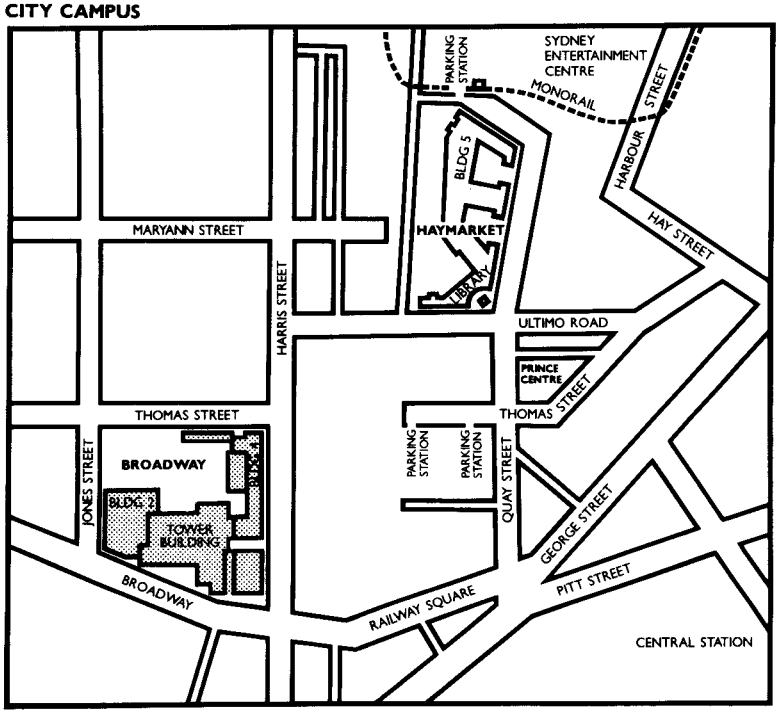
FACULTY LOCATION MAPS

Faculty of Engineering

Faculty Office:
Level 4, Building 2
Broadway, City Campus

Postal Address:
PO Box 123,
Broadway NSW 2007

CITY CAMPUS



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Broadway, City Campus,
Telephone: (02) 20930

School of Electrical Engineering
Level 24, Building 1,
Broadway, City Campus,
Telephone: (02) 20930

School of Mechanical Engineering
Level 6, Building 2,
Broadway, City Campus,
Telephone: (02) 20930

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C. Evans

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E. Newton

NOTICE

Attention All New And Re-enrolling Engineering Students

COURSE RESTRUCTURING

Major changes to the structure of all Bachelor of Engineering degree courses will be introduced from the beginning of 1992.

The changes will include:

* reducing the semester length from 18 to 14 teaching weeks;
* reducing the industrial experience minimum requirement from 144 weeks to 96 weeks;
* changes to many subjects;
* an increase in the number of semesters of University attendance for both sandwich and part-time programmes. Examples of attendance patterns are given on the opposite page;
* attendance of up to 14 hours per week for part-time students who obtain one day (or two half- days) per week of work release; or attendance of up to 12 hours per week for part-time students who obtain one half-day per week of work release.

The sandwich and part-time courses will remain identical in content, and students will be able to transfer between attendance patterns at the start of any semester. Part-time students will be encouraged to undertake sandwich semesters whenever possible to speed their progress through the course.

All new students in 1991 will be enrolled on the understanding that they will be undertaking the new programme from the beginning of 1992.

Students re-enrolling in 1991 should consider the coming changes when planning their enrolment.

Students should check with School-based academic advisors about restructuring details, including any special enrolment requirements for the 1991 academic year.

Further details will be provided during 1991.

NOTICE

COURSE ATTENDANCE

Introduction of restructured engineering courses in 1992 will provide the same flexibility which has characterised these courses in previous years.
Students are able to adopt an attendance pattern (or combination of patterns) which best suits personal and employer requirements. Students should design their programme in consultation with their employer and academic advisor.

The following are examples of what is possible.

Sandwich Programme

Example 1:
Attend for eight semesters with up to 24 contact hours per week and include two years of full-time study i.e. two years during the course each with two academic semesters. The industrial experience may be taken in the form of four industry semesters which leads to an overall course duration of six years. Alternatively, by using three industry semesters plus summer periods, the duration can be reduced to 5.5 years.

Example 2:
As for Example 1 except to limit the number of years of full-time study to one. In this case the overall duration is six years.

Example 3:
Attend for eight semesters with up to 24 contact hours per week and limit attendance to one academic semester per year. More than the required 96 weeks of industrial experience could be obtained. This arrangement would provide an overall duration of 7.5 years.

Example 4:
Attend for seven semesters with up to 24 contact hours per week plus three semesters on a part-time basis with up to six contact hours per week. Part-time attendance would be during work-experience semesters and would be available only to those students located in Sydney who received written approval from their employers. Overall duration would be five years subject to timetable arrangements being suitable.

Part-time Programme

Example 1:
Attend for five years part-time for 13 or 14 hours per week plus one year full-time for up to 24 hours per week. Weekly contact hours each semester would vary depending on timetable arrangements. Overall duration would be six years.

Example 2:
Attend for seven years part-time for 13 or 14 hours per week.

Example 3:
Attend for eight years part-time for up to 12 hours per week.

Part-time students attending 14 hours per week (or more) must obtain one day (or two half-days) work release per week. Each example is subject to timetable arrangements being suitable.

COURSES

The Faculty of Engineering has a strong vocational orientation. Its courses have been designed to achieve standards of education and professional competence which equip graduates to play an effective role in industry immediately upon gaining their qualification. The Faculty's most important distinguishing feature is its commitment to the philosophy of Cooperative Education: that is, the belief that the development of fully professional engineers requires both academic and industrial training, and that these should be experienced concurrently. Industrial experience is therefore an essential feature of all undergraduate engineering courses. Graduate programmes and other activities also involve close association with industry and the engineering profession, and the Faculty maintains working contact with many hundreds of employers of engineers.

The Faculty has three Schools. They offer these courses:

School of Civil Engineering
- Bachelor of Engineering in Civil Engineering
- Bachelor of Engineering in Structural Engineering
- Master of Engineering (Local Government)
- Master of Engineering by Thesis
- Graduate Diploma in Local Government Engineering

School of Electrical Engineering
- Bachelor of Engineering in Electrical Engineering
- Bachelor of Engineering in Computer Systems Engineering
- Master of Engineering by Thesis
- Graduate Certificate in Software Engineering

School of Mechanical Engineering
- Bachelor of Engineering in Mechanical Engineering
- Bachelor of Engineering in Manufacturing Engineering
- Master of Engineering by Thesis

In addition the following programmes are offered on a faculty basis:
- Graduate Diploma in Engineering
- Master of Engineering (Engineering Management)
- Master of Engineering (Telecommunications)
- Doctor of Philosophy

The sections immediately below give information on those aspects of the courses which are common to the Faculty as a whole. These are followed by specific entries relating to the courses offered by each School, and finally by further general information on other activities of the Faculty. Detailed advice may be sought from the appropriate School or from the Dean of the Faculty.

UNDERGRADUATE COURSES

Structure and Attendance Patterns

Major changes to the structure of the Faculty's undergraduate courses will be introduced from the beginning of 1992. Please read the Notice to all new and re-enrolling engineering students on pages 10 & 11 of this handbook which outlines the new course structure to be introduced in 1992.

The information which follows relates to the EXISTING courses.

All courses are currently of six years' duration, arranged in six academic stages, and lead to the degree of Bachelor of Engineering, abbreviated as BE(UTS). The academic year is divided into two semesters: Autumn (February - July) and Spring (July - December).

Students must gain approved industrial experience concurrently with their academic programmes. The attendance patterns which provide for this are Sandwich or Part-time. There are no full-time students.

The **sandwich** pattern consists of full-time attendance (approx. 24 hrs/wk) at the University for one semester of each year, followed by full-time employment in industry for the other semester. It is not to be considered as a full-time course in the usual sense. The student gains the educational advantage of full-time attendance and at the same time develops technical proficiency through frequent on-the-job experience, which in turn gives greater meaning to the academic programmes.

Employment arrangements for sandwich students tend to fall into three main categories:

Traineeship or cadetship: This is a formal agreement whereby the student receives training in one organisation throughout the course, and often continues after graduation with that organisation. A salary may be paid during the academic semesters as well as the industrial semesters.

Sponsorship: This is a verbal understanding between an employer and a student that regular employment will be offered in each industrial semester, subject to work availability and satisfactory performance in the job. Salary is usually paid only during the industrial semesters. The type of work offered will often be a productive job rather than a training programme.

Freelance: The student is not tied to a particular employer, but seeks jobs according to market demand and developing interests. Again the type of employment available will be in the nature of productive work rather than a training programme, and the student would only be paid while actually working for an employer.

It should be noted that the responsibility for finding suitable industrial experience rests with the student. However, the Faculty's Industrial Liaison Unit and Industrial Training Advisors in each of the Faculty's schools will help with information and advice. It is not necessary for a student to have arranged a job before first enrolment.

The **part-time** attendance pattern involves continuous employment in industry and attendance at classes for 12 hrs/wk in both semesters. This usually consists of one afternoon and three evenings (one of the evenings being on the same day as the afternoon), or on two afternoons and two evenings.

Students attending on either the Sandwich or Part-time pattern take exactly the same subjects, and all course requirements are identical except for timetabling details. The two patterns are seen as alternative ways of meeting the cooperative education ideal and it is normally possible to transfer between attendance patterns to meet the needs of students and employers.

Progression through each course is governed by subject prerequisites and it is not necessary to pass all subjects in one Stage before embarking on the next Stage. This makes it possible for students in special circumstances to take reduced or accelerated programmes, with the approval of their Head of School, and still make progress. A sandwich student who has failed a subject may repeat it in an evening class during the ensuing industrial semester, with the approval of the Head of School and the employer.

Admission

(See also Rules of the University Relating to Students)

Each course has an intake of students each year. Courses offered by Schools of Civil and Electrical Engineering may consider a mid-year intake. The School of Mechanical Engineering does not have a mid-year intake. Applications for admission in February are made through the Universities Admissions Centre, and those for admission mid-year (if applicable) are made directly to the University.

Entry from HSC Selection is based on a Tertiary Entrance Rank (TER). For admission based on the 1990 NSW HSC examination TERs were 71.15 for Civil/Structural engineering, 72.85 for Electrical/ Computer Systems engineering, and 69.55 for Mechanical/Manufacturing engineering. Although there are no formal subject prerequisites, UTS engineering courses are taught on the assumption that students will have passed 3 Unit Mathematics. Prospective students are strongly advised to attempt 2 Unit Physics and Chemisty.

Entry with TAFE Certificate or Associate Diploma Holders of Certificates/Associate Diplomas of the NSW Department of Technical and Further Education will be deemed eligible for entry to the University engineering courses as follows:

UTS Course	TAFE Certificate/ Associate Diploma
Civil & Structural Engineering	Civil Engineering Structural Engineering Surveying
Electrical & Computer Systems Engineering	Electrical Engineering Electronics and Electrical Power Generation Computer Service Technology
Mechanical & Manufacturing Engineering	Mechanical Engineering Manufacturing Engineering Naval Architecture Electrical Engineering Electronics and Communications

Again, selection will be based on academic merit. A credit grade is normally a minimum requirement.

Other Qualifications
Applications from holders of other qualifications, including TAFE Certificates/Associate Diplomas other than those listed above, will be considered individually on merit. Special provisions exist for applicants aged 22 and over who have not matriculated.

Advice to Applicants
Schools of the Faculty will offer advice to applicants who have failed to reach the necessary standard for selection, on steps they might take to improve their prospects of admission in a future year.

Advanced Standing
Students who have pursued relevant studies at another tertiary institution may be admitted to a course with advanced standing and exempted from certain subjects. Holders of appropriate TAFE Certificates/ Associate Diplomas with results of high standard may also qualify for advanced standing. Extensive Industrial experience gained prior to admission may qualify a student for exemption from part of the Industrial Experience requirements.

Industrial Experience Requirements
To become eligible for the award of a degree, students must accumulate a substantial amount of industrial experience. This requirement is currently 144 weeks; from 1992 it will be 90 weeks. Credit weeks are awarded each year or semester on the basis of the duration, continuity, and appropriateness of the work experience undertaken. Each student is issued with an Industrial Experience Record Book which must be kept up-to-date and submitted regularly for review.

Industrial experience and academic study should progress approximately in step. Specifically at least 24 weeks of approved experience must be completed before a student may enrol in Stage 3 subjects. The nature of work experience considered appropriate varies with progression through the course: at Stage 1 level, a wider variety of forms of exposure to an industrial environment would be satisfactory; in the intermediate Stages, work of technical or advanced technical level is expected; and in the final stages, students should work in close association with professional engineers. Full details are contained in the Record Book issued by each School. The School of Mechanical Engineering further stipulates that at least 24 weeks' workshop or equivalent experience and at least 24 weeks' drawing or design office experience must be included and advises that workshop experience should be completed early in the course.

Honours
The Bachelors Degree may be awarded with First or Second Class Honours for meritorious performance in the course as a whole.

Professional Recognition
All Bachelor of Engineering courses offered by the faculty have been accorded recognition by The Institution of Engineers, Australia.

Corporate Membership of The Institution of Engineers, Australia
The Institution's requirement for corporate membership, in addition to a recognised Degree, is a minimum of three years of post-graduation experience of an approved nature in professional engineering employment. UTS graduates, in general, are likely to be able to meet this requirement without difficulty, since the industrial experience gained during their course equips them to undertake immediate professional responsibility.

The Institution's regulations also contain provision, in special cases, for industrial experience gained prior to graduation to be counted towards eligibility for corporate membership. This is normally rated at half-value and to a maximum of 12 months' reduction of the postgraduation requirement, and it is emphasised that the experience must be of a suitable nature. The Faculty of Engineering maintains close contact with the Institution on this and other matters, and will advise students whether their proposed experience appears likely to be considered by the Institution as counting towards a reduction in the postgraduation professional experience requirement. The Institution will also advise students directly in this regard: it is suggested, however, that the request for advice can best be made with Faculty support.

GRADUATE COURSES

Coursework programmes at Master degree level are offered in Local Government Engineering and Engineering Management. Research degrees - Master of Engineering and Doctor of Philosophy - are also available. Other graduate programmes include Graduate Diploma degrees in Engineering and in Local Government Engineering, as well as numerous short courses which are either non-award courses or

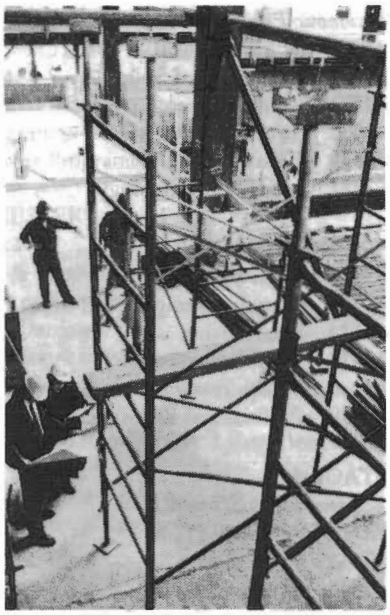
Graduate Certificate programmes. Information on the fees for graduate courses may be obtained from the UTS Information Service, or the Faculty Administrative Assistant, 20930 ext 9030.

Details of the Master of Engineering by coursework programmes available in each School appear under the appropriate School heading below. Details of Master of Engineering by thesis, Master of Engineering Management and Graduate Diploma in Engineering follow the School entries.

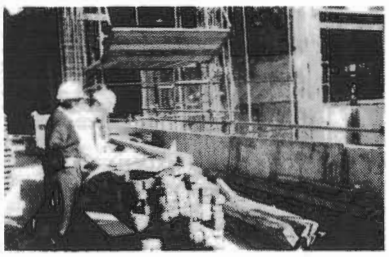
Application for admission to graduate programmes should be made directly to the University (refer also to General Rules for Masters Degrees and Graduate Diplomas).
Further details are available on enquiry.

Faculty of Engineering Location
The headquarters of the Faculty of Engineering is located on Level 4 of the Engineering Building, Broadway, and contains the following main offices:

	Room	Ext.
Dean of Engineering		
P.J. Parr	426	9272
Secretary		
Vacant	426	9160
Visiting Professor		
A. Pattison	424A	9404
Sub-Dean		
Vacant		
Administrative Officer		
D.J. Carraro	426A	9049
Director of Industrial Liaison		
J.G. Crowe	424B	9039
Administrative Assistant		
N. Muckle	433	9030
General Office		
P.J. Doyle (Part-time)		
M.R. Collison (Part-time)	433	9255
L.B.M. Smith		
Women in Engineering Co-ordinators		
E. Taylor (Part-time)	430	9399
V. Webber (Part-time)	430	9399



SCHOOL OF CIVIL ENGINEERING



Major changes to the structure of the Faculty's undergraduate courses will be introduced from the beginning of 1992. Please read the Notice to all new and re-enrolling engineering students on pages 10 and 11 of this handbook which outline the new course structure to be introduced in 1992.

The information which follows relates to the existing courses in Civil and Structural Engineering.

Civil Engineering covers a wide range of activities and specialisations including:

Structural Design	Geomechanics
Construction	Transportation
Public Health	Surveying
Water Resources Management	Materials
Hydraulics	Environmental Engineering

At UTS, the School of Civil Engineering presents formal academic programmes which cover many aspects of these specialisations. Students may choose to develop academic programmes in either Civil or Structural Engineering. Within each of these programmes specialist areas of interest may be developed through the selection of electives and an appropriate project in the final year of the course.

Bachelor of Engineering (Civil Engineering)

Part-Time Attendance Pattern

STAGE 1

Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33121	Engineering Mathematics 1A	3
63132	Engineering Physics (Civil)	3
43512	Civil Engineering Drawing	3
43511	Statics	3
SPRING SEMESTER		
33122	Engineering Mathematics 1B	3
63132	Engineering Physics (Civil)	3
43510	Introduction to Civil Engineering*	1.5
43513	Introduction to Computing*	1.5
62176	Basic Chemistry*	1.5
43518	Surveying 1	3
Industrial Requirements		
43999	Professional Experience	6

** Students take two of these three subjects depending on their background in Chemistry and computing.*

STAGE 2

Academic Requirements		
AUTUMN SEMESTER		
33221	Engineering Mathematics 2A	3
43521	Mechanics of Solids 1	3
62186	Engineering Chemistry (Civil)	4
43520	Introduction to Design	2
SPRING SEMESTER		
43524	Engineering Materials 1	3
43527	Timber Engineering	3
51121	Communications 1	3
43523	Computations 1	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 3

Academic Requirements		
AUTUMN SEMESTER		
43531	Mechanics of Solids 2	3
43533	Computations 2	2
43532	Structural Analysis 1	3
43539	Construction	2
62381	Engineering Geology	2
SPRING SEMESTER		
43535	Fluid Mechanics	3
43530	Concrete Design 1	3
43534	Steel Design	3
43536	Soil Mechanics	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 4

Academic Requirements		
AUTUMN SEMESTER		
43545	Hydraulics	3
43546	Soil Engineering	3
43540	Concrete Design 2	3
43548	Surveying 2	3
SPRING SEMESTER		
43547	Engineering Materials 2	3
43549	Project Planning	3
43542	Structural Analysis 2	3
43541	Environmental Engineering	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 5

Academic Requirements		
AUTUMN SEMESTER		
43554	Concrete Technology	3
43556	Geotechnical Design	2
43551	Public Health Engineering	2
43553	Computations 3	2
51151	Communications 2	3

		Hours/Week
SPRING SEMESTER		
43557	Steel Structures & Concept Design	4
43555	Hydrology and Water Resources	3
43559	Construction Contracts	2
	Elective	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 6
Academic Requirements

AUTUMN SEMESTER		
43	Project	3-6
43578	Financial Management	2
43579	Management for Engineers	2
	Electives Programme	5-2

SPRING SEMESTER		
43	Project	3-6
43568	Road & Transportation Engineering	3
	Electives Programme	6-3
Industrial Requirements		
43999	Professional Experience	6

Bachelor of Engineering (Civil Engineering)

Sandwich Attendance Pattern
The sandwich pattern is available in both the Autumn and Spring Semesters.

STAGE 1		Hours/Week
Academic Requirements		
33120	Engineering Mathematics 1	6
63131	Engineering Physics (Civil)	6
43511	Statics	3
43512	Civil Engineering Drawing	3
43518	Surveying 1	3
43510	Introduction to Civil Engineering*	1.5
43513	Introduction to Computing*	1.5
62176	Basic Chemistry*	1.5
Industrial Requirements		
43997	Professional Experience	6

**Students take two of these three subjects depending on their background in Chemistry and Computing.*

STAGE 2
Academic Requirements

33221	Engineering Mathematics 2A	3
62186	Engineering Chemistry (Civil)	4
43521	Mechanics of Solids 1	3
43527	Timber Engineering	3
43524	Engineering Materials 1	3
51121	Communication 1	3
43520	Introduction to Design	2
43523	Computations 1	3
Industrial Requirements		
43997	Professional Experience	6

STAGE 3
Academic Requirements

43535	Fluid Mechanics	3
43536	Soil Mechanics	3
43531	Mechanics of Solids 2	3
43532	Structural Analysis 1	3
43530	Concrete Design 1	3
43534	Steel Design	3
43539	Construction	2
43533	Computations 2	2
62381	Engineering Geology	2
Industrial Requirements		
43997	Professional Experience	6

STAGE 4
Academic Requirements

43545	Hydraulics 3	
43546	Soil Engineering	3
43547	Engineering Materials 2	3
43542	Structural Analysis 2	3
43540	Concrete Desig	2
43548	Surveying 2	3
43549	Project Planning	3
43541	Environmental Engineering	3
Industrial Requirements		
43997	Professional Experience	6

STAGE 5
Academic Requirements

43555	Hydrology and Water Resources	3
43556	Geotechnical Design	2
43551	Public Health Engineering	2
43557	Steel Structures & Concept Design	4
43554	Concrete Technology	3
43553	Computations 3	2
43559	Construction Contracts	2
51151	Communications 2	3
	Elective	3
Industrial Requirements		
43997	Professional Experience	6

STAGE 6
Academic Requirements

43	Project	6-12
43568	Road & Transportation Engineering	3
43578	Financial Management	2
43579	Management for Engineers	2
	Electives	12-6
Industrial Requirements		
43997	Professional Experience	6

Bachelor of Engineering (Structural Engineering)

Part-Time Attendance Pattern

STAGE 1

Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33121	Engineering Mathematics 1A	3
63132	Engineering Physics (Civil)	3
43512	Civil Engineering Drawing	3
43511	Statistics	3
SPRING SEMESTER		
33122	Engineering Mathematics 1B	3
63132	Engineering Physics (Civil)	3
43510	Introduction to Civil Engineering*	1.5
43513	Introduction to Computing*	1.5
62176	Basic Chemistry*	1.5
43518	Surveying 1	3
Industrial Requirements		
43999	Professional Experience	6

**Students take two of these three subjects depending on their background in Chemistry and Computing.*

STAGE 2

Academic Requirements		
AUTUMN SEMESTER		
33221	Engineering Mathematics 2A	3
43521	Mechanics of Solids 1	3
62186	Engineering Chemistry (Civil)	4
43520	Introduction to Design	2
SPRING SEMESTER		
43524	Engineering Materials 1	3
43527	Timber Engineering	3
51121	Communications 1	3
43523	Computations 1	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 3

Academic Requirements		
AUTUMN SEMESTER		
43531	Mechanics of Solids 2	3
43533	Computations 2	2
43532	Structural Analysis 1	3
43539	Construction	2
62381	Engineering Geology	2
SPRING SEMESTER		
43535	Fluid Mechanics	3
43530	Concrete Design 1	3
43534	Steel Design	3
43536	Soil Mechanics	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 4

Academic Requirements		
AUTUMN SEMESTER		
43553	Computations	3
43540	Concrete Design 2	3
43641	Approximate Methods in Structural Analysis	2
43640	Structural Testing	2
43250	Foundation Engineering	3
SPRING SEMESTER		
43542	Structural Analysis 2	3
43549	Project Planning	3
43547	Engineering Materials 2	3
51151	Communications 2	3
Industrial Requirements		
43999	Professional Experience	6

STAGE 5

Academic Requirements		
AUTUMN SEMESTER		
43554	Concrete Technology	3
43650	Finite Element Analysis	2
43652	Dynamics of Structures	2
43653	Concrete Design 3	3
43654	Timber Design	2
SPRING SEMESTER		
43557	Steel Structures & Concept Design	4
43559	Construction Contracts	2
43651	High-Rise Buildings	4
	Elective/Project*	2
Industrial Requirements		
43999	Professional Experience	6

STAGE 6

Academic Requirements		
AUTUMN SEMESTER		
43	Project*	3
43660	Bridge Design	3
43661	Structural Stability	2
43578	Financial Management	2
43579	Management for Engineers	2

		Hours/Week
SPRING SEMESTER		
43	Project*	0-6
43662	Design Project	6
	Electives	6-0
Industrial Requirements		
43999	Professional Experience	6

**Total length of Project to be between 4 and 10 hours per week over up to 3 semesters.*

Bachelor of Engineering (Structural Engineering)

Sandwich Attendance Pattern

The sandwich pattern is available in both the Autumn and Spring Semesters.
To complete the course students may have to take a portion of the course in the part-time attendance pattern.

STAGE 1

Academic Requirements		*Hours/Week*
33121	Engineering Mathematics 1	6
63131	Engineering Physics (Civil)	6
43511	Statics	3
43512	Civil Engineering Drawing	3
43518	Surveying 1	3
43510	Introduction to Civil Engineering*	1.5
43513	Introduction to Computing*	1.5
62176	Basic Chemistry*	1.5
Industrial Requirements		
43997	Professional Experience	6

**Students take two of these three subjects depending on their background in Chemistry and Computing.*

STAGE 2

Academic Requirements		
33221	Engineering Mathematics 2A	3
62186	Engineering Chemistry (Civil)	4
43521	Mechanics of Solids 1	3
43527	Timber Engineering	3
43524	Engineering Materials 1	3
51121	Communication 1	3
43520	Introduction to Design	2
43523	Computations 1	3
Industrial Requirements		
43997	Professional Experience	6

STAGE 3

Academic Requirements		*Hours/Week*
43535	Fluid Mechanics	3
43536	Soil Mechanics	3
43531	Mechanics of Solids 2	3
43532	Structural Analysis 1	3
43530	Concrete Design 1	3
43534	Steel Design	3
43539	Construction	2
43533	Computations 2	2
62381	Engineering Geology	2
Industrial Requirements		
43997	Professional Experience	6

Electives Programme
Elective subjects are common to the Civil and Structural Engineering degree programmes. The availability of a particular Elective is determined at the beginning of each semester.

43159	Geomechanics Elective
43169	Construction Method Elective
43171	Road Materials Elective
43172	Engineering Materials Elective
43173	Computerised Structural Analysis Elective
43175	Concrete Technology Elective
43176	Regional Planning Elective
43178	Water Engineering Elective
43179	Railway Engineering Elective
43193	Public Health Elective
43194	Welding Elective
43195	Advanced Welding Elective
43271	Site Design Elective
43275	Reinforced Concrete Structures Elective
43276	Land Development Elective
43277	Prestressed Concrete Structures Elective
43278	Introduction to Finite Element Analysis Elective
43316	Prestressed Concrete Design Elective
43319	Coastal Engineering
43561	Bridges
43563	Soil Engineering Design
43564	Timber Structures
43565	Urban Drainage Design
43566	Water Engineering Design
43562	Dams
43650	Finite Element Analysis
43670	Risk & Reliability Analysis

Graduate Diploma in Local Government Engineering

This course has been designed for professional engineers practising in the field of local government. The course gives an opportunity for people to study in depth, and at a professional level, the special factors necessary for the proper function of local government engineering.

Since the completion of this course will satisfy the academic requirements of the Certificate in Local Government Engineering, it will provide senior personnel with the necessary technical and administrative skills appropriate to the duties of the local government engineer.

Duration and Attendance Patterns
The course is offered, subject to resource allocation, on a part-time and/or block release pattern of study. The block release pattern is designed to accommodate the special problems of students who live in the country enrolling in the course.

The normal attendance pattern is based on two subjects per semester requiring a minimum of four semesters to complete the course.

The block release pattern of study currently consists of three sessions per semester in Sydney at the University. Each session involves three days of full-time attendance, covering two subjects per semester.

Admission Requirements
Engineers wishing to enter the course must either possess a Bachelors degree in Civil Engineering or Structural Engineering or hold an equivalent qualification acceptable to The Institution of Engineers, Australia.

In special circumstances engineers who do not possess a degree (or equivalent) will be admitted to the programme if they can submit evidence of general and professional qualifications and experience which will satisfy the Faculty that they possess the educational preparation and capacity to pursue graduate studies.

Enquiries
Further information may be obtained by telephoning Dr K Sproats, Director of Local Government Engineering, on (02) 20930 extension 9186 or the Faculty Administrative Assistant on extension 9030.

Course Structure		*Hours/Week*
43401	Environmental Planning	3
43402	Traffic and Transportation	3
43403	Management and Industrial Relations	3
43404	Asset Maintenance Management	3
43405	Water and Sewerage Systems Operations	3
43406	Roads and Streets	3
43407	Water Engineering	3
43408	Powers, Duties and Financial Management in Local Government Engineering	3

Master of Engineering (Local Government)

The purpose of this course is to provide qualified Civil Engineers and related professionals with technical, management and administrative skills required at senior levels of Local Government. The course is administered by the School of Civil Engineering and draws upon the resources of the Faculties of Engineering and Business. Where appropriate, external specialists supplement the Faculty's existing resources.

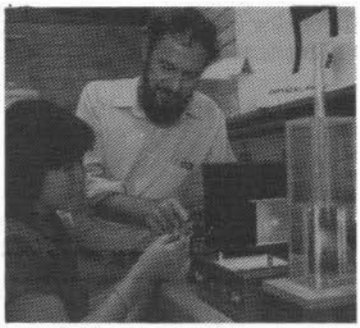
However, as this course is undergoing a significant review, further details are not yet available. Please direct any enquiries to the Faculty Administrative Assistant, on (02) 20930 extension 9030, or Dr Kevin Sproats, Director of Local Government Studies, on extension 9186.

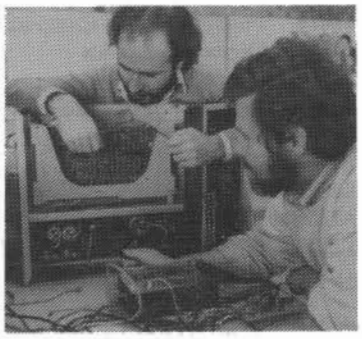
Staff and Location of Facilities

The School of Civil Engineering is located in the Engineering Building (Building 2) on Broadway. The School's headquarters and academic staff offices are on Level 5. Laboratories and teaching rooms are on Levels 5, 2, and 1.

The names, office locations and professional interests of academic and senior non-academic staff are listed below. The University's telephone number is 20930 and staff can be reached at the extension numbers given below. Messages may be left, either personally or by telephone, at the School Office. Emergency contact with staff or students may be made outside normal hours through the Security Officer, the Tower Building, on 218-9316 or 218-9159.

	Room	Ext.
Professor of Civil Engineering and Head of School		
Professor S.L. Bakoss		
Structural Mechanics	511C	9192
Deputy Head of School		
Mr E.A. Brady		
Surveying	511A	9152
Professor of Civil Engineering		
Professor K.A. Faulkes	426B	9272
Associate Professors		
Mr T.A. Anderson	521	9171
Construction		
Dr M.R. Hausmann	527	9186
Soil Engineering		
Dr G.G. O'Loughlin	503	9110
Water Engineering		
General Office Enquiries	511	9149
Academic Staff		
Dr H.W. Chung	519	9168
Construction Materials		
Dr J.W. Ivering	529	9151
Civil Engineering Design		
Dr M.R. Karim		9217
Structural Mechanics		
Dr K.L. Lai		9143
Design and Construction		
Mr P.C. Liu	508	9123
Civil Engineering Design		
Dr S. Parsanejad	504	9110
Design of Steel Structures		
Dr M. Patarapanich	524	9176
Water Engineering		
Mr W.G. Peters	518	9168
Civil Engineering Design		
Dr R. Sri Ravindrarajah	509	9143
Concrete Technology		
Dr G.L. Ring	506	9217
Soil Engineering		
Dr A. Saleh	525	9176
Structural Mechanics		
Dr B. Samali	513	9157
Structural Dynamics and Structural Mechanics		
Dr S. Vigneswaran	523	9174
Environmental Engineering		
Non-Academic Staff		
Mrs L. Venglinsky	511	9149
Secretary to Head of School		
B. Blakeway	511B	9149
Office Manager		
Mrs S. Ali	511	9149
General Secretary		
Mr M.J. Taragel	114C	9003
Engineer-in-Charge		
Mr I.A. Hutchings	116J	9027
Engineer		
Mr D.A. Tapner	116K	9022
Engineer		
Mr A. Lah	252	9698
Engineer		
Mr P. Mathai 1	02B	9001
Senior Technical Officer Materials Testing		
Mr J. Holmes	116L	9020
Senior Technical Officer		
Mr H. Hefka	116L	9019
Technical Officer		
Mr H. Myers	1/2A253	9666
Senior Laboratory Craftsman		
Mr L. Slade	1/2A253	9666
Senior Laboratory Craftsman		
Mr J. McMahon		9095
Technical Officer		
Mr M. Benitez		9002
Technical Officer		
Mr S.E. Gabor	205B	9096
Stores Officer		





SCHOOL OF ELECTRICAL ENGINEERING

Major changes to the structure of the Faculty's undergraduate courses will be introduced from the beginning of 1992. Please read the Notice to all new and re-enrolling engineering students on pages 10 and 11 of this handbook which outline the new course structure to be introduced in 1992.

The information which follows relates to the existing courses in Electrical and Computer Systems Engineering.

The School offers two Bachelor courses: Electrical Engineering and Computer Systems Engineering. The first two stages of the courses are common and all students enrol initially in Electrical Engineering. Transfer to Computer Systems Engineering at the end of Stage 2 will be based on academic merit and employment prospects. For Computer Systems Engineering, at least 48 weeks of the total of 144 weeks of industrial experience must be in the Computer Systems Engineering field.

The Electrical Engineering course prepares students for a career in three main areas: electrical power, electronic instrumentation and control, and electrical communications. The Computer Systems Engineering course prepares students for a career in the application of computers for engineering purposes such as industrial control, data acquisition, storage, retrieval and transmission, or computer-aided design and manufacture.

An engineer is required to be open-minded in considering problems and very objective in the execution of a task once it has been planned. As engineering is directed essentially towards satisfying people's needs, it is necessary for engineers to fully appreciate the social, environmental and economic impacts of their work.

The last two decades have seen dramatic advances in the technology of Electrical Engineering, the impact of which is just beginning to be felt. Professional engineers use the fundamental knowledge gained in a degree course as a guide through whatever further changes in technology will take place during their professional life.

Most engineering activities are of sufficient magnitude to involve the efforts of teams of people. This makes it important that the individual engineer can work effectively as part of a large team of engineers or other professionals. Understanding and acceptance of discipline, management and leadership qualities and competence in written and spoken communication are essential. Electrical engineers are employed by electrical manufacturing companies and public utilities, and in research, development and consulting. There is an increasing tendency for electrical engineers to be concerned with industries with a non-electrical product: communications, patents, education, government, banking, process industries, agriculture, mining, medical electronics, and service industries such as control of gas, oil and water distribution, the movement of rail or road traffic and computer facilities.

The Computer Systems Engineering course has been introduced in response to this trend, and to fill an obvious gap in available courses.

Bachelor of Engineering (Electrical Engineering)

Part-Time Attendance Pattern

STAGE 1

Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33120	Engineering Mathematics 1	6
63113	Engineering Physics (Electrical)	6
SPRING SEMESTER		
41613	Electrical Engineering Principles	6
41614	Fundamentals of Computing	3
41615	Digital Electronics	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 2

Academic Requirements		
AUTUMN SEMESTER		
33220	Engineering Mathematics 2	6
41622	Microcomputer Engineering	6
SPRING SEMESTER		
63734	Materials Technology	3
41623	Field Theory	3
41624	Network Theory	3
41625	Engineering Communication	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 3

Academic Requirements		
AUTUMN SEMESTER		
41631	Electromagnetics	3
41632	Electronic Devices & Circuits	6
41633	Engineering Statistics	3
SPRING SEMESTER		
41742	Signal Theory	3
63152	Materials Physics	3
41634	Continuous and Discrete Systems	6
Industrial Requirements		
41999	Professional Experience	6

		Hours/Weeks
STAGE 4		
Academic Requirements		
AUTUMN SEMESTER		
41641	Numerical Methods	3
41646	Transmission Lines & Filters	3
41643	Analogue Electronics	6
SPRING SEMESTER		
41647	Electromagnetic Wave Theory	3
41642	Planning Methods	3
41645	Power Apparatus & Systems	6
Industrial Requirements		
41999	Professional Experience	6

At this point the student must choose an area of specialisation:

Telecommunications Strand

STAGE 5		
Academic Requirements		
AUTUMN SEMESTER		
63155	Communications Physics	3
41673	Signal Processing	3
41675	Digital Transmission	3
41676	Communications Engineering	3
SPRING SEMESTER		
41677	Communications Systems	6
42195	Physical Design & Production	3
41678	Data Communications	3
41594	Communications Networks	3
Industrial Requirements		
41999	Professional Experience	6
STAGE 6		
Academic Requirements		
AUTUMN SEMESTER		
41	Professional Electives	9
42195	Physical Design and Production	3
SPRING SEMESTER		
41666	Electrical Engineering Project	6
41667	Systems Engineering	3
51	Social Science Elective	3
Industrial Requirements		
41999	Professional Experience	6

Instrumentation & Control Strand

STAGE 5		
Academic Requirements		
AUTUMN SEMESTER		
41673	Signal Processing	3
41681	Digital System Design	3
41682	Analogue & Digital Control	6
SPRING SEMESTER		
41	Professional Elective	3
42195	Physical Design & Production	3
41753	Data Acquisition & Distribution	6
Industrial Requirements		
41999	Professional Experience	6
STAGE 6		
Academic Requirements		
AUTUMN SEMESTER		
41	Professional Electives	6
41683	CAD of Electronic Circuits	3
	or	
41685	Principles of VLSI Design	3
	plus	
41684	Multivariable & Adaptive Control	3
SPRING SEMESTER		
41666	Electrical Engineering Project	6
41667	Systems Engineering	3
51	Social Science Elective	3
Industrial Requirements		
41999	Professional Experience	6

Power & Machines Strand

STAGE 5		
Academic Requirements		
AUTUMN SEMESTER		
42195	Physical Design & Production	3
41	Professional Electives	9
SPRING SEMESTER		
41691	Power Circuit Theory	3
41692	Dynamics of Electrical Machines	3
41693	Power Equipment Design	3
41694	Power Electronics	3
Industrial Requirements		
41999	Professional Experience	6
STAGE 6		
Academic Requirements		
AUTUMN SEMESTER		
63154	Electric Power Generation	3
41695	Power Systems Analysis & Protection	6
41696	Electrical Variable Speed Drives	3

(Note: A 3 s.h. professional elective may be substituted for Electrical Variable Speed Drives if Analogue & Digital Control (6 s.h.) is taken as the other 6 s.h. of Professional Electives)

SPRING SEMESTER

41667	Systems Engineering	3
41666	Electrical Engineering Project	6
51	Social Science Elective	3
Industrial Requirements		
41999	Professional Experience	6

Sandwich Attendance Pattern

The course programme for Sandwich attendance is identical except that all academic subjects of one Stage are normally taken in one semester. In Stages 5 and 6, the Sandwich academic semester is confined to the Autumn; in other Stages of the Electrical Engineering course, students may choose either Autumn or Spring.

Electrical Engineering Elective Subjects
Over half the subjects to be taken by students in Stages 5 and 6 of the course are determined by the choice of one of three programme strands offered - Power and Machines, Instrumentation and Control, and Telecommunications. Students take 24 semester hours of stranded material in addition to a six semester hour project relevant to the field of their choice. Another nine semester hours of free-choice electives typically selected from other strands or the Computer Systems Engineering course are also undertaken. Students wishing to undertake a Computing Strand should first consult with Associate Professor C.E. Peterson.

Subjects preferred by large numbers of senior students (and taken as electives), will be available each semester, but others will be available in two or three out of every four semesters. For students who complete their studies under a standard Sandwich attendance pattern, full Stage 5/6 programmes in each strand will be guaranteed by the School for one (Autumn) semester only in any year. Standard part-time students will not be restricted in any way by timetables. Detailed information on electives is given in the School Handbook. In addition, there are three electives as follows:

41359 Rehabilitation Engineering
41369 Bioelectronics
41601 Microelectronic Technologies

Bachelor of Engineering (Computer Systems Engineering)

Part-Time Attendance Pattern
Students initially enrol in the Electrical Engineering course and may apply for the Computer Systems Engineering course at the end of Stage 2. Selection will be based on academic performance and industrial experience prospects. At least 48 weeks of the required 144 weeks of industrial experience must be related to Computer Systems Engineering.

The course programme is exactly the same in Stages 1 and 2 as that for Electrical Engineering, and is offered on either a part-time or sandwich basis.

Computer Systems Engineering sandwich students in Stages 3-6 are confined to an Autumn academic semester except where common subjects are offered in Electrical Engineering for the Spring semester.

STAGE 1

Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33120	Engineering Mathematics 1	6
63113	Engineering Physics (Electrical)	6
SPRING SEMESTER		
41613	Electrical Engineering Principles	6
41614	Fundamentals of Computing	3
41615	Digital Electronics	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 2

Academic Requirements		
AUTUMN SEMESTER		
33220	Engineering Mathematics 2	6
41622	Microcomputer Engineering	6
SPRING SEMESTER		
63734	Materials Technology	3
41623	Field Theory	3
41624	Network Theory	3
41625	Engineering Communication	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 3

Academic Requirements		
AUTUMN SEMESTER		
33131	Discrete Mathematics	3
41732	Operating Systems	6
41633	Engineering Statistics	3

		Hours/Week
SPRING SEMESTER		
41632	Electronic Devices and Circuits	6
41634	Continuous and Discrete Systems	6
Industrial Requirements		
41999	Professional Experience	6

STAGE 4

Academic Requirements

AUTUMN SEMESTER		
33141	Database Structure and Management	3
41742	Signal Theory	3
41746	Digital Systems	3
41747	Software Engineering & Languages	3
SPRING SEMESTER		
41641	Numerical Methods	3
41643	Analogue Electronics	6
41642	Planning Methods	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 5

Academic Requirements

AUTUMN SEMESTER		
41758	Computer Aided Engineering	3
41752	Electromechanical Systems	3
41756	Computer Integrated Systems	3
42157	Robots and Flexible Manufacturing	3
SPRING SEMESTER		
41755	Computer Networks	3
41753	Data Acquisition and Distribution Systems	6
41751	Data Communications	3
Industrial Requirements		
41999	Professional Experience	6

STAGE 6

Academic Requirements

AUTUMN SEMESTER		
417	Professional Electives	6
31163	Knowledge Based Systems	3
41764	Industrial Systems Design	3
SPRING SEMESTER		
51	Social Science Elective	3
41766	Thesis	6
41667	Systems Engineering	3
Industrial Requirements		
41999	Professional Experience	6

The professional electives, subject to quotas, may be chosen from Electrical Engineering professional electives or strand subjects, or from other schools. It is also possible to select a business or law subject as a Social Science Elective, so that a suite of nine hours of business or law subjects may be taken (e.g. suites in Applied Psychology, Industrial Relations, Personnel Management, Accounting, Marketing, Company Law).

Staff and Location of Facilities

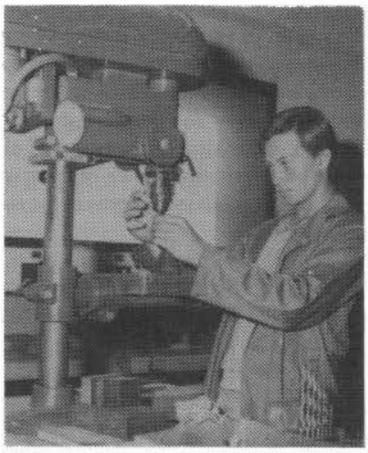
The School of Electrical Engineering is located in the Tower Building on Broadway, occupying levels 18 to 25 together with specialist laboratories on levels 9 and 22. The School's headquarters is on level 24.

The names, office locations, and professional interests of academic and selected non-academic staff members are given below. The University's telephone number is 20930 and staff can be reached at the extensions given below. Each staff member publishes times of availability for consultation with students on his or her office door. Messages for staff may be left, either personally or by telephone at the School General Office. Emergency contact with staff or students may be made outside normal hours via the Security Officer, Building 1, on 218-9316 or 218-9159.

	Room	*Ext.*
Head of School		
Professor K.W. Yates Communication System Theory, Signal Processing, Antennas and Propagation, Electromagnetic Compatibility, Filter Design	2427	9300
Mr R. Beilinson Software Testing, Software Engineering, Human Factors in Software	2227	9379
General Office		
Enquiries	2425	9360
Academic Staff		
Mr T. Aubrey Analogue Electronics Communications Systems Microwave Electronics	2434	9408
Associate Professor G.E. Beard Satellite Communication Systems, UHF, VHF and Microwave Electronics, Electrical Instrumentation, Analogue Electronics	2419B	9391
Professor W.R. Belcher Antennas, Microwave Systems, Communication Systems, Systems Engineering, Computer Aided Engineering	2419C	9397

	Room	*Ext.*
Associate Professor P. Bryce Microhydroelectricity, Appropriate Technology, Fibre Optic Communications, Electromagnetic Theory	2429	9331
Dr T. Buczkowska Microcomputer System Design, Software Engineering, Computer Networks, Data Communications	2420A	9321
Dr J.D.D. Carmo Electromagnetics, Reliability Theory, Numerical Methods and Optimisation	1920	9392
Mr N.J. Carmody Microcomputer System Design, Operating Systems, Computer Architecture, VLSI, Digital Control Systems	2221B	9381
Professor C. Drane Satellite Positioning Systems, Multimedia Telecommunications, Software Engineering	2221A	9394
Mr K.K. Fung Parallel Processing, Software Engineering	2225	9299
Mr G.I. Gedgovd Power Systems, Computer Applications, Operations Research, Numerical Methods and Optimisation, Education Research and Co-operative Education	2420E	9390
Dr A. Ginige Digital Systems, Systems Engineering, Image Processing, Real Time Systems, Computer Networks, Rehabilitation Engineering	2224	9384
Mr W.G. Hooper Power Systems, Electromagnetic Theory, Educational Psychology, Electrical Plant Design	2420B	9293
Dr S.Y.R. Hui Power Electronics, Computer Modelling, Electrical Machines		9079
Mr J.R.M. Leaney System Engineering, Software Engineering, Computer System Design, Real Time Computing, Microprocessor Based Instrumentation, Industrial Control	2221A	9320
Dr V. Ramaswamy Power Electronics, Electrical Machines, Computer Systems	2420D	9293
Assoc Prof H.T. Nguyen Control Systems Theory, Power Electronics, Control Theory, Instrumentation, Machine Control, Production Processes, Real Time Signal Processing, Computer Simulation, Computer Systems		9292
Dr J.G. Nicol Control Theory, Optimal Control, Multivariable Control	2420C	9294
Assoc Prof C.E. Peterson Computer Integrated Manufacturing, Image Analysis, Process Control, Robotics, Artificial Intelligence	2222	9380
Assoc Prof V.S. Ramsden Electrical Machines, Electrical Variable Speed Drives, Rehabilitation Engineering, Field Theory, Electromagnetics	2428	9295
Assoc Prof S. Riesenfeld Communication Systems, Satellite Communication, Information Theory, Modulation Channel Coding, Synchronisation	2512B	9298
Dr B.S. Rodanski Device Modelling for CAD, Numerical Methods, Computer-Aided Design, Software Engineering	2545	9474
Dr A. Seneviratne Data Communications, Protocol Design, Software Engineering, Computer Networks	2431	9595
Mr T. Stevenson Signal Processing, Communication Systems, Electromagnetics	2430	9395
Dr P.J. White Antennas and Propagation Microwave and RF Circuit Design Analogue Electronics	2512A	9333
Industrial Training Advisors		
Dr G.E. Beard		
Mr G.I. Gedgovd		
Selected Non-Academic Staff		
Mrs E. With Office Manager	2424	9360
Mr W.A. Symons Vax Computer Manager	2210B	9332

	Room	*Ext.*
Mr J.B. Vagg Laboratory Manager	2542	9371
Mr P.D. Cooper Engineer (Telecommunications)	2520	9391
Mr W.M. Holliday Engineering (P & M)	1814	9410
Mr P. Mallon Engineer (CSE)	2210C	9382
Mr R. Nicholson Engineer (Instrumentation & Control)	2118	9154
Mr A.C. Curgenven Senior Technical Officer Power and Machines	2021	9372
Mr G. Evans Senior Technical Officer Communications	2313	9388
Mr S.Y. Shoon Engineer	2514	9338
Mr L. Weber Senior Technical Officer, Instrumentation & Control	2520D	9594
Mr R. Moore Senior Technical Officer, Mechanical Workshop	2033	9375



SCHOOL OF MECHANICAL ENGINEERING

Major changes to the structure of the Faculty's undergraduate courses will be introduced from the beginning of 1992. Please read the Notice to all new and re-enrolling engineering students on pages 10 and 11 of this handbook which outline the new course structure to be introduced in 1992.

The information which follows relates to the existing courses in Mechanical and Manufacturing Engineering.

Mechanical Engineering covers a wide spectrum of engineering activities.

Mechanical Engineers are involved in the design of mechanical plant, in the supervision of its construction, operation and maintenance, in the planning and supervision of large engineering projects, in sales and in management.

Equipment, for which the mechanical engineer is responsible, is used in ever-widening fields of application, including power generation, transport, materials handling, process control, manufacture of machines and consumer goods, mining and textile industries, printing and agriculture.

The profession provides opportunity for specialisation in a number of fields such as design, analysis of mechanisms, energy, control, manufacturing and management. Most students in the School seek to graduate in *Mechanical Engineering*. However, students who specialise in manufacturing engineering and management may graduate in *Manufacturing Engineering*.

Manufacturing Engineers evaluate and improve production design and production methods to eliminate unnecessary manufacturing costs. They design or redesign machines and processes for efficient production. They require a working knowledge of economic principles and human relations, and may be concerned with production design and work study, operations research, systems engineering, quality control or production planning. Whatever their particular interest, they must be both production conscious and cost conscious and because of this dual orientation, they may well find management opportunities open to them.

Undergraduate Degree Courses in Mechanical and Manufacturing Engineering

The degrees of Mechanical and Manufacturing Engineering are currently six years duration, and are offered by the School either on a part-time or sandwich course basis over six progressive stages. The normal sandwich programme entails 24 class contact hours per week and 12 class contact hours per week for those undertaking the part-time programme.

Students undertake a common core of subjects at the end of which an approved social science elective subject and seven approved professional elective subjects are selected. Of these seven professional elective subjects, students taking the degree of BE in Manufacturing Engineering shall complete the four nominated Manufacturing and Management subjects. All other students will graduate with the degree of BE in Mechanical Engineering.

Examples of professional elective subjects and the nominated manufacturing and management subjects are listed below. This list may be amended from time to time to allow for changing demand and technology. Students may also select approved elective subjects from other schools at UTS or from other tertiary institutions. Advisor approval for electives is necessary.

ELECTIVE SUBJECTS

Nominated Manufacturing and Management Subjects

42054 Contract Engineering
42055 Engineering Economics
42252 Quality & Reliability
42255 Production and Cost Control

Applied Mechanics and Design

42354 Materials Handling
42357 Industrial Design
42652 Solid Mechanics 3
42653 Kinematics & Dynamics of Machines

Energy & Control

42456 Refrigeration & Air Conditioning
42457 Power Cycles & Fluid Machines (was Power Cycles)
42552 Advanced Engineering Computing
42569 Control Engineering 2

Ungrouped Electives

42163 Ergonomics
42263 Computer Aided Manufacturing (CAD/CAM)
42351 Structures
42655 Finite Element Applications

Social Science electives are offered by the Faculty of Social Sciences. Details of subjects and their availability each semester can be obtained from the Faculty of Social Sciences.

COURSE PROGRAMMES

Mechanical Engineering Degree

Part-Time Attendance Pattern

STAGE 1

Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33121	Engineering Mathematics 1A	3
63117	Engineering Physics (Mechanical)	3
42612	Mechanical Engineering Analysis	6
SPRING SEMESTER		
33122	Engineering Mathematics 1B	3
42312	Engineering Graphics	3
62171	Engineering Chemistry	6
Industrial Requirements		
42999	Professional Experience	6

STAGE 2

Academic Requirements		
AUTUMN SEMESTER		
33221	Engineering Mathematics 2A	3
42022	Communication	3
42621	Mechanics 2	3
63704	Materials Engineering 1	3
SPRING SEMESTER		
42529	Computer Programming	3
63127	Electrical Engineering 1 (Mechanical)	3
42226	Manufacturing Processes 1	3
42429	Fluid Mechanics	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 3

Academic Requirements		
AUTUMN SEMESTER		
42032	Engineering and Society	3
42631	Mechanics 3	3
41299	Electrical Engineering 2 (Mechanical)	3
42439	Thermodynamics	3
SPRING SEMESTER		
33222	Engineering Mathematics 2B	3
42238	Engineering Statistics	3
42237	Manufacturing Processes 2	3
42632	Solid Mechanics 1	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 4

Academic Requirements		
AUTUMN SEMESTER		
42549	Numerical Analysis	3
42643	Dynamics of Mechanical Systems	3
42642	Solid Mechanics 2	3
42340	Design 1	3
SPRING SEMESTER		
42041	Engineering Management	3
42449	Thermofluids	3
42644	Materials Engineering 2	3
42641	Mechanics of Machines	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 5

Academic Requirements		
AUTUMN SEMESTER		
42350	Design 2	3
42558	Measurements and Instrumentation	3
	Professional Elective 1	3
	Professional Elective 2	3
SPRING SEMESTER		
42459	Heat Transfer	3
42559	Control Engineering 1	3
42359	Project 1	3
	Professional Elective 3	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 6

Academic Requirements		
AUTUMN SEMESTER		
42360	Design 3	3
42368	Project 2	3
	Professional Elective 4	3
	Professional Elective 5	3
SPRING SEMESTER		
42368	Project 2	3
	Social Science Elective*	3
	Professional Elective 6	3
	Professional Elective 7	3
Industrial Requirements		
42999	Professional Experience	6

*Subjects offered by the Faculty of Social Sciences.

Table 1 - Course Structure

STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6
Engineering Graphics 42312	Manufacturing Processes 1 42226	Manufacturing Processes 2 42237	Design 1 42340	Design 2 42350	Design 3 42360
Engineering Physics (Mech) 63117	Communication 42022	Engineering & Society 42032	Dyn. of Mech. Systems 42643	Measurement & Instrmntn. 42558	Social Science Elective
Mechanical Engineering Analysis 42612 6 s.h.	Electrical Eng. 1 (Mech.) 63127	Electrical Eng. 2 (Mech.) 41299	Engineering Management 42041	Control Engineering 1 42559	Professional Elective 4
	Mechanics 2 42621	Mechanics 3 42631	Mechanics of Machines 42641	Professional Elective 1	Professional Elective 5
Engineering Chemistry 62171 6 s.h.	Fluid Mechanics 42429	Thermo-dynamics	Thermofluids 42449	Heat Transfer 42459	Project 2 42369 6 s.h.
	Materials Engineering 1 63704	Solid Mechanics 1 42362	Solid Mechanics 2 42642	Project 1 42359	
Engineering Mathematics 1* 33120 6 s.h.	Engineering Mathematics 2A 33221	Engineering Statistics 42238	Materials Engineering 2 42644	Professional Elective 2	Professional Elective 6
	Computer Programming 42529	Engineering Mathematics 2B 33213	Numerical Analysis 42549	Professional Elective 3	Professional Elective 7

- Each single-line block represents three hours per week for one semester (3 sh).
- The subject Professional Experience - PT (2 x 3 sh) 42999: SW (1 x 6 sh) 42997 - must be undertaken concurrently with the academic programme. At present 144 weeks are required to graduate.
- Each student selects seven approved professional electives.
- For the MANUFACTURING B.E. degree, students complete four nominated Manufacturing and Management subjects in their seven professional electives.
- Engineering Maths 1 may be replaced by Engineering Maths 1A (33121) and Engineering Maths 1B (33122) (each 3 sh); Engineering Maths 1A is a prerequisite for Engineering Maths 1B.

Mechanical Engineering Degree

Sandwich Attendance Pattern

The sandwich programme is available in both Autumn and Spring Semesters.

STAGE 1		*Hours/Week*
Academic Requirements		
33120	Engineering Mathematics 1	6
62171	Engineering Chemistry	6
42612	Mechanical Engineering Analysis	6
42312	Engineering Graphics	3
63117	Engineering Physics	3
Industrial Requirements		
42997	Professional Experience	6

STAGE 2		
Academic Requirements		
33221	Engineering Mathematics 2A	3
42529	Computer Programming	3
42621	Mechanics 2	3
42022	Communication	3
63704	Materials Engineering 1	3
42226	Manufacturing Processes 1	3
63127	Electrical Engineering 1 (Mechanical)	3
42429	Fluid Mechanics	3
Industrial Requirements		
42997	Professional Experience	6

STAGE 3		
Academic Requirements		
42237	Manufacturing Processes 2	3
42032	Engineering and Society	3
41299	Electrical Engineering 2 (Mechanical)	3
42631	Mechanics 3	3
42439	Thermodynamics	3
42632	Solid Mechanics 1	3
42238	Engineering Statistics	3
33222	Engineering Mathematics 2B	3
Industrial Requirements		
42997	Professional Experience	6

STAGE 4		
Academic Requirements		
42549	Numerical Analysis	3
42340	Design 1	3
42642	Solid Mechanics 2	3
42643	Dynamics of Mechanical Systems	3
42041	Design 1	3
42449	Thermofluids	3
42644	Materials Engineering 2	3
42641	Mechanics of Machines	3
Industrial Requirements		
42997	Professional Experience	6

STAGE 5		*Hours/Week*
Academic Requirements		
42350	Design 2	3
42558	Measurements and Instrumentation	3
42559	Control Engineering 1	3
	Professional Elective 1	3
42459	Heat Transfer	3
	Professional Elective 2	3
42359	Project 1	3
	Professional Elective 3	3
Industrial Requirements		
42997	Professional Experience	6

STAGE 6		
Academic Requirements		
42360	Design 3	3
	Social Science Elective*	3
	Professional Elective 4	3
	Professional Elective 5	3
42369	Project 2	6
	Professional Elective 6	3
	Professional Elective 7	3
Industrial Requirements		
42997	Professional Experience	6

*Subjects offered by the Faculty of Social Sciences.

Manufacturing Engineering Degree

Part-Time Attendandce Pattern

STAGE 1		
Academic Requirements		*Hours/Week*
AUTUMN SEMESTER		
33121	Engineering Mathematics 1A	3
63117	Engineering Physics (Mechanical)	3
42612	Mechanical Engineering Analysis	6
SPRING SEMESTER		
33122	Engineering Mathematics 1B	3
42312	Engineering Graphics	3
62171	Engineering Chemistry	6
Industrial Requirements		
42999	Professional Experience	6

STAGE 2		
Academic Requirements		
AUTUMN SEMESTER		
33221	Engineering Mathematics 2A	3
42022	Communication	3
42621	Mechanics 2	3
63704	Materials Engineering	3

		Hours/Week
SPRING SEMESTER		
42529	Computer Programming	3
63127	Electrical Engineering 1 (Mechanical)	3
42226	Manufacturing Processes 1	3
42429	Fluid Mechanics	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 3
Academic Requirements

AUTUMN SEMESTER		
42032	Engineering and Society	3
42631	Mechanics 3	3
41299	Electrical Engineering 2 (Mechanical)	3
42439	Thermodynamics	3
SPRING SEMESTER		
33222	Engineering Mathematics 2B	3
42238	Engineering Statistics	3
42237	Manufacturing Process 2	3
42632	Solid Mechanics 1	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 4
Academic Requirements

AUTUMN SEMESTER		
42549	Numerical Analysis	3
42642	Solid Mechanics 2	3
42340	Design 1	3
42643	Dynamics of Mechanical Systems	3
SPRING SEMESTER		
42041	Engineering Management	3
42449	Thermofluids	3
42644	Materials Engineering 2	3
42641	Mechanics of Machines	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 5
Academic Requirements

AUTUMN SEMESTER		
42350	Design 2	3
42558	Measurements and Instrumentation	3
	Professional Elective 1	3
	Professional Elective 2	3
SPRING SEMESTER		
42459	Heat Transfer	3
42559	Control Engineering 1	3
42359	Project 1	3
	Professional Elective 3	3
Industrial Requirements		
42999	Professional Experience	6

STAGE 6
Academic Requirements

AUTUMN SEMESTER		
42360	Design 3	3
	Professional Elective 4	3
42368	Project 2	3
	Professional Elective 5	3
SPRING SEMESTER		
	Social Science Elective*	3
	Professional Elective 6	3
42369	Project 2	3
	Professional Elective 7	3
Industrial Requirements		
42999	Professional Experience	6

*Subjects offered by the Faculty of Social Sciences.

Manufacturing Engineering Degree

Sandwich Attendance Pattern

The sandwich programme is available in both Autumn and Spring Semesters.

STAGE 1		*Hours/Week*
Academic Requirements		
33120	Engineering Mathematics 1	6
42612	Mechanical Engineering Analysis	6
42312	Engineering Graphics	3
62171	Engineering Chemistry	6
63117	Engineering Physics (Mechanical)	6
Industrial Requirements		
42997	Professional Experience	6

STAGE 2
Academic Requirements

33221	Engineering Mathematics 2A	3
42529	Computer Programming	3
42621	Mechanics 2	3
42022	Communication	3
63704	Materials Engineering 1	3
42226	Manufacturing Processes 1	3
63127	Electrical Engineering 1 (Mechanical)	3
42429	Fluid Mechanics	3
Industrial Requirements		
42997	Professional Experience	6

		Hours/Week
STAGE 3		
Academic Requirements		
42237	Manufacturing Processes 2	3
42032	Engineering and Society	3
41299	Electrical Engineering 2 (Mechanical)	3
42631	Mechanics	3
42439	Thermodynamics	3
42632	Solid Mechanics 1	3
42238	Engineering Statistics	3
33222	Engineering Mathematics 2B	3
Industrial Requirements		
42997	Professional Experience	6
STAGE 4		
Academic Requirements		
42549	Numerical Analysis	3
42642	Solid Mechanics 2	3
42340	Design 1	3
42643	Dynamics of Mechanical Systems	3
42041	Engineering Management	3
42449	Thermofluids	3
42644	Materials Engineering 2	3
42641	Mechanics of Machines	3
Industrial Requirements		
42997	Professional Experience	6
STAGE 5		
Academic Requirements		
42350	Design 2	3
42558	Measurements and Instrumentation	3
42559	Control Engineering 1	3
	Professional Elective 1	3
42459	Heat Transfer	3
	Professional Elective 2	3
42359	Project 1	3
	Professional Elective 3	3
Industrial Requirements		
42997	Professional Experience	6
STAGE 6		
Academic Requirements		
42360	Design 3	3
	Social Science Elective*	3
	Professional Elective 4	3
	Professional Elective 5	3
42369	Project 2	6
	Professional Elective 6	3
	Professional Elective 7	3
Industrial Requirements		
42997	Professional Experience	6

*Subjects offered by the Faculty of Social Sciences.

Stages 5 and 6 are available on the Sandwich Pattern in Autumn Semester subject to sufficient enrolments. If enrolments are insufficient, students will complete the course by transferring to the part-time attendance pattern.

Staff and Location of Facilities

The School of Mechanical Engineering is located in the Engineering Building (Building 2) on Broadway. The School's headquarters and academic staff offices are on Level 6. Laboratories and teaching rooms are on Levels 2, 3 & 6.

The names, office locations and professional interests of academic and senior non-academic staff are listed below. The University's telephone number is 20930 and staff can be reached at the extensions given below. Messages may be left, either personally or by telephone, at the School Office (ext. 9282). Emergency contact with staff or students may be made outside normal hours through the Security Officer, the Tower Building on 218-9316 or 218-9159.

	Room	*Ext.*
Professor		
Dr J.P. Gostelow Turbomachinery, gas turbines, fluid mechanics, solar energy, technology policy	627	9027
Head of School		
Mr S.F. Johnston Design, ergonomics, social impact of technology	612C	9400/ 9282
Associate Professors		
Dr S-L. Hall Combustion, acoustics, instrumentation, aero/thermodynamics, technology/education policy	608	9223
Dr C.T. Mathews Control engineering, industrial instrumentation, energy resources, technical change, engineering management, engineering education	628	9231
Academic Staff		
Dr E. Baker Heat transfer, solar energy, creep and fatigue, life testing	622	9265
Dr Y.P. Bhasin Operations management, operations research, work study, planning & control, engineering economics, quality & reliability	605	9205

	Room	Ext.
Mr A.J. Burfitt Stress analysis, photoelasticity, design	630	9059
Dr K.S. Chan Applied mechanics, design, materials handling, air-conditioning and refrigeration	604	9205
Dr B.P. Huynh Control engineering, computing, fluid mechanics	616	9243
Dr A.N.F. Mack Computing, aerodynamics, finite element methods; computational fluid dynamics	626	9329
Mr G.M. Marks Appropriate technology, industry development policy, thermofluids, engineering education	625	9329
Mrs H. McGregor Human communication, engineering and social issues, cooperative education, training and human development	620	9249
Mr L.E. Reece Biomedical engineering, control engineering, aerodynamics	613	9237
Dr R.M. Spencer Production planning and control, computer-aided manufacture, metrology, robotics,	612A	9229
Dr F.C.O. Sticher Advanced kinematics dynamics, instrumentation	623	9312
Mr K.A. Stillman Control engineering, chemical engineering, advanced computing	624	9312
Dr F.B. Swinkels Production engineering, materials, computer-aided design	607	9223
Mr H.G.R. Wiedemann Materials, hydraulic and pneumatic transport of solids, biomedical engineering	614	9237
Mr R.M. Wiltshire Stress analysis, structural and vehicle dynamics, computer-aided engineering	609	9224
Non-Academic Staff		
Ms K. Rassmussen Administrative Assistant	612	9282/ 9229
Mrs S. Tanuwidjaja Administrative Assistant	612	9282
Mr J.J. McCaffrey Engineer	323C	9047
Mr K.W. Bowyer Engineer	603	9194
Mr A. Revel Engineer	301A	9008
Mr P.H. Alt Assistant Laboratory Manager	313A	9085
Mr C.E. Evans Assistant Laboratory Manager	212	9041
Mr T. Bayfield Senior Technical Officer	649	9343
Mr C. Chapman Senior Technical Officer	318A/303A	9078/ 9075
Mr J.I. Gibson Senior Technical Officer	212D	9042
Mr L. D'Arcy Senior Technical Officer	201	9005
Mr M. Duncan Technical Officer	313	9085
Mr G. Bayley Senior Laboratory Craftsman	212	9040
Mr S.M. Gordon Senior Laboratory Craftsman	212	9040
Mr J.R. Grove Workshop Supervisor	Workshop	9666
Mr L. Stonard Laboratory Craftsman	Workshop	9666
Mr T. Newton Stores Officer	205B	9097

FURTHER PROGRAMMES IN ENGINEERING

GRADUATE CERTIFICATE IN SOFTWARE ENGINEERING

This course equips experienced engineers with a computing background for senior positions involving software systems development and software project management. It is intended for those who need to manage, lead or influence projects containing a significant software component, but who have no special training in the methods and tools of modern software engineering practice.

It covers both the methodologies and tools of modern software engineering and software project management. It is supported by a new laboratory and draws upon case studies suggested by attendees where possible. The course is presented by senior academics from the School, software project team managers from industry and overseas guest lecturers.

Duration and Attendance Patterns

The course is offered part-time over two evenings per week for one year (two semesters). There will be four subjects each of three hours duration.

Admission Requirements

Those who have an engineering degree or equivalent, and several years experience in industry with some involvement in projects where software is a significant component. Typically the applicant will be involved in hardware/software projects or real-time software.

Fee for Full-Fee Paying Students

In 1991 the fee was approximately $5,500. The course fee includes textbooks, comprehensive course notes and other materials.

Applications for Admission

The closing date for applications for admission to the course is the end of June each year. Lectures commence in late July.

GRADUATE CERTIFICATE IN MECHATRONICS

Subject to final approval, the Faculty of Engineering plans to introduce a Graduate Certificate in Mechatronics in 1991.
Mechatronics can be seen as the union of mechanical, electrical and computer engineering. Its practice typically involves design teams with skills at advanced levels in disciplinary areas such as: manufacturing practice, kinematics, control theory, instrumentation and sensing and/or programmable digital systems.

Applications for mechatronics range from the modern, flexible, manufacturing environment to the current consumer products like video and audio equipment.

The Graduate Certificate will total 12 semester hours of coursework. It will be offered over one year (two semesters) part-time.

There will be four subjects, each of three hours duration. Each subject will be taught jointly by the Schools of Electrical and Mechanical Engineering, reflecting the inter-disciplinary nature of Mechatronics.

GRADUATE DIPLOMA IN ENGINEERING

The objective of this course, offered on a Faculty basis, is to provide practising professional engineers with an opportunity to expand their engineering knowledge beyond the subject areas covered in their first degree and/or to bring their engineering and associated skills up to date with recent advances in engineering. The emphasis of the course is directed towards engineering practitioners who have found that their previous education and professional experience have not provided adequately for current or future career prospects.

Admission Requirements

Engineers wishing to enter the course must possess either a recognised engineering degree or an equivalent qualification. In certain circumstances, consideration may be given to applicants not possessing formal academic qualifications but who are deemed to have suitable professional qualifications and experience to enable them to pursue graduate studies.

In special cases, applications may also be considered from non-engineering graduates whose careers bring them into close contact with professional practice.

This course does not guarantee admission to membership of the Institution of Engineers, Australia.

Duration

The course comprises a minimum of twenty-seven semester hours of approved subjects and may be taken on a two semester, full-time basis or on a four semester, part-time basis.

Attendance

This depends on the subjects chosen, and the number of subjects undertaken each semester. Most subjects are three semester hours and involve attendance either one afternoon or one evening per week.

Enquiries

Initial enquiries should be made to the Faculty Administrative Assistant by telephoning 20930 ext 9030.

Course Structure

Each student takes a personally designed programme that is structured to suit individual needs. Each student determines programme details prior to enrolment, in consultation with an academic advisor. There is an opportunity to choose from a broad range of undergraduate and graduate subjects offered in the University's nine faculties.

It is important for students to note that at least 60 per cent of subjects included in a programme must be offered by the Faculty of Engineering. Also, subject selection should be clearly related to a professional theme involving either an expansion of knowledge beyond the areas covered in the student's first degree, or an advance in skills resulting from recent developments in engineering and associated technologies.

Groups of subjects are available which are likely to be of particular interest in relation to certain specialist career paths. These include:

Communications
Computer Systems
Energy Engineering
Engineering Management
Information Technology
Instrumentation and Control
Medical and Rehabilitation Engineering
Power Systems and Electrical Machines
Refrigeration and Air-Conditioning
Soil Engineering/Foundation Design
Surface Mining Engineering
Telecommunications
Thermofluids
Hydraulics/Hydrology
Structural Analysis and Design

MASTER OF ENGINEERING (BY THESIS)

The Schools of the Faculty of Engineering provide opportunities for engineering graduates to work towards a Master of Engineering degree by research and the presentation of a thesis. In keeping with the Faculty's general objectives, the emphasis is on applied research and development work, although basic research proposals are also welcomed. Topics which involve close cooperation with industry are particularly encouraged, and a majority of current candidates are engaged on topics which are actively supported by their employers. The research may be carried out using either the facilities made available by the Faculty, or at an industrial location.

The degree allows practising professional engineers the opportunity to pursue, in depth, the solution of an engineering problem which requires individual effort beyond the scope of a Bachelor degree. The thesis must be a distinct contribution to knowledge in the area covered by the research. Its contents may report the result of an original investigation, review or criticise some aspect of engineering knowledge, or present an engineering design or solution involving the application of new or known techniques to an engineering problem of significance.

Duration

For full-time students, the minimum time to be spent working on research and the presentation of a thesis is four semesters, and the maximum time is six semesters; the time required for part-time and external students is at least six semesters, and not more than nine semesters.

Admission requirements

Applicants must either possess a Bachelors degree in engineering or hold an equivalent qualification. In special circumstances, those who do not possess a degree (or equivalent) will be admitted to the programme if they submit evidence of general and professional qualifications which will satisfy the

Faculty Board in Engineering that they possess the educational preparation and capacity to pursue graduate studies. In some cases, the Faculty Board might prescribe additional requirements for admission.

Research Areas

Each School in the Faculty operates modern laboratory and research facilities on the Broadway campus in Sydney. These are supported by extensive computer facilities and library services. The laboratories have excellent back-up workshops and support staff. Many opportunities exist for interesting and challenging research programmes, especially in activities related directly to community and industrial needs.

School of Civil Engineering
Research interests within the School are: engineering materials, soils and foundation engineering, water engineering, road materials, public health engineering, local government engineering, structural analysis and design, timber engineering, prestressed and reinforced concrete, steel structures, environmental engineering, engineering construction and project management, FEM and computer applications.

School of Electrical Engineering
Research opportunities include: image processing, intelligent networks, video conferencing, ATM networks, protocol engineering, digital transmission, multiple access schemes, spread spectrum communication, neural networks, information theories as applied to position fixing systems, software engineering, industrial applications of microwaves, microwave circuit design, antennas, digital signal processing in communications, digital systems design, electrical machines and industrial drives, instrumentation and data acquisition systems, microhydroelectric control and instrumentation, power systems analysis, adaptive multivariable control, and data eucryption.

School of Mechanical Engineering
Research interests include: advanced design, air-conditioning, dynamics, biomedical engineering, energy conservation, environmental protection, control engineering, fluid dynamics, heat transfer, machine tools, computer aids to manufacturing, computer-aided design and manufacture, robotics, stress analysis, fuels and combustion processes, technology for development, turbomachinery, viscoelastic materials.

Enquiries

Initial enquiries may be made with the Administrative Assistant in the Faculty on 20930 ext. 9030. After preliminary discussions, prospective Masters degree candidates will be directed to one or more members of the academic staff for consultations leading to the selection of an appropriate research topic. This will ensure the availability of laboratory facilities, special equipment and research supervision.

MASTER OF ENGINEERING MANAGEMENT

The Master of Engineering Management programme places a greater emphasis on the interface between technology and management than does the traditional MBA. Although the programme is formally administered by the Faculty of Engineering, there has been close collaboration with the Faculty of Business in its presentation and on-going development.

The MEM programme provides the opportunity for engineers who seek career prospects in engineering management to undertake a formal course of relevant study at the Masters degree level. The course is designed for engineers or scientists who perform, or who aspire to perform, management tasks while maintaining currency in their technical specialities.

The Master of Engineering Management aims to equip its graduates with the ability to formulate technical strategies and successfully deal with the human aspects, organisation issues, project considerations and resource allocations at all phases of the life cycle of technical activities. It enhances skills for the comprehensive treatment of the issues at the decision-making level and focuses on the management of:

- basic and applied research
- development and design
- operations/construction/manufacturing
- technology transfer
- maintenance

Duration

The course requires 42 semester hours of study. The programme is structured for part-time attendance and is scheduled for two evening sessions per week for three to three and a half years. An occasional attendance may be required outside the normal evening session times.

Admission requirements

An undergraduate degree in engineering or other technological/applied science field is required for entry to the course. Either the degree should be conferred at honours level or the candidate must have appropriate professional experience.

Applications should be supported by a detailed curriculum vitae, the names, addresses and telephone numbers of two professional referees, a statement of support from your employer and a covering letter setting out your reasons for wishing to undertake the programme.

Transfer of students from Graduate Diploma in Engineering to Master of Engineering Management

1. A student who is enrolled in the Graduate Diploma in Engineering may transfer to the Master of Engineering Management (MEM) course after completing at least 12 semester hours from the MEM course and satisfying the following conditions:

   (i) The MEM subjects have to be completed within three semesters (not including periods of leave of absence).

   (ii) The subjects shall not contribute to the attainment of any other award.

   (iii) The student shall satisfy the normal admission requirements for the MEM.

2. Students will then be required to complete the remaining subjects of the MEM course, making a total course length of at least 42 semester hours, to be eligible for the award of the Master of Engineering Management.

Enquiries

Initial enquiries may be made with the Administrative Assistant in the Faculty on 20930 ext 9030.

COURSE STRUCTURE		*Hours/Week*
Semester 1		
43811	Economics for Engineers	3
21718	Organisation Analysis and Design	3
Semester 2		
42812	Contemporary Issues & Technological Change	3
22726	Accounting and Financial Administration	3
Semester 3		
44802	Management Decisions	3
24734	Managerial Marketing*	3
Semester 4		
41823	Systems Engineering and Decision Modelling	3
21719	Organisational Behaviour	3
Semester 5		
25742	Financial Management	3
21720	Employment Relations	3
Semester 6		
43833	Project Management	3
22737	Engineering Law	3
plus	2 Electives	3 & 3
	or	
44143A	Project A	3
44143S	Project B	3

Electives may be taken at any stage.

NOTE:* Engineers employed in the public sector may be permitted to take Public Sector Management (21728) as an alternative core subject to Managerial Marketing (24734).

Electives

Two electives are chosen from a wide selection of subjects from the faculties of Engineering and Business. Electives require prior approval of the course coordinator.

MASTER OF ENGINEERING (TELECOMMUNICATIONS)

This course is offered jointly by the University of Technology, Sydney and the University of Wollongong.

The enormous growth in demand for telecommunications services is causing a serious world-wide shortage in the supply of professional telecommunications engineers. In response to this situation, the telecommunications research teams at the University of Wollongong and the University of Technology, Sydney have combined their efforts to provide a Masters degree course in telecommunications engineering. This course enables electrical, electronic and computer engineering graduates to develop an in-depth specialisation in the telecommunications technologies that are now emerging.

Experienced graduates will also find the course attractive as a means of keeping up to date with the technologies that are having such a profound influence on their industry.

Admission requirements

The equivalent of a first class honours degree in electrical, electronic, communications or computer systems engineering is required. Applicants with other backgrounds will be permitted to enrol in a qualifying course. The qualifying course may be undertaken at either UTS or the University of Wollongong. Where the qualifying course is equivalent to 27 or more semester hours at UTS or 48 credit points at the University of Wollongong, the qualifying course will earn the award of a Graduate Diploma in Engineering.

Enquiries

Initial enquiries may be made with the Administrative Assistant in the Faculty on 20930, ext 9030.

Overview of the course

The course consists of up to six subjects and a research thesis. The research thesis has a fifty percent weighting when six coursework subjects are undertaken, and 100 percent weighting when no coursework is undertaken. The following coursework subjects are offered at the rate of two per semester in the following sequence.

Communications Protocols *and* Telecommunications Signal Processing

Teletraffic Engineering *and* Integrated Services Networks

Transmission Systems *and* Elective

The elective may be chosen from any appropriate level subject offered by the Computing Science or Electrical Engineering Schools at either University. Suitable topic areas would be:

Knowledge Representation, Acquisition and Application
Logic and Databases
Advanced Computer Graphics
Perception and Planning
Parallel Architectures and Algorithms
Artificial Intelligence Programming
Robot Modelling
Advanced topics in Database Management
Operations Research
Advanced Statistics
Software Engineering and Languages

Attendance arrangements

The course may be undertaken with either a full-time or part-time attendance pattern. Lectures run from the first week of March until mid-June and the first week in August until mid-November. Students will be based at one University for their research project but will be expected to attend some classes at the other University. All subjects are taught in three hour modules, one module per week, a module consisting of two one hour lectures and a tutorial session. In all subjects students are expected to complete assignments and laboratory projects using the equipment provided at the University offering the subject. Wollongong and Sydney are 80km apart but are connected by an efficient train service (approx. 1 hour 15 mins journey).

Minimum completion for the degree is three semesters.

DOCTOR OF PHILOSOPHY

Initial enquiries about the PhD programme, conditions of award for the available scholarship(s) and application details should be directed to the Graduate Studies Officer of the University through the UTS Information Service, Level 4, Tower Building, Broadway (Postal address: PO Box 123, Broadway 2007).

Continuing Education Programme

The Faculty offers a wide range of extension courses on engineering topics and is constantly expanding its activities in continuing education. In addition to those advertised, extension courses can often be arranged on request for a suitable group of participants. A variety of durations and attendance patterns can be arranged according to the needs of prospective students. Further information on extension course activities may be obtained from the appropriate Head of School.

Examples of some extension courses are:

Advances in Urban Drainage Design
Principles of Engineering Hydrology
Retarding Basin Design and Water Resources Law
Prestressed Concrete
Prestressed Slab Systems
Industrial Robots
Microcomputer Systems for Technical Managers
Local Area Networks
Variable Speed Drives for A.C. Motors

Satellite Communications
Ergonomics Fundamentals
Contract Engineering
Computer Integrated Manufacturing
FORTH for Real Time Applications
Solar Energy System Design

Consulting and Advisory Service

The Faculty offers a research and development, consulting, and advisory service to industry and government on specific problems. Members of academic and professional staff are active in basic and applied research, and in development work related to industrial needs. They will investigate and advise on problems which fall within their areas of expertise.

These arrangements cover a wide spectrum. At one end of the scale are major research and development projects, involving several members of staff and possibly graduate students preparing for higher degrees. Such projects may be supported by funding from government bodies or from industry. At the other end of the scale, and equally welcome are short-term consulting and advisory tasks relating to comparatively minor problems, which might occupy no more than a few days or weeks. Prototype development, testing of materials and components, and emergency repairs to specialised plant are also possible.

Arrangements can be made for practising engineers to make use of the Faculty's laboratories, to conduct feasibility studies and development work with the advice of academic and professional staff. This service can be of great value to companies requiring the occasional use of specialised equipment the purchase of which is not warranted; or wishing to conduct preliminary investigation of the viability of a proposed venture before setting up their own development facilities.

Many of these activities are conducted through the University's affiliated company, Insearch Ltd.

While individual staff members have a wide variety of expertise, there are a number of professional areas each involving several staff with closely related interests. Among the most prominent of these are:

Communications
Design and Stress Analysis
Digital Systems and Microcomputer Applications
Electronics and Instrumentation
Energy Systems
Engineering Materials and Materials Testing
Fuels and Combustion Processes
Maintenance and Condition Monitoring
Manufacturing Engineering including Automation Robotics, and Computer Aids to Manufacturing
Public Health Engineering
Structural Engineering
Turbomachinery
Water Engineering

Enquiries should be directed in the first instance to the Dean of Engineering, to the appropriate Head of School or Insearch.

As well as making use of the consulting and advisory service, employers of senior undergraduate students are invited to propose project work which students can undertake in fulfilment of the final-stage Project requirements of each of the BE degree courses. As with Masters degree work, undergraduate Projects can be undertaken in an industrial location subject to adequate supervision by a member of academic staff. Many highly successful projects have been conducted in this way and the results put to immediate use by employers.

Associations for Students

Of special interest to students are the three School Associations formed to promote links between students, staff and graduates. These are:

The Civil and Structural Engineering Society - CASES
The Electrical Engineering Society - EES
The Mechanical and Production Engineering Association - MECHPAS

All three have vigorous social and technical programmes. Activities are supported from the Clubs and Societies budget of the Students' Association, and membership fees are nominal. Enquiries should be directed to the appropriate School Office from which membership forms are available.

There is also a Campus Chapter of the Institution of Engineers, Australia, which all engineering students are invited to join.

Social Science Electives

Subjects are offered by the Faculty of Social Sciences, some of which are principally for students in courses outside the Faculty. Others are subjects in the BA (Communication) degree. Engineering students may enrol in certain of the BA subjects if places are available, if the Faculty of Social Sciences approves, and if, in appropriate cases, prerequisites are met.

Details of subjects and their availability each semester are available from the Faculty of Social Sciences.

SYNOPSES

41299 ELECTRICAL ENGINEERING 2 (Mechanical)
Three semester hours

This course provides mechanical engineers with a background in electronics. The subject is taught by focusing on a number of devices, looking at their characteristics then studying a number of applications examples. Devices covered include the diode, BJT, Thyristor, operational amplifier and digital logic elements. An electronics construction project is a keystone of the subject.

41359 REHABILITATION ENGINEERING
Three semester hours
Prerequisite: All stage 4

The course is concerned with developing an awareness of the problems of disabled people and the methods, data and equipment available to solve them. In the presentation of this subject the accent is placed on the instrumentation and equipment used in care of the sick and debilitated or severely handicapped, the application of electrical and mechanical engineering to the resulting problems of mobility, communications, home life and work life, contact with disabled people, visits to hospitals and rehabilitation centres, and emphasising the fact that often their quality of life can be greatly improved by the provision of technical aids, sometimes remarkably simple in construction.

41369 BIOELECTRONICS
Three semester hours
Prerequisite: All stage 4

The subject consists of a series of lectures and laboratory sessions. It is intended as an introduction for an engineer who shows interest in clinical and/or hospital instrumentaion. It explains the basic terminology of physiology, anatomy, pathology and clinical medicine with an emphasis on these areas where the engineering application has gained an established position or has a potential to do so (e.g. x-ray, electric cardiography, electric encephalography, electrophoresis, electro-analygesia, Doppler's effect).

41594 COMMUNICATIONS NETWORKS
Three semester hours
Corequisite: 41678 Data Communications (Electrical)

The subject begins with a description of communication networks in terms of the OSI model and with the mathematical tools such as queuing theory and topological analysis techniques that are needed to design networks and evaluate their performance. Connectivity analysis, flow control and routing strategies are studied in detail. In the next section of the course each of the layers in the OSI model is presented and the relevant standards examined. The course concludes with a study of circuit switching techniques, signalling for network management and the evolution towards integrated networks such as ISDN and broadband ISDN. Laboratory work includes case studies of a number of LAN's and computer manufacturer's networks, the simulation and analysis of communications protocols using a proprietary package (PROTEAN), the design and implementation of network management software and the evaluation of network performance.

41601 MICROELECTRONIC TECHNOLOGIES
Three semester hours
Prerequisites: 41632 Electronic Devices and Circuits, 63152 Materials Physics
Corequisite: 42195 Physical Design and Production

This subject is a stage 5/6 non-strand elective offered to all students. The aim of this elective is to develop in students the skills and knowledge required to select and use the appropriate microelectronic technology for given design tasks. Topics include: monolithic I.C. technology - bipolar and M.O.S.; thick-film and thin-film technologies and design; advanced PCB and surface-mounted assembly technologies and design; high density packaging; interconnection and assembly technologies; characterisation, automatic testing methods and reliability assessment; comparative assessment of technologies; system design aspects.

41613 ELECTRICAL ENGINEERING PRINCIPLES
Six semester hours

This is a first course in electric circuit theory, components and measurements. It covers the analysis of d.c. and a.c. circuits with lumped parameters (R, L, M and C), the behaviour and application of diodes, transistors and operational amplifiers, and the use of a.c. and d.c. meters and the oscilloscope.

41614 FUNDAMENTALS OF COMPUTING
Three semester hours

This is a first course in computing which lays the foundations for the use of sound engineering principles in the use of computers. It covers techniques for the analysis, design documentation, and testing of software such as data flow diagrams, data dictionaries, stepwise refinement and module design, module independence, and hierarchical and modular testing. The Pascal programming language is taught and used, and concepts of computer architecture and operating systems are discussed.

41615 DIGITAL ELECTRONICS TECHNIQUES
Three semester hours

This subject introduces digital logic elements, the fundamental components of computers and most control equipment. Combinational, sequential and microcode systems are covered, with appropriate number theory and system architecture principles, so that digitally based systems may be designed and commissioned. The formal design techniques are supported by comprehensive laboratory exercises.

41622 MICROCOMPUTER ENGINEERING

Six semester hours

Prerequisites: 41613 Electrical Engineering Principles, 41614 Fundamentals of Computing, 41615 Digital Electronics

The course introduces microcomputers, showing how to use peripheral integrated circuits, how to interface to industrial equipment, and how to programme in assembly language. Topics include interrupt handling, screen input and output, software tools, project planning, programme descriptor languages, and structured fault location. The students' skills in software engineering are developed by extensive laboratory work, team projects, and the use of the same high-level language taught in Fundamentals of Computing.

41623 FIELD THEORY

Three semester hours

Prerequisite: 33120 Engineering Mathematics 1
Corequisite: 41613 Electrical Engineering Principles

This subject is designed as a first exposure to the fundamental laws of electromagnetism, covering electrostatics, magnetostatics and electromagnetic induction. Concepts presented include: charge, electrostatic forces, electric field, electric flux, electric potential, dielectrics and conductors, conduction and displacement current, Gauss's law, capacitance, magnetic field, magnetic flux density, Amperes law, magnetic circuits, Biot Savart law, electromagnetic induction, self and mutal inductance, energy storage in a field, meters, transformers, hysteresis and eddy current losses, and introduction to three phase systems.

41624 NETWORK THEORY

Three semester hours

Prerequisites: 41613 Electrical Engineering Principles, 33120 Engineering Mathematics 1
Corequisite: 33220 Engineering Mathematics 2

The subject covers in a formal manner the analysis techniques of linear, time-invariant networks for transient and steady-state response to singularity functions such as impulse, step and ramp inputs and sinusoidal input. After a brief review of network theorems and mesh and nodal analysis, the time response of first-order and second-order circuits is dealt with in detail, using both differential equations and Laplace transforms. The other topics covered are network functions and two-port networks. Frequency response including Bode plots and sinusoidal analysis are covered briefly. Effect of poles and zeros on time and frequency response is highlighted. Demo-SPICE is used for circuit analysis.

41625 ENGINEERING COMMUNICATION

Three semester hours

This subject deals with the development of engineering communication skills. These include engineering drawing, information retrieval, written reports, and public speaking. The drawing component of the course develops skills in pencil and ink to Australian Standards with emphasis on electrical drawings. Other skills are developed via a literature survey, a carefully written laboratory report and an oral presentation of a technical topic.

41631 ELECTROMAGNETICS

Three semester hours

Prerequisites: 33220 Engineering Mathematics 2, 41623 Field Theory

The subject develops the topics of both static and electric and static magnetic fields that lead to, and include, time varying applications. The fundamental laws of Poisson, Laplace, Faraday, Gauss, Ampere and Kirchoff are derived and placed in context with Maxwell's equations. Extensive examples enable the simultaneous development of advanced mathematical tools for the analysis of two-dimensional boundary value problems.

41632 ELECTRONIC DEVICES AND CIRCUITS

Six semester hours

Prerequisites: 41623 Field Theory, 41624 Network Theory

Topics include: semiconductor physics, free carriers in crystals; the p-n junction, the semiconductor diode, diode models and basic applications, rectifiers and power supply design; the JFET: operation, characteristics, model; the Bipolar Junction Transistor (BJT), operation, characteristics, basic model, refinement of models, small-signal and switching models, biasing of BJT and JFETs, the transistor as an amplifier, basic amplifier and op-amp circuits; physics of the MOS system; the MOSFET: operation, characteristics, models; integrated circuit technology, IC components and equivalent circuits; bipolar logic circuit families: TTL, IIL, ECL; NMOS and CMOS logic families; VLSI; memory circuits.

41633 ENGINEERING STATISTICS

Three semester hours

Prerequisite: 33220 Engineering Mathematics 2 or 33222 Engineering Mathematics 2B, 41622 Microcomputer Engineering

This subject presents an introduction to statistical theory with applications in engineering. Topics are illustrated with engineering examples and case studies. Topics include: probability theory, random variables, density and distribution functions including Gaussian, Binomial, Poisson and Rayleigh, Transformation and generation of random variables, Moments and expected value calculations, Summation of random variables, Central limit theorem, Sampling from a normal population, Estimates of means and variances, Confidence limits, Correlation, linear regression, multiple regression, Analysis of variance, The design of experiments, Reliability theory, MTBF calculations, Markov chains.

41634 CONTINUOUS AND DISCRETE SYSTEMS

Six semester hours

Prerequisites: 33220 Engineering Mathematics 2 or 33222 Engineering Mathematics 2B, 41624 Network Theory
Corequisite: 41631 Electromagnetics

This subject gives a comprehensive coverage of the theory of linear systems with and without feedback. Continuous and discrete systems are presented in parallel. The emphasis is on state-space methods to balance the classical transfer function approach adopted in the Stage 2 subject Network Theory. There are 12 two-hour laboratory sessions. Topics include: physical system modelling, linearisation, block diagrams, signal flow graphs, Laplace and z transforms, state transition matrix, time and frequency domain response, root locus, stability criteria (Routh, Hurwitz, Jury, Nyquist).

Magnetic properties and superconductivity: magnetic quantities, paramagnets, ferromagnets and diamagnets, magnetic moments and saturation in metals and alloys, ferrites, garnets, rare-earth intermetallics, origin of spontaneous moments, anisotropy, shape, magnetostriction, domains, frequency response to microwave frequencies, superconducting materials, transition temperature and critical field, type 1 and 2 superconductors, applications of superconductivity.

41641 NUMERICAL METHODS

Three semester hours

Prerequisites: 41632 Electronic Devices and Circuits, 41633 Engineering Statistics

This subject deals with standard numerical techniques, covering the solution of systems of equations, root finding, differentiation and integration, curve fitting, solution of systems of differential equations, the evaluation of eigenvalues, and optimisation techniques. In all cases questions of problem conditioning, numerical accuracy, memory requirements and speed are considered. On completion of the course students will have built up their own integrated set of tested and documented PASCAL numerical analysis tools.

41642 PLANNING METHODS

Three semester hours

Prerequisites: 41625 Engineering Communication, 41633 Engineering Statistics

This subject forms part of a sequence on project design and management (incorporating environmental and societal issues) together with Engineering Communication and Systems Engineering. Topics include economics-accounting, analysis, role of capital; decision theory - decision trees, modelling, forecasting techniques, linear programming; project management - structure, planning, controlling, PERT, CPM, manpower, environmental and macroeconomic issues - environmental impacts, pollution. Guest lecturers and case studies are used to stimulate discussion and develop a broad outlook.

41643 ANALOGUE ELECTRONICS

Six semester hours

Prerequisites: 41632 Electronic Devices and Circuits, 41634 Continuous and Discrete Systems

Topics include: amplifier characteristics; ideal and real operational amplifiers models and limitations; linear and nonlinear op-amp applications; review of BJT, JFET and MOSFET characteristics, models and limitations; single- and two-transistor small-signal amplifiers; current sources and active loads; typical on-amp gain stages and subcircuits; frequency and step response of amplifiers; computer simulations and analysis of analogue circuits, SPICE, ENAP; power limitations of transistors; output stages of amplifiers; operational amplifier circuit design; feedback amplifiers, properties, stability, frequency compensation; oscillators; voltage regulators; voltage comparators; multipliers and applications.

41645 POWER APPARATUS AND SYSTEMS

Six semester hours

Prerequisites: 41624 Network Theory, 41631 Electromagnetics

The course covers transformer equivalent circuits from geometry and material properties, e.m.f. induced in a moving circuit with a non-uniform time-varying field, winding m.m.f. and air gap flux density, force and torque calculations in a doubly-excited electromagnetic system, principles of d.c. and a.c. machines (including stepping motors), steady-state calculations, speed control, the swing equation, two-machine power flow, control of real and reactive power, protection of motors and transformers against short circuits.

41646 TRANSMISSION LINES AND FILTERS

Three semester hours

Prerequisites: 41631 Electromagnetics, 41742 Signal Theory, 41634 Continuous and Discrete Systems

The subject material is equally divided between transmission lines and filters. Transmission line performance is analysed in a genealised form across the frequency spectrum. The Smith chart is used extensively to simplify applications of transmission lines to a wide variety of applications. Passive and active filters are examined in detail with the emphasis being placed on active filters using operational amplifiers.

41647 ELECTROMAGNETIC WAVE THEORY

Three semester hours

Prerequisite: 41631 Electromagnetics

This subject looks specifically at the wave behaviour of electromagnetic fields in bounded and unbounded media. Reflection and transmission are examined at both dielectric and conductor boundaries. Case studies are used to demonstrate practical aspects of wave behaviour at high and low frequencies in uniform guiding structures, the mode theory and power flow receiving close attention. The subject culminates with the analysis of antennas and simple radiating systems.

41666 PROJECT (ELECTRICAL ENGINEERING)
Six semester hours
Prerequisite: six semester hours of professional electives

The primary objective of the project is to give the student individual responsibility for the completion of a significant engineering task, requiring the application at professional level of knowledge gained during the degree course.

The details covering the conduct and nature of the Electrical Engineering Project are covered in a separate document available from the General Office, or the Projects Co-ordinator (see Directory, Level 24). Students should obtain this document at least six months before intending to do the project. In brief, the arrangements are as follows:

Students select a project from a list. Projects may be submitted for the list by both staff and students, so that topics of interest to both groups are available. For students the project must be submitted through a member of staff who is willing to supervise it. Projects should be of an applied nature in the fields of research, development, design and construction. There should be scope for the student to demonstrate his or her ability in a professional electrical engineering situation.

41667 SYSTEMS ENGINEERING
Three semester hours
Prerequisites: 41633 Engineering Statistics, 41642 Planning Methods, 41997 or 41999 Industrial Experience - 96 weeks minimum

This subject completes the course strand concerned with engineering practice. The systems approach to typical engineering projects is studied in detail with emphasis on the techniques required at each stage of the process. Several distinctive engineering projects are used as case studies.

41673 SIGNAL PROCESSING
Three semester hours
Prerequisite: 41742 Signal Theory

This subject covers digital implementation of filters, modulations, demodulators, detectors and other communication system building blocks. In the second half of the course the statistical nature of signals is emphasised and models are developed to explore the optimum (and adaptive) separation of signals from noise. Techniques for processing random signals are introduced including spectral estimation, modelling, optimum estimation/detection and Kalman filtering. Examples of signal processing applications in other fields of science are used to illustrate the generality of the subject material. Laboratory work makes extensive use of applications software and simulation techniques, with diverse problems encouraging original design solutions. A number of design exercises based upon state of the art digital signal processing microprocessors are included.

41675 DIGITAL TRANSMISSION
Three semester hours
Corequisite: 41673 Signal Processing

The subject provides an understanding of the principal concepts, techniques and technologies for digital communication over all types of channels, in the context of Shannon theory. Each lecture covers a particular building block in a complete digital link. Included are the source encoder, the line coder, baseband pulse shaping and equalisation, modulation techniques for carrier based digital transmission, carrier and timing extraction, detection and a sequence of lectures on error control techniques.

Laboratory work exposes students to currently used test equipment, and the hardware design of modules covered in the lectures. Computer simulation is used to evaluate the performance of complete links.

41676 COMMUNICATIONS ENGINEERING
Three semester hours
Prerequisites: 41646 Transmission Lines and Filters, 41643 Analogue Electronics, 41647 Electromagnetic Wave Theory
Corequisite: 63155 Communications Physics

The transmission and reception of signals at optical and microwave frequencies are considered in terms of equipment requirements, design principles and performance limitations. Representative elements of communication links are covered in terms of present technology and hardware alternatives. Both guided wave and free space systems are examined. Properties associated with analogue equipment are emphasised in design studies and laboratory work. Topics include antennas, low noise and high power bandpass amplifiers, converters, oscillators, frequency synthesisers and phase lock loops.

41677 COMMUNICATIONS SYSTEMS
Six semester hours
Prerequisites: 63155 Communications Physics, 41678 Data Communication (Electrical), 41673 Signal Processing
Corequisites: 41594 Communications Networks, 41675 Digital Transmission, 41676 Communications Engineering

The modelling and design of communication systems is treated in an integrated theoretical and practical programme. Simulation studies using commercial software and laboratory work covering communication techniques form the major component of the subject which culminates in a group design project. This integrated engineering treatment is a capstone subject for the telecommunications strand.

41678 DATA COMMUNICATION (ELECTRICAL)

Three semester hours

Prerequisites: 41622 Microcomputer Engineering, 41742 Signal Theory

Data may be communicated in serial or parallel, asynchronously or synchronously at a specified symbol rate in blocks of specified length with or without error control and over wires, optical fibres or a line or radio communications channel. This subject explains the basis for making choices between the above options and for making the detailed design decisions. Modules of one or more lectures with associated laboratories are devoted to UART/USARTs, interface standards, modems, multiplexing and concentration, issues in the design and control of data terminal equipment, data link control and protocol analysis. Electrical engineering students and Computer Systems Engineering students do 12 lectures of the course in common, with the remainder being devoted to digital transmission fundamentals for CSE students and communications systems software for EE students.

41681 DIGITAL SYSTEMS DESIGN

Three semester hours

Prerequisite: 41622 Microcomputer Engineering

This is a digital hardware subject which covers computer organisation and interfacing, the design and specification of synchronous and asynchronous digital sub-systems, implementation using LSI and VLSI, and a digital simulation package.

41682 ANALOGUE AND DIGITAL CONTROL

Six semester hours

Prerequisites: 41634 Continuous and Discrete Systems, 41753 Data Acquisitions and Distribution

This subject introduces students to the use of classical and state variable techniques as applied to the analysis and design of continuous and discrete feedback control systems. Topics include: sampling theory, data holds, cascade and feedback compensation employing lead/lag and three-term controllers, deadbeat control, discretisation, digital filters, Lagrangian dynamics, state estimation and state variable feedback control, phase plane, describing functions, Popov and circle criteria, identification, specifications.

41683 COMPUTER AIDED DESIGN OF ELECTRONIC CIRCUITS

Three semester hours

Prerequisites: 41643 Analogue Electronics, 41641 Numerical Methods

This subject gives the knowledge and understanding of concepts and techniques of computer-aided analysis and design of electronic circuits and systems and provides the essential skills in using these modern design tools in engineering practice. Simulation packages such as SPICE and ENAP are explained and used to analyse a variety of circuits and systems. Extended modelling of BJT and FET for computer simulation as well as macro-modelling of op-amps is presented.

The software packages are used as major design tools in an analogue design project.

41684 ADAPTIVE AND MULTIVARIABLE CONTROL

Three semester hours

Prerequisite: 41682 Analogue and Digital Control

In this subject students will study multi-variable control, adaptive control and optimal control to an advanced level. Topics include: direct and inverse Nyquist arrays, characteristic locus, robust control, pole shifting techniques, identification algorithms, minimum variance control, self-tuning adaptive regulators, linear quadratic regulator design, state estimation and the Kalman filter, H designs.

41685 PRINCIPLES OF VLSI DESIGN

Three semester hours

Prerequisites: 41681 Digital Systems Design, 41632 Electronic Devices and Circuits

Topics include: NMOS and CMOS technologies; electrical properties of devices and circuits; spice simulation of MOS circuitry; full custom design; IC testing and testability; CAD for full custom design.

Semi-custom design; standard cell and gate array techniques. CAD for full custom design; automatic place and route techniques; mask design; silicon foundry interfaces; system design. Each student will develop a full or semi-custom IC as part of the course.

41691 POWER CIRCUIT THEORY

Three semester hours

Prerequisite: 41645 Power Apparatus and Systems

This subject covers the elements required to model and analyse transformers, transmission lines and cables used for the transport of electrical energy. Topics studied include the calculation of capacitance and inductance and the design of line and cable systems. Techniques used to estimate the steady-state and transient performance of the system are introduced.

41692 DYNAMICS OF ELECTRIC MACHINES

Three semester hours

Prerequisites: 41641 Numerical Methods, 41645 Power Apparatus and Systems

This course enables students to: describe the d.q. axis transformation and its application to rotating machines; calculate and measure starting and fault performance of rotating machines; measure the parameters necessary for the calculation of dynamic performance; set up equations necessary for the evaluation of machine stability.

41693 POWER EQUIPMENT DESIGN

Three semester hours

Prerequisites: 41641 Numerical Methods, 41645 Power Apparatus and Systems, 63152 Materials Physics, 41647 Electromagnetic Wave Theory

Corequisite: 42195 Physical Design and Production

This subject considers the thermal, electric, magnetic and mechanical constraints on the design of electric power equipment and covers some equipment examples. Topics include: thermal rating; electric and magnetic rating - insulation, magnetic materials; mechanical rating - forces, noise, vibration; design optimisation - minimum cost, weight etc. Equipment examples - power transformers, lines, cables, busbars, electroheat, rotating machines, electromagnets.

41694 POWER ELECTRONICS

Three semester hours

Prerequisites: 41643 Analogue Electronics, 41645 Power Apparatus and Systems

The course covers power semiconductor devices such as thyristors, GTOs power transistors, MOSFETs and standard power electronics circuits for AC/DC conversion using these devices. Device characteristics, firing and protection schemes are discussed. Circuit operation and analysis control techniques, and harmonic considerations are emphasised.

41695 POWER SYSTEMS ANALYSIS AND PROTECTION

Six semester hours

Prerequisites: 41691 Power Circuit Theory, 41692 Dynamic Behaviour of Electrical Machines, 41693 Power Equipment Design, 41694 Power Electronics

The subject is intended for students specialising in electric power engineering. The main topics studied are: modelling and measurement of parameters of transformers, lines, cables and rotating machinery; analysis of the steady-state and transient response of the system; protection schemes and safety considerations.

A substantial proportion of the time is devoted to project work involving digital computing and laboratory work.

41696 ELECTRICAL VARIABLE SPEED DRIVES

Three semester hours

Prerequisites: 41692 Dynamics of Electrical Machines, 41694 Power Electronics

The aim of the course is to gain appreciation of variable-speed electric drives. Topics offered in lectures include phase-controlled rectifiers, choppers, inverters, cycloconverters, slip-energy recovery (including 3-ph commutator machines), pole amplitude modulation, electronic commutation, eddy-current couplings, variable voltage a.c. energy savings, drive selection. The effect of the control system on the supply and the motor is emphasised (power factor, form factor, harmonics, pulsating torques, noise, losses).

Laboratory work forms an important part of the course. Laboratory d.c. drives are studied, and commercial a.c. drives are demonstrated.

41732 OPERATING SYSTEMS

Six semester hours

Prerequisite: 41622 Microcomputer Engineering

An operating system is required in a computer to effectively share the resources of the machine (CPU, memory and Input/Output) when there is more than one user or one task. This subject covers the concept of a process and the operating system services so that the specific areas of process management, system management, file systems and interactive computation can be treated.

The subject then focuses on real-time executives, that is, operating systems with a calculable response time that may not require disk storage. The student will be able to design tasks for a multitasking environment, use interprocess communication and synchronisation facilities, write device drivers, configure real-time executives and exploit operating system services.

41742 SIGNAL THEORY

Three semester hours

Prerequisite: 41624 Network Theory

Corequisite: 41633 Engineering Statistics

Selected introductory topics from communications and information theory are developed commencing with time and frequency representation of signals and their classification, extended through Fourier theory to applications in both analogue and digital systems. Random signals are examined with particular emphasis on noise.

41746 DIGITAL SYSTEMS

Three semester hours

Prerequisites: 33131 Discrete Mathematics, 41622 Microcomputer Engineering

This digital hardware subject provides a structured approach to design of complex digital systems, concurrently introducing computer architecture, through a common application/system description.

Different phases in a design process: system specification, architectural design, logical design and implementation are introduced. Architectural and logical design phases are covered in detail. In the architectural design phase overall system is divided into sub-systems taking into account the speed requirements and these sub-systems are specified using a hardware description language. In the logical design phase these sub-system specifications are converted to logical implementations.

Topics covered in this subject are Data flow analysis, system partitioning, concurrency, Hardware description languages, microprogramming, hardwired logic, asynchronous and synchronous state machines and design/system testing methods.

Laboratory work involves design of digital systems using ECAD tools and verification of the design using simulation techniques, both at architectural and logical levels.

41747 SOFTWARE ENGINEERING AND LANGUAGES

Three semester hours

Prerequisites: 33131 Discrete Mathematics, 41732 Operating Systems

This computing subject builds on previous software engineering techniques to provide the tools for designing large complex software based systems. It shows the effect of language on projects and introduces design and translation of languages.

By the extended use of formal specification, design and testing techniques in teams of students, the student will be equipped for software encountered in complex industrial systems.

This course includes: Requirements definition, formal specifications using automated data flow diagrams, data dictionaries and module design, specification validation and verification. Preliminary and detailed design, code and unit testing, software integration. Formal testing. Software maintenance and readability. Software reliability.

Language characteristics and selection. Introduction to compilers and intepreters. Interpreters for person-machine interfacing and defensive programming. The language section is taught by the School of Computing Sciences, and comprises about a quarter of the course.

41751 DATA COMMUNICATIONS

Three semester hours

Prerequisites: 41622 Microcomputer Engineering, 41635 Signal Theory

Data may be communicated in serial or parallel, asychronously or synchronously at a specified symbol rate in blocks of specified length with or without error control and over wires, optical fibres or a line or radio communications channel. This subject explains the basis for making choices between the above options and for making the detailed design decisions. Currently available hardware and data communications services are studied, analysed and evaluated. Students from the EE and CSE course are streamed for the final four sessions. EE students covering communications software methodologies and CSE students the fundamentals of digital transmission.

Topics in the common module include: Information codes, full/half duplex, serial/parallel synchronous/asynchronous communication, switched channel/based line, multiplexing, concentrating, circuit/message/packet switching. Physical interface protocols: CCITT V and X series; data link protocols: character, bit and hybrid types, standards (ISO CCITT, ANSI), manufacturers protocols (BSC, SDLC). Modems, concentrators, multiplexors, data communications IC's; Public data services: Datel, Austpac, DDC, international services.

41752 ELECTROMECHANICAL SYSTEMS

Three semester hours

Prerequisites: 33220 Engineering Mathematics 2, or 33221 Engineering Mathematics 2A and 33222 Engineering Mathematics 2B, 41623 Field Theory, 41624 Network Theory

This subject will give students an understanding of the operating principles and characteristics of electromechanical devices used in computer controlled systems. The concepts developed in Field Theory and Network Theory are extended to cover doubly-excited systems with mechanical displacement. Topics covered include single-phase transformers, actuators and displacement transducers, d.c. motors, a.c. motors, stepping motors. The scope is limited to the principles of operation and some performance aspects such as speed control and elementary dynamic behaviour. Laboratory and tutorial work is an important part of the subject.

41753 DATA ACQUISITION AND DISTRIBUTION

Six semester hours

Prerequisites: 41622 Microcomputer Engineering, 41643 Analogue Electronics, 41646 Transmission Lines and Filters
Corequisite: 41673 Signal Processing

This subject aims to develop skills in the analysis, design and practical implementation of data acquisition and distribution systems interfacing computers to plant and installations.

Students should be able to: Evaluate plant measurement, display and compute and control problems; Select and specify a data acquisition/distribution system or an automatic test system (ATE); Specify and select or design sensors and actuators, analogue interfacing and signal conditioning circuits, data conversion devices and subsystems, digital interfacing subsystems; Write efficient software for interfacing the Data Acquisition and Distribution System (DADS) or ATE to a computer; Work in a team to design, build and test a complete DADS.

Topics include: Structures, applications, design considerations of DADS; Sensors and actuators; general characteristics; Transduction principles: Transducers for mechanical quantities and process parameters; Optoelectronic transducers; Transducer analogue interfacing; Actuator interfacing; Low-level signal conditioning; instrumentation and isolation amplifiers; grounding and shielding; Data conversion devices and systems; Multiplexers and sample and hold circuits;

D/A and A/D Converters: Sample rate, resolution and aliaising: Error Budget. Specification and selection criteria of DAS; Structures for DAS computing; Software specification and testing; DAS and control interfacing to microcomputers; Software for interfacing; The General Purpose Interface Bus (IEEE-488): automatic test systems.

41755 COMPUTER NETWORKS

Three semester hours

Corequisite: 41678 Data Communications (Electrical) or 41751 Data Communications (CSE)

This subject covers the concepts and theoretical analysis tools which underpin design and performance evaluation techniques associated with computer and telecommunication networks. The subject refects the layered approach inherent in the ISO Open Systems Interconnection (OSI) model. Following a review of queuing theory and issues in capacity assignment for networks, each layer of the networks, circuit switching techniques, signalling and network management strategies and future integrated network architectures (ISDN, Fast Packet) are all given extensive coverage.

41756 COMPUTER INTEGRATED SYSTEMS

Three semester hours

Prerequisites: 31141 Database Structures and Management, 41633 Engineering Statistics, 41747 Software Engineering and Languages

The aim is to draw together information from a range of earlier subjects so the functionality and configuration alternatives of a large computer supervisory and control system can be analysed. The hardware components of such a system typically include dedicated microcomputers or programmable logic controllers for 'local' machine or process control, powerful microcomputers for data collection and supervisory control with associated industrial graphics and report generation, plus a mainframe for management and accounting purposes (change of product mix and quantity, monitoring product volume and material usage), all connected by a combination of point to point data links and local area networks. The software components may be real time executives, multitasking operating systems, device handlers, DBMS systems and graphic display drivers.

The object is for the student to gain an understanding of the interaction of the various hardware and software components in the system and the effects on system specification (response time, data availability and accessibility, reliability, expandability etc). The subject is supported by industrial visits and major case studies as well as by a laboratory programme based on system performance measurements. Mathematical modelling of the system is assisted by programmes such as GPSS and SIMULA which aid the translation from logical into physical requirements and system tuning to meet specifications.

41758 COMPUTER AIDED ENGINEERING

Three semester hours

Prerequisites: 31141 Database Structures and Management, 41642 Planning Methods, 41746 Digital Systems

This subject provides a professional perspective on the current and projected character of computer technology on engineering practice, together with an assessment of its impact. Using case study examples, computer aided engineering is examined at several levels, ranging from the specialised technical applications characteristic of CADMAT to the broader management concepts affecting organisations.

At the technical level, the common database focus of CAE as a means of integrating formerly disparate aspects of information transfer is emphasised. Examples typical of the engineering process, covering research, tendering, design, manufacturing, testing, selling, installation and operation, allow an appreciation of benefits, risks, problems and trends of CAE. Topics include the use of computers in engineering design (with case study reference to VLSI applications), in engineering processes, (with reference to the overall control of materials in a production environment) and in engineering organisations (with reference to the management of resources and information flow).

A review of managerial and societal issues directly linked to the introduction of computer technology is integrated with this programme, with a series of guest lecturers providing professional assessment in key areas.

41764 INDUSTRIAL SYSTEMS DESIGN

Three semester hours

Prerequisites: 41753 Data Acquisition and Distribution, 41755 Computer Networks, 41756 Computer Integrated Systems

The student is to study the design of large industrial monitoring and control systems starting from a professional specification which may have been written by a non-specialist. The full software and hardware details need to be itemised plus the salient performance characteristics. The system may require transducers, actuators, signal conditioning, local control, machine terminals, telemetry subsystems, multidrop lines, LAN's, fibre optic links, shop floor computers and connection to company mainframes. The emphasis is on the presentation of appropriate information to people at each level in the organisation, from the shop floor to the chief executive. The skills required for this task are those of a systems analyst.

41800 PROJECT (GradDipEng) ELECTRICAL

Students undertaking the Graduate Diploma in Engineering may select a project as part of their overall programme of study. The topic should relate to the general theme of the programme and to the coursework subjects chosen, and must be approved by the students' academic advisor and the Higher Degree Committee of the Faculty Board in Engineering. The work must result in a properly presented report which will form the main basis for assessment.

Projects of varying duration may be chosen, depending on the number of coursework subjects taken. Academic advisors will assist in defining an appropriate body of work to complement the coursework elements. Project topics may be initiated by staff, students, or employers, but the student is responsible for the complete execution from detailed specification to final report. A project may include any aspects of investigation, analysis, design, construction and testing of engineering hardware, software, or systems. The key feature should be a professional approach to a problem of relevance to industry, commerce or the community.

41823 SYSTEMS ENGINEERING AND DECISION MODELLING

Prerequisite: 42813 Operations Research

The underlying process of problem-solving through engineering projects is interpreted as a unifying theme in current professional practice. The tools and methodologies of this system engineering process are examined from an engineering management viewpoint.

Management situations involving decisions with multiple alternatives and dependencies are also considered. The subject shows how these can be stated and analysed in the form of mathematical models taking account of factors such as event frequency or probability. The application of the resulting models to management decision making is illustrated.

41987 PhD THESIS (ELEC. ENG. - P/T)

41988 PhD THESIS (ELEC. ENG. - F/T)

41997 PROFESSIONAL EXPERIENCE (SANDWICH)

41999 PROFESSIONAL EXPERIENCE (P/T)

Six semester hours

All students in the Electrical Engineering degree course must accumulate a total of 144 weeks of industrial experience during the period of their academic studies.

The subject 41999 is not a subject with formally conducted classes; enrolment in this subject signifies that the student is obtaining industrial experience during the current semester. Following each period of industrial experience the student's log book is checked and the appropriate number of weeks credited. Students should enrol in the subject each year in the case of part-time students, and each industrial semester in the case of students attending on the sandwich pattern, until a pass in the subject is notified, following the accumulation of 144 weeks of credit.

42022 COMMUNICATION

Three semester hours

This course covers the various aspects of the communication process, including written and oral presentations, technical and laboratory work, reports, language usage, information retrieval, conduct of meetings. Listening, note-taking and study skills are also covered. Students participate in small group discussions, make oral presentations, and prepare written assignments and critiques.

42032 ENGINEERING AND SOCIETY

Three semester hours

The subject deals with the nature of the engineering profession and its various interactions with society. Attention is given to the historical development of mechanical engineering, the philosophical basis of the profession, and its relationships with the environment, industry and the community.

42041 ENGINEERING MANAGEMENT

Three semester hours

This is an introduction to the major functions and activities of management, and how these relate to the engineer. While the topics are generally on classic management functions of planning, organising, leading/motivating and controlling, the emphasis in all of these is on decision-making as a primary activity of management. The techniques presented show how this management activity relates to the classic functions, and form an introduction to the future management strand subjects.

42052 OPERATIONS RESEARCH

Three semester hours

This is an introduction to the philosophy and methodology of operations research, and a more detailed treatment of selected techniques including simulation, linear programming, dynamic programming, network analysis (CPM, PERT, Least Cost Scheduling), and queuing theory.

42053 TEROTECHNOLOGY (Maintenance Management)

Three semester hours

Prerequisite: 42238 Engineering Statistics

Corequisites: 42340 Design 1, 42558 Measurements and Instrumentation

This subject aims to introduce the student to the engineer's responsibility for many aspects of effective asset management. Although the course has a bias towards maintenance considerations, it is concerned with the whole asset management cycle from the formation of project objectives through specification, design and installation, operation maintenance and disposal.

Specific topics include: design for safety and reliability, availability and maintainability, maintenance strategies, condition monitoring, failure statistics, failure analysis, risk and hazard analysis and loss control, maintenance organisations and computers in maintenance.

42054 CONTRACT ENGINEERING
Three semester hours

The subject emphasis is on the practical aspects of contract engineering. It includes an introduction to basic commercial terms and practice, to tendering, administering contracts and site work.

Students are required to prepare tenders for a hypothetical project, and supervise the subsequent contract under realistic commercial and technical conditions. Course evaluation depends in part on the profitability of this hypothetical project.

42055 ENGINEERING ECONOMICS
Three semester hours

The subject covers economic considerations in evaluating operational problems: revenue-cost relationship through break-even analysis; time-value analysis; cost-benefit analysis; depreciation; income tax on economic evaluations, replacement studies; risk, uncertainty and sensitivity considerations; introductory macroeconomics.

42162 ENVIRONMENTAL ENGINEERING
Three semester hours

The course deals mainly with the interaction of humans and their work environment and includes the topics of: noise, thermal comfort, lighting, dust, vibration, gases and chemicals, radiation, safety programmes, ergonomics and the wider environment.

Emphasis is placed on the responsibility the engineer has for providing a safe and effective working environment. The relevant codes and standards, legislation and assisting organisations will be described.

While the course deals mainly with the work environment, the effects of many wastes and pollutants on the wider environment will be described.

42163 ERGONOMICS
Three semester hours
Prerequisites: 42340 Design 1, 42238 Engineering Statistics, 42041 Engineering Management

This course covers the basic concepts of ergonomics, and illustrates the relationship between improved health and safety and improved productivity by relating human capabilities to engineering design and task design factors in the workplace.

The course consists of approximately equal parts of health science topics and engineering topics. The health science topics include basic physiology, anatomy, biomechanics, perception etc to provide a background for the understanding of the relationship between people and their workplace and work tasks. The engineering topics deal with basic design approaches which incorporate the abilities and limitations of people, and the analysis and synthesis of work organisation. Practical demonstrations and exercises using actual work situations are included.

42194 THERMODYNAMICS AND HEAT TRANSFER (Electrical)
Three semester hours
Prerequisites: 33120 Engineering Mathematics 1, 33222 Engineering Mathematics 2B

This is an introductory course on the basic principles of thermodynamics and heat transfer. Topics include the properties of simple substances, the first and second laws of thermodynamics and their application to power and refrigeration cycles; conduction, convection and radiation heat transfer, particularly in electrical and electronic devices.

42195 PHYSICAL DESIGN AND PRODUCTION (Electrical)

Prerequisite: 63152 Materials Physics

This subject is for students in the Electrical Engineering degree programme. The subject considers the requirements of translating a paper electronic design into a producible item of equipment. Half the course covers the practical properties of materials and components which must be considered in designing for producibility, how components are tested, packaged and assembled with appropriate precautions, and some of the tools for automating design and assembly . A study of heat transfer with applications to electronic and electrical design forms the remaining half of the course.

42221 METROLOGY
Three semester hours

Scientific principles for workable specifications, their interpretations and methods of quality control and measurement of engineering components.

Geometric modelling in computer graphics and generalised polyhedrons as an assemblage of features. Workable specifications for any component, variations of parametric form and size of form of features and position between features. Relationship with and between dimensional tolerancing and geometry tolerancing, implicit and explicit information, local size measurement. Methods of accommodating variations in practice, the vast use and importance of machine process quality control as distinct from individual component quality control; fit and adjust on assembly. Error analysis. Machine tool laser alignment. Measurement by local size and geometry; co-ordinate measuring machines.

42226 MANUFACTURING PROCESSES 1
Three semester hours

This is the first of two related subjects dealing with processes and techniques of manufacturing engineering. After an introduction to safety engineering, processes studied include non-permanent and permanent mould casting, hot working of metals, welding and material cutting. Where appropriate, lectures will be supported by factory visits, videotapes, motion pictures, case studies, seminars, laboratory work and student involvement in manufacturing operations.

42237 MANUFACTURING PROCESSES 2
Three semester hours
Prerequisite: 42226 Manufacturing Processes 1

This is the second of two related subjects with an overall objective to develop an appreciation and understanding of processing principles and their application in manufacturing.

In Manufacturing Processes 2, following an introduction to strain hardening theory and its application, selected coldwork forming processes are investigated and laboratory experiments conducted. Other processes which may be treated include those associated with sintering, plastic products, numerical control of machines, introductory robotics, inspection, assembly and finishing. Factory visits may be used to supplement classroom work.

42238 ENGINEERING STATISTICS
Three semester hours
Prerequisite: 33221 Engineering Mathematics 2A

An introductory subject in applied statistics, taught with emphasis on worked examples drawn from the mechanical and production engineering fields.

Topics include summarising data, probability, discrete and continuous distributions including the bionomial, Poisson and normal distributions, sample statistics, estimation and confidence intervals, tests of hypotheses, regression and correlation, and analysis of variance, as well as applications to experimental design, quality control and life testing.

42252 QUALITY AND RELIABILITY
Three semester hours
Prerequisite: 42238 Engineering Statistics

Quality control in manufacturing. Process capability. Control chart techniques for attributes and for variables. Detection of changes in means and variances. Cumulative sum charts. Principles of acceptance control. Standards for attributes and variables acceptance sampling.

Reliability: stages in equipment life, predictions using the exponential distribution for series and parallel systems and standby systems, reliability testing for exponential and Weibull distributions, including graphical determination of B and prediction of reliabilities.

42253 FLEXIBLE MANUFACTURING
Three semester hours
Prerequisites: 42237 Manufacturing Processes 2

Emphasis in this course is given to Australia's demographic structure in relation to domestic and international markets and the continuing assimilation of technological change in its manufacturing industries. The inherent flexibility of computer software is considered in the modular development of flexible manufacturing cells.

Topics treated will be chosen from the following: Planning - definitions; employee involvement, JIT; types of forecasting, product lead time and aggregation; variety reduction, Pareto analysis; group technology, coding, geometric and matrix flow analysis; facilities design; Programming - NC machine commssioning; axis servos, interpolators; offline and online programming; load/unloading, jigs, pallets, mechanisms, probes; unattended machining; Integration - stations; interfacing, problems; material/part handling sub-systems, mobile carts, conveyors; modularity; simulation; investment proposals.

42255 PRODUCTION AND COST CONTROL
Three semester hours

This subject illustrates and applies quantitative methods to the planning and control of materials and costs in production processes. Materials management, transportation, inventory control; production scheduling, levels of planning horizons; production control, resource marshalling; network analysis; costing, distribution of overheads, ratio analysis; annual reports.

42256 PLASTICS TECHNOLOGY
Three semester hours
Prerequisite: 42644 Materials Engineering 2

This subject deals with thermoplastic and thermoset material and manufacturing of products of these materials. Special emphasis is given to the properties, compounding, processing and testing of the principal commercial plastics; additives used; and the modern manufacturing processes.

42263 COMPUTER AIDED MANUFACTURING (CAD/CAM)
Three semester hours
Prerequisite: 42237 Manufacturing Processes 2

This subject provides an introduction to CAD/CAM technology. An understandig of wire frame geometry, surface definition, solid modelling and geometric transformations is developed. These concepts are then applied to areas such as computer graphics, simulation, design and computer-aided manufacture. The opportunity to use computer-aided design and computer-aided manufacturing equipment is provided as appropriate.

42265 WORK STUDY
Three semester hours
Prerequisites: 42237 Manufacturing Processes 2, 42238 Engineering Statistics

This subject presents the basic techniques and skills required for method improvement and work measurement in industrial work situations. Emphasis is placed on the use of recording techniques, and critical analysis. Work measurement techniques include time study and PMTS systems for the development of standard times. Statistical approach is applied in work sampling and machine interference. Basic techniques are used to effect improvement in materials handling and plant layout. Knowledge of human factors in relation to the design of workspace and equipment and in relation to environmental constraints is presented.

42273 COMPUTATION FOR CAD/CAM
Three semester hours

This subject develops the transformation matrices for rotation, translation and scaling etc in homogenous co-ordinates. These are then applied to computer graphics, computer-aided design, simulation and computer-aided manufacturing including numerical control, robotics and vision systems.

42276 ROBOTICS
Three semester hours
Prerequisites: 42237 Manufacturing Processes 2, 42340 Design 1, 42641 Mechanics of Machines

Co-ordinate classification of joints, spatial kinematics, configurations, geometric duality, envelopes, trajectories, safety. Joint interpolation between positions, homogenous co-ordinate transformations, kinematic equations, differential relationships, velocity and acceleration, singularity positions, joint/end effector/world co-ordinate systems. Kinetics, force and motion reciprocity, assembly problems, compliance, design of parts of assembly.

42312 ENGINEERING GRAPHICS
Three semester hours

This subject covers the basics of graphic expression and communication for mechanical engineers. There is a major emphasis on development of three-dimensional sketching and visualisation skills. The subject is equally divided between objective drawing, isometric sketching and conventional mechanical engineering drawing (third angle orthographic projection), in that order. Topics included are: sketching, lettering, drafting, and the use of drawing instruments and drawing boards. The subject includes a demonstration of computer-aided drafting.

42340 DESIGN 1
Three semester hours
Prerequisites: 42631 Mechanics 3, 42632 Solid Mechanics 1

This is the first in a sequence of three Design subjects. The philosophy underlying these subjects is to introduce the student to the various tasks and decisions associated with engineering design projects from the stage of problem formulation to final presentation.

This subject covers such aspects as design methodology, the design of individual machine elements - bolted and welded joints, springs, shafts, gears, bearings and factors affecting materials selection. Power transmission systems are then discussed including selection criteria, couplings, clutches, chain and belt drives.

The subject involves the completion of a major project extending over approximately one-third of the course.

In all Design subjects and projects students will be required to give particular attention to applicable codes and regulations, safety and requirements of the human operators, and the wider responsibilities of the engineer in preserving health, the environment and public safety.

42350 DESIGN 2
Three semester hours
Prerequisites: 42340 Design 1, 42643 Dynamics of Mechanical Systems

This is the second subject in the three which comprise the core of the Design strand. Specific systems are examined and further emphasis is given to methodology. Experimental stress analysis, weld and pressure vessel design are discussed. Occupational health and safety, and fatigue design are examined in detail.

42351 STRUCTURES
Three semester hours
Prerequisite: 42642 Solid Mechanics 2

This is a non-specialist course aimed at providing the mechanical engineer with an understanding of the methods and techniques underlying structural steel design and also of reinforced concrete design.

42352 MACHINE DESIGN
Three semester hours
Prerequisites: 42340 Design 1, 42641 Mechanics of Machines, 42642 Solid Mechanics 2, 42643 Dynamics of Mechanical Systems

Particular emphasis is placed in this subject on the detailed design of mechanisms and machines. Specific topics treated include: the tribology of bearings, gears and cams, including hydrodynamic and hydroelastic lubrication; variable speed drive and control elements, including special purpose mechanisms and hydraulic drives and couplings and their characteristics and capabilities; machine logic and control.

A project applying a number of these elements to the design of a mechanism or machine forms a major part of the subject assessment.

42354 MATERIALS HANDLING
Three semester hours
Prerequisite: 42340 Design 1

This course expounds the place of materals handling in a technological society. The subject is grouped under three general divisions covering:
(a) Large bulk-materials handling systems
(b) Moving and storing unit-loads in-plant
(c) Long distance movement of freight by road, rail, ship and aeroplane.

Emphasis is placed on the systems approach to materials handling, stressing the need to match size and capability of individual elements making up the total system. System capabilities in terms of speed, mass flow rate, life between overhauls etc, limitations and strengths of a system will be delineated. The economic aspects of design, operations and maintenance are also covered.

42355 APPROPRIATE TECHNOLOGY
Three semester hours
Prerequisite: 42340 Design 1

This subject deals with the limits to economic growth and the engineering implications of the need to move towards use of renewable rather than non-renewable resources. Topics considered include criteria for the appropriateness of technology, transfer of technology; large and small scale energy sources, transport and waste disposal and recycling.

42356 DESIGN FOR RELIABILITY
Three semester hours
Prerequisites: 42340 Design 1, 42644 Materials Engineering 2

System complexity and the ever-increasing cost of equipment failures, in both dollars and human terms, is making new demands on the engineering skills. Traditional design focusing on components and simple design codes and guides no longer satisfies these demands.

This subject presents and gives some experience with techniques available for evaluating operating plant, design, prototypes and components, as well as design proposals. It deals with basic definitions of reliability and acceptable performance and safety, reliability and performance models, mathematical and computer aids, and physical and environment testing, including accelerated life testing.

42357 INDUSTRIAL DESIGN
Three semester hours
Prerequisite: 42340 Design 1

This subject introduces the engineer to the discipline of industrial design. The emphasis is on innovation, human factors and visual semantics. Teaching involves lectures, student projects and visits to practising industrial design offices.

42359 PROJECT 1
Three semester hours
Corequisite: 42350 Design 2

Students are responsible for the complete execution of a project, from specification to final report. Projects may be initiated by staff, students or employers, and students may work individually or in groups. A project may include any aspects of design, building, testing, analysis or software. The key feature should be a professional approach to a problem of relevance to industry, commerce or to the community.

Students are required to write a preliminary design report, give a short seminar on the chosen project to the project class and complete a literature survey and any preliminary planning appropriate to the initial stages of such an exercise.

42360 DESIGN 3
Three semester hours
Prerequisite: 42350 Design 2

Further development of the skills needed for project design and management related to systems with many complex variables. Lectures stress the synthesis of engineering and economic skills required in the course to date and encourage students to build on that foundation by specific research to satisfy the project at hand.

Plant visits are arranged to supplement material presented in the lectures. Students undertake small design projects, singly or in groups.

42368 PROJECT 2 (P/T)
Three semester hours
Prerequisite: 42359 Project 1

42369 PROJECT 2 (S/W)
Six semester hours
Prerequisite: 42359 Project 1

Students are responsible for the complete execution of a project, from specification to final report. Projects may be initiated by staff, students or employers, and students may work individually or in groups. A project may include any aspects of design, building, testing, analysis or software. The key feature should be a professional approach to a problem of relevance to industry, commerce or the community.

Project 2 continues the activities of Project 1 and covers the activities that follow the preliminary planning phase of an engineering project. The student carries out the design, building, test, analysis or software development as specified.

Assessment is based on the project report and, if required, a supporting oral presentation.

42429 FLUID MECHANICS
Three semester hours
Prerequisites: 33121 Engineering Mathematics 1A, 42610 Engineering Analysis, 42611 Mechanics 1

The aim of this subject is to provide mechanical and manufacturing engineering students with an understanding of fluid flow and fluid statics. Both ideal fluids and real fluids are considered. Attention is given to the principles of fluid metering, manometry and wind tunnel testing.

42439 THERMODYNAMICS
Three semester hours
Prerequisites: 33120 Engineering Mathematics 1, 42429 Fluid Mechanics, 63117 Engineering Physics (Mechanical)

This is an introductory course with the emphasis on the basic principles of thermodynamics including a thorough discussion of the First and Second Laws. The properties of a simple substance and the ideal gas concept are also considered and the principles briefly applied to power and refrigeration cycles.

42449 THERMOFLUIDS
Three semester hours
Prerequisite: 42439 Thermodynamics

The basic principles of fluid mechanics and thermodynamics are consolidated by application to fluid machines and engineering plants. The subject extends basic principles in the following areas: standard and actual power cycles, dimensional analysis and similitude, principles and selection of pumps and fans, compressible flow.

42451 HEAT TRANSFER (Solar Design)
Three semester hours

This course considers some of the basic knowledge and skills needed for the thermal design of engineering systems. Aspects of the thermal design of buildings and the components of solar heating and cooling systems are examined. In addition some thermal aspects of system degradation and reliability are explored. Attention is also given to methods of modifying existing systems to improve their thermal characteristics.

42452 ENERGY RESOURCES AND UTILISATION
Three semester hours

This subject surveys the present sources of energy in Australia and on a world-wide basis. The present utilisation rates of the various sources of energy are discussed and the utilisation is also related to categories of users. These are projected forward and some conclusions drawn with regard to these projections.

42453 COMBUSTION AND AIR POLLUTION
Three semester hours
Prerequisite: 42439 Thermodynamics

The fundamentals of combustion; the consideration of fuels and their characteristics. Special attention is given to the products of combustion and their relationship to current air pollution considerations.

42454 ADVANCED HEAT TRANSFER
Three semester hours
Prerequisite: 42459 Heat Transfer

This subject covers the basic knowledge and skills needed for the thermal design of engineering systems. Aspects of thermal design of heat exchangers, reciprocating machinery, electronic assemblies and buildings are examined. In addition, some effects of temperature on system degradation and reliability are explored. Attention is also given to methods of modifying existing systems to improve their thermal characteristics.

42456 REFRIGERATION AND AIR CONDITIONING
Three semester hours
Prerequisite: 42459 Heat Transfer

The subject deals with the different methods of refrigeration, refrigerating systems and equipment, psychrometry, air conditioning problems, cooling and heating load calculations, duct design, systems design and layout, and energy conservation.

42457 POWER CYCLES AND FLUID MACHINES
Three semester hours
Prerequisite: 42449 Thermofluids

The objective of this professional strand subject is to extend the analysis of power cycles, combustion and fluid machines commenced in earlier subjects. Fuel properties and combustion chemistry is considered, and various power cycles are studied in depth. The fluid machine aspect concentrates on axial flow compressors and turbines as elements of gas turbines.

42459 HEAT TRANSFER
Three semester hours
Prerequisite: 42439 Thermodynamics

This subject presents a basic introduction to the field of engineering heat transfer and to some of its applications. Its intent is to convey a physical understanding of the processes by which heat is transferred and to provide the tools necessary to obtain quantitative solutions to engineering problems involving one or more of the basic modes of heat transfer. It includes conduction, radiation, both free and forced convection and the thermal design of heat exchangers.

42460 MICROCOMPUTERS IN THERMOFLUIDS
Three semester hours
Prerequisite: 42459 Heat Transfer

This subject uses existing microcomputer programmes to solve advanced problems in thermofluids. In most cases the student will use several different programmes and perhaps need to modify some of the programmes to obtain a solution to the problem. Topics covered include one- and two-dimensional conduction (both steady state and transient), convection, radiation, mixed-mode heat transfer, heat exchangers, fluid friction, and fluid flow in pipe networks.

42529 COMPUTER PROGRAMMING
Three semester hours
Prerequisites: 33120 Engineering Mathematics 1, 42610 Engineering Analysis

This course introduces the computer as a means of solving engineering problems and is designed to develop programming skills and competence in the use of a computer. Programme structure that leads to uncomplicated and adaptable programmes is emphasised.

Fortran 77 is the programming language used but others will be discussed. The course will use the UNIX operating system and its text editing facilities.

42549 NUMERICAL ANALYSIS
Three semester hours
Prerequisite: 42529 Computer Programming

This subject introduces the application of numerical methods to the solution of engineering problems. It follows on from Computer Programming and makes extensive use of the computer. Topics include: numerical precision and errors, integration, solution of equations (linear, non-linear, simultaneous), curve fitting, differential equations (ordinary, simultaneous, partial).

42551 MICROPROCESSORS
Three semester hours
Prerequisites: 42558 Measurements and Instrumentation, 42549 Numerical Analysis

This subject introduces the basic concepts of microprocessor architecture and programming, and develops the skills needed for the applications of the microprocessor in industrial systems. The programming models and basic features of microprocessors and microcomputer instruction sets are examined, and the basic techniques of microprocessor programming, encoding and number systems developed. The methodology of structured software design is reviewed with an emphasis on microprocessor applications. The characteristics of the major microprocessor system components are reviewed at the board level. Input/output facilities, interrupt systems, and other ancillary devices related to control systems are explored.

42552 ADVANCED ENGINEERING COMPUTING
Three semester hours
Prerequisite: 42549 Numerical Analysis

This subject combines and extends the two subjects Computer Programming and Numerical Analysis, with emphasis on engineering problems. A structured approach to programming is insisted on throughout. The course begins with revision of Fortran 77. This is followed by an introduction to Pascal. Concurrently, assignments are drawn from areas such as: list and file handling, optimisation, simulation, computer-aided design, use of a graph plotter and application packages.

42553 PROCESS CONTROL
Three semester hours
Prerequisite: 42559 Control Engineering 1

This subject will apply control theory to the control and instrumentation of process systems. While theory is important, the subject places an equally strong emphasis on practice and current industrial applications.

The subject will cover measuring transducers, transducers, control valves, controllers (analogue and digital), programmable logic controllers and computer control. A small number of highly automated processes will also be studied and visited.

42555 PROGRAMMABLE CONTROLLERS AND APPLICATIONS
Three semester hours
Corequisite: 42559 Control Engineering 1

Modern process and manufacturing control technology includes the application of discrete logic control as well as classical analog control. The discrete logic analysis of processes is introduced and examined using binary logic and Boolean algebra, and other tools which are available to the control engineer. The Programmable Logic Controller (PLC) is introduced as a specialised computing device which applies binary logic to control processes, and its various functions and capabilities are examined. Techniques are applied such as state and ladder diagram development and the application of high level languages for programming. Communication facilities and protocol are discussed with the view to integration of complete control systems. The emphasis of the course is oriented towards the design of solutions to applications requiring discrete input/output control, and programmable analog input/output using case studies.

42558 MEASUREMENT AND INSTRUMENTATION
Three semester hours
Prerequisites: 41229 Electrical Engineering 2 (Mechanical), 42643 Dynamics of Mechanical Systems

This subject is aimed at introducing the student to a variety of measuring techniques. A large proportion of the time is spent in carrying out experiments. Topics covered will be drawn from the following: length, time, angular measurement, straightness, flatness, pressure, temperature, strain, force, torque, vibration and sound.

42559 CONTROL ENGINEERING 1
Three semester hours
Prerequisite: 42643 Dynamics of Mechanical Systems
Corequisite: 42558 Measurement and Instrumentation

The methods and concepts required for classical control analysis are developed: mathematical models based on linear differential equations, Laplace transforms as a method solution, transfer functions, block diagrams, transient analysis, simulation, controller actions, error analysis, frequency response analysis, and stability are treated. A variety of control systems are analysed with particular emphasis on servo systems and process control. A proportion of the course is devoted to laboratory studies of various real control systems. Although this is the first of two subjects entitled Control Engineering, it is self-contained and may be effectively taken alone.

42561 BIOMEDICAL ENGINEERING
Three semester hours

The anatomy and physiology of the systems of the human body are briefly introduced, then engineering principles are applied to understand selected physiological principles. Applications studied include patient monitoring, artificial kidneys, feedback systems in the body, biomechanics and cardiovascular dynamics.

42568 ADVANCED INSTRUMENTATION
Three semester hours
Prerequisite: 42558 Measurement and Instrumentation

The course, which is laboratory oriented, deals with the collection, transmission and analysis of time-varying signals from a wide variety of transducers. Laboratory work concentrates on examples from acoustics, vibration and condition monitoring in various mechanical and process systems. All students are given hands-on experience with some of the latest instrumentation that is now coming into wide use in industry.

42569 CONTROL ENGINEERING 1
Three semester hours
Prerequisite: 42449 Control Engineering 1

This subject follows on from Control Engineering 1, extending the classical system analysis by including the root locus technique and then devoting considerable time to the design of control systems using classical techniques. Additional topics then covered are state space analysis, design of control systems, and a brief introduction to discrete and non-linear systems. A proportion of the course is devoted to laboratory studies of various real control systems, programmable logic controllers, digital control and common systems using some of the above components. There are also a number of industrial visits.

42589 PROJECT B
Eighteen semester hours
Prerequisite: 42580 Project A

The student is required to select and complete a major project in the general field of control engineering theory, instrumentation, design or computer application. The project may be undertaken as part of the student's normal employment. The subject is of 18 semester hours duration made up of six 3-hour units. Starting in the student's third semester the six units may spread in any combination through semesters 3 to 6 of the course.

42612 MECHANICAL ENGINEERING ANALYSIS
Six semester hours
(Formerly offered as 42610 Engineering Analysis and 42611 Mechanics 1)

Mechanical Engineering Analysis is an introduction to the principles of Newtonian mechanics, applied to planar motion. The behaviour of non-rotating bodies is analysed through an explicit investigation of Newton's three laws of motion, extending to energy and momentum methods. This subject lays the foundation for advanced work in mechanics in succeeding subjects. Students are also introduced to the professional method of dealing with engineering problems, through both discussion and selected exercises. This includes providing an awareness of the stages of problems analysis and the conceptual need for simplification and approximation. It is anticipated that the emphasis placed on physical principles and concepts will prepare the student for the sensible application of computer based methods of analysis. The subject includes an introduction to the practical ways computers are used in mechanical engineering.

42621 MECHANICS 2
Three semester hours
Prerequisites: 33120 Engineering Mathematics 1, 42611 Mechanics 1

This is the second of three subjects covering basic engineering mechanics. Major topics include the following: three-dimensional force systems, analysis of structures, internal forces in beams, determination of principal axes for second moments of area, analysis of curvilinear motion of particles, and impact of particles.

42631 MECHANICS 3
Three semester hours
Prerequisite: 42621 Mechanics 2

This is the third of three subjects covering basic engineering mechanics. The major topics are intended to be an introduction to the study of machines and mechanisms and include the following: motion with respect to rotating reference frames, three-dimensional kinematics of particles and rigid bodies, virtual work and the plane dynamics of rigid bodies.

42632 SOLID MECHANICS 1
Three semester hours
Prerequisite: 42621 Mechanics 2

This is the first of two core subjects dealing with the basics of solid and structural mechanics. The concepts of stress and strain, material properties (both linear and non-linear) and structural analysis are introduced in terms of axial, torsional, bending and shear stresses and the deflection of beams. Further work includes the transformation of stress and strain, combined stresses in beams, and yield and failure analysis. Laboratory work is a significant component of the course.

42641 MECHANICS OF MACHINES
Three semester hours
Prerequisite: 42631 Mechanics 3

The content is approximately equally divided into studies of the kinematics of plane mechanisms, forces in mechanisms, cam and gear kinematics, and balancing of machinery. Some of the main topics are mobility, relative motion and acceleration analysis of complex mechanisms: link force analysis and dynamic analysis using the method of virtual power; dynamically equivalent masses and flywheels; cam specifications and analytical cam design; standard spur gear characteristics and meshing; balancing of rotating and reciprocating masses, and of engines.

Each study has associated with it laboratory periods involving self-instruction of mechanisms' operations.

42642 SOLID MECHANICS 2
Three semester hours
Prerequisite: 42632 Solid Mechanics 1

This is the second of two core subjects dealing with the basics of solid and structural mechanics. The topics include continuous beams, energy methods, virtual work, torsion and shear in thin-walled sections, shells of revolution, thick-walled cylinders, composite beams, limit analysis and elastic stability. An overview is given of experimental stress analysis and computer-based numerical methods. Laboratory work is an integral part of the course.

42643 DYNAMICS OF MECHANICAL SYSTEMS
Three semester hours
Prerequisites: 33222 Engineering Mathematics 2B, 42631 Mechanics 3

This subject is an introduction to the behaviour of mechanical systems with an emphasis on the analysis of mechanical vibrations. The content includes free and forced response of spring/mass/damper systems, two- and multi-degree of freedom systems, torsional vibrations and the transverse vibration of beams. Laplace transformation, mechanical impedance and matrix methods are used and both analytical and computer based numerical solutions are presented.

42644 MATERIALS ENGINEERING 2
Three semester hours
Prerequisites: 42621 Mechanics 2, 63704 Materials Engineering 1

This is a design-oriented subject that is concerned with predicting material behaviour under various operating conditions. These operating conditions include the environment, the loads and the expected life. The subject uses mathematical methods of material behaviour based on theoretical considerations where these are known, or on empirical relationships which have been found to work in practice. Topics include fracture mechanics, fatigue, stress relaxation, creep and creep-rupture in metals and plastics, viscoelelasticity, corrosion and the behaviour of adhesive and composites.

42652 SOLID MECHANICS 3
Three semester hours
Prerequisite: 42642 Solid Mechanics 2

This subject introduces the theories of elasticity and plasticity, matrix structural analysis, and the theory of plates and shells. It includes the design of pressure vessels, limit analysis, structural stability, the bending of plates and shells, the use of fracture mechanics in design and experimental stress analysis.

42653 KINEMATICS AND DYNAMICS OF MACHINES
Three semester hours
Prerequisite: 42643 Dynamics of Mechanical Systems

Half the course is devoted to advanced machine dynamics, the other half to advanced kinematic analysis and synthesis of mechanisms. The subjects covered in dynamics are: gyroscopic effects of flywheels on the natural frequencies of rotating shaft systems; vibration of some continuous systems; oil whirl phenomena; torsional vibration of composite shafts such as crankshafts; dynamic design of cams; advanced vibration monitoring. Subjects covered in kinematics are: freedom and constraint in mechanisms; the geometry of three-dimensional motion; planar mechanism synthesis; gross motion of three-dimensional mechanisms.

42654 APPLIED DYNAMICS
Three semester hours
Prerequisite: 42643 Dynamics of Mechanical Systems

This course introduces the application of the theories of rigid body dynamics and mechanical vibrations to machine and structural analysis. Topics include spatial dynamics and Euler's equations of motion, the vibration of continuous systems, modal analysis and parametric excitation. These topics are applied to the study of vehicle dynamics, inertial guidance systems and the vibration of beam and plate structures. Both analytical and computer-based solution techniques are covered and laboratory work is an integral part of the course.

42655 FINITE ELEMENT APPLICATIONS
Three semester hours
Prerequisite: 42652 Solid Mechanics 3

This subject is a practical introduction to the Finite Element Method and is intended for potential users of Finite Element computer programmes. As a consequence the course is in two parts:

(i) An introduction to the basic theories of the finite element method. This includes a review of matrix structural analysis, the use of structural and variational methods to formulate element stiffnesses, geometric and material non-linearity, and dynamic analysis.

(ii) The modelling process and the analysis of finite element solutions. This includes problem formulation, the preparation of data for finite element computer programmes, element selection, convergence and the analysis of errors. Particular attention is paid to the use and behaviour of isoparametric and frame and plate bending elements.

General purpose structural analysis programmes, (e.g. NASTRAN, POLO-FINITE) and small special purpose programmes are used to obtain finite element solutions.

42777 THESIS (F/T)
Twenty-four hours

42778 THESIS (P/T Ext)
Twelve hours

The thesis must be a contribution to knowledge in the area covered by the research. Its contents may report the result of an original investigation, review or criticise some aspect of engineering knowledge, or present an engineering design or solution involving the application of new or known techniques to an engineering problem of significance.

The accent is on applied research and development work, although basic research proposals are also welcomed. Projects which involve close co-operation with industry are encouraged and a majority of current candidates are engaged on projects which are actively supported by their employers. The research may be carried out either using the facilities made available by the Faculty or in an industrial location.

Supervision will involve at least one full-time member of academic staff of the School of Mechanical Engineering.

42800 PROJECT (GradDipEng) MECHANICAL

See 41800

42812 CONTEMPORARY ISSUES AND TECHNOLOGICAL CHANGE

In this subject the results of introduction of technological innovations into society are examined, using both historical and contemporary examples. The potential effects of emerging technologies are considered and the possibilities of facilitating planned and desirable technological developments. The subject is also seen as a key element in the development of communication skills at a professional level, orally in small and large groups and in written work.

Topics addressed vary according to timeliness and interest but might include, for example: Australia and its place in the world of trade; the nature of, and prospects for, post-industrial society, a study in technological determinism; the relationship between computers and employment; technological forecasting; engineers and politics; the nuclear power debate; the strategic defense initiative; innovation and technological change - making them happen.

42813 OPERATIONS RESEARCH

A detailed treatment is given of selected techniques in operations research. The testing of models and their solution, evaluation, implementation and maintenance will be discussed. Topics covered include: statistical methods; simulation techniques; linear programming; queuing theory; inventory control; quality control; dynamic programming; optimisation techniques; non-linear programming; dynamic optimisation.

42987 PhD THESIS (MECH. ENG. — P/T)

42988 PhD THESIS (MECH. ENG. — F/T)

42997 PROFESSIONAL EXPERIENCE (SANDWICH)
Six semester hours

42999 PROFESSIONAL EXPERIENCE (P/T)
Three semester hours

This subject is an important part of the course. Enrolment in it indicates that the student is currently obtaining industrial experience. While there are no formal classes at UTS, 144 weeks of experience must be obtained in a prescribed range of work of activities before the student may graduate.

Following each period of industrial experience, the student's log book is checked and the appropriate number of weeks credited. Until they have accumulated the required number of weeks of experience, part-time students enrol each year for both semesters, while sandwich students enrol only for their industrial semester.

43002 PROJECT (2 hours)

In completing the Civil Engineering Project the student is expected to apply and extend the skills and knowledge acquired during the course to the solution of a significant task in civil engineering analysis, design or construction. Topics cover all fields of civil engineering and may involve extensive reading, review of case studies and laboratory work. In many cases students choose topics related to the activities of their current or future employer.

Students should enrol in between six and twelve hours over up to three semesters.

43003 PROJECT (3 hours)

43004 PROJECT (4 hours)

43006 PROJECT (6 hours)

43009 PROJECT (9 hours)

43012 PROJECT (12 hours)

43159 GEOMECHANICS ELECTIVE
Two semester hours

Advanced theoretical and field testing techniques for use in complex design situations. Elastic theory applied to soils. Applications of the finite element method to soil and rock mechanics problems.

43169 CONSTRUCTION METHOD ELECTIVE
Two semester hours
Prerequisites: 43160 Construction 1, 43549 Construction Planning

This course presents, through lectures, site visits and student presentations, a cross section of modern construction projects and the techniques and equipment used in their execution.

43171 ROAD MATERIALS ELECTIVE
Two semester hours
Prerequisite: 43101 Road Engineering

This course has been designed to provide the basic principles involved in the design of pavements together with various methods of pavement design which are in use overseas and in Australia. The procedure in selecting and testing pavement materials such as soils, gravels, stabilised materials, asphaltic concrete and bituminous materials is given. Laboratory work includes the testing of fine crushed rock, lime and/or cement stabilised soils and the designing and testing of asphaltic concrete.

43172 ENGINEERING MATERIALS ELECTIVE
Two semester hours
Prerequisite: 43533 Computations 2

Each student is asked to nominate two topics of particular interest. A programme of lectures is arranged which consists mainly of dissertations by the students but has contributions from staff members and special lectures from people outside the University.

Relevant industrial visits are also arranged. Topics covered in previous semesters are as follows:

Corrosion of steel, structural use of aluminium alloys; brittle fracture of welded steel joints; fatigue of welded steel joints; alternative materials in developing countries; steel fibre reinforced concrete; prediction of creep and shrinkage in concrete; full-depth asphalt for roads; expansion of bricks; plastics in civil engineering; restoration of sandstone in buildings; blast furnace slag as a road material; durability of concrete; grouting materials; mastic joints; epoxy concrete; laminated timber; fire behaviour of materials.

43173 COMPUTERISED STRUCTURAL ANALYSIS ELECTIVE
Two semester hours
Prerequisites: 43533 Computations 2, 43532 Structural Analysis 1, 43542 Structural Analysis 2

This subject provides an introduction to the matrix method of analysis of linear skeletal structures. The computer implementation of these methods is emphasised. Both the Force-Flexibility and Displacement-Stiffness formulations are considered.

43175 CONCRETE TECHNOLOGY ELECTIVE
Two semester hours
Prerequisite: 43554 Concrete Technology

Field control of plastic concrete. Analysis of hardened concrete and trouble shooting. Durability of field concrete. Types of cement and admixtures for concrete. Concrete for special purposes. Shrinkage and creep of field concrete. Emphasis is placed on field aspects and control. At least one site visit is made to highlight these aspects.

43176 REGIONAL PLANNING ELECTIVE
Two semester hours

History of urban and regional planning. The neighbourhood unit. Land use planning and the natural landscape. Town form. Planning legislation in NSW and legal aspects of planning. National, state and regional planning. Decentralisation of industry in NSW. Planning in the Sydney region. Landscape planning techniques. Socio-economic aspects of planning. Local government and the planning process.

43179 RAILWAY ENGINEERING ELECTIVE
Two semester hours

The objective of the subject is to study in-depth the civil engineering components of railway engineering. Approximately half of the lectures cover topics related to the design and construction of railway bridges and the other half deals with requirements and engineering concepts related to the design and construction of railway tracks. Current engineering practice and standards of NSW railways are emphasised.

43190 ADMINISTRATIVE LAW FOR ENGINEERS
Two semester hours

The objective of this course is to introduce the student to quasi-judicial bodies in modern Australia.

As professionals in the field of local government or civil engineering it is especially important that the workings of these bodies be understood as well as the remedies which are available to reverse a capricious or unjust decision.

This course studies briefly the civil legal system, procedure and rules of evidence and the rules of natural justice and shows how these are applied in administrative tribunals.

Attention is paid to presenting a case before such a tribunal.

43193 PUBLIC HEALTH ELECTIVE
Two semester hours

Prerequisite: 43551 Public Health Engineering

This subject focuses on the design of municipal wastewater and water treatment plants. Topics include: wastewater characteristics, population and flow estimates, design requirements and criteria, conventional and extended aeration and activated sludge, drinking water sources, physical and chemical water treatment processes, disposal of sludges and treated wastewater.

43194 WELDING ELECTIVE
Two semester hours

The objective of this elective is to introduce students to the various welding processes and the attendant metallurgical and physical aspects involved. The following topics are treated: metallurgy of welding, welding processes, mechanical testing of welds, brittle fracture, weld preparation and specification design of weldments, flaws and weld imperfections, non-destructive testing, fatigue, distortion of weldments. Heat affected zone, heat treatment, costing.

43195 ADVANCED WELDING ELECTIVE
Two semester hours

This elective builds on the framework of Welding Elective (43194) and extends the treatment of various topics. The student also studies by means of laboratory testing the factors relating to stress analysis, hardness, residual stress, distortion etc. The student is also involved in a project. The following topics are covered: metal transfer, electrode and process selection, photo-elastic demonstration of stress at joints and defects, hardness range through welds, ultimate and working stress levels in fillet and butt welds, fracture mechanics, residual stress, fatigue, distortion, codes and specifications, design and detailing of welds.

43250 FOUNDATION ENGINEERING
Three semester hours
Prerequisite: 43536 Soil Mechanics

An introduction to methods of investigation, analysis and design used in the solution of foundation problems. Topics include shallow and deep foundations, earth retaining structures, embankments and methods of soil improvement.

43275 REINFORCED CONCRETE STRUCTURES ELECTIVE
Two semester hours
Prerequisite: 43530 Concrete Design 1

The course deals with the various modes of failure of reinforced concrete beams and columns. For beams, moment curvature relationships are derived using first principles. Using these relationships, accurate methods of predicting deflection are obtained. Code equations are derived and explained.

For columns, moment-load interaction diagrams are determinmed and the effect of slenderness is taken into account.

A testing programme is used to reinforce the knowledge acquired by theory. Reinforced concrete beams are fabricated, instrumented and tested to failure to demonstrate the different modes of failure: tension, compression and shear. Eccentrically loaded, reinforced concrete slender columns are also fabricated, instrumented and tested to failure.

43276 LAND DEVELOPMENT ELECTIVE
Two semester hours

The course is intended for senior students in local government or land development companies. It covers the legal and engineering aspects of land subdivisions and the creation of new roads. Other areas covered vary according to the backgrounds and interests of the students but usually include: land resumptions, strata titles, councils' development codes for industrial, commercial or medium density housing developments, quarrying and mining and traffic considerations in land development.

43277 PRESTRESSED CONCRETE STRUCTURES ELECTIVE
Two semester hours
Prerequisite: 43540 Concrete Design 2

The aim of this course is to acquaint students with the various prestressing systems and techniques. Visits to a number of manufacturers and to construction sites are organised throughout the semester.

Specialised topics are dealt with in class. These include: load balancing method, end block design, evaluation of losses and prediction of deflection.

A testing programme is used to reinforce the knowledge acquired by theory. Full-size, pre-tensioned and post-tensioned beams are manufactured, stressed, instrumented and tested to failure. The results comparing experimental behaviour with theory are presented in the form of an extensive report.

43278 INTRODUCTION TO FINITE ELEMENT ANALYSIS ELECTIVE

Two semester hours

Prerequisite: 43227 Matrix Structural Analysis Part A, or 43228 Matrix Structural Analysis Part B, or 43173 Computerised Structural Analysis Elective

This subject provides an introduction to the application of the finite element method in structural mechanics. The properties of plane stress and plate bending elements are considered.

43309 ADVANCED GEOMECHANICS

Two semester hours

Practice of site investigations. Evaluation of field and laboratory data. Basic soil mechanics principles as applied to the analysis of bearing capacity, settlement of foundations and earth pressures. Recognition and treatment of slope instability and its relevance to urban planning. Soil reinforcing and stabilising techniques. Formulation of design criteria. Methods of performance evaluation. The role of government authorities, specialist consultants and contractors in soil engineering projects. Sources of geotechnical information. Current professional activities and developments in geomechanics.

43310 ADVANCED HYDRAULICS

Two semester hours

Review of pipeline hydraulics with particular emphasis on the calculation of hydraulic grade lines.

Open channel hydraulics, definition of critical, subcritical and supercritical flow and their occurrence as applied to rectangular and non-rectangular channels. Calculation of conjugate depth upstream and downstream of hydraulic jumps in non-rectangular channels. The use of the Manning, Darcy-Weisbach and the Colebrook-White equation to calculate energy losses in natural and artificial channels. Energy losses in various channel transitions. These various aspects are brought together to develop the procedures for calculating the water surface profiles in channels. Particular emphasis is given to situations which could occur in local government engineering hydraulic modelling. Development of the theory relating to hydraulic modelling with particular emphasis on Froude models. Design of models. Construction of models. Testing of models and interpretation of the model result.

43317 COMPUTER METHODS IN WATER ENGINEERING

The aim of this course is to provide students with expertise in computer programmes and packages currently in use for hydrological and hydraulic studies.

The content includes revision of hydrological and hydraulic principles, synthetic unit hydrography methods, storage network models, pipe network models, open channel flow models and other appropriate models.

43318 ADVANCED TRANSPORTATION ENGINEERING

This subject aims to provide the basic principles in transportation planning, traffic engineering and traffic management. Environmental, political, and technical influences are analysed. Emphasis is directed toward application of engineering in the planning and reorganisation of traffic problems in local government situations. Topics include traffic analysis, control and improvement of traffic flows, estimation of parking demand, traffic studies, accidents and their prevention, traffic management, street lighting, environment effects and transportation policies.

43319 COASTAL ENGINEERING

The subject deals with problems encountered in coastal processes and with methods of shore protection. Topics include wave theory, wave forecasting, refraction and diffraction of waves, littoral processes, methods of shore stabilisation, engineering methods of beach protection and foreshore protection; construction of mound-type breakwaters, wind and wave erosion and beach sediment budgeting. Computer programmes are used in solving problems involving engineering analysis of coastal processes.

43320 TREATMENT PLANT DESIGN

This subject aims to familiarise students with the NSW Clean Waters Act, to demonstrate the need for sewage and water treatment and to provide fundamental systems approaches for the design of sewage and water treatment plants.

Sewage Treatment topics include design requirement and effluent criteria; population, flow and polluted load estimates; design of each unit process; optimisation of design, operating considerations; economic considerations.

Water Treatment topics include: sources of water, water supplies; design criteria and standards; design of each unit process; optimisation of design, operating considerations.

43401 ENVIRONMENTAL PLANNING

The objective of this subject is to ensure that the local government engineer has a sound knowledge and understanding of the principles and procedures of urban and regional planning.

Topics include evolution of town and country planning; New South Wales environmental planning legislation; environmental planning process, neighbourhood planning; development control process and the civil engineer; national, state and regional planning; and environmental impact assessment and traffic.

43402 TRAFFIC AND TRANSPORTATION

This subject provides the basic principles in transportation planning and traffic engineering. Environmental, political and technical influences are analysed. Emphasis is directed towards the application of traffic engineering in the planning and re-organisation of traffic problems in the local government situation.

43403 MANAGEMENT AND INDUSTRIAL RELATIONS

This subject examines the principles of management and considers the aspect of corporate management as developed by the Local Government and Shires Association of New South Wales. The following topics are covered: elements of management and industrial relations; concepts of corporate management; the Council; financial management; works management; policies, codes and delegated authority; and the review process.

43404 ASSET MAINTENANCE MANAGEMENT

This subject examines the combination of management, financial, engineering and other practices applied to physical assets in the pursuit of economic life-cycle costs and aims to enable the local government engineer to develop a proper maintenance strategy. Topics to be included are terotechnology and logistics and benefit cost analysis.

43405 OPERATION OF WATER AND WASTEWATER SYSTEMS

This subject concentrates on the operation and maintenance of municipal wastewater treatment plants, sewerage systems and water supply systems. Topics include statutory requirements, constituents and quality of wastewater, description, operation and control of treatment processes, performance monitoring, description and operation of sewerage and water supply systems, trouble shooting and problem solving.

43406 ROADS AND STREETS

The aim of this subject is to equip students with the knowledge of good practice in the design, construction and maintenance of roads. Besides the basic principles involved in pavement design and construction, particular attention is drawn to the design, construction and maintenance of streets in residential areas.

Students will also become conversant with the standards of the design of road and street alignment, as practised by the appropriate authorities in New South Wales.

Study of road elements, road features, and road structures is included in the course content.

43407 WATER ENGINEERING

This subject focuses on urban drainage and methods of flood control and protection. Topics include urban drainage design; design flood estimation techniques; culvert design; floodway design; detention or retarding basin design; total catchment management; erosion and scour protection; flood mitigation practice; and coastal engineering.

43408 POWERS, DUTIES AND FINANCIAL MANAGEMENT IN LOCAL GOVERNMENT ENGINEERING

This subject aims to establish the requirement of the various Local Government Acts. The legal responsibilities and liabilities of councils and the administrative, financial and accounting procedures related to local government are examined. Topics include the Local Government Act, 1919; Ordinances under the Local government Act; legal responsibilities and liabilities of Councils; administration of government finances; account and cost-control; and management statistics.

43409 ENVIRONMENTAL PLANNING AND ASSESSMENT

This subject provides a sound understanding of the environmental effects of engineering projects and an awareness of NSW environmental and planning legislation and policies. Students will also become familiar with the preparation and assessment of environmental impact statements.

Subject content includes an introduction to environmental impact assessment; environmental and planning legislation; requirements for environmental impact statements; ecological concepts; land and water ecosystems and impacts; the atmosphere and impacts; noise pollution; aesthetics, socio-economic aspects; critical review of environmental impact statements.

43500 CIVIL ENGINEERING PROJECT (1 sem)

Six to twelve semester hours

In completing the Civil Engineering Project the student is expected to apply and extend the skills and knowledge acquired during the course to the solution of a significant task in civil engineering analysis, design or construction. Topics cover all fields of civil engineering and may involve extensive reading, review of case studies and laboratory work. In many cases students choose topics related to the activities of their current or future employer.

43501 CIVIL ENGINEERING PROJECT (2 sem)
Three to six semester hours

In completing the Civil Engineering Project the student is expected to apply and extend the skills and knowledge acquired during the course to the solution of a significant task in civil engineering analysis, design or construction. Topics cover all fields of civil engineering and may involve extensive reading, review of case studies and laboratory work. In many cases students choose topics related to the activities of their current or future employer.

43510 INTRODUCTION TO CIVIL ENGINEERING
One and one half semester hours

The purpose of this subject is to familiarise new students with the history and practice of civil engineering. Topics include the history of civil engineering, phases of engineering work, the branches of civil engineering, engineering methods, professional societies, industrial matters, career paths, principles and ethics.

43511 STATICS
Three semester hours

Study of the effect of forces on bodies in equilibrium. Bodies include 2D and 3D particles and 2D rigid bodies only. Internal actions in structural members - axial force, shear force and bending moment diagrams. Forces in plane truss members. Analysis of pin-jointed frames. Centroids, first and second moments for plane areas.

43512 CIVIL ENGINEERING DRAWING
Three semester hours

Geometrical construction, third-angle, orthographic projection, position of points and lines, auxiliary projections, true length and point projection of line, edge view and true shape of plane, relationship of lines and planes, force systems graphically, strike and dip, skew lines, locus, contours and construction cones.

History, role of drawings, instruments and paper types, drawing lines, lettering, drawing skills and techniques, pictorial drawings, scheduling steel reinforcement, principal views of an object, layout of foundations or structure, reinforced concrete members, structural steel framework and timber truss.

43513 INTRODUCTION TO COMPUTING
One and one half semester hours

Introduction to computers, MSDOS, and programming: BASIC commands, numerical expressions, strings and graphics; input-output; loops, arrays, data files, subroutines; programming exercises.

43518 SURVEYING 1
Three semester hours

Fundamental surveying theory, techniques and instruments used in Civil Engineering, viz, levelling, tacheometry and traversing. Elementary setting-out of Civil structures including horizontal and vertical curve calculations. Elementary familiarity with volume estimation and the role of the Professional Surveyor on Civil projects.

43520 INTRODUCTION TO DESIGN
Two semester hours

Principles of problem solving. Methodology of design. Assessment of alternative designs. Whole-life, cost-benefit analyses. Design for reliability.

Formulation of design objectives and criteria. Conceptual design. Documentation. Case studies and examples of the design process in a range of projects drawn from various areas of civil engineering.

43521 MECHANICS OF SOLIDS 1
Three semester hours
Prerequisite: 43511 Statics

Statics of bar: axial force, bending moment, shear force, torque. Relationship of load shear forces and bending moments in beam, properties of plane area.

Concept of stress and strain at a point. Stress-strain relationship for elastic material obeying Hooke's Law. Stresses due to axial force, bending moment. Shear force and torsion. Beam deflection.

Combined stresses and transformation of stresses and strains at a point. Mohr circle for stresses and strains. Theories of failure. Introduction to column buckling.

43523 COMPUTATIONS 1
Three semester hours
Prerequisite: 43513 Introduction to Computing

Basic programming: arrays and array manipulation; programming structuring and subroutines; algorithm development and programming logic; use of data files; engineering and statistical programming applications.

Statistics: probability laws; statistics of central tendency and dispersion; probability distribution - bionomial, geometric, Poisson, exponential, normal; statistical significance - of the mean, hypothesis testing; linear regression and correlation; introduction of statistical approaches to design.

43524 ENGINEERING MATERIALS 1
Three semester hours
Corequisites: 62186 Engineering Chemistry (Civil), 43521 Mechanics of Solids 1

This subject deals with the basic properties of engineering materials. In the section on materials science the major topics are classification and structure of solids; primary and secondary bonding; metals, polymers and ceramics, heat treatment and joining methods; durability and corrosion.

In the section on mechanical properties the major topics are the behaviour of materials subjected to tensile and compressive loads: hardness. The lecture programme is supported by a series of laboratory demonstrations and experiments.

43527 TIMBER ENGINEERING
Three semester hours
Prerequisite: 43511 Statics

Fundamental properties of wood and the utilisation of structural timber as one of the country's most useful building resources. The course introduces the theoretical design of simple beam, column and tension members together with the performance and design of fasteneres. This approach is illustrated by laboratory assignments and site visits.

43530 CONCRETE DESIGN 1
Three semester hours
Prerequisite: 43521 Mechanics of Solids 1

Introduction to reinforced concrete. Flexural analysis of cross-sections from first principles. Ultimate strength in flexure and shear. Anchorage of reinforcement. Rectangular, T, L and general cross-sections. Serviceability and deflections. Design procedures. Design and detailing of continuous beams. Analysis and design of columns. Development and use of interaction curves. Slenderness effects.

43531 MECHANICS OF SOLIDS 2
Three semester hours
Prerequisite: 43521 Mechanics of Solids 1

Behaviour of beams of two or more materials. Elastic-plastic flexure, plastic hinge. Shear stresses in thin-walled sections, shear centre. Torsion of solid rectangular section, closed thin-walled sections. Unsymmetrical bending. Column buckling with eccentric load, concept of effective length. Strain energy due to axial load, shear force, bending moment and torque. Deflection by energy method. Impact loads. Introduction to beam stability, concept of lateral restraint and effective length.

43532 STRUCTURAL ANALYSIS 1
Three semester hours
Prerequisite: 43521 Mechanics of Solids 1
Corequisite: 43531 Mechanics of Solids 2

Degree of indeterminancy. Virtual work and its applications to deflection calculations. Analysis of simple statically-independent structures by the force method of analysis. Introduction to the direct stiffness method. The moment distribution method and its application to continuous beams and frames subjected to simple sway.

43533 COMPUTATIONS 2
Two semester hours
Prerequisite: 43523 Computations 1

This subject aims to familiarise students with a number of computational techniques which are applicable to the solution of a wide range of engineering problems. Emphasis is given to computer implementation of many of the techniques involved.

The subject is also used to continue the development of computing skills. Students are introduced to the Fortran programming language.

Syntax of Fortran 77; structured programming with Fortran; solution of sets of linear equations; solution of non-linear equations; numerical differentiation and integration; introduction to the solution of initial value and boundary value problems; errors in numerical processes.

43534 STEEL DESIGN
Three semester hours
Prerequisite: 43521 Mechanics of Solids 1

Overview of the history and characteristics of structural steel. Hot rolled and cold formed sections. Building systems, nomenclature, bracing and stability. Design for strength and serviceability. The role of Australian standards and use of design aids. Assess dead and live loads in combination with wind loads. Proportion columns, beams, plate girders, ties and struts. Design and detail bolted and welded joints for connection of structural components, splices, cap and base plates. Introduce the use of computer software in structural analysis and design.

43535 FLUID MECHANICS
Three semester hours
Prerequisites: 33221 Engineering Mathematics 2A, 43521 Mechanics of Solids 1

Definition of fluids; fluid properties; types of fluid; hydrostatic pressures and forces; fluid continuity; kinetics of ideal fluids - Euler, Bernoulli and energy equations; momentum; hydraulic machinery; kinetics of real fluids; pipe flows; flow measurement; dimensional analysis.

43536 SOIL MECHANICS
Three semester hours

Nature of soil, phase relationships. USCS classification of soil, state of stress in a soil mass. Mohr circle construction, principle of effective stress, steady seepage of water in soil, one-dimensional consolidation and settlement, shear strength behaviour of cohesionless and cohesive soils.

43539 CONSTRUCTION
Three semester hours

The principle objective of this subject is to develop an understanding of the equipment, processes and methods associated with construction work.

Topics include initial site establishment, earth moving, grading and compaction equipment, shoring, underpinning, pumps, ground water control, pile driving equipment, air compressors and air tools, formwork and falsework techniques, building in reinforced and post-tensioned concrete.

43540 CONCRETE DESIGN 2
Three semester hours
Prerequisites: 43530 Concrete Design 1, 43532 Structural Analysis 1

Design of prestressed concrete beams. Partial and full prestress. Flexural and shear strength. Serviceability, deflection and cracking. Design procedures of concrete beams with any level of prestress. Brief discussion of secondary effects in continuous beams. Reinforced concrete flat slabs. Equivalent frame analysis. Punching shear. Drop panels and column capitals. Deflection control.

43541 ENVIRONMENTAL ENGINEERING
Three semester hours
Prerequisite: 62186 Engineering Chemistry

This subject aims to make students aware of the major features of NSW environmental legislation, the consequences of engineering activities on natural environments and engineering procedures for minimising or avoiding adverse environmental impacts. Topics include the NSW EPA Act, fundamentals of environmental science of water, land and air, basic ecological principles, major categories of engineering environmental impacts, impact measurement, mitigation of adverse environmental impacts, case studies.

43542 STRUCTURAL ANALYSIS 2
Three semester hours
Prerequisites: 43531 Mechanics of Solids 2, 43532 Structural Analysis 1

The students are expected to master the analysis of structures using the stiffness method and become familiar with its computer application. They are also introduced to the analysis of structures with material and geometric nonlinearities and to problems of elastic stability.

43545 HYDRAULICS
Three semester hours
Prerequisite: 43535 Fluid Mechanics

Review of fluid mechanics; steady flow in pipe networks; gradually varied unsteady flow in pipe networks; water hammer; specific and total energy in open channels; critical flow; normal flow; flow controls; interaction of flow controls; sketching flow profiles; calculation of flow profiles; determination of flow conditions in erodible channels; physical modelling of prototype flow conditions.

43546 SOIL ENGINEERING
Three semester hours
Prerequisite: 43536 Soil Mechanics

An introduction to methods of investigation, analysis and design used in the solution of basic civil engineering problems involving soil as a foundation or construction material; shallow and deep foundations, earth retaining structures, embankments, soil improvement.

43547 ENGINEERING MATERIALS 2
Three semester hours
Prerequisites: 43521 Mechanics of Solids 1, 43524 Engineering Materials 1

Strain and work-hardening; bending and shear behaviour; creep; impact, notch toughness, fracture-safe design, elementary fracture mechanics; fatigue; welded steel joints, defects, non-destructive testing methods; composites, glass reinforced polymers; rubber; behaviour of materials under fire conditions, fire ratings. The lecture programme is supported by a series of laboratory demonstrations and experiments.

43548 SURVEYING 2
Three semester hours
Prerequisite: 43518 Surveying 1

Developments and evaluation of modern surveying equipment; simple photogrammetry and parallax heightening; modern mapping methods; construction project surveying, such as survey control for dams, bridges, tunnels and high-rise buildings; co-ordinate systems and associated calculations; precise levelling; deformation surveys; introduction to Land Law and NSW Land Title Systems.

43549 PROJECT PLANNING
Three semester hours

The principle objective of this subject is to provide the student with a detailed knowledge of a series of techniques which guide engineers in their managerial decision making.

Topics include the critical path method (CPM) - planning, scheduling and resource levelling, PERT, bar charts, S curves linear balance charts. Prediction of earthmoving production and fleet balancing. Time value of money and cash flow analysis. An introduction to preliminary and detailed cost estimating.

43551 PUBLIC HEALTH ENGINEERING
Two semester hours
Prerequisite: 43541 Environmental Engineering

The purpose of this subject is to give civil engineers a basic background in the areas of water pollution, water and wastewater treatment, and solid waste disposal. Topics include water quality constituents; the NSW Clean Waters Act; sources, types and examples of water pollution; sources and characteristics of sewage; physical, chemical and biological treatment processes used in NSW; sources of drinking water supply; objectives of drinking water treatment; methods of achieving water treatment in the Sydney Water Board area.

43553 COMPUTATIONS 3
Two semester hours
Prerequisite: 43533 Computations 2

This subject aims to enable students to solve a wide variety of practical problems using computational techniques such as finite differences, finite element and optimisation. Emphasis is placed on the role of computer packages in solving such problems.

43554 CONCRETE TECHNOLOGY
Three semester hours
Prerequisite: 43547 Engineering Materials 2

The design of concrete mixes to meet a range of requirements is treated in detail. The influence of the properties of the raw materials on the concrete mix is discussed. The factors affecting workability and compaction of plastic concrete are presented. The factors which influence the properties of hardened concrete are discussed, in particular regarding strength durability, shrinkage and creep. The significance and methods of quality assurance are presented. Special concretes made with other than Portland cements or with exotic aggregates are examined.

43555 HYDROLOGY AND WATER RESOURCES
Three semester hours
Prerequisites: 43545 Hydraulics, 43533 Computations 2

Introduction to hydrology, meteorology, data collection, statistical analysis, design rainfall data, the rainfall-runoff process, infiltration, evaporation, surface runoff, groundwater, the rational method, unit hydrographs, routing, reservoir yield analysis, introduction to water resources engineering, types of projects, water resources of Australia, planning and development, management, law.

43556 GEOTECHNICAL DESIGN
Two semester hours
Prerequisite: 43546 Soil Engineering

Site investigation, design criteria, codes of practice, design methods, selection of geotechnical design parameters, interrelationship between design and construction, expansive soils, elementary rock mechanics.

43557 STEEL STRUCTURES AND CONCEPT DESIGN
Four semester hours
Prerequisite: 43534 Steel Design

Relevant SAA codes, texts and design aids. Application of commercial products - sheeting, cold-formed sections, block work, timber trusses etc. Elastic and plastic design concepts for steel structures. Analysis of single and double bay portal frames. Bolted and welded connections. AISC standard structural connections. Composite design. Use of Bondek for slabs and stairs. Bracing of structural steel systems. Lateral instability of beams.

43559 CONSTRUCTION CONTRACTS
Two semester hours

The principle objective of this subject is to provide an awareness of the activities and functions associated with the administration of civil engineering contracts.

Topics include types of contracts, tender documents and tender procedure. The parties to the contract. The general conditions - a detailed review of the important Clauses and their implications. Contract law. Negotiation, arbitration litigation.

43561 BRIDGES
Two semester hours
Prerequisite: 43540 Concrete Design 2

The objective of this subject is to introduce the student to the design and construction concepts related to small highway bridges. Standard types of bridge superstructure and substructure are discussed and a specific case of bridge crossing is selected for the design and analysis, which is to be carried out by the student.

43562 DAMS
Two semester hours

This subject deals with concepts and contributing factors which must be taken into account in the design and construction of dams. An emphasis is given to the overall co-ordination of hydrological objectives, ground stability criteria, and typical structural solutions.

43563 ENGINEERING PRINCIPLES OF GROUND MODIFICATIONS
Two semester hours
Prerequisite: 43546 Soil Engineering

This subject aims to develop the methods of analysis and design of selected geotechnical construction techniques. The typical lecture topics are: compaction - shallow and deep; dewatering; chemical soil stabilisation; grouting; stabilising excavations; soil reinforcement; geotextiles; tunnelling.

43565 URBAN DRAINAGE DESIGN
(formerly Water Engineering Design A)
Two semester hours
Corequisite: 43555 Hydrology and Water Resources

Urban stormwater drainage systems, design methods and standards, design rainfalls, pipe system design, rational method, hydraulic grade lines, computer models, trunk drainage design, channels, culverts, detention basins, stormwater pollution, safety, property drainage, on-site detention.

43566 WATER SUPPLY AND SEWERAGE
(formerly Water Engineering Design B)
Two semester hours
Prerequisite: 43554 Concrete Technology

This subject covers design of water supply and sewerage collection systems, concentrating on design and selection of system components such as valves, pipelines and pumping stations. (Detailed design of treatment plants is not covered). Contents include: soures of water, demands, storages, operation of water supply systems, design of components. Sources of sewage, flowrates, design of sewerage systems components, pumping stations, system operation.

43568 ROAD AND TRANSPORTATION ENGINEERING

Three semester hours
Prerequisite: 43546 Soil Engineering

The driver-vehicle-road relationship, road furniture, traffic, intersection, drainage, earth structures, plant calculation, bridges, road location, road maintenance, overview of the transportation system, transportation technology, operations, transportation planning.

43578 FINANCIAL MANAGEMENT

Prerequisites: 43549 Project Planning, 43559 Construction Contracts

The main purpose of this subject is to provide knowledge of the economics and financial aspects of engineering works. Methods of assessing and planning projects, such as cash-flow analysis, are presented.

Topics covered include: overall project planning and assessment; marketing, technical, economic and financial assessments; interest formulae; macro- and microeconomics; cost-benefit analysis; economic project assessment - guidelines, criteria and frameworks; intangibles and multiple objectives; special aspects - sensitivity, probability, taxation, depreciation, discount rates and inflation; financial assessment; accounting framework; financial operations of organisations; financial viability.

43579 MANAGEMENT FOR ENGINEERS

Two semester hours
Prerequisites: 43549 Project Planning, 43559 Construction Contracts

The principle objective of this subject is to develop an awareness of management theories and an understanding of practice and techniques associated with management of business and in particular engineering endeavours.

Topics covered include a review of the planning process, tracing and analysing, cost control, status reports. Engineering ethics, professional liability. Time management. Organisation structure, leadership and motivation theories. Industrial relations, occupational health and safety. Quality assurance systems.

43640 STRUCTURAL TESTING

Two semester hours
Prerequisites: 43531 Mechanics of Solids 2, 43532 Structural Analysis 1

Muller-Breslau Principle, influence lines from indirect models; structural similitude, design and application of direct models. Measurement of strain, displacement and force. Instrumentation and data logging. Case studies of concrete and metal structures.

43641 APPROXIMATE METHODS IN STRUCTURAL ANALYSIS

Two semester hours
Prerequisites: 43531 Mechanics of Solids 2, 43532 Structural Analysis 1

Degree of inaccuracies inherent in various methods of structural analysis; concepts leading to approximate methods; approximate methods used for determination of stress resultants, approximate methods for determination of deflection, comparison of some of these methods with more exact analyses; a case study illustrating a preliminary design.

43650 FINITE ELEMENTS ANALYSIS

Three semester hours
Prerequisites: 43542 Structural Analysis 2, 43533 Computations 2

Linear constitutive relationships, stiffness formulation of the finite element method. Mesh grading. Elements plane stress, plate bending, folded plate, shells and axisymmetric solids. Characteristics of higher order elements, isoparametric elements. Interpretation and validation of results of F.E. analyses. Application of the F.E. method to the analysis of plane stress problems, folded plates, flat slabs/plates, axisymmetric problems.

43651 HIGH-RISE BUILDINGS

Four semester hours
Prerequisites: 43542 Structural Analysis 2, 43540 Concrete Design 2, 43641 Approximate Methods in Structural Analysis

In this subject the student studies how to analyse, optimise, and design medium- to high-rise, multi-storey buildings subjected to wind, earthquake and gravity loads. Design of reinforced concrete frames and shear walls, braced steel frames, load bearing masonry buildings and buildings which include any combination of steel, concrete or masonry. Determination of equivalent static wind and earthquake loads by considering dynamic characteristics of the building through analytical approaches and/or wind tunnel testing. Also, building services such as lifts, air ducts, plumbing, electrical services, plant rooms, etc.

43652 DYNAMICS OF STRUCTURES

Two semester hours
Prerequisites: 43542 Structural Analysis 2, 43533 Computations 2

Overview of structural dynamics including fundamental objective, types of loadings, essential characteristics of a dynamic problem, methods of discretisation and formulation of the equations of motion. Single-degree-of-freedom and multi-degree-of-freedom systems.

Dynamic analysis of continuous systems including free vibration of uniform beams, vibration of single-span beams, vibration of continuous beams, dynamic response of beams and thin plates, applications in design of thin slabs and footbridges.

43653 CONCRETE DESIGN 3
Three semester hours
Prerequisite: 43540 Concrete Design 2

Design of continuous prestressed concrete beams fully and partially prestressed; effect of redundant reactions; serviceability requirements. Prestressed concrete flat slabs; design for strength and deflection. Reinforced concrete retaining walls; cantilever retaining wall, counterfort retaining wall; design for stability and structural strength. Design of slabs. Suspended design by the strip method; slabs on ground. Detailing reinforced and prestressed concrete components and connections.

43654 TIMBER DESIGN
Three semester hours
Prerequisites: 43527 Timber Engineering, 43547 Engineering Materials 2

Role of timber engineering in Australia and utilisation in construction industry. Examples of structural design in timber and problems caused by lack of appreciation of anistropic properties, variability, moisture content, creep and visco-elastic parameters.

This subject is a core subject in the BE Structural degree and an elective in the BE Civil degree.

43660 BRIDGE DESIGN
Three semester hours
Prerequisite: 43540 Concrete Design 2

Level and length of superstructure. Geometric features of roadways and footways. Spacing of girders. Standard traffic loads and other specified loads. Types of bridge deck. Bending moment and sheer force envelopes. Composite construction of reinforced concrete deck on steel girders and prestressed concrete girders. Continuity of superstructure for dead loads and/or live loads. Standard types of abutments, their design and analysis. Typical bridge piers, their design, analysis and appearance. Bridge bearings.

Effects of skew and curvature on bridge design. Field joints and connections. Rigorous analysis of bridge superstructure. Cost effectiveness and cost estimate for bridge structures. Examples of selected bridges.

43661 STRUCTURAL STABILITY
Prerequisite: 43542 Structural Analysis 2

The behaviour of elastic and elastic plastic compression members and beam columns; the effects of boundary conditions and imperfections. Introduction to plate and beam buckling. Energy based methods; characteristic equations. Stability of Framed Structures.

43662 DESIGN PROJECT
Six semester hours
Prerequisite: 43557 Steel Structures and Concept Design

This subject will require students to critically examine the functional requirements of a project and to formulate the conceptual outlines of alternative preliminary solutions. Students will then have to carry out the investigations necessary to firm up the proposals to a stage where the alternative solutions can be evaluated.

This stage of the work is concerned with defining the main requirements that the project has to satisfy and devising alternative schemes that can meet these requirements. This requires that the objectives be quantified and the constraints clearly spelt out. One of the most important aspects of this subject is considered to be the task of devising the outlines of schemes which provide solutions to the functional requirements, and bringing these alternatives to a stage where they can be objectively assessed relative to one another.

When the preferred option has been identified the final design and documentation of appropriate portions of the overall project will be carried out.

43666 PROJECT (CIVIL ENG.) MASTERS (2 SEM)

An intellectually challenging project relevant to local government engineering is undertaken by each student. The project normally involves the unique application of known technology to a local government engineering problem. A report must be submitted covering all aspects of the work.

43800 PROJECT (GradDipEng) CIVIL

See 41800

43811 ECONOMICS FOR ENGINEERING

This subject deals with the effect of economics on activities and management in two ways, aiming: to provide an understanding of the economic forces that shape the environment of engineering activities; to provide engineering managers with economics-related techniques of decision making and management.

Main topics: macroeconomic issues and policies; microeconomic market theory; theory of the firm; project evaluation and cost benefit analysis; intangibles and risk; an introduction to operations research and systems engineering, finance and project accounting, project management.

43833 PROJECT MANAGEMENT
Prerequisites: 41823 Systems Engineering and Decision Modelling, 21719 Organisational Behaviour

The subject is intended to have an integrating effect in which work from the various subjects covered earlier in the course is brought together for further examination and illustration.

The emphasis is an interdisciplinary one of relevance to all fields of engineering. The subject considers the management, financial and contractual responsibilities of engineering managers and organisations from the establishment of a project team and the instigation of a contract.

The perspectives of all parties, including principals, contractors and sub-contractors are considered. Examples of topics are: project evaluation and selection; project life cycle; planning of activities; allocation of resources; selection of human and physical resources; management of human physical resources; the matrix organisation; estimating; costing of work and utilisation of cost data; operations management; cash flow; progress control; opportunities for success and failure; industrial and external relations.

43987 PhD THESIS (CIVIL ENG. — P/T)

43988 PhD THESIS (CIVIL ENG. — F/T)

43997 PROFESSIONAL EXPERIENCE (SW)
Six semester hours

Students must accumulate at least the equivalent of 144 weeks of approved professional experience. Each four-week period of approved professional experience provides credit for one semester hour. Proportional credit is possible. At least 24 weeks of industrial experience must be taken before the commencement of Stage 3 of the course.

43999 PROFESSIONAL EXPERIENCE (P/T)
Six semester hours

Students must accumulate at least the equivalent of 144 weeks of approved professional experience. Each four week period of approved experience provides credit for one semester hour. Proportional credit is possible. At least 24 weeks of industrial experience must be taken before the commencement of Stage 3 of the course.

44143 PROJECT (MEM)
Two semesters
Prerequisite: 43833 Project Management

This six-semester-hour capstone subject is taken across two consecutive semesters and provides an opportunity for the practical application and integration of the professional background and skills presented in Project Management and other subjects.

The emphasis is on small-team project work in interdisciplinary groups. An advanced level of commercial and professional expertise in the conduct of the project is expected, from evaluation and selection, through the seminar mode presentation of a business plan, to the final execution and reporting of the project.

The conduct of the subject is tightly structured with the encouragement of both creativity in approach and discipline in execution. Strong emphasis is placed on the meeting of all deadlines.

44802 MANAGEMENT DECISIONS

This subject presents a critique of rational decision aids in the light of modern descriptive theories of judgement, choice and decision in organisations. The methods of management science, decision analysis and judgement analysis are presented and models of reasoning, argument construction, persuasion and negotiation. Real decision behaviour is discused using sociological and behavioural models of decisions in bureaucracies and firms.

THE STUDENTS' ASSOCIATION (SA)

All students of the University are members of the SA. In general the SA plays a representative and advoacy role on behalf of students. It also operates to organise and encourage students themselves to become active in campaigns. It liaises closely with the University Union and the Student Services Unit. Additionally, it negotiates with and/or lobbies government and non-government organisations on education and welfare issues in the interests of the students.

The Students' Association maintains close links with student bodies in other tertiary institutions and has political role to play in maintaining educational standards and conditions for students both within the University and the tertiary sector as a whole.

The SA is governed by the Student Representative Council (SRC) which deals with University-wide issues and is responsible for controlling the SA's funds. At a campus level there are Campus Committees dealing with campus related issues. There are five Campus Committees:

- Balmain
- Broadway
- Kuring-gai
- Haymarket
- Northern (Gore Hill & St Leonards)

The SRC and the Campus Committees are elected by students and are accountable to the student body. Any student is welcome to attend the SRC and Campus Committee meetings.

The full-time paid President of the SA is directly elected by students. An Executive Committee assists the President in carrying out the directions of the SRC and the day-to-day management of the Association. The Education Vice-President is employed to represent student education interests. At a campus level the Campus Convenor carries out the directions of the Campus Committee and generally represents the Campus.

A Women's Officer and International Students' Officer are employed on a full-time basis. A Special Needs Officer is employed on a part-time basis to provide support and representation to students with disabilities.

The SA provides resource centres at Broadway, Haymarket, Gore Hill and Balmain, second-hand bookshops at Broadway, Haymarket and Kuring-gai, and photocopying is provided at Broadway, Haymarket, Gore Hill, St Leonards and Balmain. Three Education Officers are employed by the SA to provide assistance in educational matters and Austudy.

For further information contact the main office of the SA which is located at the Broadway campus on level 3A of the Tower Building (telephone 218 9064). Opening hours: 9.00am to 7.00pm. Or alternatively contact the Students' Centre at Balmain campus (Batty Street).

PRINCIPAL DATES FOR 1991

AUTUMN SEMESTER

January

14	Release of HSC results
21	Closing date for changes of preference of 1990 NSW HSC applicants (4.30 pm)
26	Australia Day
29	Public School Holidays end
29-31	Enrolment of continuing students at Broadway Campus

February

1-21	Enrolment of continuing and new students at Broadway Campus
25-28	Enrolment at Kuring-gai Campus
27-28	University Orientation Day at Broadway Campus

March

1	University Orientation Day at Kuring-gai Campus
15	Last day to enrol in a course or add subjects
28	Last day to apply for leave of absence
29	Public School Holidays commence
29	Good Friday
31	HECS Census Date

April

1	Easter Monday
1-5	Vice-Chancellors' Week (non-teaching)
7	Public School Holidays end
12	Last day to drop a subject without academic penalty
12	Last day to withdraw from course without academic penalty
25	Anzac Day
29	Graduation Ceremonies commence

May

6-10	Tutorial Week (Engineering)
10	Graduation Ceremonies finish
24-25	Information Evening
31	Closing date for applications for Spring Semester

June

7	Formal examinations commence
29	Public School Holidays commence

SPRING SEMESTER

July

5	End of formal examinations
3-12	Vice-Chancellors' week (non-teaching)
14	End of Public School Holidays
19-26	Enrolment of new students

August

9	Last day to enrol in a course or add subjects
23	Last day to apply for Leave of Absence
26-30	Tutorial Week (Engineering)
31	HECS Census Date

September

6	Last day to drop a subject
6	Last day to withdraw from a course
28	Public School Holidays commence
30	Undergraduate applications close for admission in 1992
30	Vice-Chancellors' Week (non-teaching)

October

6	End of Public School holidays

November

11	Formal examinations commence

December

6	End of formal examinations
14	Public School Holidays commence

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