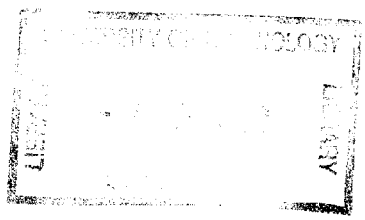
UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

# FACULTY OF ENGINEERING

## HANDBOOK ◆ 1992

UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

# FACULTY OF ENGINEERING



# HANDBOOK 1992

# 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) and on the entrance level of Kuring-gai campus. If you can't visit them, write to PO Box 123 Broadway 2007 NSW Australia or telephone (02) 330 1222 or (02) 413 8200.

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

Open Days are your chance to visit the campus and discuss your career plans and course preferences with members of the Academic staff.

**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.

# EQUAL OPPORTUNITY

It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of sex, race, marital status, age, physical ability, sexual preference, political conviction or religious belief.

# MISSION

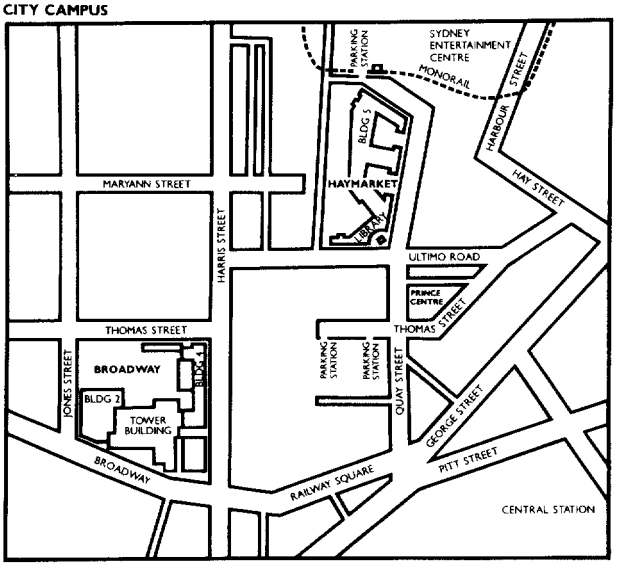
The mission of the University of Technology, Sydney is to provide higher education for professional practice which anticipates and responds to community needs and the effects of social and technological change. The University offers access to its human, physical and technological resources for the advancement 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

CITY CAMPUS




## Faculty of Engineering

Faculty Office:
Level 4, Building 2
Broadway, City Campus
Telephone: (02) 330 2605
Facsimile: (02) 330 2611

Postal Address:
PO Box 123
Broadway NSW 2007

**School of Civil Engineering**
Level 5, Building 2
Broadway, City Campus
Telephone: (02) 330 1990

**School of Electrical Engineering**
Level 24, Building 1
Broadway, City Campus
Telephone: (02) 330 1990

**School of Mechaniocal Engineering**
Level 6, Building 2
Broadway, City Campus
Telephone: (02) 330 1990

# CONTENTS


| | |
|---|---|
| Staff | 7 |
| Courses | 11 |
| **School of Civil Engineering** | |
| Undergraduate Courses | 17 |
| Postgraduate Courses | 21 |
| Staff and Location of Facilities | 23 |
| **School of Electrical Engineering** | |
| Undergraduate Courses | 25 |
| Staff and Location of Facilities | 28 |
| **School of Mechanical Engineering** | |
| Undergraduate Courses | 31 |
| Staff and Location of Facilities | 33 |
| Further Programmes in Engineering | 35 |
| Synopses | 41 |
| The Students' Association | 82 |
| University Principal Dates | 83 |


Information correct at March 1992
Produced by the Publications Branch

# STAFF

*Professor of Electrical Engineering and Dean*
P J Parr, MSc, PhD (Belf), CPEng, FIEAust

*Secretary to the Dean*
K F Inglis

*Faculty Administrator*
D J Carraro, BA (NE)

*Professor*
A Pattison, MSc, PhD (Stan), ASTC, FIEAust

*Associate Professor and Director, Management Studies in Engineering*
J V Parkin, MSc, MEnvStud, PhD (NSW), FIEAust, FICE

*Director, Industrial Liaison*
J G Crowe, BE (Qld), MEngSc (NSW), FCIT, MIEAust

*Administrative Assistant*
B Buckenmaier

*Administrative Assistants (P/T)*
M R Collison
P J Doyle

*Administrative Secretary*
L B Smith

*Engineering Workshop Manager*
J R Grove

*Women in Engineering Co-ordinator*
Vacant

## School of Civil Engineering

*Professor of Civil Engineering and Head of School*
S L Bakoss, BE (Syd), MEngSc (NSW), MS (Calif), PhD (NSW), MASCE, FIEAust

*Professor of Civil Engineering*
K A Faulkes, ME, PhD (NSW), MS (Ill), FIEAust

*Deputy Head of School*
E A Brady, BSurv, MSurvSc (NSW), MISAust, Registered Surveyor (NSW)

*Associate Professors*
T A Anderson, BEng (NSW), MEngSc (Syd)
M R Hausmann, DiplIng (Zur), MSc (Alberta), DipAdmin, PhD (NSW), MIEAust, MASCE
G G O'Loughlin, BE, PhD (NSW), MIEAust, MASCE

*Senior Lecturers*
J W Ivering, MIng (Gdan), MEngSc (NSW), DrTechn (Inn), MIEAust
S C Beecham, BSc PhD (Manc)
S Parsanejad, B Arch (Tehran), BSc (CSU), MSc, PhD (Lehigh)
M Patrapanich, BEng (Chulalongkorn), MEng (AIT), MSc (Strath), PhD (WA), MIEAust
W G Peters, BE (Syd), MEngSc (NSW)
G L Ring, BE, PhD (Syd)
B Samali, BS, MS, DSc (GWU), MASCE
S Vigneswaran, BSc (Sri Lanka), MSc (AIT), DrIng (Montpellier), DSc (Inst Nat Polytechnique, Toulouse)

*Associate Professor and Executive Director, Centre for Local Government Education and Research*
K Sproats, BTP, GradDipHNP (NSW), PhD (NE), MRAPI, AIMM

*Lecturers*
H W Chung, BSc (Eng), MSc (UHK), PhD (Leeds), FIEAust, FICE, FHKIE
M R Karim, BSc (UEng & Tech), MSc (Middle East Tech Uni), PhD (Birm), MIES, MASCE, MIEAust, MSSSS, MSCI
K L Lai, BEng, PhD (NSW)
P C Liu, ME (NSW), MIEAust
R Sri Ravindrarajah, BSc (Sri Lanka), PhD (Sheff)
A Saleh, DipIng, DrIng (RWTH Aachen)

*Associate Lecturer*
K J Halstead, BE (NSWIT), ME (Woll), LGE, LGTNCT, MIEAust

*Office Manager*
B D Blakeway, ASA, AAUQ

*Administrative Secretary*
L Venglinsky

*Secretary*
S Ali

*Word Processor Operator*
J Chetcuti

*Engineers*
M J Taragel, BSc (Tech) (NSW), CPEng, MIEAust
I A Hutchings, BE (NSWIT)
D A Tapner, BE (NSWIT)
A Lah, BE (NSWIT)

*Senior Technical Officer*
J C Holmes

*Technical Offcer Grade 2*
M Benitez

*Technical Officers*
H J Hefka
St J Parmigiani
H J McMahon
Hao H Ngo, MSc (National U Taiwan)
P Martinus
W Howse

*Technical Officer - Electronics and Computing*
P M Chatfield

*Senior Laboratory Craftsman*
H A Myers

*Laboratory Craftsman*
D Byfield

*Engineering Trades Assistant*
D R Hooper

*Stores Officer*
S E Gabor

## School of Electrical Engineering

*Professor of Electrical Engineering and Head of School*
K W Yates, BSc, BE, PhD (Syd), FIEAust, SMIREE, MIEE, SMIEEE

*Professor of Electrical Engineering*
W R Belcher, BE, MEngSc (Qld), PhD (Lond), DIC, CEng, MIEE, FIREE,FIEAust

*Professor of Computer Systems Engineering*
C R Drane, BSc, PhD (Syd), MIEEE, MAIP

*Associate Professors*
G E Beard, BSc (Tech), ME, PhD (NSW), CEng, MIEE
P Bryce, BSc, PhD (NSW), FIREE, MSSRE
T Buczkowska, BE, MSc (Warsaw), PhD (ABU), MIEEE, MCS, AACS, FIREE
H T Nguyen, BE, ME, PhD (Ncle)
C E Peterson, BSc, BE, PhD (Syd)
V S Ramsden, BE, MEngSc (Melb), PhD (Aston)
S Reisenfeld, BScEng (Ill), MSc, PhD (UCLA)

*Adjunct Professors*
E W Aslaksen, MSc (Swiss Fed IT), PhD (Lehigh), MIEAust, MAIP
A Seeto, BS (Qld), PhD (NSW), MIEEE
R Stere, DipEng, DEng (Bucharest), MIEEE, MSICF

*Senior Lecturers*
N J Carmody, BE, MEngSc (NSW)
K K Fung, BSc (UHK), MSc (Lond)
G I Gedgovd, BE, ME (NSW), GradDipOR, MAppSc (NSWIT), GradDipEd (STC), GradAdEd (ITATE), ASTC, MACS
A Ginige, BSc (Mech) (Moratuwa), PhD (Cambridge)
W G Hooper, BE, MEngSc (NSW), ASTC, MIEAust
S Y R Hui, BSc (Eng), DIC, PhD, AMIEE, MEEE
J R M Leaney, BE, ME (NSW), SMIREE
P G Lewis, BSc (NSW)
R Meegoda, MSc, PhD (Aston), CPEng, MIEAust, MACS, PCP, AIMM
J G Nicol, BSc (Eng), PhD (Strath), SMIREE, MIEE
V Ramaswamy, BE, MTech, PhD (Madras)
A Seneviratne, BSc (Hons) (Middx), PhD (Bath)
S Sridharan, BSc, MSc (Manch), PhD (NSW), CEng, MIEE, SMIEEE
P J White, BSc, BE (Syd), PhD (NSW), MIEE

*Lecturers*
T A Aubrey, BE (UTS), SIEEE
J D Carmo, BSc (Lond), MSc (Aston), PhD (QMC)
B S Rodanski, MSc, PhD (Wroclaw), MIEEE
D Sharma, BScEng (PunjabU), MEng, DEng (AIT), CPEng, MIEAust
T J Stevenson, BE (NSWIT), MIEEE, CEng
E A Taylor, BE (NSW), CPEng, MIEAust

*Research Fellow*
N Law, BSc, MPhil, CertEd (HK), PhD (Lond)

*Research Assistants*
C Gibson, BSc (Hons) (Syd)
P A Watterson, BSc (Hons) (Monash), PhD (Cantab)

*Administrative Assistant*
E With

*Secretary*
R L Tay

*Word Processor Operator*
T C Lai

*Vax Computer Manager*
WA Symons, BE (NSWIT)

*Manager, Research Computing Centre*
R A Jelliffe, BEc (Syd)

*Analyst/Programmer*
P M Yardley

*Programmers*
G J Ingram
H R Witjetlaka, BEng (Warwick)

*Engineers*
P D Cooper
W M Holliday, BE (NSW)
P Mallon, BE, BSc (Syd), MEngSc (NSW)
R S Nicholson
S Y Shoon, BSc (Coll of Chinese Culture, Taiwan), MSc (Nat Taiwan IT)

*Laboratory Manager*
J B Vagg

*Assistant Laboratory Manager*
A C Curgenven

*Senior Technical Officers*
J J Boswell
G W Evans
P T Gimes
R C Moore
L Weber

*Technical Officers*
M De La Villefromoy
R Jarman
V L Huynh
R B Smith

*Laborarory Assistant*
S J Ashton

*Apprentice*
P Moor

## School of Mechanical Engineering

*Head of School*
S F Johnston, BE, ME (NSW), FIEAust

*Professor of Mechanical Engineering*
J P Gostelow, BEng, PhD, DEng (Liv), MA (Cantab), MA (Lond), FIEAust, FRAeS, MASME

*James N Kirby Professor of Manufacturing Engineering*
F B Swinkels, BE (NSWIT), PhD (Cantab)

*Associate Professors*
S-L Hall, BSME (Ill), MSME (Conn), PhD (Syd), FIEAust
C T Mathews, BE (Syd), MSc, PhD (NSW), FIEAust, FIICA
R M Spencer, DipME (Qld), MSc (UMIST), PhD (NSW), MIEAust

*Senior Lecturers*
A J Burfitt, DipAM, MEngSc (Sheff), MIEAust
H McGregor, BS (Drexel), MA (Macq)
L E Reece, BE (NSW), MEngSc (Syd), MBioengSc (Strath), MIEAust
K A Stillman, BE (Syd), MEng (NSWIT)
R M Wiltshire, MSc (Cranfield), MIEAust

*Lecturers*
Y P Bhasin, BScEng (Agra), MTech (Kharagapur), PhD (NSW), CEng, MIProdE (UK), MIMS (UK), MIE (India), MIIE (Aust), MBIM, MIIE, SrMIIE (USA)
K S Chan, BSc, PhD (Birm), FIEM, FIMechE, MASHRAE, MIEAust
B P Huynh, BE, MEngSc, PhD (Syd), MIEAust, MIACM, MIICA
A N F Mack, BSc, BE, MEngSc, PhD (Syd), MAIAA
G M Marks, BE (NSWIT), CEng, MIMarE
F C O Sticher, BE, PhD (Syd)
R B Ward, BE (NSW), MBA (Macq), ASTC, MIEAust, AAIM
H G R Weidemann, BE, ME (NSW), MIEAust

*Administrative Secretary*
S Tanuwidjaja

*Word Processor Operator*
C Lew

*Engineer Grade 4*
J J McCaffrey, BE (NSWIT), MEngSc (NSW)

*Engineers Grade 3*
K W Bowyer, DipTech (NSWIT), MEngSc (NSW)
K C Barnes, BA (Macq)

*Engineer Grade 2*
A Revel, BE (NSWIT), MIEAust

*Scientific Officer*
C M Chapman, BSc (UTS)

*Assistant Laboratory Managers*
P H Alt
C E Evans

*Senior Technical Officers*
T J Bayfield
L M D'Arcy
J I Gibson
R J Turnell

*Assistant Workshop Manager*
L Slade

*Senior Laboratory Craftsmen*
S M Gordon
G J Bayley
T E Wells
L S Stonard

*Stores Officer*
E J Newton

# 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 contacts 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 by Thesis
- Master of Local Government (offered jointly with the Faculty of Business)
- Graduate Diploma in Local Government

**School of Electrical Engineering**
- Bachelor of Engineering in Electrical Engineering
- Bachelor of Engineering in Computer Systems Engineering
- Master of Engineering (Telecommunications)
- 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 Management
- 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 Faculty Office.

## UNDERGRADUATE COURSES

### Description

Undergraduate courses are available in Civil, Structural, Electrical, Computer Systems, Mechanical and Manufacturing engineering and lead to the award of Bachelor of Engineering, abbreviated as BE(UTS).

Each course incorporates the principles of cooperative education in which classroom and laboratory work is developed with the needs of professional practice in mind. All students are required to undertake at least 90 weeks of approved work in industry during their course enrolment. Work experience is accumulated in blocks of at least 22 weeks duration and must satisfy a number of rules covering its quality and timing (See Industrial Experience Requirements, p. ). The attendance patterns which provide for this are Sandwich or Part-time. There are no full-time students.

### Attendance Patterns

The structure of each course provides for both sandwich and part-time attendance patterns. Combined sandwich and part-time attendance is also possible.

A semester consists of 14 weeks of teaching, a one week study period prior to exams and a two week examination period.

Sandwich attendance requires the completion of eight academic semesters plus at least 90 weeks of approved work experience. Part-time students must be employed in work relevant to their course for the duration of their course. Part-time students are required to attend University for up to 15 hrs/week, which includes one full day (or equivalent) release from employment each week.

With approval from their Head of School, students are permitted to change their attendance pattern from part-time to sandwich or vice-versa to suit their circumstances provided that industrial experience requirements are met.

### Duration of Course

Normally, the sandwich attendance program will provide for students to complete the course in eight academic semesters plus four blocks of work experience with an overall duration of six years. The first two academic semesters (Stages 1 & 2) are

usually completed in the first year of enrolment. The first period of work experience would normally be undertaken in the second year of enrolment. Sandwich pattern students who choose to undertake additional subjects on a part-time basis during periods of work experience and who can satisfy work experience requirements in three blocks each of at least 30 weeks duration, can complete the course in a minimum period of five years.

The part-time attendance program provides for an overall course duration of 14 academic semesters or seven years. Part-time students are encouraged to reduce the overall duration of the course by planning for periods of sandwich attendance as they progress through the course.

## Cooperative Education in Action

Employment arrangements for sandwich students usually fall into three categories:

*Cadetships:* These are made available by employers for student engineers. Some cadets are selected by employers on the basis of HSC results and are then directed to study engineering at UTS. Others are selected after completing the early stages of their course at UTS. Cadets are usually paid while studying during their academic semesters as well as during periods of work experience. A cadet would work for the same employer during each work experience period. Cadetships are also available for part-time students.

*Sponsorship:* This tends to be a verbal understanding between an employer and a student which means 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:* This means that a student may be employed by the same or a different employer during successive industrial experience semesters.

While each student is responsible for finding suitable industrial experience, the Faculty's Industrial Liaison Unit and advisors in each School will help with information and advice. **It is not necessary for a student to have arranged a job before enrolling in the course.**

In contrast to sandwich students, part-time students are continuously employed for the duration of their course enrolment, and usually have a job before commencing their studies.

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 going on the next stage. This allows students with special circumstances to take reduced or accelerated programmes, with the approval of their Head of School, and still maintain progress in the course. A sandwich student who has failed a subject may repeat it in an evening class during the next industrial semester, with the approval of the Head of School and employer.

## Admission

(See also Rules of the University Relating to Students)

Each course has an intake of students in March each year. Courses offered by the 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 March are made through the Universities Admissions Centre, and those for admissions 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 1991 NSW HSC examination TERs were 76.70 for Civil/Structural engineering, 74.60 for Electrical Engineering, 88.15 for Computer Systems engineering, and 73.20 for Mechanical/ Manufacturing engineering. Although there are no formal subject prerequisites, UTS engineering courses are taught on the assumption the students will have passed 3 Unit Mathematics, 2 Unit Physics and 2 Unit Chemistry. It is recommended that 2 Unit General English be completed as well.

**Entry with TAFE awards.** Applicants holding approved TAFE awards will satisfy the University's general matriculation requirement. Selection to a particular course will depend, among other things, upon the level of achievement in the appropriate qualification.

The Faculty of Engineering is currently reviewing selection criteria for applicants holding engineering-related TAFE awards.

## Other Qualifications

Applications from holders of other qualifications, including TAFE Certificates/Associate Diplomas will be considered individually on merit.

## 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

The following rules have been confirmed by the Faculty Board in Engineering and are based on the Board's policy document, Undergraduate Industrial Experience Requirements. The Rules will apply from Autumn Semester 1992.

1. **Work Experience**: Engineering students must gain relevant work experience throughout their course. This experience must satisfy requirements relating to the type of work, its amount and timing. Also, various enrolment procedures relating to Industrial Experience need to be followed. Credit will be awarded for work experience only if these requirements and procedures are satisfied.

2. **Type of Work Experience:** During work experience, students are expected to be engaged on activities and projects relevant to their academic studies. The final period of industrial experience should involve work approaching that likely to be experienced after graduation. Schools publish specific requirements relating to the type of experience required.

3. **Amount of Work Experience:** The minimum amount of approved industrial experience to be accumulated prior to graduation is 90 weeks. However, most students will obtain more than 90 weeks.

   Students enrolled in engineering courses prior to Autumn 1992 will be required to obtain credit for between 90 and 144 weeks of work experience, the actual duration being determined by the effect of these Rules.

   Students must enrol in Industrial Experience prior to undertaking work experience for credit.

4. **Periods of Work Experience:** For sandwich students, work experience will normally include four blocks of approximately 24 weeks duration. However, students may elect to obtain their experience in longer blocks, but must take at least three blocks. Periods shorter than 22 weeks will not receive credit unless specifically approved by the Faculty Board. Each period of industrial experience for sandwich students must be preceded and followed by at least one academic semester. Sandwich students whose employers wish them to commence their course with an industrial experience period may do so with the prior approval of the Head of School.

   Sandwich students will not be permitted to enrol in more than three consecutive academic semesters.

   Sandwich students may in suitable circumstances study academic subjects during a period of industrial experience. Students need, however, to give a high level of commitment to their industrial experience and will be allowed to enrol in academic studies only with the written approval of their employer and the approval of the Head of School. Enrolment in academic subjects during an industrial semester normally will be limited to six hours per week but in no case should exceed two evening sessions.

   Part-time students should be employed in work relevant to their course throughout their enrolment. Students who need time either to find initial employement or arrange a change of employment should seek a short exemption from this requirement. Students who remain part-time throughout the course will accumulate much more than the minimum 90 weeks of work experience.

   Requirements concerning enrolment in Industrial Experience must be followed by all students. These will be identified by individual Schools.

5. **Advanced Standing:** Students who have had relevant work experience prior to entering their course can seek advanced standing in Industrial Experience. The level of advanced standing granted will be influenced by factors such as the quality of previous work experience and the level of advanced standing granted for academic studies. Normally advanced standing for Industrial

Experience will not exceed 30 weeks. For students granted advanced standing all other rules will continue to apply.

6. **Recording Industrial Experience:** Each student will be issued with a log book in which to record industrial experience. This must be kept up-to-date and submitted for assessment when required by the School. These records and their assessment carry the same weight as academic subjects in determining students' progress. False or misleading claims of work experience will be treated as academic malpractice.

   Schools will require students to submit comprehensive reports on work experience. Report assessments will be included in students' academic records.

## Honours

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

## Engineering Co-op Scholarships

In 1992 thirteen students were awarded Engineering Co-op Scholarships. It is expected that the same number of Scholarships will be available in 1993.

Scholarships will be awarded to students who are successful at the 1992 Higher School Certificate examinations (or equivalent) and who are either Australian citizens or permanent Australian residents.

Selection is based on a combination of achievements at the trial and actual HSC exminations and personal attributes relevant to a career in professional engineering such as an interest in engineering, communication skills, leadership, and creativity.

Main features of the Scholarships

- Scholarships are only available to applicants who satisfy requirements for admission to the sandwich program of any of the Bachelor of Engineering courses at aUTS;
- Each Scholarship is valued at between $5,000 and $10,000;
- Scholarships apply in the first academic year of the course only;
- An initial payment (10% of total value) is made to each Scholar at the time of enrolment. This is followed by fortnightly payments commencing in the second week of the Autumn semester. Payments conclude at the end of the Spring semester examination period;
- Following the first academic year each Scholar will be given the opportunity to undertake one period of work experience with the sponsor of their Scholarship.

Sponsors

In 1992 external sponsors of the Engineering Co-op Scholarship program were: State Rail Authority, Canon Australia Ltd, Sydney Electricity, Commonwealth Bank, Merlin Gerin (Aust) Ltd, and BP Australia Ltd. Internal sponsors were staff in each of the Schools of Civil Engineering and Mechanical Engineering.

Applications

Application forms will be available from Careers Advisors by August 1992 for the 1993 intake of students.

## 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' reducation 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 post-graduation 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 Masters degree level are offered in Local Government, Telecommunications 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, 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's Graduate Studies Officer, 330 1990, ext. 2606.

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 office of the Dean of Engineering and General Faculty Office are located on Level 4 of the Engineering Building, Broadway. Staff associated with these offices are

| | Room | Ext. |
|---|---|---|
| *Dean of Engineering*<br>P J Parr | 426B | 2599 |
| *Secretary*<br>K F Inglis | 426 | 2596 |
| *Faculty Administrator*<br>D J Carraro | 426A | 2594 |
| *Professor*<br>A Pattison | 424A | 2591 |
| *Associate Professor and Director, Managment Studies in Engineering*<br>J V Parkin | 520 | 2638 |
| *Director, Industrial Liaison*<br>J G Crowe | 424B | 2592 |
| *Graduate Studies Officer*<br>B Buckenmaier | 433 | 2606 |
| *Industrial Liaison Officers (Part-Time)*<br>M R Collison<br>P J Doyle | 433 | 2605 |
| *Administrative Secretary*<br>L B M Smith | 433 | 2604 |
| *Women in Engineering Co-ordinators*<br>Vacant | | |

# SCHOOL OF CIVIL ENGINEERING

The School offers Bachelor degrees in Civil and Structural Engineering.

Civil Engineers are key professionals involved in the design, construction and operation of the facilities and services which are not only characteristic of today's societies, but which also safeguard the quality of the physical environment for the future. Examples would be the design of a new harbour, or of a water supply system, or of an integrated transport system.

Structural Engineering involves the design, construction and operation of a variety of structures that may be as diverse as the fuselage of an aeroplane, a highway bridge or an off-shore platform. The structural engineer plays an important role wherever something is built which has to carry load or resist forces to perform its function.

Civil and Structural engineers will find themselves searching for cost effective, safe and environmentally appropriate solutions, and efficient construction processes which requires an understanding of a wide range of technical, economic and social issues.

Both degrees provide a thorough foundation in the physical sciences and applied engineering sciences which underpin the engineering practice subjects undertaken in latter stages of each course. Emphasis is placed on the role of the profession in society and the contexts in which engineering is practised. The courses foster the development of communication skills which are vital to professional practice, particularly as individual engineers will often be working in multidisciplinary teams with other engineering professionals and technicians, as well as architects, economists and social planners.

Through electives and project work students can choose to undertake additional studies in areas of special interest to them.

## BACHELOR OF ENGINEERING (CIVIL ENGINEERING)

### SANDWICH ATTENDANCE PATTERN
Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 33121 | Engineering Mathematics 1A | 3 |
| 47110 | Introduction to Civil Engineering | 3 |
| 47113 | Computations 1 | 3 |
| 47117 | Statics | 3 |
| 47118 | Surveying 1A | 3 |
| 63131 | Engineering Physics (Civil) | 6 |

| STAGE 2 | | |
|---|---|---|
| 33122 | Engineering Mathematics 1B | 3 |
| 47120 | Graphics | 3 |
| 47127 | Mechanics of Solids 1 | 3 |
| 47128 | Surveying 1B | 3 |
| 51131 | Communication 1 | 3 |
| 62178 | Engineering Chemistry | 6 |
| 63721 | Materials Science for Engineers | 3 |

| STAGE 3 | | |
|---|---|---|
| 33221 | Engineering Mathematics 2A | 3 |
| 47131 | Structural Mechanics | 3 |
| 47133 | Computations 2 | 3 |
| 47134 | Construction Materials | 3 |
| 47135 | Fluid Mechanics | 3 |
| 47137 | Mechanics of Solids 2 | 3 |
| 62388 | Geology for Engineers | 3 |

| STAGE 4 | | |
|---|---|---|
| 47140 | Concrete Design 1 | 3 |
| 47141 | Structural Analysis 1 | 3 |
| 47142 | Environmental Engineering | 3 |
| 47144 | Timber Design | 3 |
| 47145 | Hydraulics | 3 |
| 47146 | Soil Mechanics | 3 |
| 47149 | Construction | 3 |
| 51161 | Communication 2 | 3 |

| STAGE 5 | | |
|---|---|---|
| 47153 | Computations 3 | 3 |
| 47150 | Concrete Design 2 | 3 |
| 47151 | Structural Analysis 2 | 3 |
| 47155 | Hydrology | 3 |
| 47152 | Public Health Engineering | 3 |
| 47156 | Soil Engineering | 3 |
| 47154 | Concrete Technology | 3 |
| 47159 | Project Planning | 3 |

| STAGE 6 | | |
|---|---|---|
| 47161 | Steel Design 1 | 3 |
| 47160 | Concrete Design 3 | 3 |
| 47162 | Advances in Pollution Control | 3 |
| 47163 | Computations 4 | 3 |
| 47164 | Metals Technology | 3 |
| 47166 | Geotechnical Engineering | 3 |
| OR | | |
| 47176 | Ground Modification | 3 |
| 47167 | Road Engineering | 3 |
| 47168 | Surveying 2 | 3 |

| STAGE 7 | | Hrs/Wk |
|---|---|---|
| 47171 | Steel Structures and Concept Design 1 | 3 |
| 47175 | Water Engineering | 3 |
| 47177 | Transportation Engineering | 3 |
| 47178 | Project Economics | 3 |
| 47179 | Construction Contracts | 3 |
| 47003 | Project | 3 |
| ..... | Electives | 6 |

| STAGE 8 | | |
|---|---|---|
| 47189 | Management for Engineers | 3 |
| ..... | Electives (6 to 12 hrs) | 6 - 12 |
| ..... | Project (6 to 12 hrs)# | 6 - 12 |

## PART-TIME ATTENDANCE PATTERN

*Academic Requirements**

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 33121 | Engineering Mathematics 1A | 3 |
| 47117 | Statics | 3 |
| 47120 | Graphics | 3 |
| 63132 | Engineering Physics (Part-time) | 3 |
| Spring Semester | | |
| 33122 | Engineering Mathematics 1B | 3 |
| 47110 | Introduction to Civil Engineering | 3 |
| 47113 | Computations 1 | 3 |
| 47118 | Surveying 1A | 3 |
| 63132 | Engineering Physics (Part-time) | 3 |

| STAGE 2 | | |
|---|---|---|
| Autumn Semester | | |
| 47127 | Mechanics of Solids 1 | 3 |
| 47128 | Surveying 1B | 3 |
| 51131 | Communication 1 | 3 |
| 62178 | Engineering Chemistry | 6 |
| Spring Semester | | |
| 33221 | Engineering Mathematics 2A | 3 |
| 47131 | Structural Mechanics | 3 |
| 47133 | Computations 2 | 3 |
| 63721 | Materials Science for Engineers | 3 |

| STAGE 3 | | |
|---|---|---|
| Autumn Semester | | |
| 47135 | Fluid Mechanics | 3 |
| 47137 | Mechanics of Solids 2 | 3 |
| 47149 | Construction | 3 |
| 62388 | Geology for Engineers | 3 |
| Spring Semester | | |
| 47141 | Structural Analysis 1 | 3 |
| 47142 | Environmental Engineering | 3 |
| 47153 | Computations 3 | 3 |
| 47134 | Construction Materials | 3 |

| STAGE 4 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 47140 | Concrete Design 1 | 3 |
| 47144 | Timber Design | 3 |
| 47145 | Hydraulics | 3 |
| 51161 | Communication 2 | 3 |
| Spring Semester | | |
| 47150 | Concrete Design 2 | 3 |
| 47152 | Public Health Engineering | 3 |
| 47154 | Concrete Technology | 3 |
| 47146 | Soil Mechanics | 3 |

| STAGE 5 | | |
|---|---|---|
| Autumn Semester | | |
| 47151 | Structural Analysis 2 | 3 |
| 47156 | Soil Engineering | 3 |
| 47159 | Project Planning | 3 |
| 47162 | Advances in Pollution Control | 3 |
| Spring Semester | | |
| 47155 | Hydrology | 3 |
| 47161 | Steel Design 1 | 3 |
| 47163 | Computations 4 | 3 |
| 47168 | Surveying 2 | 3 |

| STAGE 6 | | |
|---|---|---|
| Autumn Semester | | |
| 47160 | Concrete Design 3 | 3 |
| 47164 | Metals Technology | 3 |
| 47166 | Geotechnical Engineering | 3 |
| OR | | |
| 47176 | Ground Modification | 3 |
| 47167 | Road Engineering | 3 |
| Spring Semester | | |
| 47171 | Steel Structures and Concept Design 1 | 3 |
| 47175 | Water Engineering | 3 |
| 47179 | Construction Contracts | 3 |
| 47003 | Project | 3 |
| ..... | Elective | 3 |

| STAGE 7 | | |
|---|---|---|
| Autumn Semester | | |
| 47177 | Transportation Engineering | 3 |
| 47178 | Project Economics | 3 |
| ..... | Electives (6 to 9 hrs) | 6 - 9 |
| ..... | Project (3 to 6 hrs)# | 3 - 6 |
| Spring Semester | | |
| 47189 | Management for Engineers | 3 |
| ..... | Electives (3 to 6 hrs) | 3 - 6 |
| ..... | Projects (3 to 6 hrs)# | 3 - 6 |

* Professional Experience, 47997 (Sandwich) and 47999 (Part-time) to be undertaken in accordance with the Faculty's Industrial Experience Rules, see page 13.

# Project subject numbers:
47002 Project (2 hrs)
47003 Project (3 hrs)
47004 Project (4 hrs)
47006 Project (6 hrs)
47009 Project (9 hrs)
47012 Project (12 hrs)
47015 Project (15 hrs)

## BACHELOR OF ENGINEERING (STRUCTURAL ENGINEERING)

### SANDWICH ATTENDANCE PATTERN
*Academic Requirements**

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 33121 | Engineering Mathematics 1A | 3 |
| 47110 | Introduction to Civil Engineering | 3 |
| 47113 | Computations 1 | 3 |
| 47117 | Statics | 3 |
| 47118 | Surveying 1A | 3 |
| 63131 | Engineering Physics | 6 |

| STAGE 2 | | |
|---|---|---|
| 33122 | Engineering Mathematics 1B | 3 |
| 47120 | Graphics | 3 |
| 47127 | Mechanics of Solids 1 | 3 |
| 47128 | Surveying 1B | 3 |
| 51131 | Communication 1 | 3 |
| 62178 | Engineering Chemistry | 6 |
| 63721 | Materials Science for Engineers | 3 |

| STAGE 3 | | |
|---|---|---|
| 33221 | Engineering Mathematics 2A | 3 |
| 47131 | Structural Mechanics | 3 |
| 47133 | Computations 2 | 3 |
| 47134 | Construction Materials | 3 |
| 47135 | Fluid Mechanics | 3 |
| 47137 | Mechanics of Solids 2 | 3 |
| 62388 | Geology for Engineers | 3 |

| STAGE 4 | | |
|---|---|---|
| 47141 | Structural Analysis 1 | 3 |
| 47140 | Concrete Design 1 | 3 |
| 47142 | Environmental Engineering | 3 |
| 47144 | Timber Design | 3 |
| 47146 | Solid Mechanics | 3 |
| 47237 | Domestic Building Design and Construction | 3 |
| 47149 | Construction | 3 |
| 51161 | Communication 2 | 3 |

| STAGE 5 | | |
|---|---|---|
| 47153 | Computations 3 | 3 |
| 47151 | Structural Analysis 2 | 3 |
| 47161 | Steel Design 1 | 3 |
| 47150 | Concrete Design 2 | 3 |
| 47156 | Soil Engineering | 3 |
| 47154 | Concrete Technology | 3 |
| 47159 | Project Planning | 3 |

| STAGE 6 | | |
|---|---|---|
| 47160 | Concrete Design 3 | 3 |
| 47163 | Computations 4 | 3 |
| 47164 | Metals Technology | 3 |
| 47265 | Finite Element Analysis | 3 |
| 47267 | Approximate Methods in Structural Analysis | 3 |
| 47268 | Dynamics of Structures | 3 |
| 47171 | Steel Structures and Concept Design 1 | 3 |
| ..... | Elective | 3 |

| STAGE 7 | | |
|---|---|---|
| 47178 | Project Economics | 3 |
| 47179 | Construction Contracts | 3 |
| 47270 | Concrete Design 4 | 3 |
| 47275 | Bridge Design | 3 |
| 47277 | Loading on Building Structures | 3 |
| 47278 | Structural Stability | 3 |
| 47281 | Steel Structures and Concept Design 2 | 3 |
| 47003 | Project | 3 |

| STAGE 8 | | |
|---|---|---|
| 47189 | Management for Engineers | 3 |
| 47285 | Design Project | 6 |
| 47287 | Structural Testing | 3 |
| 47288 | High Rise Buildings | 3 |
| ..... | Electives (3 to 6 hrs) | 3 - 6 |
| ..... | Project (3 to 6 hrs)# | 3 - 6 |

### PART-TIME ATTENDANCE PATTERN
**Academic Requirements***

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 33121 | Engineering Mathematics 1A | 3 |
| 47117 | Statics | 3 |
| 47120 | Graphics | 3 |
| 63132 | Engineering Physics (Part-time) | 3 |
| Spring Semester | | |
| 33122 | Engineering Mathematics 1B | 3 |
| 47110 | Introduction to Civil Engineering | 3 |
| 47113 | Computations 1 | 3 |
| 47118 | Surveying 1A | 3 |
| 63132 | Engineering Physics (Part-time) | 3 |

| STAGE 2 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 47127 | Mechanics of Solids 1 | 3 |
| 47128 | Surveying 1B | 3 |
| 51131 | Communication 1 | 3 |
| 62178 | Engineering Chemistry | 6 |
| Spring Semester | | |
| 33221 | Engineering Mathematics 2A | 3 |
| 47131 | Structural Mechanics | 3 |
| 47133 | Computations 2 | 3 |
| 63721 | Materials Science for Engineers | 3 |

| STAGE 3 | | |
|---|---|---|
| Autumn Semester | | |
| 47135 | Fluid Mechanics | 3 |
| 47137 | Mechanics of Solids 2 | 3 |
| 47149 | Construction | 3 |
| 62388 | Geology for Engineers | 3 |
| Spring Semester | | |
| 47134 | Construction Materials | 3 |
| 47153 | Computations 3 | 3 |
| 47141 | Structural Analysis 1 | 3 |
| 47142 | Environmental Engineering | 3 |

| STAGE 4 | | |
|---|---|---|
| Autumn Semester | | |
| 47140 | Concrete Design 1 | 3 |
| 47144 | Timber Design | 3 |
| 47237 | Domestic Building Design and Construction | 3 |
| 51161 | Communication 2 | 3 |
| Spring Semester | | |
| 47146 | Soil Mechanics | 3 |
| 47150 | Concrete Design 2 | 3 |
| 47154 | Concrete Technology | 3 |
| 47163 | Computations 4 | 3 |

| STAGE 5 | | |
|---|---|---|
| Autumn Semester | | |
| 47151 | Structural Analysis 2 | 3 |
| 47156 | Soil Engineering | 3 |
| 47159 | Project Planning | 3 |
| 47267 | Approximate Methods in Structural Analysis | 3 |
| Spring Semester | | |
| 47160 | Concrete Design 3 | 3 |
| 47161 | Steel Design 1 | 3 |
| 47268 | Dynamics of Structures | 3 |
| 47265 | Finite Element Analysis | 3 |

| STAGE 6 | | |
|---|---|---|
| Autumn Semester | | |
| 47164 | Metals Technology | 3 |
| 47178 | Project Economics | 3 |
| 47179 | Construction Contracts | 3 |
| 47277 | Loading on Building Structures | 3 |
| 47287 | Structural Testing | 3 |
| Spring Semester | | |
| 47171 | Steel Structures and Concept Design 1 | 3 |
| 47189 | Management for Engineers | 3 |
| 47270 | Concrete Design 4 | 3 |
| 47275 | Bridge Design | 3 |

| STAGE 7 | | |
|---|---|---|
| Autumn Semester | | |
| 47278 | Structural Stability | 3 |
| 47281 | Steel Structures and Concept Design 2 | 3 |
| ..... | Elective | 3 |
| 47003 | Project | 3 |
| Spring Semester | | |
| 47285 | Design Project | 6 |
| 47288 | High Rise Buildings | 3 |
| ..... | Electives (3 to 6 hrs) | 3 - 6 |
| ..... | Project (3 to 6 hrs)# | 3 - 6 |

* Professional Experience, 47997 (Sandwich) and 47999 (Part-time) to be undertaken in accordance with the Faculty's Industrial Rules, see page 13.

\# Project subject numbers:

| | |
|---|---|
| 47002 | Project (2 hrs) |
| 47003 | Project (3 hrs) |
| 47004 | Project (4 hrs) |
| 47006 | Project (6 hrs) |
| 47009 | Project (9 hrs) |
| 47012 | Project (12 hrs) |
| 47015 | Project (15 hrs) |

## ELECTIVES PROGRAMME – SCHOOL OF CIVIL ENGINEERING

Elective subjects are common to the Civil and Structural Engineering degree programs. Furthermore Civil Engineering students may take core subjects from the Structural Engineering degree programme as electives – similarly Structural Engineering students may take core Civil Engineering subjects as electives.

Electives are offered on demand, and not all are offered in every semester or even every year. The availability of a particular elective is determined at the beginning of each semester and classes scheduled only if sufficient numbers of students are enrolled.

Proposed electives 1992

47304 Coastal Engineering
47306 Geomechanics
47301 Railway Engineering
47305 Risk and Reliability Analysis
47308 Road Materials
47302 Welding

## GRADUATE DIPLOMA IN LOCAL GOVERNMENT ENGINEERING

This course had 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.

The completion of this course 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 usually only offered on a block release pattern. Subject to available resources, however, the course may be available on a part-time attendance pattern.

Progression is based on two subjects per semester requiring a minimum of four semesters to complete the course.

The block release pattern currently consists of attending 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.

| Course Structure | | Hrs/Wk |
|---|---|---|
| 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 LGE | 3 |

## MASTER OF LOCAL GOVERNMENT

This course is designed for individuals employed in local government in a range of occupational groups, such as administrators, community workers, engineers, health and building inspectors and librarians, who aspire to senior executive positions in local government.

The course is relevant for those with professional backgrounds who have been promoted into positions with substantial management responsibilities. Those with a generalist administrative background would also find this a suitable course for updating their management education.

**Admission Requirements**
*Assumed Knowledge*
It will be assumed that successful applicants will have a sound knowledge of the environment and operations of local government and will have demonstrated competence in a relevant functional and/or professional field.

*Qualification*
A Bachelors degree in a discipline appropriate to the activities of local government is a normal minimum requirement for admission.

*Work Experience*
Successful applicants would normally be expected to have a minimum of five years relevant experience in a professional and/or administrative position following attainment of the minimum required educational qualifications for that position.

*Provisional Admission*
Applicants who do not possess a degree or equivalent qualification may be considered for provisional admission if they can demonstrate:

(i) Possession of other relevant postsecondary qualifications;

(ii) a minimum of five years of work experience at a senior level in local government; and

(iii) adequate preparation and capacity to successfully pursue postgraduate studies.

*Enquiries*
For further information contact the Faculty of Business on 330 3552 or the Faculty of Engineering on 330 2606.

**Course Aims**
For individuals with appropriate backgrounds the course aims to give them opportunities to develop both a sound knowledge of major community issues facing local government, and the management competencies to deal with them. While there will be a local government emphasis, a broader public sector orientation will be maintained throughout the course.

**Course Structure**
The course draws upon the experience and expertise of the Faculty of Business and the Faculty of Engineering at UTS. Both Faculties have offered educational programmes over many years for individuals in local government.

The course is offered by part-time mode, normally completed over three years (six semesters). All students enrol in the Master of Local Government, however, those who successfully complete the six foundation subjects plus two electives (or one elective and one project subject) will be permitted to withdraw from the course, graduating with a Graduate Diploma in Local Government.

**Subject Units**

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 43451 | Environment of Professions in Local Govt | 3 |
| 21728 | Public Sector Management | 3 |
| **STAGE 2** | | |
| 43452 | Environmental Management | 3 |
| 21731 | Resource Management (Public) | 3 |
| **STAGE 3** | | |
| 43453 | Infrastructure Management | 3 |
| ..... | Project or Elective or Research Stream I | |
| **STAGE 4** | | |
| 21729 | Human Resource Management (Public) | 3 |
| ..... | Project or Elective or Research Stream II | |
| **STAGE 5** | | **Hrs/Wk** |
| ..... | Elective or Project or Research Stream III | |
| ..... | Elective or Project or Research Stream IV | |
| **STAGE 6** | | |
| 43454 | Managing Local Enterprise | 3 |
| 21758 | Strategic Management (Public) | 3 |

**Electives**
Students may submit for approval a portfolio of up to four elective subjects prior to enrolment in those subjects. Students will be counselled in selecting a balanced portfolio.

**Applied Research Stream**
Students who demonstrate an aptitude for research and who have gained a minimum average Credit assessment in the first four subjects of the course may be permitted to undertake a research stream (equivalent to four subjects). High quality students may view this as preparation for a PhD.

**Action Projects (Work Learning)**
Students will have the option of undertaking an action learning project, equivalent to one subject. It will normally combine investigation and action in a real work situation in which both the employer and the University have an interest in the outcome.

**Short Courses**
It is possible to accumulate limited credit for completion of approved short courses. This is limited to the equivalent of two subjects, called Vocational Competencies I and II. Conditions are:

- Approval of the student's portfolio of short courses;
- short courses must be completed during the period of enrolment in the Master of Local Government. No credit will be allowed for short courses completed prior to enrolment.

**Advanced Standing**
Subject to places being available, individuals who have completed the University's Graduate Diploma in Local Government Engineering with a minimum Credit level average may gain entry to this masters course with advanced standing. Such students will be required to complete a further six subjects, normally over three semesters.

## Articulation Programme from Graduate Diploma in Local Government Engineering

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 43451 | Environment of Professions in Local Govt | 3 |
| 21728 | Public Sector Management | 3 |
| **STAGE 2** | | |
| 21731 | Resource Management (Public) | 3 |
| 21729 | Human Resource Management (Public) | 3 |
| **STAGE 3** | | |
| 43454 | Managing Local Enterprise | 3 |
| 21758 | Strategic Management (Public) | 3 |

### Staff and Location of Facilities

The School of Civil Engineering is located in the Engineering Building (Building 2), City Campus, Broadway. The School Office and academic staff offices are on Level 5. Laboratories and classrooms are on Levels 1, 2 and 5.

The names, office locations and professional interests of academic and senior non-academic staff are listed below. The University's telephone number is 330 1990 and staff can be reached at the extension numbers given below. Messages may be left, either in person or by telephone, at the School Office, Room 2/560A, ext. 2615.

| | Room | Ext. |
|---|---|---|
| *Professor of Civil Engineering and Head of School* | | |
| Professor S L Bakoss<br>Structural Mechanics | 511C | 2629 |
| *Deputy Head of School* | | |
| Mr E A Brady<br>Surveying | 511A | 2627 |
| *Professor of Civil Engineering* | | |
| Professor K A Faulkes | 528 | 2646 |
| *Associate Professors* | | |
| Mr T A Anderson<br>Construction | 521 | 639 |
| Dr M R Hausmann<br>Soil Engineering | 527 | 2645 |
| Dr G G O'Loughlin<br>Water Engineering | 526 | 2644 |
| *General Office Enquiries* | 560A | 2615 |
| *Academic Staff* | | |
| Dr S C Beecham<br>Water Engineering | 507 | 2623 |
| Dr H W Chung<br>Construction Materials | 519 | 2637 |
| Dr J W Ivering<br>Civil Engineering Design | 529 | 2647 |
| Dr M R Karim<br>Structural Mechanics | 505 | 2621 |
| Mr P J Kenny<br>Roads and Transport | 502 | 2618 |
| Dr K L Lai<br>Design and Construction | 510 | 2626 |
| Mr P C Liu<br>Civil Engineering Design | 508 | 2624 |
| Dr S Parsanejad<br>Design of Steel Structures | 504 | 2620 |
| Dr M Patarapanich<br>Water Engineering | 524 | 2642 |
| Mr W G Peters<br>Civil Engineering Design | 518 | 2636 |
| Dr R Sri Ravindrarajah<br>Concrete Technology | 509 | 2625 |
| Dr G L Ring<br>Soil Engineering | 506 | 2622 |
| Dr A Saleh<br>Structural Mechanics | 517 | 2635 |
| Dr B Samali<br>Structural Dynamics and Structural Mechanics | 513 | 2632 |
| Dr S Vigneswaran<br>Environmental Engineering | 523 | 2641 |
| *Non-Academic Staff* | | |
| Mrs L Venglinsky<br>Secretary to Head of School | 511 | 2630 |
| Mr B Blakeway<br>Office Manager | 560A | 2615 |
| Mrs S Ali<br>General Secretary | 512 | 2650 |
| Mr M J Taragel<br>Engineer–in–Charge | 114 | 2519 |
| Mr I A Hutchings<br>Engineer | 116J | 2512 |
| Mr D A Tapner<br>Engineer | 116K | 2513 |
| Mr A Lah<br>Engineer | 1/2A252 | 1030 |
| Mr J Holmes<br>Senior Technical Officer | 542 | 2514 |
| Mr H Hefka<br>Technical Officer | 116 | 2515 |
| Mr H Myers<br>Senior Laboratory Craftsman | 1/2A253B | 1026 |
| Mr L Slade<br>Senior Laboratory Craftsman | 253 | 1026 |
| Mr J McMahon<br>Technical Officer | 204 | 2537 |
| Mr M Benitez<br>Technical Officer | 116M | 2516 |
| Mr S E Gabor<br>Stores Officer | 205B | 2536 |

# SCHOOL OF ELECTRICAL ENGINEERING

The School offers Bachelor degrees in Electrical Engineering and Computer Systems Engineering.

The Electrical Engineering course prepares students for career in three main areas: electrical power, electronic instrumentation and control, and electrical communication.

The practice of Electrical Engineering has changed dramatically over the last few decades. Instrumentation systems have always been vital in Electrical Engineering since electricity itself cannot be seen. Modern computer based instruments have in-built sophisticated design tools which enable the engineer to deal effectively and efficiently with electronic and software systems of enormous complexity.

Most engineering activities are of sufficient scope to call on the talents of teams of people from varying professions. The individual engineer must therefore work effectively with such teams. Understanding and acceptance of discipline, management and leadership qualities and competence in written and spoken communications are essential.

A typical graduate electrical engineer working in electronics would develop sub-systems. This involves selection of components, designing circuits (often using computer graphics packages), simulating the circuits using computers to ensure correct operation, designing the layout of conducting tracks on printed circuit boards using further computer packages, populating the boards with components and then testing for correct operation.

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.

A Computer Systems Engineer is a highly trained professional, who needs to have knowledge of not only software programming, but electronics, mathematics and physics. Because of this breadth of training, a Computer Systems Engineer can also work as a software engineer or an electronics engineer.

All students in both the Electrical and Computer Systems Engineering degrees at UTS are required to complete approved industrial experience as they progress through their course.

## BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING)

### SANDWICH ATTENDANCE PATTERN

Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 33110 | Engineering Mathematics 1 | 6 |
| 63113 | Engineering Physics 1 | 6 |
| 45115 | Engineering Practice | 3 |
| 33100 | Discrete Mathematics | 3 |
| 45113 | Digital Techniques | 3 |
| 45116 | Electrical Engineering 1 | 3 |
| **STAGE 2** | | |
| 63123 | Engineering Physics 2 | 3 |
| 45125 | Engineering Discovery | 3 |
| 33210 | Engineering Mathematics 2 | 6 |
| 45123 | Fundamentals of Computing | 3 |
| 63734 | Materials Technology | 3 |
| 45124 | Electrical Engineering 2 | 6 |
| **STAGE 3** | | |
| 45133 | Software Engineering 1 | 3 |
| 45135 | Engineering Communications | 3 |
| 33310 | Engineering Mathematics 3 | 6 |
| 45134 | Network Theory | 6 |
| 63133 | Engineering Physics 3 | 3 |
| **STAGE 4** | | |
| 45144 | Electronic Devices and Circuits | 6 |
| 45145 | Engineering Statistics | 3 |
| 45242 | Electromagnetics | 3 |
| 45141 | Continuous and Discrete Systems | 6 |
| 45143 | Computer Hardware | 3 |

**Subjects in STAGES 5 to 8 of the Electrical Engineering degree are selected from one of the following strands:**

**Telecommunications**
**Power and Machines**
**Instrumentation and Control**

Requirements for each strand are set out below:

### TELECOMMUNICATIONS STRAND

| STAGE 5 | | Hrs/Wk |
|---|---|---|
| 45151 | Signal Theory 1 | 3 |
| 45154 | Contextual Studies | 3 |
| 45252 | Power Apparatus and Systems | 6 |
| 45155 | Project A | 3 |
| 45264 | Fields and Waves | 3 |

| STAGE 6 | | Hrs/Wk |
|---|---|---|
| 45163 | Real Time Software and Interfacing | 3 |
| 45152 | Signal Theory 2 | 3 |
| 45166 | Project Management | 3 |
| 45665 | Data Communications | 3 |
| 45666 | Communications Physics | 3 |
| 45113 | Digital Techniques | 3 |
| 45265 | Numerical Methods | 3 |

| STAGE 7 | | |
|---|---|---|
| 45661 | Communications Networks | 3 |
| 45662 | Signal Processing | 3 |
| 45678 | Project B (Tel) | 3 |
| 45182 | Thesis 1 | 3 |
| 45664 | Communications Engineering | 3 |
| 45176 | Systems Engineering | 3 |
| 45274 | Physical Design and Production | 3 |

| STAGE 8 | | |
|---|---|---|
| 45681 | Communications Systems | 6 |
| 45183 | Thesis 2 | 6 |

## POWER AND MACHINES STRAND

| STAGE 5 | | |
|---|---|---|
| 45151 | Signal Theory 1 | 3 |
| 45154 | Contextual Studies | 3 |
| 45252 | Power Apparatus and Systems | 6 |
| 45153 | Analogue Electronics | 6 |
| 45155 | Project A | 3 |
| 45265 | Numerical Methods | 3 |

| STAGE 6 | | |
|---|---|---|
| 45163 | Real Time Software and Interfacing | 3 |
| 45264 | Fields and Waves | 3 |
| 45166 | Project Management | 3 |
| 45461 | Power Circuit Theory | 3 |
| 45481 | Dynamics of Electric Machines | 3 |
| 45274 | Physical Design and Production | 3 |
| 45482 | Power Equipment Design | 3 |

| STAGE 7 | | |
|---|---|---|
| 45152 | Signal Theory 2 | 3 |
| 45485 | Electric Power Generation | 3 |
| 45182 | Thesis 1 | 3 |
| 45176 | Systems Engineering | 3 |
| 45472 | Project B (P&M) | 3 |

| STAGE 8 | | |
|---|---|---|
| 45483 | Power Systems Analysis and Protection | 6 |
| 45484 | Electrical Variable Speed Drives | 3 |
| 45183 | Thesis 2 | 6 |

## INSTRUMENTATION AND CONTROL STRAND

| STAGE 5 | | Hrs/Wk |
|---|---|---|
| 45151 | Signal Theory 1 | 3 |
| 45154 | Contextual Studies | 3 |
| 45252 | Power Apparatus and Systems | 6 |
| 45153 | Analogue Electronics | 6 |
| 45155 | Project A | 3 |
| 45264 | Fields and Waves | 3 |

| STAGE 6 | | |
|---|---|---|
| 45163 | Real Time Software and Interfacing | 3 |
| 45152 | Signal Theory 2 | 3 |
| 45166 | Project Management | 3 |
| 45561 | Digital Systems Design | 3 |
| 45581 | Analogue and Digital Control | 3 |
| 45265 | Numerical Methods | 3 |

| STAGE 7 | | |
|---|---|---|
| 45562 | Data Acquisition and Distribution | 6 |
| 45662 | Signal Processing | 3 |
| 45577 | Project B (I & C) | 3 |
| 45182 | Thesis 1 | 3 |
| 45176 | Systems Engineering | 3 |
| 45274 | Physical Design and Production | 3 |

| STAGE 8 | | |
|---|---|---|
| 45583 | Adaptive and Multivariable Control | 3 |
| 45582 | Computer Aided Design of Electronic Circuits | 3 |
| 45183 | Thesis 2 | 6 |

## PART-TIME ATTENDANCE PATTERN

Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 33110 | Engineering Mathematics 1 | 6 |
| 33100 | Discrete Mathematics | 3 |
| 45113 | Digital Techniques | 3 |
| 45115 | Engineering Practice | 3 |
| Spring Semester | | |
| 63113 | Engineering Physics 1 | 6 |
| 45116 | Electrical Engineering 1 | 6 |
| 45123 | Fundamentals of Computing | 3 |
| 45125 | Engineering Discovery | 3 |

| STAGE 2 | | |
|---|---|---|
| Autumn Semester | | |
| 33210 | Engineering Mathematics 2 | 6 |
| 63123 | Engineering Physics 2 | 3 |
| 63734 | Materials Technology | 3 |

| Spring Semester | | Hrs/Wk |
|---|---|---|
| 45124 | Electrical Engineering 2 | 6 |
| 63133 | Engineering Physics 3 | 3 |
| 45133 | Software Engineering 1 | 3 |
| 45135 | Engineering Communications | 3 |

**STAGE 3**

| Autumn Semester | | |
|---|---|---|
| 33310 | Engineering Mathematics 3 | 6 |
| 45134 | Network Theory | 6 |
| Spring Semester | | |
| 45144 | Electronic Devices & Circuits | 6 |
| 45145 | Engineering Statistics | 3 |
| 45242 | Electromagnetics | 3 |

**STAGE 4**

| Autumn Semester | | |
|---|---|---|
| 45141 | Continuous & Discrete Systems | 6 |
| 45143 | Computer Hardware | 3 |
| 45151 | Signal Theory 1 | 3 |
| 45154 | Contextual Studies | 3 |
| Spring Semester | | |
| 45153 | Analogue Electronics | 6 |
| 45252 | Power Apparatus and Systems | 6 |
| 45155 | Project A | 3 |

**STAGE 5**

| Autumn | | |
|---|---|---|
| 45152 | Signal Theory 2 | 3 |
| 45163 | Real Time Software and Interfacing | 3 |
| 45166 | Project Management | 3 |
| Spring Semester | | |
| ..... | Subjects selected from Strand | 9 |
| 45265 | Numerical Methods | 3 |

**STAGE 6**

| Autumn Semester | | |
|---|---|---|
| ....., | Subjects selected from Strand | 9 |
| 45274 | Physical Design and Producation | 3 |
| ..... | Social Science elective | 3 |
| Spring Semester | | |
| ..... | Electives | 9 |
| 45176 | Systems Engineering | 3 |
| ..... | Project B | 3 |

**STAGE 7**

| Autumn Semester | | |
|---|---|---|
| ..... | Subjects selected from Strand | 6 |
| ..... | Thesis | 9 |

* Professional Experience, 45997 (Sandwich) and 45999 (Part-time) to be undertaken in accordance with the Faculty's Industrial Experience Rules, see page 13.

## BACHELOR OF ENGINEERING (COMPUTER SYSTEMS ENGINEERING)

### SANDWICH ATTENDANCE PATTERN

Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 33110 | Engineering Mathematics 1 | 6 |
| 63113 | Engineerng Physics 1 | 6 |
| 45115 | Engineering Practice | 3 |
| 33100 | Discrete Mathematics | 3 |
| 45113 | Digital Techniques | 3 |
| 45116 | Electrical Engineering 1 | 3 |

**STAGE 2**

| | | |
|---|---|---|
| 63123 | Engineering Physics 2 | 3 |
| 45125 | Engineering Discovery | 3 |
| 33210 | Engineering Mathematics 2 | 6 |
| 45123 | Fundamentals of Computing | 3 |
| 63734 | Materials Technology | 3 |
| 45124 | Electrical Engineering 2 | 6 |

**STAGE 3**

| | | |
|---|---|---|
| 45142 | Computer Hardware | 3 |
| 45133 | Software Engineering 1 | 3 |
| 45135 | Engineering Communications | 3 |
| 33310 | Engineering Mathematics 3 | 6 |
| 45134 | Network Theory | 6 |

**STAGE 4**

| | | |
|---|---|---|
| 45144 | Electronic Devices & Circuits | 6 |
| 45145 | Engineering Statistics | 3 |
| 45163 | Real Time Software and Interfacing | 3 |
| 45141 | Continuous and Discrete Systems | 6 |
| 45342 | Electromechanical Systems | 3 |

**STAGE 5**

| | | |
|---|---|---|
| 45353 | Operating Systems | 6 |
| 45151 | Signal Theory 1 | 3 |
| 45364 | Digital Systems | 3 |
| 45153 | Analogue Electronics | 6 |
| 45155 | Project A | 3 |
| 45363 | Software Engineering 2 | 3 |

**STAGE 6**

| | | |
|---|---|---|
| 45154 | Contextual Studies | 3 |
| 45152 | Signal Theory 2 | 3 |
| 45166 | Project Management | 3 |
| 45665 | Data Communications | 3 |
| 45372 | Computer–Systems Analysis | 3 |
| 46701 | Robotics and Flexible Manufacturing | 3 |
| 31141 | Database Structures and Mangement | 3 |

**STAGE 7**

| | | |
|---|---|---|
| 45661 | Communications Networks | 3 |
| 45562 | Data Acquisition and Distribution Systems | 3 |

| | | Hrs/Wk |
|---|---|---|
| 45265 | Numerical Methods | 3 |
| 45182 | Thesis 1 | 3 |
| 45176 | Systems Engineering | 3 |

**STAGE 8**

| | | |
|---|---|---|
| 45387 | Project B | 3 |
| 33163 | Knowledge Based Systems | 3 |
| 45381 | Computer Aided Engineering | 3 |
| 45382 | Computer Systems Design | 3 |
| 45183 | Thesis 2 | 6 |

**PART-TIME ATTENDANCE PATTERN**
Academic Requirements*

**STAGE 1**

| Autumn Semester | | Hrs/Wk |
|---|---|---|
| 33110 | Engineering Mathematics 1 | 6 |
| 33100 | Discrete Mathematics | 3 |
| 45113 | Digital Techniques | 3 |
| 45115 | Engineerng Practice | 3 |
| Spring Semester | | |
| 63113 | Engineering Physics 1 | 6 |
| 45116 | Electrical Engineering 1 | 6 |
| 45123 | Fundamentals of Computing | 3 |
| 45125 | Engineering Discovery | 3 |

**STAGE 2**

| Autumn Semester | | |
|---|---|---|
| 33210 | Engineering Mathematics 2 | 6 |
| 63123 | Engineering Physics 2 | 3 |
| 63734 | Materials Technology | 3 |
| Spring Semester | | |
| 45124 | Electrical Engineering 2 | 6 |
| 45143 | Computer Hardware | 3 |
| 45133 | Software Engineering 1 | 3 |
| 45135 | Engineering Communications | 3 |

**STAGE 3**

| Autumn Semester | | |
|---|---|---|
| 33310 | Engineering Mathematics 3 | 6 |
| 45134 | Network Theory | 6 |
| Spring Semester | | |
| 45144 | Electronic Devices & Circuits | 6 |
| 45145 | Engineering Statistics | 3 |
| 45342 | Electromechanical Systems | 3 |

**STAGE 4**

| Autumn Semester | | |
|---|---|---|
| 45141 | Continuous & Discrete Systems | 6 |
| 45163 | Real Time Software & Interfacing | 3 |
| 45151 | Signal Theory 1 | 3 |
| 45154 | Contextual Studies | 3 |
| Spring Semester | | |
| 45153 | Analogue Electonics | 6 |
| 45353 | Operating Systems | 6 |
| 45155 | Project A | 3 |

**STAGE 5**

| Autumn Semester | | |
|---|---|---|
| 45152 | Signal Theory 2 | 3 |
| 45364 | Digital Systems | 3 |
| 45363 | Software Engineering 2 | 3 |
| 45166 | Project Management | 3 |
| Spring Semester | | |
| 45665 | Data Communications | 3 |
| 45562 | Data Acquisition & Distribution Systems | 3 |
| 31141 | Database Structures and Management | 3 |

**STAGE 6**

| Autumn Semester | | |
|---|---|---|
| 45661 | Communication Networks | 3 |
| 45372 | Computer Systems Analysis | 3 |
| 46701 | Robotics and Flexible Manufacturing | 3 |
| 45265 | Numerical Methods | 3 |
| ..... | Social Science elective | 3 |
| Spring Semester | | |
| 33163 | Knowledge Based Systems | 3 |
| ..... | Elective | 3 |
| ..... | Elective | 3 |
| 45176 | Systems Engineering | 3 |
| 45387 | Project B | 3 |

**STAGE 7**

| | | |
|---|---|---|
| 45381 | Computer Aided Engineering | 3 |
| 45382 | Computer Systems Design | 3 |
| ..... | Thesis | 9 |

* Professional Experience, 45997 (Sandwich) and 45999 (Part–time) to be undertaken in accordance with the Faculty's Industrial Experience Rules, see page 13.

**Staff and Location of Facilities**

The School of Electrical Engineering is located in the Tower Building (Building 1), City Campus, Broadway and occupies levels 18 to 25 together with specialist laboratories on levels 9 and 22. The School Office is on level 24.

The names, office locations, and professional interests of academic and selected non-academic staff are given below. The University's telephone number is 330 1990 and staff can be reached on the extensions listed. Each staff member publishes times of availability for consultation with students on his or her

office door. Messages for staff may be left either in person or by telephone at the School Office, ext 2432.

| | Room | Ext |
|---|---|---|
| *Head of School* | | |
| Professor K W Yates<br>Communication System Theory, Signal Processing, Antennas and Propagation, Electromagnetic Compatibility Filter Design | 2427 | 2436 |
| *General Office* | | |
| Enquiries | 2424 | 2432 |
| *Academic Staff* | | |
| Mr T Aubrey<br>Analogue Electronics<br>Communications Systems<br>Microwave Electronics | 2019 | 2359 |
| Associate Professor G E Beard<br>Satellite Communication Systems<br>UHF, VHF and Microwave Electronics Electrical Instrumentation,<br>Analogue Electronics | 2419B | 2413 |
| Professor W R Belcher<br>Antennas, Microwave Systems<br>Communication Systems, Systems Engineering, Computer Aided Engineering | 2419C | 2423 |
| Associate Professor P Bryce<br>Microhydroelectricy,<br>Appropriate Technology,<br>Fibre Optic Communications,<br>Electromagnetic Theory | 2420A | 2425 |
| Associate Professor T Buczkowska<br>Microcomputer System Design,<br>Software Engineering,<br>Computer Networks,<br>Data Communications | 2542 | 2458 |
| Dr J D Carmo<br>Electromagnetics, Reliability Theory, Numerical Methods and Optimisation | 1920 | 2339 |
| Mr N J Carmody<br>Microcomputer System Design,<br>Operating Systems,<br>Computer Architecture, VLSI,<br>Digital Control Systems | 2221B | 2391 |
| Professor C Drane<br>Satellite Positioning Systems,<br>Multimedia Telecommunications,<br>Software Engineering | 2221A | 2390 |
| Mr K K Fung<br>Parallel Processing,<br>Software Engineering | 2225 | 2394 |
| Mr G I Gedgovd<br>Power Systems, Computer Applications, Operations Research, Numerical Methods and Optimisation, Education Research and Co-operative Education | 2420E | 2429 |
| Dr A Ginige<br>Digital Systems, Systems Engineering, Image Processing, Real Time Systems, Computer Networks, Rehabilitation Engineering | 2224 | 2393 |
| Mr W G Hooper<br>Power Systems, Electromagnetic Theory, Educational Psychology, Electrical Plant Design | 2428 | 2438 |
| Dr S Y R Hui<br>Power Electonics,<br>Computer Modelling,<br>Electrical Machines | 2420D | 2428 |
| Mr J R M Leaney<br>System Engineering,<br>Software Engineering,<br>Computer System Design,<br>Real Time Computing,<br>Microprocessor Based Instrumentation, Industrial Control | 2220 | 2389 |
| Dr V Ramaswamy<br>Power Electronics, Electrical Machines, Computer Systems | 2417A | 2418 |
| Associate Professor H T Nguyen<br>Control Systems Theory,<br>Power Electronics, Control Theory,<br>Instrumentation, Machine Control,<br>Production Processes, Real Time Signal Processing,<br>Computer Simulation,<br>Computer Systems | 2517 | 2451 |
| Dr J G Nicol<br>Control Theory, Optimal Control, Multivariable Control | 2119A | 2370 |
| Associate Professor C E Peterson<br>Computer Integrated Manufacturing, Image Analysis, Process Control, Robotics, Artificial Intelligence | 2222 | 2392 |
| Associate Professor V S Ramsden<br>Electrical Machines, Electrical Variable Speed Drives,<br>Rehabilitation Engineering,<br>Field Theory, Electromagnetics | 2417C | 2420 |
| Associate Professor S Riesenfeld<br>Communication Systems, Satellite Communication, Information Theory, Modulation Channel Coding, Synchronisation | 2512B | 2448 |

| | Room | Ext. |
|---|---|---|
| Dr B S Rodanski<br>Device Modelling for CAD,<br>Numerical Methods,<br>Computer-Aided Design,<br>Software Engineering | 2420B | 2426 |
| Dr A Seneviratne<br>Data Communications,<br>Protocol Design,<br>Software Engineering,<br>Computer Networks | 2431 | 2441 |
| Mr T Stevenson<br>Signal Processing,<br>Communication Systems,<br>Electromagnetics | 2545 | 2460 |
| Dr P J White<br>Antennas and Propagation,<br>Microwave and RF Circuit Design,<br>Analogue Electronics | 2315 | 2401 |
| *Industrial Training Advisors* | | |
| Dr G E Beard | 2315 | 2401 |
| Mr G I Gedgovd | 2420E | 2429 |
| *Selected Non-Academic Staff* | | |
| Mrs E With<br>Office Manager | 2424 | 2432 |
| Mr W A Symons<br>Vax Computer Manager | 2210B | 2379 |
| Mr R Jelliffe<br>Research Computing<br>Centre Manager | 2019 | 2355 |
| Mr J B Vagg<br>Laboratory Manager | 2430 | 2440 |
| Mr P D Cooper<br>Engineer (Telecommunications) | 2324 | 2414 |
| Mr W M Holliday<br>Engineering (P & M) | 1814 | 2315 |
| Mr P Mallon<br>Engineer (CSE) | 2210C | 2380 |
| Mr R Nicholson<br>Engineer (Instrumentation & Control) | 2118 | 2369 |
| Mr A J Boswell<br>Senior Technical Officer | 2212 | 2382 |
| Mr A C Curgenven<br>Senior Technical Officer<br>Power and Machines | 2021 | 2364 |
| Mr G Evans<br>Senior Technical Officer<br>Communications | 2313 | 2398 |
| Mr S Y Shoon<br>Engineer | 2520C | 2454 |
| Mr L Weber<br>Senior Technical Officer,<br>Instrumentation & Control | 2520D | 2455 |
| Mr R Moore<br>Senior Technical Officer,<br>Mechanical Workshop | 2033 | 2366 |

# SCHOOL OF MECHANICAL ENGINEERING

The School offers Bachelor degrees in Mechanical and Manufacturing Engineering.

Mechanical Engineers are responsible for the design, manufacture, development, installation, testing, control and maintenance of machinery. They provide technical input and management for a wide range of industrial projects and processes, including power generation and transport. They have an important responsibility for protecting the environment and for the efficient use of energy and natural resources. Mechanical Engineers cooperate with other professionals, with technicians and with production workers to create safe, efficient and pleasant working conditions.

Manufacturing Engineering includes the design, development and optimisation of both product and process technology. This involves interacting with other professionals, including market researchers and industrial designers.

The courses in Mechanical and Manufacturing Engineering provide a thorough grounding in the physical sciences, especially mathematics and physics. Accompanying this is a strong emphasis on the development of creativity and problem-solving skills. Analysis, design and experimentation are central aspects of professional activity in these branches of engineering. Oral, written, graphic and mathematical communication skills are also important. The need for sensitivity to the social, economic and environmental context of engineering is incorporated in subjects throughout the courses.

## BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) and BACHELOR OF ENGINEERING (MANUFACTURING ENGINEERING)

### SANDWICH ATTENDANCE PATTERN
Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| 33121 | Engineering Mathematics 1A | 3 |
| 46110 | Mechancis 1 | 6 |
| 46310 | Introduction to Engineering | 3 |
| 46311 | Engineering Graphics | 3 |
| 46810 | Introduction to Computing | 2 |
| 62171 | Engineering Chemistry | 6 |

| STAGE 2 | | Hrs/Wk |
|---|---|---|
| 33122 | Engineering Mathematics 1B | 3 |
| 46111 | Mechanics 2 | 4 |
| 46710 | Manufacturing Processes 1 | 4 |
| 46811 | Computer Programming | 4 |
| 63117 | Engineering Physics (Mechanical) | 4 |
| 63704 | Materials Engineering 1 | 4 |

| STAGE 3 | | |
|---|---|---|
| 33221 | Engineering Mathematics 2A | 3 |
| 46120 | Mechanics 3 | 4 |
| 46220 | Solid Mechanics 1 | 4 |
| 46420 | Fluid Mechanics | 4 |
| 46620 | Engineering Communication | 4 |
| 63127 | Electrical Engineering 1 (Mechanical) | 4 |

| STAGE 4 | | |
|---|---|---|
| 33222 | Engineering Mathematics 2B | 3 |
| 46121 | Mechanics of Machines | 4 |
| 46320 | Design 1 | 4 |
| 46421 | Thermodynamics | 4 |
| 46720 | Manufacturing Processes 2 | 4 |
| 46820 | Engineering Statistics | 3 |

| STAGE 5 | | |
|---|---|---|
| 45931 | Electrical Engineering 2 (Mechanical) | 4 |
| 46130 | Dynamics of Mechanical Systems | 4 |
| 46230 | Solid Mechanics 2 | 4 |
| 46430 | Thermofluids | 4 |
| 46630 | Engineering and Society | 4 |
| 46830 | Numerical Analysis | 4 |

| STAGE 6 | | |
|---|---|---|
| 46990 | Industrial Review | 3 |
| 63741 | Materials Engineering 2 | 4 |
| 46330 | Computer Aided Drafting and Design | 4 |
| 46431 | Heat Transfer | 4 |
| 46530 | Measurement and Instrumentation | 4 |
| 46531 | Control Engineering 1 | 4 |

| During a professional experience period: | | |
|---|---|---|
| 46990 | Industrial Review | 3 |

| STAGE 7 | | |
|---|---|---|
| 46030 | Project 1 | 3 |
| 46332 | Design 2 | 3 |
| 46991 | Professional Review | 3 |
| ..... | Humanities Elective | 3 |
| ..... | Professional Elective 1** | 3 |
| ..... | Professional Elective 2 | 3 |
| ..... | Professional Elective 3 | 3 |

| STAGE 8 | | |
|---|---|---|
| 46031 | Project 2 | 9 |
| 46333 | Design 3 | 3 |

| | | Hrs/Wk |
|---|---|---|
| ..... | Professional Elective 4 | 3 |
| ..... | Professional Elective 5 | 3 |
| 46641 | Commercial Issues for Engineers | 3 |

## PART–TIME ATTENDANCE PATTERN

Academic Requirements*

| STAGE 1 | | Hrs/Wk |
|---|---|---|
| Autumn Semester | | |
| 46110 | Mechanics 1 | 6 |
| 33121 | Engineering Mathematics 1A | 3 |
| 46310 | Introduction to Engineering | 3 |
| 46810 | Introduction to Computing | 2 |
| Spring Semester | | |
| 62171 | Engineering Chemistry | 6 |
| 46311 | Engineering Graphics | 3 |
| 63117 | Engineering Physics (Mechanical) | 4 |

| STAGE 2 | | |
|---|---|---|
| Autumn Semester | | |
| 46111 | Mechanics 2 | 4 |
| 33122 | Engineering Mathematics 1B | 3 |
| 46711 | Manufacturing Processes 1A | 2 |
| 63704 | Materials Engineering 1 | 4 |
| Spring Semester | | |
| 46220 | Solid Mechanics 1 | 4 |
| 46811 | Computer Programming | 4 |
| 46711 | Manufacturing Processes 1B | 2 |
| 63127 | Electrical Engineering 1 (Mechanical) | 4 |

| STAGE 3 | | |
|---|---|---|
| Autumn Semester | | |
| 46120 | Mechanics 3 | 4 |
| 46420 | Fluid Mechanics | 4 |
| 46721 | Manufacturing Processes 2A | 2 |
| 46620 | Engineering Communication | 4 |
| Spring Semester | | |
| 46421 | Thermodynamics | 4 |
| 33221 | Engineering Mathematics 2A | 3 |
| 46721 | Manufacturing Proccesses 2B | 2 |
| 46320 | Design 1 | 4 |

| STAGE 4 | | |
|---|---|---|
| Autumn Semester | | |
| 46121 | Mechanics of Machines | 4 |
| 33222 | Engineering Mathematics 2B | 3 |
| 46820 | Engineering Statistics | 3 |
| 46630 | Engineering and Society | 4 |
| Spring Semester | | |
| 46230 | Solid Mechanics 2 | 4 |
| 46830 | Numerical Analysis | 4 |
| 46330 | Computer Aided Drafting and Design | 4 |

| STAGE 5 | | |
|---|---|---|
| Autumn Semester | | |
| 46130 | Dynamics of Mechanical Systems | 4 |
| 46430 | Thermofluids | 4 |
| 45931 | Electrical Engineering 2 (Mechanical) | 4 |
| Spring Semester | | |
| 46431 | Heat Transfer | 4 |
| 46531 | Control Engineering 1 | 4 |
| 46631 | Engineering Management | 3 |
| 46990 | Industrial Review | 3 |

| STAGE 6 | | |
|---|---|---|
| Autumn Semester | | |
| 46530 | Measurement and Instrumentation | 4 |
| 63741 | Materials Engineering 2 | 4 |
| ..... | Professional Elective 1** | 3 |
| ..... | Humanities Elective | 3 |
| Spring Semester | | |
| 46030 | Project 1 | 3 |
| ..... | Professional Elective 2 | 3 |
| 46991 | Professional Review | 3 |
| 46332 | Design 2 | 3 |

| STAGE 7 | | |
|---|---|---|
| Autumn Semester | | |
| 46032 | Project 2A | 3 |
| ..... | Professional Elective 3 | 3 |
| 46641 | Commercial Issues for Engineers | 3 |
| 46333 | Design 3 | 3 |
| Spring Semester | | |
| 46032 | Project 2B | 6 |
| ..... | Professional Elective 4 | 3 |
| ..... | Professional Elective 5 | |

* Professional Experience, 46997 (Sandwich) and 46999 (Part–time) to be undertaken in accordance with the Faculty's Industrial Experience Rules, see page 13.

** Professional Electives are chosen from the subjects listed below.

**Manufacturing** students must choose their five professional electives from the group "Manufacturing and Management".

## PROFESSIONAL ELECTIVE SUBJECTS

### Manufacturing and Management

| | | Hrs/Wk |
|---|---|---|
| 46640 | Terotechnology | 3 |
| 46642 | Engineering Economics | 3 |
| 46740 | Quality and Reliability | 3 |
| 46741 | Flexible Manufacturing | 3 |
| 46742 | Production and Cost Control | 3 |
| 46743 | Work Study | 3 |
| 46744 | Computer Aided Manufacturing | 3 |

### Applied Mechanics and Design

| | | |
|---|---|---|
| 46140 | Kinematics and Dynamics of Machines | 3 |
| 46141 | Applied Dynamics | 3 |
| 46142 | Robotics | 3 |
| 46143 | Einstein's Universe | 3 |
| 46240 | Solid Mechanics 3 | 3 |
| 46241 | Finite Element Stress Analysis Applications | 3 |
| 46340 | Structures | 3 |
| 46341 | Machine Design | 3 |
| 46342 | Materials Handling | 3 |
| 46343 | Appropriate Technology | 3 |
| 46344 | Engineering Speculation | 3 |
| 46345 | Industrial Design | 3 |

### Energy and Control

| | | |
|---|---|---|
| 46441 | Combustion and Air Pollution | 3 |
| 46442 | Advanced Fluid Dynamics | 3 |
| 46444 | Power Cycles | 3 |
| 46445 | Fluid Machines | 3 |
| 46540 | Programmable Controllers and Applications | 3 |
| 46541 | Control Engineering 2 | 3 |
| 46542 | Process Control | 3 |
| 46840 | Advanced Engineering Computing | 3 |
| 46841 | Operations Research | 3 |
| 46842 | Microprocessors | 3 |

### Ungrouped

| | | |
|---|---|---|
| 46040 | Ergonomics | 3 |
| 62193 | Corrosion Technology for Engineers | 3 |
| 91349 | Environmental Science for Engineers | 3 |

The Humanities Elective is chosen from subjects offered by the Faculty of Business or the Faculty of Social Sciences.

### Staff and Location of Faculties

The School of Mechanical Engineering is located in the Engineering Building (Building 2), City Campus, Broadway. The School Office and academic staff offices are on Level 6. Laboratories and classrooms are on Levels 2,3 and 6.

The names, office locations and professional interests of academic and senior non-academic staff are set out below. The University's telephone number is 330 1900 and staff may be reached at the extensions below. Messages may be left, either in person or by telephone, at the School Office, ext. 2669.

| | Room | Ext |
|---|---|---|
| *Head of School* | | |
| Mr S F Johnston<br>Design, ergonomics social impact of technology | 612B | 2668 |
| *Professor* | | |
| Dr J P Gostelow<br>Turbomachinery, gas turbines, fluid mechanics, solar energy, technology policy | 627 | |
| *James N Kirby Professor of Manufacturing Engineering* | | |
| Dr F B Swinkels<br>Production engineering, materials, computer aided design | 416 | 2588 |
| *Associate Professor* | | |
| Dr S-L Hall<br>Combustion, acoustics, instrumentation, aero/thermodynamics, technology/education policy | 608 | 2662 |
| Dr C T Mathews<br>Control engineering, industrial instrumentation, energy resources, technical change, engineering management, engineering education | 628 | 2686 |
| *Academic Staff* | | |
| Dr E Baker<br>Heat transfer, solar energy creep and fatigue, life testing | 622 | 2680 |
| Dr Y P Bhasin<br>Operations management, operations research, work study, planning & control, engineering economics, quality & reliability | 605 | 2659 |
| Mr A J Burfitt<br>Stress analysis, photoelasticity, design | 630 | 2689 |
| Dr K S Chan<br>Applied mechanics, design, materials handling, air-conditioning and refrigeration | 604 | 2658 |
| Dr B P Huynh<br>Control engineering, computing, fluid mechanics | 616 | 2675 |
| Dr A N F Mack<br>Computing, aerodynamics, finite element methods, computational fluid dynamics | 626 | 2684 |

| | Room | Ext. |
|---|---|---|
| Mr G M Marks<br>Appropriate technology, industry development policy, thermofluids, engineering education | 625 | 2683 |
| Mrs H McGregor<br>Human communication, engineering and social issues, cooperative education, training and human development | 620 | 2678 |
| Mr L E Reece<br>Biomedical engineering, control engineering, aerodymanics | 613 | 2673 |
| Dr R M Spencer<br>Production planning and control, computer-aided manufacture, metrology, robotics, | 612A | 2667 |
| Dr F C O Sticher<br>Advanced kinematics dymanics, instrumentation | 623 | 2681 |
| Mr K A Stillman<br>Control engineering, chemical engineering, advanced computing | 624 | 2682 |
| Mr H G R Wiedemann<br>Materials, hydraulic and pneumatic transport of solids, biomedical engineering | 614 | 2674 |
| Mr R M Wiltshire<br>Stress analysis, structural and vehicle dynamics, computer–aided engineering | 609 | 2663 |
| *Non-Academic Staff* | | |
| Mrs S Tanuwidjaja<br>Executive Officer | 612 | 2671 |
| Mrs C Lew<br>Administrative Assistant | 612 | 2670 |
| Mrs K Johnston<br>Word Processor Operator | 612 | 2669 |
| Mr J J McCaffrey<br>Engineer | 323C | 2558 |
| Mr K W Bowyer<br>Engineer | 602 | 2656 |
| Mr A Revel<br>Engineer | 301A | 2550 |
| Mr P H Alt<br>Assistant Laboratory Manager | 313A | 2569 |
| Mr C E Evans<br>Assistant Laboratory Manager | 212B | 2544 |
| Mr T Bayfield<br>Senior Technical Officer | 649A | 2691 |
| Mr C Chapman<br>Senior Technical Officer | 318A | 2561 |
| Mr J I Gibson<br>Senior Technical Officer | 212D | 2543 |
| Mr L D'Arcy<br>Senior Technical Officer | 201 | 2533 |
| Mr R Turnell<br>Senior Technical Officer | 313A | 2570 |
| Mr G Bayley<br>Senior Laboratory Craftsman | 212 | 2545 |
| Mr S M Gordon<br>Senior Laboratory Craftsman | 212 | 2546 |
| Mr T E Wells<br>Senior Laboratory Craftsman | 253 | 1026 |
| Mr J R Grove<br>Workshop Supervisor | 253B | 1026 |
| Mr L Stonard<br>Laboratory Craftsman | 253 | 1026 |
| Mr T Newton<br>Stores Officer | 205B | 2535 |

## FURTHER PROGRAMMES IN ENGINEERING

## 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

Applicants must possess either a recognised engineering degree or an equivalent qualification. In special cases, applications may also be considered from non-engineering graduates whose careers bring them into close contact with professional practice.

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.

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 (but some are four hours and six hours) and involve attendance either one afternoon or one evening per week.

### Course Structure

Each student designs their own programme, structured to suit their individual needs. Programme details are determined prior to enrolment, in consultation with an academic adviser. There is an opportunity to choose from a broad range of undergraduate and graduate subjects offered by the University's nine faculties.

It is important for students to note that at least 60 percent of the 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.

### Enquiries

Initial enquiries should be made to the Faculty's Graduate Studies Officer, Ms Beate Buckenmaier, telephone 330 2606.

Academic enquiries should be directed to the following people:

*Civil Engineering*
Professor S L Bakoss
Head of School
Civil Engineering
Room 2/511C, telephone 330 2629

*Electrical Engineering*
Associate Professor T Buczkowska
School of Electrical Engineering
Room 1/2542, telephone 330 2458

*Mechanical Engineering*
Dr Y Bhasin
Lecturer
School of Mechanical Engineering
Room 2/605, telephone 330 2659

## 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 Bachelors degree. The thesis must be a distinct contribution to the 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 City Campus at Broadway. 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 encryption.

*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 Faculty's Graduate Studies Officer on 330 1990 ext. 2606. 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 future 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 an employer and a covering letter setting out 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 requirments 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.

| COURSE STRUCTURE | | *Hrs/Wk* |
|---|---|---|
| *Semester 1* | | |
| 43811 | Economics for Engineers | 3 |
| 21718 | Organisation Analysis and Design | 3 |
| *Semester 2* | | |
| 42812 | Technological Change | 3 |
| 22726 | Accounting and Financial Adminstration | 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** | |
| 44143 | 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).

\# Not available in 1992.

**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.

**Enquiries**
Initial enquiries may be made with the Faculty's Graduate Studies Officer on 330 2606.

## MASTER OF ENGINEERING (TELECOMMUNICATIONS)

This course is offered jointly by the University of Technology, Sydney and the University of Wollongong. The combined resources of the telecommunications research laboratories of both institutions are considerable, and students consequently have a greater range of areas from which to select their research speciality. The course is designed to enable graduates of Electrical or Computer Engineering to develop an in-depth specialisation in one of the telecommunications technologies currently emerging. Experienced graduates will also find the course attractive as a means of keeping current with the technologies that are influencing their industry. Special features include the opportunity to undertake a substantial Telecommunications Research Project and to participate in the industrially relevant research progammes in place at both universities.

**Admission Requirements**
Engineers wishing to enter the programme must possess a First or Second Class Honours degree in Electrical or Computer Systems Engineering from an Australian university, or an equivalent four year full-time degree.

Prospective students who do not meet the entrance requirements will be invited to undertake qualifying study before commencing the Masters programme.

Qualifying students, who complete a total of 27 semester hours of undergraduate electrical engineering subjects with a credit average , will be accepted into the Masters programme.

In certain circumstances students will be permitted, after partial completion of the prescribed 27 semester hours, and with a grade of Credit or higher, to transfer to the Masters programme.

Students who fail to reach the required standard in the qualifying programme but achieve a Pass in all their subjects will be awarded a Graduate Diploma in Engineering.

**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 will be offered at the rate of two per semester in the following sequence.

41865 Communication Protocols **and**
41867 Teletraffic Engineering

41868 Transmission Systems **and**
41864 Integrated Services Networks

41866 Telecommunications Signal Processing **and**
..... Elective

The elective may be chosen from any graduate level subject in Telecommunications Engineering, Computer Systems Engineering, Statistics or Computer Science offered by either University.

**Attendance Arrangements**
Some lectures will be held in the evening, for 3 hours, and some will be offered in three two-day modules, with students to independently undertake computer assignments and reading programmes between modules. (It is anticipated that most such modules will be offered Friday/Saturday.) Subjects will be examined by means of a formal examination at the end of each semester. Students will undertake a research project at the University of their principal supervisor. Excellent facilities for computer aided design, hardware development and system simulation are available at each university.

Each of the subjects may be undertaken independently as a short course and later credited towards a Master's degree. For information on short courses applicants should contact the Continuing Professional Education directorate on 330 1620/1624/1626.

**Duration**
The minimum time for completion of the degree is three semesters for full-time candidates and five semesters for part-time candidates.

**Fees**
In 1991 the fee for full-fee paying overseas students was $16,500 per annum for the Graduate Diploma and the Master's degree. The course fee for 'local' students was approximately $425 per subject, to be paid soon after the student enrolled. This course fee is in lieu of the Commonwealth Government HECS charge.

**Enquiries**
Initial enquires may be made with the Faculty's Graduate Studies Officer, tel 330 2606.

## DOCTOR OF PHILOSOPHY

Initial enquires 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 courses 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
Turbomachnery
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 course. 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.

# SUBJECT SYNOPSES

Subject synopses appear in numerical order. Subject numbers are made up of five digits.

The first digit indicates the Faculty which teaches the subject. For example:

2 = Faculty of Business
3 = Faculty of Mathematical & Computing Sciences
4 = Faculty of Engineering
5 = Faculty of Social Sciences
6 = Faculty of Science (School of Physical Sciences)
7 = Faculty of Law
9 = Faculty of Science (School of Biological & Biomedical Sciences)

Within the Faculty of Engineering, the second digit indicates the School to which the subject belongs, and whether it is an undergraduate or postgraduate subject. For example:

**Civil Engineering**
Undergraduate subjects begin with '47'
Postgraduate subjects begin with '43'

**Electrical Engineering**
Undergraduate subjects begin with '45'
Postgraduate subjects begin with '41'

**Mechanical Engineering**
Undergraduate subjects begin with '46'
Postgraduate subjects begin with '42'

**KEY TO ABBREVIATED COURSE NAMES USED IN SYNOPSES:**

| | |
|---|---|
| CE | Bachelor of Engineering (Civil Engineering) |
| SE | Bachelor of Engineering (Structural Engineering) |
| EE | Bachelor of Engineering (Electrical Engineering) |
| CSE | Bachelor of Engineering (Computer Systems Engineering) |
| ME | Bachelor of Engineering (Mechanical Engineering) |
| MFG | Bachelor of Engineering (Manufacturing Engineering) |
| MEM | Master of Engineering Management |
| MEng (Tel) | Master of Engineering (Telecommunications) |
| MLG | Master of Local Government |
| GDLGE | Graduate Diploma in Local Government Engineering |
| Grad Dip Eng | Graduate Diploma in Engineering |

### 21718 ORGANISATION ANALYSIS AND DESIGN

Course: MEM
Three semester hours

The central concern of this subject is to develop skills in organisational analysis and on the basis to develop diagnostic and prescriptive skills in regard in organisational design. The method of presentation is a weekly class of three hours which will involve a combination of lectures, discussion of readings, analysis of case studies and simulation exercises. Students are expected to have read the assigned material in advance so that there can be more informal discussion of key issues.

### 21719 ORGANISATIONAL BEHAVIOUR

Course: MEM
Three semester hours

This subject uses theory and research from the social sciences to explore human behaviour at work. Students are introduced to the basics of individual psychology which is then critically applied to the fields of motivation and job design. Social psychology's work on group dynamics is presented and applied to the management of work groups and committees. Various theories of leadership are examined and critically assessed. The question of intergroup behaviour and conflict is discussed as is power and politics in organisations. The question of change in organisations draws upon much of the foregoing. The subject takes a critical approach to management theory and practice.

### 21720 EMPLOYMENT RELATIONS

Course: MEM
Three semester hours

This subject provides an introduction to the areas of industrial relations and personnel management. The historical steps in the development of the personnel function and the forces which have shaped the development of the personnel function are examined. The major functions of personnel and industrial relations managers are explored, as well as the

relationship between the personnel and industrial relations functions in the modern organisation. The nature of industrial relations and the various theoretical approaches to the subject are examined. A study is made of the nature of industrial conflict and the contribution to understanding made by several conflict theorists. The structure and functioning of the formal industrial tribunal systems in Australia are examined, as well as the form and function of the employer and employee organisations party to employment relations.

**21728 PUBLIC SECTOR MANAGEMENT**
Course: MEM and MLG
Three semester hours

This subject provides a broad conceptual framework for studying approaches to management within the political environment of the public sector. An evaluation is undertaken of the utility of contemporary business management concepts in pubic sector organisations. Topics: Organisations and management; Perceptions of management in the pubic sector; Managerial roles and skills; Catalysts for reform; Performance management; Politics and management; Strategic management; Decision making and implementation; Programme and project management; Resources acquisition and management; Dealing with the public; Ethics and values; Accountability; the future.

**21729 HUMAN RESOURCE MANAGEMENT (Public)**
Course: MLG
Equivalent three hours per week (intensive mode)

Human Resource Management (Public) adopts a strategic perspective to the management of human resources in public sector organisations analysing strategies and processes to meet the needs of both organisations and individuals. An analysis is conducted of the balance of responsibilities between achieving broad governmental objectives and agency goals; and agency performance and just a concern for employees.

**21731 RESOURCE MANAGEMENT**
Course: MLG
Equivalent three hours per week (intensive mode)

The objectives of this subject are for students: (1) To recognise the accountability and reporting requirements managers have in relation to resources in the public sector: (2) To develop competencies necessary for line managers to develop budgets and arrange long term financing; (3) To develop competencies in analysing financial performance of programmes and units in local government; (4) To relate to auditors and co-operate in presenting financial reports. Students will be expected to prepare case and reading material for analysis and discussion in workshops. Additional case material will be introduced for consideration in workshops. At the end of each workshop students will review 'principles' and other considerations arising from the session. Topic guides will be provided by the workshop leader.

**21758 STRATEGIC MANAGEMENT (Public)**
Course: MLG
Three semester hours
*Prerequisite: Stages 1-5*

Strategic Management (Public) provides an integrative approach to the development and implementation of strategies appropriate to the peculiar political, legal and financial environments of public sector organisations. Alternative strategy models are examined for their relevance in particular situations.

**22726 ACCOUNTING AND FINANCIAL ADMINISTRATION**
Course: MEM
Three semester hours

The aim of this subject is to introduce accounting to persons who are not preparing for a career in accounting, but are going to use accounting information in their roles. Topics include both financial and management discounting; financial statements, balance sheet and income statement, financial statement analysis and understanding financial statements, the nature of management accounting, cost behaviour, differential accounting, capital budgeting, responsibility accounting, budgeting.

**24734 MANAGERIAL MARKETING**
Course: MEM
Three semester hours

This subject views marketing as a key managerial decision making area, necessarily at the locus of interface between the firm and its environment. Drawing extensively on the literature in marketing management, the subject will adopt a case method approach to the exposition of the nature and complexity of managerial marketing decision-making.

**25742 FINANCIAL MANAGEMENT**
Course: MEM
*Prerequisites: 22726 Accounting and Financial Administration, 43811 Economics for Engineers*

Topics: analytical techniques applied to financial decision making and the basic structure of the Australian financial system; capital budgeting; capital structure; dividend policy; risk minimisation; current

asset management; lease vs borrow analysis; the leveraged lease; the computer as an effective tool of financial management.

**31141 DATABASE STRUCTURES AND MANAGEMENT**
Course: CSE
Three semester hours
*Prerequisite: 45353 Operating Systems*

The nature of common data structures and their use was introduced in 45133 Software Engineering. This subject covers operations on data structures, basic file systems, common database architectures and their relative merits, data entry to database and data retrieval. The student will, on completion, have the knowledge to be able to select and configure suitable databases to meet a specification and be able to write handlers to supply and extract data from the database. Key features of the subject are the illustration of concepts by commercial systems such as PICK, UNIFY, DBASE IV or LOTUS 123, plus a major assignment using an asynchronous communications port for data input and ad-hoc report generation from the stored data.

Topics include: Review of strings, arrays, lists, trees, linking, and structures of structures; operations including sort, search, merge; basic file systems on mass storage, distributed databases, data input (forms, handlers) and data retrieval (ad-hoc queries, report generator, alarms), database administration.

**31163 KNOWLEDGE BASED SYSTEMS**
Course: CSE
Three semester hours
*Prerequisites: 31141 Database Structures and Management, 45363 Software Engineering 2*

The objective of the subject is to introduce students to the theory, design and implementation of various knowledge-based techniques. While the emphasis will be on expert systems, there will be an overview of Artificial Intelligence, and some examples of knowledge based systems will be examined in detail.

Topics include: Overview of AI: reasoning and computation; knowledge representation, expert systems and knowledge elicitation. The course will be lecture based, however there will be several case studies and the students will gain familiarity with a commercially available expert systems shell.

**33100 DISCRETE MATHEMATICS**
Course: EE/CSE
Three semester hours

The objective of this subject is to master the symbolism of discrete mathematics, as applied to set theory, logic and the predicate calculus. To introduce the concept of a formal system as a basis of description and proof. To introduce proving techniques.

The course will cover:

Formal systems and proof methods. Propositional logic. Quantifiers and predicate logic. Method of induction. Sets and set operations. Indexing, mappings, relations and functions. Equivalence relations. Recursive definition of functions. Partially ordered sets. Semigroups, lattices and Boolean algebras and state machines. Basic combinational techniques and applications. Isomorphisms. Graphs, trees, sequences.

**33110 ENGINEERING MATHEMATICS 1 (Electrical)**
Course: EE/CSE
Six semester hours
*Prerequisite: HSC 3 Unit Mathematics is assumed*

The objective of this subject is for students to master the fundamental mathematical operations used in most branches of electrical engineering. Specifically those of determinants, matrices, vectors and complex numbers; the basic computational methods of single variable differentiation and integration and the properties of elementary functions.

The subject content is as follows:

Matrices and determinants. Solution of linear equations. Gaussian reduction. Vectors. Products of vectors. Equations of lines and planes. Complex numbers. Polar form. De Moivre's theorem. Limits, continuity and differentiation. Mean value theorem. Curve sketching. Related rates. Maxima and minima. Integration. Riemann sums. Fundamental theorem of calculus. Application to areas and volumes and to lengths of curves. Logarithm and exponential functions. Trigonometric and hyperbolic functions. L'Hopital's rule.

**33121 ENGINEERING MATHEMATICS 1A**
Courses: CE/SE and ME/MFG
Three semester hours
*Prerequisite: Nil*

This subject presents basic aspects of calculus to engineering students. On completion of the subject, students should have a knowledge of the following topics: matrices and determinants; vectors; limits,

continuity and differentiation; applications of differentiation.

**33122 ENGINEERING MATHEMATICS 1B**
Courses: CE/SE and ME/MFG
Three semester hours
*Prerequisite: 33121 Engineering Mathematics 1A*

This subject presents basic aspects of calculus to engineering students. On completion of the subject, students should have a knowledge of the following topics: integration and applications; elementary functions; methods of integration; sequences, series and complex numbers.

**33210 ENGINEERING MATHEMATICS 2 (Electrical)**
Course: EE/CSE
Six semester hours
*Prerequisites: 33110 Engineering Mathematics 1 (Electrical), 33100 Discrete Mathematics*

The objective of this subject is to have students master the fundamental aspects of differential calculus and the solution of ordinary differential equations, and the conceptualisation of abstract vector spaces. This is achieved through development of expertise in some areas of theoretical linear algebra, in functions of several variables and partial derivatives and in ordinary differential equations and their solution by classical and Laplace transform methods.

The subject content is as follows:

Methods of integration. Sequences and their convergence. Series and their convergence. Tests for convergence. Power series. Radius of convergence. Taylor series. Vector spaces. Linear independence. Bases. Inner products. Linear transformations. Rank of matrix. Ordinary differential equations. First order linear and variable separate equations. Solution of linear equations by auxiliary equation and undetermined coefficients. Systems of linear equations. Application of matrix exponentials. Partial derivatives. Gradient. Lagrange multipliers. Laplace transforms. Application to ordinary differential equations. Convolution theorem. There will be emphasis on formally proving the fundamental concepts.

**33221 ENGINEERING MATHEMATICS 2A**
Courses: CE/SE and ME/MFG
Three semester hours
*Prerequisite: 33122 Engineering Mathematics 1B*

This subject builds on the elementary aspects of calculus covered in Engineering Mathematics 1A and 1B. On completion of the subject, students should have a knowledge of partial derivatives, multiple integrals and differential equations. Topics covered include: partial derivatives; double integrals and applications; triple integrals and applications; differential equations.

**33222 ENGINEERING MATHEMATICS 2B**
Course: ME/MFG
Three semester hours
*Prerequisite: 33221 Engineering Mathematics 2A*

This is the fourth of a series of mathematics subjects which develop the mathematical skills and awareness needed by engineering students (in the ME and MFG degrees). This subject focusses on solution of more difficult equations.

Topics are: Solution of ordinary differential equations by Laplace transforms. Convolution theorem. Step functions. Series solutions of ordinary differential equations. Regular singular points. Bessel functions. Boundary value problems. Fourier series. Vibrating membrane and Bessel functions. Vector fields. Divergence and curl. Line and surface integrals. Theorems of Gauss and Stokes.

**33310 ENGINEERING MATHEMATICS 3 (Electrical)**
Course: EE/CSE
Three semester hours
*Prerequisite: 33210 Engineering Mathematics 3 (Electrical)*

The objective of this subject is to have students master the series solution of differential equations and the conceptualisation of simple problems requiring multi-dimensional thinking, for example boundary value problems, vector calculus and complex variable theory.

The subject content is as follows:

Series solution of linear differential equations. Ordinary and regular singular points. Bessel functions. Boundary value problems for one dimensional heat and wave equations. Laplace equation in a circle. Circular drum. Double and triple integrals. Polar cylindrical and spherical co-ordinates. Line and surface integrals. Green's theorem. Divergence theorem and Stokes' theorem. Analytic functions. Cauchy-Riemann equations. Conformal mapping. Cauchy's integral theorem. Taylor and Laurent series. The residue theorem. Inverse Laplace Transforms. There will be emphasis on deriving proofs of the fundamental concepts.

**41749 MANAGEMENT OF TELECOMMUNICATIONS**
Course: MEM and MEng (Tel)
Three semester hours

This subject introduces the main concepts of the assessment, control and management of telecommunications systems. Its aim is to develop an understanding of the importance of telecommunications policy and strategic planning of telecommunications systems for efficient operation of an organisation and to provide necessary tools to apply this understanding and underlying concepts techniques in real life case studies.

The subject is designed to provide a strategic communications management perspective. It explores the changing telecommunications/information systems environment and focuses on techniques of corporate telecommunications planning, evaluation and selection.

**41800 PROJECT (GradDipEng) ELECTRICAL**
Course: Grad Dip Eng - 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**
Course: MEM
*Three semester hours*
*Prerequisite: 46841 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 applications of the resulting models to management decision making is illustrated.

**41864 INTEGRATED SERVICES NETWORKS**
Course: MEng (Tel)
Three semester hours

Characteristics to telecommunication traffic voice, data and video. Packet and Circuit Switching. Narrowband ISDN Networks. Broadband networks. LAN and MAN networks.

**41865 COMMUNICATIONS PROTOCOLS**
Course: MEng (Tel)
Three semester hours

Layered Architectures. Local Area Networks. Network Layer. Transport Layer Protocols. Session Layer. Presentation Layer. Application Layer. Practical work: Development of a Simple LLC protocol for a Cheapernet LAN and Development of a simple Transport Protocol.

**41866 TELECOMUNICATIONS SIGNAL PROCESSING**
Course: MEng (Tel)
Three semester hours

Extracting the information contained in the samples of on analog signal. Analysis of discrete systems. DSP Hardware. FIR filter design. IIR filter design. Advanced topics in filter design, detection, estimation, Wiener filtering. Spectral Estimation. Speech coding algorithms. Image coding. Adaptive signal processing. Communications signal processing. Case study: DSP modem. The implementation of a complete DSP modem will be reviewed (V.29.). DSP implementation of fast transforms.

**41867 TELETRAFFIC ENGINEERING**
Course: MEng (Tel)
Three semester hours

Introduction to Teletraffic Engineering Review of relevant mathematics. Basic Queuing Models. Basic Teletraffic Theory. Basic Methods of Traffic Measurement. Traffic in non-loss systems. Delay/Throughput analysis in Data Networks. Network Planning and Management Simulation.

**41868 TRANSMISSION SYSTEMS**
Course: MEng (Tel)
Three semester hours

Analog Transmission. Baseband Digital Transmission. Digital Carrier Modulation. M-ary Carrier Modulation. Synchronization. Effect of Timing Error. Sensitivity of various modulation types to carrier phase and timing errors. Introduction to Channel Coding. Cyclic Codes. Convolutional Codes. Link Budgets. Optical Link Case Study. Satellite Link Case Study. Spread spectrum and Multiple Access.

**42812 TECHNOLOGICAL CHANGE**
Course: MEM
Three semester hours

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 with 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.

**43401 ENVIRONMENTAL PLANNING**
Course: GDLGE
Three semester hours

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 to be covered 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; traffic environmental impact assessment.

**43402 TRAFFIC AND TRANSPORTATION**
Course: GDLGE
Three semester hours

This subject provides the basic principles in transportation planning and traffic engineering. The influence of environmental and political aspects will be analysed as well as technical aspects. Emphasis will be directed towards the application of traffic engineering in the planning and reorganisation of traffic problems in local government situations.

**43403 MANAGEMENT AND INDUSTRIAL RELATIONS**
Course: GDLGE
Three semester hours

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 will be 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**
Course: GDLGE
Three semester hours

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

**43405 WATER AND SEWERAGE SYSTEMS OPERATIONS**
Course: GDLGE
Three semester hours

This subject concentrates on the operation and maintenance of municipal wastewater treatment plants, sewerage systems and water supply systems. Topics to be covered include statutory requirements, constituents and quality of wastewaters, 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**
Course: GDLGE
Three semester hours

The aim of this subject is to equip students with the knowledge of good practice in the design, construction and maintenance of roads, as well as 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: design standards of road and street alignment as practised by the appropriate authorities in New South Wales; road elements; road features; and road structures.

**43407 WATER ENGINEERING**
Course: GDLGE
Three semester hours

This subject focuses on urban drainage and methods of control and protection as well as aspects of coastal engineering. Topics to be covered include urban drainage design; design flood estimation techniques; culvert design; erosion and scour protection; flood mitigation practice and coastal engineering.

**43408 POWERS, DUTIES AND FINANCIAL MANAGEMENT IN LOCAL GOVERNMENT ENGINEERING**
Course: GDLGE
Three semester hours

This subject aims to establish the requirement of the various Local Government Acts. The legal responsibilities and accounting procedures related to local government are examined. Topics to be covered include the Local Government Act; legal responsibilities and liabilities of Councils; administration of government finances; account and cost control; and management statistics.

**43451 ENVIRONMENT OF PROFESSIONS IN LOCAL GOVERNMENT**
Course: MLG
Three semester hours

This subject establishes an understanding of cross-disciplinary competencies available in the professions working in local government. This provides a foundation for exploring management applications in later subjects.

**43452 ENVIRONMENTAL MANAGEMENT**
Course: MLG
Three semester hours
*Prerequisite: 43451 Environment of Professions in Local Government*

This subject examines current environmental issues and their implication at the local level. Global, national and local policy approaches are evaluated as a basis for developing local government multi-disciplinary management approaches.

**43453 INFRASTRUCTURE MANAGEMENT**
Course: MLG
Three semester hours
*Prerequisite: 21731 Resource Management*

This subject examines current and likely future roles of local government in the provision of urban and regional infrastructure. Future infrastructure technologes are examined (such as information transfer), as are methods of public and private provision.

**43454 MANAGING LOCAL ENTERPRISE**
Course: MLG
Three semester hours

This subject, together with Strategic Management (Public), forms the capstone of the course. Students prepare a management plan, at a standard suitable for publication, for a selected local development issue (such as unemployment or environmental degradation). The emphasis is on issues in a Council's external environment.

**43811 ECONOMICS FOR ENGINEERS**
Course: MEM
Three semester hours

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**
Course: MEM
Three semester hours

The emphasis will be 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 will be considered.

**44143A/44143S PROJECT A AND B**
Course: MEM

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 to be on small team project work in inter-disciplinary groups.

**44802 MANAGEMENT DECISIONS**
Course: MEM
Three semester hours

This subject presents a critique of rational decision aids in the light of modern descriptive theories of judgment, choice and decision in organisations. The methods of Management Science; Decision Analysis and Judgment Analysis are presented and models of reasoning, argument construction, persuasion and negotiation. Real decision behaviour is discussed using sociological and behavioural models of decisions in bureaucracies and firms.

**45113 DIGITAL TECHNIQUES**
Course: EE/CSE
Three semester hours
*Prerequisite: None (33100 Discrete Mathematics recommended)*

The first part of this subject will introduce number systems and Boolean algebra. Techniques of manipulating and minimizing Boolean functions, and implementing these functions using logic gates will then be presented. The concepts introduced will be demonstrated by designing and building a combinatorial circuit in the laboratory.

The introduction to sequential circuit design will being by examining the operation of D, and JK flip flops. Methods of formally describing the operation of sequential circuits using state tables and state diagrams will then be introduced. Finally techniques of implementing the circuits represented in the form of state tables and diagrams will be presented. These concepts will again be demonstrated by designing and building a sequential circuit in the laboratory.

**45115 ENGINEERING PRACTICE**
Course: EE/CSE
Three semester hours

The aim of this subject is to help students:

1. develop their understanding of the practice of electrical and computer systems engineering, the role(s) of practitioners, and the academic disciplines which support these professions;

2. develop an appreciation of their communications capabilities and provide support for those needing to remedy weaknesses;

3. develop an understanding of how their course is designed to contribute to their professional development;

4. assume responsibility for their own learning. (Students are encouraged to see their progression through the course as an engineering project that is to be delivered on time and to a specified standard);

5. take action to equip themselves with skills that will be required in future studies and work.

**45116 ELECTRICAL ENGINEERING 1**
Course: EE/CSE
Three semester hours

This is a first course in d.c. and a.c. circuit theory and introduces electric and magnetic fields. Circuits containing resistors and capacitors are analysed. Circuit measurements use a.c. and d.c. meters and the oscilloscope.

**45123 FUNDAMENTALS OF COMPUTING**
Course: EE/CSE
Three semester hours
*Prerequisite: 33131 Discrete Mathematics (recommended)*

This is an introductory subject in computing where students learn the basics of computer architecture and operating systems. The Pascal programming language is then taught together with software engineering principles of structured analysis, design and testing. The overall emphasis is on the importance of achieving a correct, well structured design before implementation, in the programming building process.

**45124 ELECTRICAL ENGINEERING 2**
Course: EE
Six semester hours
*Prerequisite: 45116 Electrical Engineering 1*
*Corequisite: 33210 Engineering Mathematics 2 (Electrical)*

The subject covers the essential theory needed by students in their first industrial semester. It deals with electromagnetic theory, measurements, basic electronic rectifier and amplifier circuits and electromechanical devices. It consists of lectures, tutorials, laboratory and computing work.

**45125 ENGINEERING DISCOVERY**
Course: EE/CSE
Three semester hours
*Prerequisite: 45115 Engineering Practice*

The objectives of this subject are to continue and extend the exposure of students to team based approaches to tackling open ended problems, for which the team members initially have neither the

skills nor the knowledge to solve. It aims to develop in students the confidence and enthusiasm that allow a positive response to the challenge of working with problems where step by step procedures are unknown and to provide a setting in which students have the freedom to explore and discover methods of fostering their own creativity and ingenuity. It aims to develop advocacy, written and verbal reporting skills and the ability to use communications technology.

The problem based learning approach introduced in Engineering Practice is continued in this subject. The students, grouped into syndicates, will be presented with challenges generally contained within scenarios which attempt to simulate realistic but simplified situations with which junior engineers might be confronted. Resource sessions are provided where necessary at which students have the opportunity to acquire the necessary knowledge and skills.

**45133 SOFTWARE ENGINEERING 1**
Course: EE/CSE
Three semester hours
*Prerequisite: 45123 Fundamentals of Computing*
*Corequisite: 33100 Discrete Mathematics*

Analysis, design and testing techniques: module quality, information clusters, abstract data types: type, operations, preconditions, axioms; pre/post conditions, simple programme proving, testing; recursive definitions; abstract data types, introduction to object oriented techniques. Implementation techniques; Pascal:- modules; pointers; recursion, object oriented concepts. Data structures and algorithms: queues, stacks, lists, trees; sorting, searching.

**45134 NETWORK THEORY**
Course: EE/CSE
Three semester hours
*Prerequisite: 45124 Electrical Engineering 2*
*Corequisite: 33310 Engineering Mathematics 3 (Electrical)*

This subject will outline the general techniques of network analysis. The emphasis is on the time response and frequency response of I and II-order networks. Discussion on response of networks will be preceded by description of typical signals, such as singularity functions, sinusoidal and non-sinusoidal signals, and nodal and mesh analysis. Obtaining the response of networks containing active elements will be explained, with the equivalent circuit of an active element being given to the students. The topic of three phase networks will be covered briefly.

**45135 ENGINEERING COMMUNICATION**
Course: EE/CSE
Three semester hours
*Prerequisite: 45115 Engineering Practice*

The practice of engineering relies on effective technical communication, and utilises various standard documents and procedures to achieve precision and clarity. The subject develops an understanding of the requirements for effective technical communication in engineering and provides experience in the development, presentation, interpretation and maintenance of engineering information, with respect to established and developing practice.

**45141 CONTINUOUS AND DISCRETE SYSTEMS**
Course: EE/CSE
Three semester hours
*Prerequisites: 33310 Engineering Mathematics 3 (Electrical), 45134 Network Theory*

This subject gives a comprehensive coverage of the theory of linear systems with and without feedback. Continuous and discrete systems are presented in parallel. State-spece are introduced and compared with frequency domain techniques. There are 6 two-hour laboratory sessions. Topics include: physical system modelling, linearisation, block diagrams, signal flow graphs, Laplace and transforms, state equations, time and frequency domain response, root locu, stability criteria (Routh, Hurwitz, Jury, Nyquist).

**45143 COMPUTER HARDWARE**
Course: EE
Three semester hours
*Prerequisites: 45123 Fundamentals of Computing, 45116 Electrical Engineering 1, 45113 Digital Techniques*
*Corequisite: 45133 Software Engineering 1*

This subject introduces microprocessor and microcomputer hardware, as well as assembly language programming. Topics include architectures of common microprocessors, assembly language programming, memory subsystem, interrupts, I/O subsystem and I/O controllers.

**45144 ELECTRONIC DEVICES AND CIRCUITS**
Course: EE/CSE
Three semester hours
*Prerequisites: 63133 Engineering Physics 3 (Electrical), 45134 Network Theory*

Semiconductor physics, p-n junction, ideal vs. real semiconductor diode, JFET, properties of the MOS

system, MOSFET, BJT. Device modelling. Basic applications of semiconductor devices. Other solid state devices (thyristors, photoelectronic devices, microwave devices). Introduction to integrated circuits.

Each topic introduced in a lecture will be reinforced in a tutorial session. In addition, there will be four laboratory sessions dealing with diodes and their applications, field-effect transistors and simple FET amplifiers, BJT characteristics and model parameter extraction and BJT amplifier configurations. Students will also be required to complete 3-4 assignments.

**45145 ENGINEERING STATISTICS**
Course: EE/CSE
Three semester hours
*Prerequisites: 33310 Engineering Mathematics 3 (Electrical), 45123 Fundamentals of Computing, 45124 Electrical Engineering 2*

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 Raleigh, 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.

The subject is taught in three modules: Probability Theory, Characterisation of Random Variables and Sampling Statistics.

**45151 SIGNAL THEORY 1**
Course: EE/CSE
Three semester hours
*Prerequisite: 45141 Continuous and Discrete Systems*

This subject is an introductory course in communication systems. It presents the theoretical basis for communication system analysis and gives students skills in using the techniques to design components of communication systems. The treatment is continued in the subject Signal Theory 2.

The subject's objectives are to bring students to the point where they can design active and passive lumped element filters which conform to a given mark with specified component tolerances and to equip students with the analytical tools used to characterise deterministic and random signals in both the time and frequency domains.

The subject is taught in 3 modules: Filter Design, The Fourier Transform and Signal Theory and Correlation and Power Spectral Density.

**45152 SIGNAL THEORY 2**
Course: EE/CSE
Three semester hours
*Prerequisite: 45151 Signal Theory 1, 45145 Engineering Statistics*

This subject applies the analytical techniques developed in Signal Theory 1 to the analysis and design of practical baseband and bandpass point-to-point communications systems. Students are also familiarised with the design choices that are embodied in many current communication systems standards in broadcasting and telephony.

The subject is taught in 3 modules: Baseband Communication Systems, Bandpass Communication Systems, Communication System Performance in Noise.

**45153 ANALOGUE ELECTRONICS**
Course: EE
Six semester hours
*Prerequisites: 45144 Electronic Devices and Circuits. 45141 Continuous and Discrete Systems*

The subject aims to develop skills in the analysis, design, practical implementation and testing of the main analogue electronic circuits of interest to an electrical or computer systems engineer.

Students should be able to understand the characteristics and limitations of devices and ICs used in analogue systems; master the analysis and design methods of linear and non-linear electronic analogue circuits and systems, test and measure the parameters of analogue circuits and systems using standard laboratory equipment.

**45154 CONTEXTUAL STUDIES**
Course: EE/CSE
Three semester hours
*Prerequisite: At least 22 weeks of Approval Industrial Experience*

This subject aims to develop an appreciation of the contexts within which engineers practice; including their professional roles and responsibilities within society. It provides an overview and basic framework of knowledge from other disciplines and an appreciation of their interfaces with engineering practice. It also aims to contribute to the development of personal skills, self-knowledge and understanding of society.

**45155 PROJECT A**
Course: EE/CSE
Three semester hours
*Prerequisite: 45243 Computer Hardware*
*Corequisites: 45151 Signal Theory 1, 45153 Analogue Electronics.*

Project A is laboratory based and provides students with an individual experience of an analogue design project. It builds on theoretical knowledge gained from prior or concurrent core subjects. Tasks are presented in the form of a request for tender, including a system specification and requires an individually engineered prototype solution. Students are required to design, construct, demonstrate, cost, report on and defend a tender submission for their project. Project topics are allocated from a list intended to cover a range of technical interests.

**45163 REAL TIME SOFTWARE AND INTERFACING**
Course: EE/CSE
Three semester hours
*Prerequisite: 45133 Software Engineering 1*
*Corequisite: 45143 Computer Hardware*

The subject will introduce students to the methods used to develop solutions for real time computer controlled applications. The optimal design of both the software and hardware required to interface to the 'outside world' is the objective of this course. It will emphasise the real time and complex interface issues through case studies and laboratory work. The single chip micro-computer and supporting devices will be used to develop a stand alone real time application.

**45166 PROJECT MANAGEMENT**
Course: EE/CSE
Three semester hours
*Prerequisite: 45145 Engineering Statistics*

This subject provides students with knowledge and skills essential to the management of engineering projects. The engineering disciplines required to achieve project objectives within time, budget and resource constraints feature prominently. The subject builds on topics introduced in the prerequisite subject, and forms the contextual background to Systems Engineering.

**45176 SYSTEMS ENGINEERING**
Course: EE/CSE
Three semester hours
*Prerequisites: 45166 Project Management, Industrial Experience: 60 weeks minimum*

The subject seeks to develop in students a combination of the knowledge, skills and attitudes required to solve complex problems in engineering, with particular reference to the design of electrical, electronic and computer systems. The subject draws strongly on insights gained from industrial experience, and prepares students for contemporary professional practice.

**45182 THESIS 1**
Course: EE/CSE
Nine semester hours
*Prerequisites: 45155 Project Management, 45176 Systems Engineering (recommended)*

The primary objective of the subjects Thesis 1 and 2 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 Thesis subjects are covered in a separate document available from the School Office, or the Projects Co-ordinator. Students should obtain this document at least six months before intending to do the project. In brief, the arrangements are as follows:

Students may choose a project topic proposed by a member of academic staff or may undertake a topic that has been mutually agreed between themselves and a member of academic staff. All topics will need to have scope for the student to demonstrate his or her ability to successfully complete an engineering project of professional standard.

Thesis I provides for the definition, analysis and specification of a task, culminating in a documented programme for completion of the task within Thesis II.

**45183 THESIS 2**
Course: EE/CSE
Six semester hours
*Prerequisite: 45182 Thesis 1*

A significant engineering task, researched within Thesis I, is completed in this subject with the presentation of a seminar and production of a thesis document.

**45242 ELECTROMAGNETICS**
Course: EE
Three semester hours
*Prerequisites: 33310 Engineering Mathematics 3 (Electrical), 45134 Network Theory*

The subject develops the topics of static electric and magnetic fields that lead to, and include, time varying applications. The magnetic field is seen as a spatial

'distortion' of the electrostatic field, and Maxwell's equations developed from this basis. The fundamental laws of Poisson, Laplace, Faraday, Gauss, Ampere and Kirchoff are derived and placed in context with Maxwell's equations. Examples enable the simultaneous development of advanced mathematical tools for the analysis of two-dimensional boundary value problems.

### 45252 POWER APPARATUS AND SYSTEMS

Course: EE
Six semester hours
*Prerequisite: 45242 Electromagnetics*

The subject 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, two-machine power flow, control of real reactive power.

### 45264 FIELDS AND WAVES

Course: EE
Three semester hours
*Prerequisite: 45242 Electromagnetics, 45134 Network Theory*

Fields and Waves builds on material introduced in the subjects 45242 Electromagnetics and 45134 Network Theory to consider the theoretical aspects of transmission technology based on electromagnetic field theory. An early introduction to distributed parameter systems, boundary value problems and delayed field vectors enables consideration of steady-state transmission lines, waveguides, dielectric waveguides, optical fibres and simple antennas.

### 45265 NUMERICAL METHODS

Course: EE/CSE
Three semester hours
*Prerequisites: 45144 Electronic Devices and Circuits, 45145 Engineering Statistics, 45141 Continuous and Discrete Systems, 45242 Electromagnetics*

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 subject students will have built up their own integrated set of tested and documented PASCAL or C numerical analysis tools.

### 45274 PHYSICAL DESIGN AND PRODUCTION

Course: EE
Three semester hours
*Prerequisites: 63133 Engineering Physics 3 (Electrical), 63734 Materials Technology, 45166 Project Management*

This subject aims to introduce students to the methods and requirements of designing an electrical/electronic physical system and to translating this design into a producible and reliable item of equipment. The course consists of two modules:

PDP1: Heat transfer and thermal design of electrical and electronic equipment (7 weeks), including the following topics: Introduction to heat transfer by conduction, convection and radiation. One and two-dimensional, steady-state and transient heat transfer. Effectiveness of various configurations. Models for natural and forced convection heat transfer. Introduction to the concepts of thermal control.

PDP2: Assembly technologies and good design practice (6 weeks) including the topics. Basic processes and design constraints of electronic assembly technologies: monolithic, hybrid thick and thin film, SMA technologies. Good design practice: product definition, product development, designing for manufacture. Concurrent engineering and modern CAD tools for electrical and electronic product design.

### 45342 ELECTROMECHANICAL SYSTEMS

Course: EE
Three semester hours
*Prerequisite: 45124 Electrical Engineering 2*

The subject is concerned with the operating principles, characteristics and modelling of electromechanical devices used in computer controlled systems. Through problem based learning with access to laboratory computer aided data acquisition and control facilities, students will develop an understanding of one or more devices. Such devices may be singly or doubly excited, linear or rotary, including vibratory feeders, solenoids, stepping motors, brushless d.c. motors, linear voice coil actuators, d.c. motors, 1-ph and 3-ph induction motors. Electronic speed control may be included. Models developed will cover steady state and dymanic behaviour, linking electrical and mechanical systems.

**45353 OPERATING SYSTEMS**
Course: CSE
Six semester hours
*Prerequisite: 45163 Real Time Software and Interfacing*

Introduction to concurrency, methods of process synchronisation, proof of correctness, concurrency modelling using Petri nets, design of an operating system, distributed operating systems, multi-processor systems, design of a real time Kernel. Methods of implementing real time systems, design of I/O, device handlers. One third of the subject is taught by the School of Computing Sciences.

**45363 SOFTWARE ENGINEERING 2**
Course: CSE
Three semester hours
*Prerequisite: 45353 Operating Systems*

This subject aims to bring students to the point that they are fluent in the issues and objectives of software engineering, that they are competent in structured analysis techniques, that they can apply mathematical techniques to the programming process, that they can coordinate rigorous software analysis, design, coding and testing procedures and that they understand and can use object oriented analysis, design, coding and testing techniques.

On completion of the subject students will be competent, as a team member, in the engineering of moderately complex, but not large, engineering software systems.

**45364 DIGITAL SYSTEMS**
Course: CSE
Three semester hours
*Prerequisite: 45163 Real Time Software and Interfacing*

This subject introduces methodologies, techniques, tools and architectures for specification, design, verification using simulation, and implementation of medium to large scale digital systems.

**45372 COMPUTER-SYSTEMS ANALYSIS**
Course: CSE
Three semester hours
*Prerequisites: 45145 Engineering Statistics, 45363 Software Engineering 2*
*Corequisites: 31141 Database Structures and Management, 45665 Data Communications*

The aim is to draw together information from a range of earlier subjects so the performance and design alternatives of a large technical computer system can be analysed. The student should gain an understanding of the interaction the various hardware and software components in the system and the effects on system specification (response time, data access issues, reliability, resilience etc). The lecture programme will be supported by a laboratory programme based on systems simulation and performance measurement.

The topics include: Queuing models of computer systems, logical architecture, physical architecture, computer simulation of systems, modelling techniques, analytical modelling of computer systems and design options.

**45381 COMPUTER AIDED ENGINEERING**
Course: CSE
Three semester hours
*Prerequisite: 45364 Digital Systems*

The subject is to examine the impact that the computer has had on the process of engineering. The student will appreciate how the computer has changed the way engineers design, control, manage, plan and function in their profession. The impact of the computer on productivity, creativity, and on Australian society will be examined and an appreciation will be gained of the new emerging engineering frontiers.

**45382 COMPUTER SYSTEMS DESIGN**
Course: CSE
Three semester hours
*Prerequisites: 45176 Systems Engineering (recommended), 45372 Computer-System Analysis*
*Corequisite: 45387 Project B (CSE)*

The objective of the subject is to teach the student to specify and design complex technical computer systems. The student should be able to identify several solutions and then assess these solutions on functional, performance, interface, reliability, maintainability, safety and social acceptability criteria. The student should be able to demonstrate the use of analysis techniques learnt earlier in the course and be able to write clear, concise design documents.

The students will be formed into teams. Each team will be given the task of specifying, designing and implementing an industrial monitoring and control system. Aspects of the design process will be elucidated by a series of lectures.

### 45387 PROJECT B (COMPUTER SYSTEMS ENGINEERING)

Course: EE/CSE
Three semester hours
*Prerequisites: 45372 Computer-Systems Analysis, 45176 Systems Engineering (recommended)*
*Obligatory Corequisite: 45382 Computer Systems Design*

The objective of the subject is to teach the student to specify and design complex technical computer systems. The student should be able to identify several solutions and then assess these solutions on functional, performance, interface, reliability, maintainability, safety and social acceptability criteria. The student should be able to demonstrate the use of analysis techniques learnt earlier in the course and be able to write clear, concise design documents. This subject is part of the preparation of students for the individual project which form the basis of the subjects 45183 and 45183, (Thesis 1 and Thesis 2).

### 45461 POWER CIRCUIT THEORY

Course: EE
Three semester hours
*Prerequisites: 45252 Power Apparatus and Systems, 45265 Numerical Methods*

The subject is designed to provide students from all strands with a basic knowledge of modern power system theory. It deals with three-phase transmission lines, transformers, symmetrical components and simple switching and electromechanical transients. The lecture material is reinforced with laboratory and computing assignments.

### 45462 POWER ELECTRONICS

Course: EE
Three semester hours
*Prerequisites: 45153 Analogue Electronics, 45252 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.

### 45472 PROJECT B (POWER AND MACHINES)

Course: EE
Three semester hours
*Prerequisites: At least one of 45461 Power Circuit Theory, 45462 Power Electronics, 45481 Dynamics of Electrical Machines, 45482 Power Equipment Design*

The aim of the subject is to develop skills in the specification, engineering design, project planning, team work, practical implementation and testing of a typical hardware and software system or subsystem, on time and in compliance with given specifications.

A number of project topics will be offered for the student teams to choose from. Students may also propose projects. The topics offered will be based on, or will require knowledge relevant to, the early special subjects in the Power and Machines stand (Power Circuit Theory, Power Electronics, Power Equipment Design, Dynamics of Electrical Machines). As for other strands, projects will be group projects for typically 3-4 students. Projects will be suitable for partitioning. They will be supported by laboratory resources and possibly research grants.

All academic staff members in the Power and Machines Group may submit and supervise topics.

### 45481 DYNAMICS OF ELECTRICAL MACHINES

Course: EE
Three semester hours
*Prerequisites: 45252 Power Apparatus and Systems, 45265 Numerical Methods*

This subject deals with the transient behaviour of electric machines. The aims are to show how a motor can be modelled for operation under dynamic conditions and to illustrate how these models can be applied.

### 45482 POWER EQUIPMENT DESIGN

Course: EE
Three semester hours
*Prerequisite: 45252 Power Apparatus and Systems*
*Corequisite: 45274 Physical Design and Production*

This subject considers the thermal, electric, magnetic and mechanical constraints on the design of electric power equipment and is taught through group work on the design of practical 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, resistors, reactors, capacitors.

**45483 POWER SYSTEMS ANALYSIS AND PROTECTION**
Course: EE
Six semester hours
*Prerequisite: 45461 Power Circuit Theory*

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, steady-state and transient analysis of the system; protection schemes and safety considerations.

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

**45484 ELECTRICAL VARIABLE SPEED DRIVES**
Course: EE
Three semester hours
*Prerequisites: 45462 Power Electronics, 45481 Dynamics of Electrical Machines*

The field of electrical variable speed drives is one based on some fundamental principles implemented through rapidly changing technology. Students learn the underlying principles and gain practical experience with state of the art technology. Laboratory work, demonstration, library research, group projects are supplemented by some specialist lectures. System effects such as supply harmonics, motor derating, acoustic noise, r.f. interference are discussed as well as different drive types and system models.

**45561 DIGITAL SYSTEMS DESIGN**
Course: EE/CSE
Three semester hours
*Prerequisites: 45143 Computer Hardware, 45133 Software Engineering 1*
*Corequisite: 45163 Real Time Software and Interfacing*

This subject introduces technology, architectures methodologies and tools for specification, design and implementation of medium scale digital systems. Microprocessor based implementation methods are emphasised in this course.

**45562 DATA ACQUISITION AND DISTRIBUTION SYSTEMS**
Course: EE/CSE
Six semester hours
*Prerequisites: 45153 Analogue Electronics, 45163 Real Time Software and Interfacing*

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

Topics include: Applications and architectures of DADS; General performance characteristics of DADS components; physical principles and design fundamentals of transducers; mechanical, temperature, pressure, flow-rate transducers; optoelectronic transducers and applications; transducer analogue interfacing; low-level signal conditioning; data conversion devices and systems; DADS design; time and error budget of DADS. DADS and control interfacing to computers. Computer structures for DADS; data integrity.

Students will gain a design experience in the art of DADS by participating in a team project involving the design, assembly and testing of a DADS and/or control system in the subject 45577 Project B.

**45577 PROJECT B (INSTRUMENTATION AND CONTROL)**
Course: EE
Three semester hours
*Prerequisites: 45153 Analogue Electronics, 45163 Real Time Software and Interfacing*
*Corequisites: 45581 Analogue and Digital Control, 45562 Date Acquisition and Distribution Systems*

The aim of the subject is to develop skills in the specification, engineering design, project planning, team work, practical implementation and testing of a typical hardware and software Instrumentation or Control system or subsystem, in time and in compliance with given specifications.

A number of project topics will be offered for the student teams to choose. The topics will be closely associated with the subjects Data Acquisition and Distribution Systems, Analogue and Digital Control and Multivariable and Adaptive control. Topics on applied instrumentation and control systems for power and machines, biomedical engineering, image processing, vision system and robotics will also be offered. The completed, working system will be presented and demonstrated in a seminar. A detailed project report will be submitted by the design team.

**45581 ANALOGUE AND DIGITAL CONTROL**
Course: EE/CSE
Three semester hours
*Prerequisite: 45141 Continuous and Discrete Systems*

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, Bond graphs, state estimation and state variable feedback control, phase plane, describing functions, Popov and circle criteria, identification, specifications.

**45582 COMPUTER AIDED DESIGN OF ELECTRONIC CIRCUITS**
Course: EE
Three semester hours
*Prerequisites: 45153 Analogue Electronics, 45265 Numerical Methods*

This subject is designed to give the students the knowledge and understanding of basic concepts and techniques of computer-aided analysis and design of electronic circuits and systems and to provide the essential skills in using modern design tools in engineering practice.

**45583 ADAPTIVE AND MULTIVARIABLE CONTROL**
Course: EE
Three semester hours
*Prerequisite: 45581 Analogue and Digital Control*

In this subject students will study multi-variable control, adaptive control and optimal control to an advanced level. Laboratory projects are conducted on a continuous basis throughout the semester. 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 regulatory design, state estimation and the Kalman filter, Hoo design.

**45584 PRINCIPLES OF VLSI DESIGN**
Course: EE/CSE
Three semester hours
*Prerequisites: 45561 Digital Systems Design, 45144 Electronic Devices and Circuits*

To introduce students to the technologies and methods in designing full and semi custom Very Large Scale (VLSI) integrated circuits. A further objective is to introduce students to the methods of determining suitable architectures for supporting complex applications implemented in VLSI technologies.

**45661 COMMUNICATION NETWORKS**
Course: EE
Three semester hours
*Corequisite: 45665 Data Communications*

The course will begin with an introduction to local and metropolitan area networks. Their medium access mechanisms, and the logical link control covered by the IEEE 802 standards will be examined in detail. Then the higher level protocols of the ISO reference model: transport, session, presentation and application layers, will be examined. Special emphasis will be placed on the application layer standard covering CASEs and SASEs. Finally the concepts of wide area networking will be introduced by examining circuit switching techniques. Common channel signalling, the ISDN and B-ISDN protocol architectures will be studied in detail.

**45662 SIGNAL PROCESSING**
Course: EE/CSE
Three semester hours
*Prerequisite: 45152 Signal Theory 2*

The course covers the theoretical basis of signal processing algorithms used in signal processing and the practical implementation of these algorithms using DSP microprocessors. Time and frequency domain processing, filter design, spectral analysis, speech processing and the FFT. There is a laboratory component using the TMS320C25 or TMS320C30.

**45663 DIGITAL TRANSMISSION**
Course: EE
Three semester hours
*Prerequisite: 45662 Signal Theory 2*

This subject provides essential knowledge in digital detection theory, digital communication techniques, and digital communication system design. The students gain essential skills required for the design and development of digital communication systems. The course covers digital detection theory, digital modulation, error rate analysis, synchronization, link design, multiplexing and multiple access, and error correction coding.

**45664 COMMUNICATIONS ENGINEERING**
Course:
Three semester hours
*Prerequisites: 45151 Signal Theory 1, 45153 Analogue Electronics, 45264 Fields and Waves*
*Corequisite: 63155 Communication Physics*

The subject considers the major high frequency elements of communication systems from an engineering viewpoint. Basic principles of operation and

design are presented, together with the practical implications of non-ideal behaviour (such as transmission line attenuation and dispersion, noise and non-linearities in active circuits). The subject includes a laboratory component requiring use of design tools and modern test equipment.

Topics include: Introduction and revision of transmission lines and scattering parameters; passive devices - hybrids, couplers, filters and diplexers; small-signal, high frequency amplifier design - realisation of circuit models, lumped element noise models, s-parameter design, noise reduction in microwave amplifiers; large signal effects in amplifiers - intermodulation; RF oscillators; frequency synthesis; frequency conversion - mixers and detectors; antennas - fundamental concepts, linear elements, antenna measurements, linear antenna arrays, mutual impedances, parasitic elements, aperture antennas, reflector antennas.

**45665 DATA COMMUNICATIONS**
Course: EE/CSE
Three semester hours
*Prerequisite: 45145 Engineering Statistics*
*Corequisite: 45163 Real Time Software and Interfacing*

This subject will introduce the network layering concept and develops in detail the functions of three lower levels of the Open Systems Interconnection Model. The emphasis is placed on the mathematical treatment of systems with delays in order to develop the base for the introduction to routing in data networks and topological design.

On the completion of the subject, the students should be able to evaluate the performance of a data link, determine the routing and flow control strategies and perform some basic delay/throughput analysis.

**45678 PROJECT B (TELECOMMUNICATIONS)**
Three semester hours
*Prerequisite/Corequisite: Either 45662 Signal Processing or 45665 Data Communications*

The students in the Telecommunications Strand will be required to undertake Project B whilst either doing or having done Signal Processing or Data Communications.

The projects will involve the design and development of a product and will be carried out by a team of no more than four students and no less than two students. Each team will be assigned (a) academic staff member(s) who will act as the Client, the Company Director and Technical Adviser.

The client will be available for consultation in the 1st and 2nd weeks, and will only be available on two or three other occasions for the duration of the project. The Director/Technical adviser will be available at regular intervals, but only at specified times such as during a design group meeting.

**45681 COMMUNICATIONS SYSTEMS**
Course: EE
Six semester hours

*Prerequisites: 45662 Signal Processing, 45665 Data Communications, 45663 Digital Transmission, 45661 Communication Networks*

The subject involves 2 modules of which students must undertake one. Each module involves a major case study which students are required to evolve a working solution. In each module students will be given lectures covering background information, existing technologies, regulatory considerations and international standards, and an appreciation of the cost performance trade-offs that must be made. The case study in each module will be changed each semester.

**45997 PROFESSIONAL EXPERIENCE (Sandwich)**
**45999 PROFESSIONAL EXPERIENCE (Part-time)**
Course: EE/CSE

Not a conventional subject. Students enrol in this subject while they are gaining industrial experience which is a requirement of the course. 90 weeks of approved industrial experience must be gained prior to graduation. The objectives of the subject are for the student to experience typical environments in which professional engineering is practised, including the range of situations and requirements peculiar to the workplace and the successful operation of enterprises; to develop an understanding of the role, responsibilities and interfaces of engineering in technologically dependent enterprises and the community, having regard for other professions and disciplines; to reinforce and extend the knowledge of principles, techniques and technologies gained from the academic programme; to enrich learning through the integration of work and study experiences; and to facilitate professional development.

Students must become familiar with the Faculty's industrial experience requirements and rules which are set out in this calendar under the heading "Industrial Experience Requirements", page 13.

**46030 PROJECT 1**
Course: ME/MFG
Three semester hours
*Corequisite: 46332 Design 2*

In this, and the following subject, Project 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 the community.

In Project 1, students are introduced to project planning and management and the selection of the project is made. The student is also required to formalize this selection, write a preliminary design report, give a short seminar on the chosen project to the project class, and complete a literature search and any preliminary planning appropriate to the initial stages of such an exercise.

**46031 PROJECT 2 (Sandwich)**
Course: ME/MFG
Nine semester hours
*Prerequisite: 46030 Project 1*

Students are responsible for the complete execution of the project chosen in Project 1, from specification to final report.

Project 2 follows on from subject Project 1 and covers the activities that follow the preliminary planning phase of an engineering project. Assistance is provided with written presentation and with structuring the work. The student carries out the design, building, test, analysis or software development as specified, and writes up the work in a formal report. Student effort for the two subjects is expected to be equivalent to at least 500 hours of professional effort.

**46032 PROJECT 2 (Part-time)**
Course: ME/MFG
Nine semester hours (over two semesters)
*Prerequisite: 46030 Project 1*

Students are responsible for the complete execution of the project chosen in Project 1, from specification to final report.

Project 2 follows on from subject Project 1 and covers the activities that follow the preliminary planning phase of an engineering project. Assistance is provided with written presentation and with structuring the work. The student carries out the design, building, test, analysis or software development as specified, and writes up the work in a formal report. Student effort for the two subjects is expected to be equivalent to at least 500 hours of professional effort.

**46040 ERGONOMICS**
Course: ME/MFG
Three semester hours
*Prerequisite: 46631 Engineering Management*

This subject 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 subject 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 tasks and work organisations. Practical demonstrations and exercises using actual work situations are included.

**46110 MECHANICS 1**
Course: ME/MFG
Six semester hours
*Prerequisite: Nil*

This subject 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 more advanced work in mechanics in succeeding subjects. Through both discussion and selected exercises, students are also introduced to professional methods of dealing with engineering problems.

**46111 MECHANICS 2**
Course: ME/MFG
Four semester hours
*Prerequisites: 46110 Mechanics 1,*
*33131 Engineering Mathematics 1A*
*Corequisite: 33122 Engineering Mathematics 1B*

This subject includes an analysis of three-dimensional force systems in equilibrium, followed by area moments and mass of inertia and the kinematics and dynamics of relative motion extended to systems of bodies. This subject completes the discussion of particle mechanics introduced in Mechanics 1. The subject concludes with a preparatory discussion of planar rigid body kinematics.

**46120 MECHANICS 3**
Course: ME/MFG
Four semester hours
*Prerequisite: 46111 Mechanics 2*

This subject presents Kinematics and Dynamics in a more general way than in Mechanics 2. The spatial two and three-body velocity and acceleration equations are derived and applied to spatial and planar mechanisms. Planar Dynamics is then developed for general planar motion, including the use of energy methods, impulse, virtual work and virtual power.

**46121 MECHANICS OF MACHINES**
Course: ME/MFG
Four semester hours
*Prerequisite: 46120 Mechanics 3*

The subject presents four broad fields; forces in mechanisms including band, shoe and disc brakes, engine balancing and harmonic analysis, geometry and cams with fixed axes of rotation, and elementary gear theory. A main aim of the subject is to encourage individual thought and discussion of possible solutions which need not always follow conventional patterns.

**46130 DYNAMICS OF MECHANICAL SYSTEMS**
Course: ME/MFG
Four semester hours
*Prerequisite: 46120 Mechanics 3*

This subject aims to develop insight into the causes and effects of vibration in machinery and structures; to introduce the techniques of condition monitoring and the foundations of control theory.

The subject deals mainly with linear vibration theory. Topics covered include multi-degree of freedom systems, elementary modal analysis, frequency response, transients, simple modelling of vehicle suspension, and electrical analogues. Computer packages are used where appropriate, and some experiments and demonstrations of vibration monitoring instrumentation are introduced.

**46140 KINEMATICS AND DYNAMICS**
Course: ME/MFG
Three semester hours
*Prerequisites: 46121 Mechanics of Machines, 46130 Dynamics of Mechanical Systems*

This subject aims to introduce the student to the field of kinematic synthesis for the first time, and to the power of spatial (projective) geometry. Through the five assignments which form the assessment of the course to encourage and require the student to exercise individual judgement and design initiative.

The subject deals with "freedom and constraint" in spatial mechanisms, elementary screw-systems theory, four and five positions planar synthesis of mechanisms, function generation, open loop spatial mechanisms (robotics), gyroscopic effects on whirling speeds, dynamic equivalence, polydyne cam design and general three-dimensional dynamics including spin stability as applied to space vehicles. An integral part of the process of discovery learning, essential to this subject, is the building of working mechanism models.

**46141 APPLIED DYNAMICS**
Course: ME/MFG
Three semester hours
*Prerequisite: 46130 Numerical Analysis*

This subject aims to introduce 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.

**46142 ROBOTICS**
Course: ME/MFG
Three semester hours
*Prerequisites: 46720 Manufacturing Processes 2, 46121 Mechanics of Machines*

The objective of this subject is to develop confidence and competence in the application of kinematic, control and programming principles relevant to robots.

Topics include: coordinate classification of joints, spatial kinematics, configurations, geometric duality, envelopes, trajectories, safety; joint interpolation between positions, homogeneous coordinate transformations, kinematic equations, differential relationships, velocity and acceleration, singularity positions, joint/end effector/world coordinate systems; kinetics, force and motion reciprocity, assembly problems, compliance, design of parts for assembly.

**46143 EINSTEIN'S UNIVERSE**
Course: ME/MFG
Three semester hours
*Prerequisite: 46120 Mechanics 3*

This subject aims to give perspective to the Newtonian Model of the Universe (i.e. conventional mechanics) in the light of the philosophical and experimental difficulties of this model which were addressed by Einstein. To explain, in a simple but rigorous way, the logic and results of Einstein's Theory of Relativity.

Topics include: the special Theory of Relativity explained via the Michelson-Morley results and the Doppler effect. Consequences for the concepts of time, velocity and distance. The General Theory of Relativity from the point of view of the time paradox and the principle of equivalence. The similarities and divergences of the thought processes necessary to embrace the Newtonian synthesis, the Einstein synthesis and modern Quantum Mechanics.

**46220 SOLID MECHANICS 1**
Course: ME/MFG
Four semester hours
*Prerequisite: 46111 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, materials 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.

**46230 SOLID MECHANICS 2**
Course: ME/MFG
Four semester hours
*Prerequisite: 46220 Solid Mechanics 1*

The objectives of this subject are:

(i) To develop an understanding of the basic principles of solid mechanics and the use of these principles in the design of simple structures and machine elements.

(ii) To establish the background for further study in the areas of structural, experimental and solid mechanics with special reference to mechanical design.

This is the second of two core subjects dealing with the basics of solid and structural mechanics. The topics include the analysis of beams using moment area, superposition and energy methods, 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.

**46240 SOLID MECHANICS 3**
Course: ME/MFG
Three semester hours
*Prerequisite: 46230 Solid Mechanics 2*

The objectives of this subject are:

(i) To facilitate an understanding of the fundamental and classical principles of solid mechanics and the use of these principles in mechanical engineering design.

(ii) To establish the background for more advanced study in the area of solid mechanics and the use of Finite Element Stress Analysis.

This subject introduces the theories of elasticity and plasticity, matrix structural analysis and the theory of plates and shells. It includes material and geometric non-linearity, structural stability and limit analysis. In addition to topics relating to mechanical design, students are introduced to the use of Australian standards for the practical design of structures.

**46241 FINITE ELEMENT APPLICATIONS**
Course: ME/MFG
Three semester hours
*Prerequisite: 46240 Solid Mechanics 3, 46140 Dynamics of Mechanical Systems*
*Corequisite: 46330 Computer Aided Design and Drafting*

The objectives of this subject are:

(i) To facilitate an understanding of the practical application of solid mechanics to the design of structures and machines using the Finite Element Method.

(ii) To develop an awareness of the capabilities and limitations of the Finite Element Method in solid and structural analysis.

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 subject 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, dynamic analysis and optimisation.

(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 of behaviour of isoparametric and frame and plate bending elements.

General purpose structural analysis programmes, MSC/NASTRAN and MSC/Pal 2, are used to obtain finite element solutions.

**46310 INTRODUCTION TO ENGINEERING**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*

This subject will provide an overview of issues and concepts which are important to new engineering students, including the following:

- UTS rules and requirements
- What is engineering?
- What do professional engineers do? What are their inputs to choosing and formulating the problems they address?
- Essential engineering skills
- Design, a key focus for engineering activity
- The engineering method - a systematic approach to the design process
- Creativity
- Technology Management

The subject will include practical examples and exercises to assist students to explore issues for themselves.

The introduction to the profession will include discussion of the roles of the Institution of Engineers, Australia and its code of ethics; and the industrial body, the Association of Professional Engineers and Scientists, Australia.

The concept of co-operative education and the role of professional experience in the course and the sorts of employment which are suitable will also be discussed.

**43611 ENGINEERING GRAPHICS**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*

The aims of this subject are to enhance fundamental visualisation and drawing skills and to develop knowledge of the formal and informal graphical communication requirements of the professional mechanical engineer.

This subject commences with an overview of orthographic projection. It then covers engineering elements, basic engineering drawing, pictorial drawing, sketching and working drawings. The last topic includes tolerances and limits and fits, surface finish, detail and assembly drawings.

**46320 DESIGN 1**
Course: ME/MFG
Four semester hours
*Prerequisites: 46120 Mechanics 3, 46220 Solid Mechanics 1*

This subject introduces students to design methodology. The main emphasis of this subject is on 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.

It is the first in a sequence of three Design subjects. The overall philosophy underlying these three 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.

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.

**46330 COMPUTER AIDED DRAFTING AND DESIGN**
Course: ME/MFG
Three semester hours
*Prerequisite: 46720 Manufacturing Processes 2*

Students are introduced to the use of computers in 2D drafting and 3D wire frame, surface and solids

modelling. These modelling techniques are then applied to determine 2D sectional properties and 3D mass properties. Computer aided machine element design is introduced including mechanism design and analysis.

**46332 DESIGN 2**
Course: ME/MFG
Three semester hours
*Prerequisites: 46320 Design 1, 46130 Dynamics of Mechanical Systems*

This is the second subject in the three which comprise the core of the treatment of design in the course. The subject uses a number of projects to offer the student a creative and disciplined approach to the solution of problems. 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 treated in detail.

**46333 DESIGN 3**
Course: ME/MFG
Three semester hours
*Prerequisite: 46332 Design 2*

Further development of the skills needed for project design and management related to systems with many complex variables. Lectures will stress the synthesis of engineering and economic skills acquired in the course, and encourage students to build on that foundation by specific research applied to this project driven subject.

Industrial visits will be arranged to provide state-of-the-art information. Students will undertake design projects, singly or in groups.

**46340 STRUCTURES**
Course: ME/MFG
Three semester hours
*Prerequisite: 46230 Solid Mechanics 2*

This is a non-specialist course aimed at preparing the mechanical engineer for practical structural steel and reinforced concrete design. It aims to develop competence in structural steel and reinforced concrete design to Australian Standard requirements, based on broad understanding of the underlying theory.

**46341 MACHINE DESIGN**
Course: ME/MFG
Three semester hours
*Prerequisites: 46320 Design 1, 46121 Mechanics of Machines, 46230 Solid Mechanics 2, 46130 Dynamics of Mechanical Systems*

Particular emphasis will be placed in this subject on the detailed design of mechanisms and machines. Specific topics treated will be some of the following: 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 will be a major part of the subject assessment.

**46342 UNITISED LOAD HANDLING**
Course: ME/MFG
Three semester hours
*Prerequisites: 46332 Design 2, **or***
*Corequisite: 46332 Design 2*

The aim of this subject is to give an overview of the techniques available for the transport and storage of goods and materials handled in the form of Unitised Loads, and to enable students to select appropriate approaches and specify equipment requirements.

Aspects of unitised materials handling to be dealt with include cost statistics; belt conveyors, bulk handling; fork lifts, intermodal transport; inventory and scheduling; pipe line conveying, freight pipelining; bulk liquid pipelining; road/rail/air transport.

The subject will include site visits and practical examples and exercises.

The subject has been designed to complement 46346 Bulk Materials Handling.

**46343 APPROPRIATE TECHNOLOGY**
Course: ME/MFG
Three semester hours
*Prerequisite: 46320 Design 1*

The aim of this subject is to provide an effective vehicle for individual understanding of the term 'appropriate technology' and an appreciation of its relevance to engineering practice. This will be done by encouraging students to question the appropriateness of specific technologies, particularly in terms of their long-term sustainability, and giving students experience of project work intended to address the perceived shortcomings of present approaches.

**46344 ENGINEERING SPECULATION**
Course: ME/MFG
Three semester hours
*Prerequisite: 46620 Engineering and Society*
*Corequisite: 46632 Engineering Management*

The objective of this subject is to encourage students to consider and be aware of the opportunities, possibilities and probabilities in the results and side effects of their professional work on the world around them.

**46345 INDUSTRIAL DESIGN**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*
*Corequisite: 46332 Design 2*

The objective of this subject is primarily to broaden the students design skills and awareness and also to prepare students for working in interdisciplinary teams with Industrial Design professionals.

This subject introduces the engineer to the discipline of Industrial Design. The emphasis is on innovation, human factors and visual semantics. The teaching is largely project-based.

**46346 BULK MATERIALS HANDLING**
Course: ME/MFG
Three semester hours
*Prerequisite: 46332 Design 2* **or**
*Corequisite: 46332 Design 2*

The aim of this subject is to give an overview of the techniques available for the transport and storage of particular solid materials handled in bulk, and to enable students to select appropriate approaches and specify equipment requirements.

Aspects of bulk materials handling to be dealt with include material characteristics; systems approach; storage systems; self conveyors; pneumatic conveying; quality considerations; mechanical handling; feeding, discharge and transfer systems; environmental aspects.

The subject will include site visits and practical examples and exercises.

The subject has been designed to complement 46342 Unitised Load Handling.

**46420 FLUID MECHANICS**
Course: ME/MFG
Four semester hours
*Prerequisites: 33121 Engineering Mathematics 1A, 46110 Mechanics 1*

This subject aims to provide an introduction to the broad area of fluid mechanics, by giving a thorough grounding in fundamental principles and developing expertise in the solution of common problems.

The subject provides an introduction to fluid statics and fluid dynamics. It covers fluid properties, manometry, forces on submerged surfaces, acceleration of fluid volumes, continuity, Bernoulli, impulse-momentum and flow measurement. The limitations implied by an ideal fluid are reviewed before the modifications required for a real fluid are presented.

**46421 THERMODYNAMICS**
Course: ME/MFG
Four semester hours
*Prerequisites: 33122 Engineering Mathematics 1, 46420 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. It aims to develop fundamental understanding of thermodynamics and the ability to apply knowledge to analysis of thermodynamic systems.

**46430 THERMOFLUIDS**
Course: ME/MFG
Four semester hours
*Prerequisites: 46420 Fluid Dynamics,. 46421 Thermodynamics*

The basic principles of Fluid Mechanics and Thermodynamics are consolidated by application to fluid machines and engineering plant. 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.

**46431 HEAT TRANSFER**
Course: ME/MFG
Four semester hours
*Prerequisites: 46420 Fluid Dynamics,. 46421 Thermodynamics*

This subject aims to provide students with sufficient understanding and knowledge of heat transmission to

enable them to deal with common engineering systems.

The subject covers the fundamentals of heat transmission in engineering systems. Topics include conduction, convection, radiation and heat exchangers. Laboratory experiments are an important part of the subject.

**46441 COMBUSTION AND AIR POLLUTION**
Course: ME/MFG
Three semester hours
*Prerequisite: 46421 Thermodynamics*

This subject aims to develop an understanding of the fundamentals of combustion science and apply the results to the control of pollutant formation.

A treatment is given of the fundamentals of combustion as well as the consideration of fuels and their characteristics. Special attention will be given to the products of combustion and their relationship to current air pollution considerations.

**46442 ADVANCED FLUID DYNAMICS**
Course: ME/MFG
Three semester hours
*Prerequisites: 46430 Thermofluids, 46830 Numerical Analysis*

The subject builds on previous subjects in the thermofluids stream. It covers the Navier-Stokes equations and the difficulties with their solution. It then investigates approximations to these equations and their validity. Topics here include the inviscid Euler equations, together with potential flows. The main limitation of these approximations is their failure to model the viscious boundary layer. This topic is therefore examined, along with the effects of turbulence. Finally, numerical methods are presented for the modelling of the entire flow region.

**46443 REFRIGERATION AND AIR CONDITIONING**
Course: ME/MFG
Three semester hours
*Prerequisites: 46430 Thermofluids, 46431 Heat Transfer*

The objectives of this subject are to give student experience in applying the principles of thermodynamics, heat transfer and fluid mechanics to the air conditioning of buildings and to the design criteria and performance of commercial and industrial refrigeration equipment. Additionally, the student will be able to analyse various refrigeration cycles and be capable of undertaking an energy audit of a complete system.

The student is introduced to the concepts of determining the cooling and heating loads of a building, designing the air handling and distribution system and selecting the appropriate plant to provide the cooling and heating requirements. Energy conservation and management as applicable to the various air conditioning and refrigeration systems is reviewed.

**46444 POWER CYCLES**
Course: ME/MFG
Three semester hours
*Prerequisite: 46430 Thermofluids*

This subject covers steam and gas power cycles in depth. Combustion chemistry and efficiency, equipment details, augmentation methods and cogeneration systems are presented. It aims to develop proficiency in the performance analysis of actual steam and gas turbine power plants.

**46445 FLUID MACHINES**
Course: ME/MFG
Four semester hours
*Prerequisite: 46430 Thermofluids*

The student applies thermodynamics and fluid mechanic principles in turbomachinery analysis and design.

The objective is to present a more thorough treatment of fluid machines than was possible in the core subjects. In particular, a theoretical design and development basis will be provided for axial flow compressors, pumps, fans and turbines and for centrifugal pumps, fans and compressors.

**46530 MEASUREMENT AND INSTRUMENTATION**
Course: ME/MFG
Four semester hours
*Prerequisites: 45931 Electrical Engineering 2 (Mechanical), 46130 Dynamics of Mechanical Systems*
*Corequisite: 46531 Control Engineering 1*

The objective of this subject is to give mechanical engineering students detailed exposure to using a wide range of modern measuring instruments.

This subject introduces the student to a variety of measurement 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, frequency response, vibration and sound.

**46531 CONTROL ENGINEERING 1**
Course: ME/MFG
Four semester hours
*Prerequisite: 46130 Dynamics of Mechanical Systems*
*Corequisite: 46530 Measurement and Instrumentation*

This subject aims to develop an understanding of simple feedback control systems and the classical control theory usually used to analyse and design these systems.

The methods and concepts required for classical control analysis are developed; mathematical models based on linear differential equations and their Laplace transforms are introduced and transfer functions and block diagrams are used to depict control loops. Transient analysis, simulation, controller actions, frequency response analysis, and stability are treated. Several 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.

**46540 PROGRAMMING CONTROLLERS**
Course: ME/MFG
Three semester hours
*Prerequisite: 45931 Electrical Engineering 1 (Mechanical)*
*Corequisite: 46531 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 on design for applications requiring discrete input/output control, and programmable analog input/output. Case studies are used extensively.

**46541 CONTROL ENGINEERING 2**
Course: ME/MFG
Three semester hours
*Prerequisite: 46531 Control Engineering 1*

This subject follows on from Control Engineering 1, extending the control system analysis to include Inverse Nyguist methods and Root Locus methods. Considerable time is devoted to the design of control systems using classical techniques. Additional topics then covered are state variable feedback and control, 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.

**46542 PROCESS CONTROL**
Course: ME/MFG
Three semester hours
*Prerequisite: 46531 Control Engineering 1*

This subject aims to show control applications in the process industries and to familiarise students with a wide range of modern hardware used in this sector of industry.

It has been structured to complement the control theory subject Control Engineering 1. Control theory is applied to the control and instrumentation of process systems. While theory is important, the subject has an equally strong emphasis on practice and current industrial applications. The subject covers measuring transducers, transducers, control valves, controllers (analog and digital), programmable logic controllers and computer control. A small number of highly automated process plants are also studied and visited.

**46620 ENGINEERING COMMUNICATION**
Course: ME/MFG
Four semester hours
*Prerequisite: Nil*

The objective of this subject is to develop students' written and oral communication skills to a professional level. Students develop confidence through workshop presentations and gain advanced knowledge through lecture sessions. Reports, letters, proposals, oral presentations, meeting procedure, group dynamics and elective topics are covered.

It covers the various aspects of the communication process in an engineering context. Students participate in workshop sessions to develop written and oral skills to a professional level. Basic communication theory is used as a foundation for practical work in research techniques; writing letters, reports and discussions papers; and conducting conferences, seminars, interviews, meetings and small group discussions.

**46630 ENGINEERING AND SOCIETY**
Course: ME/MFG
Four semester hours
*Prerequisite: 46620 Engineering Communication*

This subject encourages students to think about and be aware of the social and other contexts in which their profession functions.

The subject is also intended to help students to integrate the different aspects and topic areas of the engineering course as a whole.

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 relationship with the environment, industry and the community.

**46631 ENGINEERING MANAGEMENT**
Course: ME/MFG
Three semester hours
*Prerequisite: 46630 Engineering and Society*

The over-riding emphasis in this subject is on management decision-making, which is illustrated by four basic quantitative methods and by discussion of the fundamental functions of management: planning, organising, leading and controlling. Management activities such as marketing and forecasting are covered, as is management of change and personal management.

**46640 TEROTECHNOLOGY**
Course: ME/MFG
Three semester hours
*Prerequisite: 46820 Engineering Statistics*
*Corequisites: 46332 Design 2, 46331 Engineering Management*

This subject aims to provide students with basic knowledge of the management of maintenance. To prepare them for the control of continued operation, value, depreciation and replacement of industrial assets and property, by introducing them to current philosophy, procedures, processes and equipment.

A brief review of the financial considerations of asset management, such as Nett Present Value and Depreciation, the economics of repair versus replacement, and how maintenance relates to an enterprise as a whole. Subsequent topics, illustrated with appropriate examples, will include the effects of design on maintainability; the relationship between plant availability for production and maintenance; maintenance strategies and their dependence on situations; maintenance planning; condition monitoring; failure analysis; loss control; the organisation, operation and costing of a maintenance department.

**46641 COMMERCIAL ISSUES FOR ENGINEERS**
Course: ME/MFG
Three semester hours
*Prerequisite: 46631 Engineering Management*

This subject deals in more detail with issues raised in Engineering Management 46631. It principally covers the structure of commercial entities (from sole trader through to public company), the detailed accounting procedures followed in business, the relevant legal system, marketing and personnel practices. From time to time other topics would be introduced, such as quality, management of innovative technology, business ethics, and risk management.

**46642 ENGINEERING ECONOMICS**
Course: ME/MFG
Three semester hours
*Prerequisite: 46631 Engineering Management*

This subject aims to introduce students to the basic concept of economic analysis and its application to engineering projects, an economic evaluation of investment alternatives, and the application of economic analysis techniques in the comparison of engineering design alternatives.

It will cover economic considerations in evaluating operational problems, revenue-cost relationship through break-even analysis, time-value analysis, cost-benefit analysis, depreciation, effects of income tax on economic evaluations, replacement studies, risk uncertainty and sensitivity considerations, and introductory macroeconomics.

**46701 ROBOTICS AND FLEXIBLE MANUFACTURING**
Course: CSE
Three semester hours
Teaching School: Mechanical Engineering
*Prerequisites: 45342 Electromechanical Systems, 63734 Materials Technology*

The subject is subdivided into three sequential sections, each leading into the next: (i) traditional manufacturing and production processes, (ii) fundamentals of robots and Computer Numerical Control (CNC), and (iii) flexible manufacturing in the computer integrated manufacturing (CIM) environment. Each section is prefaced with lectures aimed at familiarisation with the fundamentals behind each topic, supplemented by videos, comprehensive laboratory work and factory visits where appropriate.

**46710 MANUFACTURING PROCESSES 1 (Sandwich)**
Course: ME/MFG
Four semester hours
*Prerequisite: Nil*
*Corequisite: 63704 Materials Engineering 1*

The objective of this subject is to begin to develop appreciation and understanding of materials processing principles and their application in manufacturing.

This is the first two related subjects. It covers: Safety engineering; principles and processes of casting, hot working of metals, welding, metal cutting and permanent mould casting.

**46711 MANUFACTURING PROCESSES 1 (Part-time)**
Course: ME/MFG
Four semester hours (over two semester hours)
*Prerequisite: Nil*
*Corequisite: 63704 Materials Engineering 1*

The objective of this subject is to begin to develop appreciation and understanding of materials processing principles and their application in manufacturing.

This is the first two related subjects. It covers: Safety engineering; principles and processes of casting, hot working of metals, welding, metal cutting and permanent mould casting.

**46720 MANUFACTURING PROCESSES 2 (Sandwich)**
Course: ME/MFG
Four semester hours
*Prerequisite: 46710 Manufacturing Processes 1*

This subject continues to develop an appreciation and understanding of processing principles and their application in manufacturing.

The subject covers strain hardening theory and its application, forming processes, principles and processes associated with sintering and plastics products, computerised numerical control (CNC) machines, robotics, inspection, assembly and finishing processes.

**46721 MANUFACTURING PROCESSES 2 (Part-time)**
Course: ME/MFG
Four semester hours (over two semesters)
*Prerequisite: 46710 Manufacturing Processes 1*

This subject continues to develop an appreciation and understanding of processing principles and their application in manufacturing.

The subject covers strain hardening theory and its application, forming processes, principles and processes associated with sintering and plastics products, computerised numerical control (CNC) machines, robotics, inspection, assembly and finishing processes.

**46740 QUALITY AND RELIABILITY**
Course: ME/MFG
Three semester hours
*Prerequisite: 46820 Engineering Statistics*

The objective of this subject is to provide basic knowledge of fundamentals of quality control and reliability. At completion of the course, the student will be able to interpret quality control data and records, and establish an appropriate QC System for any process.

The subject will cover: process capability, control chart techniques, cusum charts, techniques of acceptance control, standards of acceptance sampling, prediction of reliability for series, parallel and standby systems and reliability testing.

**46741 FLEXIBLE MANUFACTURING**
Course: ME/MFG
Three semester hours
*Prerequisite: 46720 Manufacturing Processes 2*

The objectives of this subject are: to emphasise Australia's demographic structure in relation to domestic and international markets; to illustrate the need for continuing development; to illustrate the inherent flexibility of computer software; to consider the modular development of flexible manufacturing cells.

Topics treated will be chosen from the following: PLANNING - Strategic Management, Marketing, Flexibility, Definition of Flexible Manufacturing; Life Cycles, Types of Forecasting; Handling Uncertainty by lead time reduction, inventory reduction, quality, reliability, JIT, maintenance, aggregation; Group Technology, coding, geometric and matrix flow analysis; Facilities Design, Simulation, Investment Proposals. EQUIPMENT - Axis Servos, interpolators; N/C Machine Commissioning; Material/Part Handling, robots, mobile carts, conveyors, pallets, loading/unloading, storage, assembly, inspection; Modularity. PROGRAMMING - Controllers, sequential, servo; Offline and Online Programming, N/C, robots, AGVs, CMMs, probes; Unattended Machining; Interfacing Problems, Integration.

**46742 PRODUCTION AND COST CONTROL**
Course: ME/MFG
Three semester hours
*Prerequisite: 46631 Engineering Management*

This subject aims to familiarise the student with quantitative methods for the planning and control of materials and costs in manufacturing processes, and to introduce computer-aided planning and MRP2 approach.

The subject introduces an organised and systematic approach towards obtaining maximum utilisation of capacity resources in order to reduce excess inventory, controlling product quality, and ensuring timely product delivery at minimum cost. The subject will cover materials management, forecasting of demand, capacity requirement planning (CRP), materials requirement planning (MRP), production scheduling, production control, network analysis, costing, distribution of overheads, ratio analysis, and annual reports. Computer-aided planning will also be introduced.

**46744 COMPUTER AIDED MANUFACTURING**
Course: ME/MFG
Three semester hours
*Prerequisite: 46720 Computer Aided Drafting and Design*

This subject aims to develop an understanding of computer aided manufacturing technology in the areas of coordinate measurement, sheet metal applications, machine tool programming and data communication and control. Topics covered include: Coordinate Measurement for CAD/CAM data analysis and verification; Sheet metal manufacturing programming for Flat Pattern, Nesting and Punchlaser; NC programming for Point-to-point machining, planar milling and surface milling; Data communication and transfer for the various CAM processes.

**46810 INTRODUCTION TO COMPUTING**
Course: ME/MFG
Two semester hours
*Prerequisite: Nil*

This course introduces the computer as a means of solving engineering problems and as an aid to communications. The main emphasis will be on personal computers, but some time will be devoted to more powerful computers and networks. The topics covered will include DOS, word processing, spread sheets, data bases, and programming at an elementary level. Operating systems including UNIX and networking will also be treated at an elementary level.

**46811 COMPUTER PROGRAMMING**
Course: ME/MFG
Four semester hours
*Prerequisites: 46810 Introduction to Computing, 33121 Engineering Mathematics 1A*

This subject 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. UNIX operating system and its text editing facilities will be used.

**46820 ENGINEERING STATISTICS**
Course: ME/MFG
Four semester hours
*Prerequisite: 33221 Engineering Mathematics 2A*

This subject aims to introduce the basic concepts of probability and statistics and show how they are used in prediction, assessment and quality control.

Topics include: summarizing data; probability, discrete and continuous distributions including the binomial, Poisson and normal distribution; sample statistics; estimation and confidence intervals; tests of hypotheses; regression and correlation; analysis of variance. Applications to experimental design and quality control are treated.

**46830 NUMERICAL ANALYSIS**
Course: ME/MFG
Four semester hours
*Prerequisite: 46820 Engineering Statistics*

This course gives students experience in 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); interpolation; differentiation; curve fitting; differential equations (ordinary, simultaneous, partial).

**46840 ADVANCED ENGINEERING COMPUTING**
Course: ME/MFG
Three semester hours
*Prerequisite: 46830 Numerical Analysis*

This subject aims to give an appreciation of selected important topics from Computer Science and develop understanding of programme structure and data

structure. To develop skills in formulating and solving problems in optimisation.

The subject is broadly divided into programming and application. The programming section uses the Ratfor preprocessor as a bridge from Fortran into the more richly structured languages Pascal and C. The use of the Unix data processing tools awk and grep are introduced. The application section is an introduction to optimisation methods: linear programming, simulated annealing and calculus based algorithms.

**46841 OPERATIONS RESEARCH**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*

The objective of this subject is to prepare the students in the various techniques of operations research to enable them to take management decisions effectively.

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 queueing theory.

**4684 MICROPROCESSORS**
Course: ME/MFG
Three semester hours
*Prerequisites: 46530 Measurement and Instrumentation, 46830 Numerical Analysis*

This subject will introduce the basic concepts of microprocessor architecture and programming, and develop the skills needed for the applications of the microprocessor in industrial systems. The programming models and basic features of microprocessor and microcomputer programming, encoding and number systems developed. The methodology of structured software design will be reviewed with an emphasis on microprocessor applications. The characteristics of the major microprocessor system components will be reviewed at the broad level. Input/output facilities, interrupt systems, and other ancillary devices related to control systems will be explored.

**46900 INDUSTRIAL REVIEW**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*
*Corequisite: 46631 Engineering Management*

Following selected reading and tutorial discussion, students will write essays reviewing aspects of the structure and operation of the firm with which they are employed. Topics for these essays will be chosen from topics including: the organisation of the firm; industrial relations policy and practices; social location and impact of the firm in the community; product and process range and development; roles of professional engineers in the firm.

**46991 PROFESSIONAL REVIEW**
Course: ME/MFG
Three semester hours
*Prerequisite: 46990 Industrial Review*

The objective of this subject is to review and assess the industrial component of the cooperative Bachelor of Engineering programme. The different philosophies on cooperative education will be discussed. Each student will be required to present a report on their industrial experience and to give a seminar to the class, outlining this experience in the light of the course objectives.

**46997 PROFESSIONAL EXPERIENCE (Sandwich)**
**46999 PROFESSIONAL EXPERIENCE (Part-time)**
Course: ME/MFG

This subject name/number is the Professional Experience subject for Mechanical and Manufacturing Engineering degrees. Enrolment in it indicates that the student is currently obtaining industrial experience. 90 weeks of approved industrial experience must be gained prior to graduation.

Students must become familiar with the Faculty's industrial experience requirements and rules which are set out in this calendar under the heading "Industrial Experience Requirements", page 13.

**47002 PROJECT (2 hrs)**
**47003 PROJECT (3 hrs)**
**47004 PROJECT (4 hrs)**
**47006 PROJECT (6 hrs)**
**47009 PROJECT (9 hrs)**
**47012 PROJECT (12 hrs)**
**47015 PROJECT (15 hrs)**
Course: CE

In the project subject a student is expected to carry out a major engineering task and to prepare a formal bound report on that task. The project has many objectives. It develops the need to formalise a rational approach to a significant, long-term piece of work. It requires effective time management to meet deadlines. It compels students to work individually under the guidance of a supervisor. It enhances their communication and engineering skills. Finally it

gives the student a feeling of professional pride and confidence in their ability, thus preparing for their future roles in the engineering workplace.

**47110 INTRODUCTION TO CIVIL ENGINEERING**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objectives of this subject are: (1) to improve staff/student interaction and understanding and to provide close contact with at least one member of School staff; (2) to provide an insight into the breadth of Civil Engineering and the many skills and approaches required by the profession; (3) to develop written and verbal communication skills. Topics include: The phases of engineering work; the design process; materials and behaviour; environmental engineering; water engineering; geotechnical engineering; project evaluation; management and professional aspects of engineering, including ethics, professional associations, contracting and consulting.

**47113 COMPUTATIONS 1**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

This subject aims to familiarise students with computing as a tool for solving engineering problems. The emphasis in the subject is on the process of formulating problems in a manner suitable for computer solution. At the conclusion of the subject, students should be able to recognise problems which lend themselves to computer solutions and have the confidence to use a computer whenever it is warranted.

**47117 STATICS**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

This subject provides the students with the fundamental concepts of statics and the application of the basic principles of statics to solving engineering mechanics problems. Much emphasis in the course will be placed on the concepts of Free Body Diagrams and Equilibrium of the Free Body. At the end of the course students should be able to confidently apply these basic principles to solve statically determinate problems involving non-deformable bodies.

**47118 SURVEYING 1A**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objectives of this subject are to introduce students to fundamental surveying theory, techniques and instruments which are used in civil engineering. This will include levelling, distance measurement and use of the theodolite. At the completion of Surveying 1A the student should have a practical understanding of:

1. the execution of the following surveys in the field and appreciation of the accuracies achievable by: (a) levelling, (b) distance measurement by tape or wire and (c) traversing.

2. execution of the following computations and appreciation of the accuracies required in computation: (a) level reduction, (b) distance reduction, (c) traverse closure for both misclose and bearing and distance of missing line.

This subject is essential to provide students with basic material which they can use during the initial industrial training components of the subject.

**47127 MECHANICS OF SOLIDS 1**
Course: CE/SE
Three semester hours
*Prerequisite: 47117 Statics*

This subject aims to develop an understanding of the behaviour of deformable solids responding to loads, deformations and temperature changes, leading to analysis of structure and machine elements utilising established principles. The subject emphasises the use of fundamental techniques for formulating and solving problems in the mechanics of deformable solids based on equilibrium and compatibility relationships and material properties. The subject will provide the required knowledge necessary for understanding more advanced topics in Mechanics of Solids 2 and the underlying principles in structural analysis as well as design subjects.

**47128 SURVEYING 1B**
Course: CE/SE
Three semester hours
*Prerequisite: 47118 Surveying 1A*

The objectives of the subject are for students to develop basic surveying skills and to reach a significant level of competency in using basic surveying equipment such as levels, theodolites and distance measuring tapes. Students will be introduced to the engineering applications of surveying, including

detail and contour surveying, setting out of roads and buildings and introduced to road design. Students will also be introduced to current surveying computer packages.

**47131 STRUCTURAL MECHANICS**
Course: CE/SE
Three semester hours
*Prerequisite: 47127 Mechanics of Solids 1*

This subject aims at reinforcing the basic concepts of statics, mechanics of deformable solids and enhancing the student's understanding of structural behaviour of determinate frames by exploring the principles of energy, theories of failure and concepts of stability.

**47133 COMPUTATIONS 2**
Course: CE/SE
Three semester hours
*Prerequisites: 47113 Computations 1, 33121 Engineering Mathematics 1A, 33122 Engineering Mathematics 1B*
*Corequisite: 33221 Engineering Mathematics 2A*

The objective of this subject is to familiarise the student with a number of numerical methods which will be useful in the solution of a wide range of engineering problems. Emphasis will be given to application, rather than theory, but some theory will be provided to assist in the understanding of the solution techniques.

**47134 CONSTRUCTION MATERIALS**
Course: CE/SE
Three semester hours
*Prerequisite: 63721 Materials Science for Engineers*

Timber, steel, concrete and masonry are the major materials commonly used in civil engineering construction. This subject aims to provide understanding of the production, material characteristics and properties, main uses, and testing to relevant Australian Standards. A knowledge of these materials is essential in the design and construction of civil engineering structures.

**47135 FLUID MECHANICS**
Course: CE/SE
Three semester hours
*Prerequisites: 47127 Mechanics of Solids 1, 33221 Engineering Mathematics 2A*

Fluid Mechanics is the foundation subject for the Water Engineering Strand within the Civil Engineering course. It also provides a basic knowledge of fluid mechanics for structural engineering students. The subject's aim is to introduce students to concepts of fluid statics and dynamics, going from basic principles of mathematics and physics to the empirical procedures used in civil engineering applications.

**47137 MECHANICS OF SOLIDS 2**
Course: CE/SE
Three semester hours
*Prerequisite: 47127 Mechanics of Solids 1*

This subject aims to develop an understanding of the behaviour of a range of deformable solids beyond those considered in the prerequisite subject Mechanics of Solids 1. On completion of this subject, the students should understand the behaviour of deformable solids responsible to all types of internal actions on various cross-sections. This subject forms a sound knowledge to develop the fundamental principles for structural analysis and design.

**47140 CONCRETE DESIGN 1**
Course: CE/SE
Three semester hours
*Prerequisite: 47127 Mechanics of Solids 1*
*Corequisite: 47137 Mechanics of Solids 2*

On completion of this subject, the student should - understand the behaviour under load of reinforced concrete simply supported beams, columns, and one-way and two-way slabs with edge supports; be able to analyse from first principles reinforced concrete sections subjected to the bending moment and/or axial force at the stages of serviceability and ultimate strength; be able to design and detail reinforced concrete beams, columns, two-way slabs, and simple footings, considering all common limit states, except torsion; have some familiarity with the Concrete Structures Standard and be aware of the commonly used design aids. The subject is to provide students with a professional base for further studies of the design of concrete structures.

**47141 STRUCTURAL ANALYSIS 1**
Course: CE/SE
Three semester hours
*Prerequisite: 47131 Structural Mechanics*

The objective of this subject is to teach students methods, amenable to hand calculations, for analysis of indeterminate structures and to give them a thorough understanding of influence coefficient and the applicability of influence lines to design of structural frameworks.

**47142 ENVIRONMENTAL ENGINEERING**
Course: CE/SE
Three semester hours
*Prerequisite: Environmental Chemistry*

The principal objective of this subject is to introduce civil engineering students to basic environmental

concepts and the environmental consequences of typical engineering activities in order for them to:

- have a basic understanding on selected environmental science topics;
- be familiar with main aspects of NSW environmental legislation with respect to civil engineering activities,
- have a broad knowledge on current environmental problems,
- be able to determine likely environmental consequences of several types of engineering activities,
- be aware of procedures which can be used to avoid or reduce adverse environmental impacts.

**47144 TIMBER DESIGN**
Course: CE/SE
Three semester hours
*Prerequisite: 47127 Mechanics of Solids 1*

This subject aims to broaden the student's knowledge of timber as a structural material and its modern usage. To develop a professional capability for design and construction of economical timber structures.

**47145 HYDRAULICS**
Course: CE
Three semester hours
*Prerequisite: 47135 Fluid Mechanics*

Hydraulics follows on from the introductory Fluid Mechanics, subject in the Water Engineering Strand. It aims to consolidate students' knowledge of fluid principles, and to cover principles of open channel flow.

On completion, students will have a deeper knowledge of fluid flow principles, and a proficiency in solving problems and performing design calculations for open channel flow systems.

**47146 SOIL MECHANICS**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

As a particular and multiphase material, soil displays many characteristics which are distinctly different from those of other engineering materials. In order to design foundations and earth structures it is essential to understand the basic soil behaviour under different stresses and environmental conditions. The main aim is to study the components of soil and their interrelationships, soil classification for engineering purposes, stresses and failure conditions in a soil mass, and stress-strain characteristics.

**47149 CONSTRUCTION**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objective of this subject is to promote an interest in and an understanding of some of the equipment and techniques associated with civil engineering construction work.

On completing the subject the student should:

- have a well developed awareness of the equipment, processes and methods associated with construction work.
- be able to identify many of the day to day problems encountered on construction sites.
- be able to actively participate in the evolution of the solution to construction problems.

The subject is the first in the Construction and Management Strand of the course.

**47150 CONCRETE DESIGN 2**
Course: CE/SE
Three semester hours
*Prerequisite: 47140 Concrete Design 1*

In this subject students are exposed to the basic concepts of prestressed concrete, relevant to the analysis and design of simply supported beams and slabs. On completion of the subject students should understand the behaviour under load of simple prestressed concrete members of pre-tensioned and post-tensioned type. They will become familiar with the design of prestressed concrete beams and slabs to satisfy strength and serviceability limit states in accordance with the Concrete Structures Standard. The subject relates closely to the concepts learned previously in Concrete Design 1 and aims at broadening students' ability to design structural components made of concrete.

**47151 STRUCTURAL ANALYSIS 2**
Course: CE/SE
Three semester hours
*Prerequisites: 47141 Structural Analysis 1, 47133 Computations 3*

In this subject students will master the analysis of structures using the stiffness method and become familiar with the computer application in this field.

Students are also introduced to concepts of material and geometric nonlinearities and to problems of elastic stability.

**47152 PUBLIC HEALTH ENGINEERING**
Course: CE/SE
Three semester hours
*Prerequisite: 47142 Environmental Engineering*

The purpose of this subject is to provide civil engineers with a basic knowledge about water quality, the types of water pollution and objectives, processes and technology of wastewater and water treatment, in order for them to become familiar with the

- water quality constituent, measurement methods and standards,
- major types of water pollution in NSW,
- different water and waste water treatment processes used in NSW,
- rationale of choice of treatment alternatives,
- introductory design of treatment processes used commonly in NSW.

**47153 COMPUTATIONS 3**
Course: BE/SE
Three semester hours
*Prerequisite: 47133 Computations 2*

Many areas of engineering are involved with gathering and evaluating large amounts of data. Two aspects are important; the presentation of this data and what inferences can be drawn from this data. The science of statistics deals with these aspects. This subject aims to introduce the student to these areas of statistical analysis. Particular emphasis is placed on promoting an awareness in students of the variability of design input data and on the tools required to analyse this variability. A secondary component of this subject aims to further the computing skills of students through the use of both of a statistics package and a data base package.

**47154 CONCRETE TECHNOLOGY**
Course: CE/SE
Three semester hours
*Prerequisite: 47134 Construction Materials*

Concrete is one of the essential materials used in civil engineering construction. The main objective of this subject is to provide a basic understanding of concrete technology in relation to production, materials characteristics and properties, durability, and testing in accordance with relevant Australian Standards.

**47155 HYDROLOGY**
Course: CE
Three semester hours
*Prerequisite: 47135 Fluid Mechanics*

Students are introduced to the principles and methods of Engineering Hydrology, with particular concentration on Australian practice. On completion of the subject, students should understand basic principles of hydrology, and be aware of procedures used in Australia. They should be able to estimate design flowrates for various situations, and be familiar with basics of reservoir yield analysis and hydrologic modelling.

**47156 SOIL ENGINEERING**
Course: CE/SE
Three semester hours
*Prerequisite: 47146 Soil Mechanics*

Building on the knowledge of soil properties developed in Soil Mechanics, this subject introduces the solutions to problems of stability and deformation related to shallow footings, retaining structures, deep foundations (piles, piers and caissons), embankments, excavations and natural slopes. The methods of stability analysis presented are based on the Mohr-Coulomb failure law and cover the assessment of bearing capacity, earth pressure and slope stability. Elastic as well as consolidation theory are applied to deformation problems, including settlement, rotation and lateral deflection.

**47159 PROJECT PLANNING**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

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

On completing the subject the student should be able to:

- apply the rigorous techniques of critical path method networks as well as other planning systems.
- analyse cash flows associated with alternative courses of action and have an understanding of benefit/cost analysis.
- understand the basic principles of preliminary and detailed cost estimating.

- predict the likely production of earthmoving equipment and correctly balance fleets of machinery.

**47160 CONCRETE DESIGN 3**
Course: CE/SE
Three semester hours
*Prerequisite: 47150 Concrete Design 2*

The aim of this subject is to develop in the student the ability to apply the analytical methods learned in previous subjects of this strand, and in this subject, to the design of concrete structures. Through the involvement in the lectures, selected examples, and numerical assignments the student should acquire the skill of representing typical reinforced concrete structures of medium complexity, particularly those incorporating slabs, by statical systems suitable for the analysis of forces and dimensioning individual components. Students should become aware of the relative merits of various analytical models applied to the design of reinforced concrete structures and, given the task, be able to select a suitable method and design the structure.

**47161 STEEL DESIGN 1**
Course: CE/SE
Three semester hours
*Prerequisite: 47137 Mechanics of Solids 2*

The objective of this subject is for students to acquire competence in design of structural steel elements in accordance with the Australian Standard AS4100-1900 and to form a sound base for progressing into more advanced steel subjects. Upon completion of this subject, students should be capable of proportioning a complete framework.

**47162 ADVANCES IN POLLUTION CONTROL**
Course: CE
Three semester hours
*Prerequisite: 47152 Public Health Engineering*

This is an advanced subject intended to give an overview of advances in pollution control technologies and management practices in order for students to become familiar with the

- pollution control management strategies adopted by different industries,
- advanced technologies used to produce water suitable for reuse, and
- technologies used in the upgrading of water and wastewater treatment plants.

**47163 COMPUTATIONS 4**
Course: CE/SE
Three semester hours
*Prerequisite: 47153 Computations 3*

This subject aims to familiarise the student with a number of advanced computational techniques relevant to the solution of engineering problems. Emphasis will be given to the role of computer software packages, their advantages and limitations in solving such problems.

**47164 METALS TECHNOLOGY**
Course: CE/SE
Three semester hours
*Prerequisite: 47134 Construction Materials*

The subject deals with the behaviour of metals under various service conditions and loads with particular reference to structural steel. It provides the background knowledge on the material aspects of AS4100-1900: Steel Structures, thereby augmenting the students' understanding of the principles of steel design. In addition, it will help the students in selecting the appropriate grade of steel for a particular project, specifying the relevant tests for quality control and interpreting the test results.

**47166 GEOTECHNICAL ENGINEERING**
Course: CE
Three semester hours
*Prerequisite: 47156 Soil Engineering*

The geotechnical design process involves understanding the nature of soils at a site and predicting the interaction between those soils and any construction carried out on the site. The theories of soil behaviour developed in Soil Mechanics and the methods of analysis treated in Soil Engineering give the student the theoretical background on which design techniques may be built. However, soil and rock, being natural materials, are very variable materials. This course aims to develop a design philosophy which will allow this variability to be correctly covered in the design. This design philosophy is based partly on the theoretical background (the science) and partly on practical experience and engineering judgement (the art of geotechnical design).

**47167 ROAD ENGINEERING**
Course: CE
Three semester hours
*Prerequisites: 47156 Soil Engineering, 47159 Project Planning, 47155 Hydrology*

The objective of this course is to provide the student with a general introduction to Australian methods for the analysis and design of various road components.

**47168 SURVEYING 2**
Course: CE
Three semester hours
*Prerequisite: 47128 Surveying 1B*

The objectives of this subject are to widen senior students' horizons regarding advanced survey methods, instruments and theory as applied to civil engineering projects. Students will be given a choice of the practical exercises undertaken so that the subject may be tailored to suit their particular needs or interests in the area of work they find most relevant to them.

**47171 STEEL STRUCTURES AND CONCEPT DESIGN 1**
Course: CE/SE
Three semester hours
*Prerequisites: 47161 Steel Design 1, 47141 Structural Analysis 1, 47137 Mechanics of Solids 2*

The objective of this subject is for students to gain familiarity and competence in the complete design of typical steel structures and to involve students in the philosophy and methodology of structural design with the aim of attaining coherence amongst the previously acquired knowledge.

**47175 WATER ENGINEERING**
Course: CE
Three semester hours
*Prerequisites: 47145 Hydraulics, 47155 Hydrology*

Students are to be made familiar with (a) the general nature of the water industry, and (b) certain aspects of hydraulics, which form a basis for future specialist studies.

This is aimed at reinforcing earlier teaching in hydrology and hydraulics, and providing information to round-out the knowledge needed in these fields. The water industry component informs students of the framework within which water engineering work is carried out, and encourages a wide, multi-disciplinary perspective. The hydraulics part covers important topics in hydraulics and the methods applied in these situations.

**47176 GROUND MODIFICATION**
Course: CE
Three semester hours
*Prerequisite: 47156 Soil Engineering*

The subject introduces methods of ground modification for the purpose of improving the engineering properties of soils and rocks, such as: strength, compressibility, tendency to shrink and swell, durability, permeability, potential for liquefaction, and variability. Emphasis is placed on laboratory and field testing, design criteria, methods of analysis and performance evaluation. The main topics are: compaction, dewatering, soil stabilization of admixtures, grouting, soil reinforcement by inclusions and confinement. Additional geotechnical construction processes described include preloading, electro-osmosis, thermal stabilization (ground freezing or heating), soil and rock anchors, and the use of geosynthetics.

By discussing ways of modifying soils by mechanical, hydraulic, physical, chemical and other means, the student gains a deeper understanding of basic soil and rock properties. After completing this subject, a designer or construction engineer will be better able to evaluate alternative solutions when confronted with difficult foundation conditions or marginal building materials.

**47177 TRANSPORTATION ENGINEERING**
Course: CE
Three semester hours
*Prerequisite: 47167 Road Engineering*

The objective of this course is to provide students with a basic understanding with the issues involved in planning for transport and making transport work more effectively in the community.

**47178 PROJECT ECONOMICS**
Course: CE/SE
Three semester hours
*Prerequisite: 47159 Project Planning*

The objective of this subject is to advance the student's knowledge and competence in economic and financial management associated with civil engineering projects.

On completion the student should:

- have a well developed understanding of the economic framework within which selection of engineering projects is made;
- be able to provide reasoned advice on the tangible and intangible benefits and costs of projects;
- be competent in financial management techniques such as benefit-cost analysis, economic project evaluation, intangible and multiple objective analysis, sensitivity and probability analysis;

- have an understanding of the roles of engineers in business, including financial and marketing functions.

**47179 CONSTRUCTION CONTRACTS**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objective of this subject is to provide a general appreciation of some of the important aspects of contract management.

On completing the subject the student should have:

- a good understanding of the powers and duties of the parties to a construction contract.
- a sound knowledge of the Standard General Conditions of Contract
- an awareness of the activities and functions associated with the administration of civil engineering contracts.

**47189 MANAGEMENT FOR ENGINEERS**
Course: CE/SE
Three semester hours
*Prerequisites: 47149 Construction, 47159 Project Planning, 47179 Construction Contracts*

The objective of this subject is to develop an awareness of the theories of management and an understanding of the techniques and principles associated with the general management of projects and organisations.

This subject is the capstone subject of the Construction and Management Strand of the course and aims to develop a broad view of the role of an engineer may take in industry and society.

**47237 DOMESTIC BUILDING DESIGN AND CONSTRUCTION**
Course: SE
Three semester hours
*Prerequisite: 47127 Mechanics of Solids 1*
*Corequisite: 47137 Mechanics of Solids 2*

This subject aims to familiarize the students with local government's statutory regulation, the structural behaviour of domestic buildings with load bearing walls and to give a comprehensive coverage of all components of domestic buildings with emphasis on building services, construction aspects and maintenance.

**47265 FINITE ELEMENT ANALYSIS**
Course: SE
Three semester hours
*Prerequisites: 47151 Structural Analysis 2, 47133 Computations 2*

The objective of this subject is to provide an insight into the finite element method and its utilisation in solving civil engineering problems. The theoretical fundamentals underlying the method will be highlighted. Finite element software packages will be used to demonstrate the versatility and limitation of the method and to provide hands-on experience to enable students to use such software effectively.

**47267 APPROXIMATE METHODS IN STRUCTURAL ANALYSIS**
Course: SE
Three semester hours
*Prerequisites: 47141 Structural Analysis 1, 47137 Mechanics of Solids 2, 47140 Concrete Design 1, 47161 Steel Design 1*

This subject aims to explore the assumptions underlying the approximate methods of analysis and their justification and to equip students with analytical tools for rapid determination of approximate internal actions which can be either used for preliminary design of structural elements or for detection of gross errors in the results obtained from rigourous computer based analysis.

**47268 DYNAMICS OF STRUCTURES**
Course: SE
Three semester hours
*Prerequisites: 47151 Structural Analysis 2, 47133 Computations 2*

The objective of this subject is to introduce students to basic concepts and fundamental principles of structural dynamics and their application to structural design and analysis of dynamically sensitive structures such as tall buildings, towers, chimney stacks, foot bridges, and others. Upon the completion of the subject the student is expected to understand the nature of dynamic (time varying) loads such as those produced by wind, earthquake, rotating machinery, trains, human beings and other sources, and assess the response of civil engineering structures to such loads by taking into account the load-structure interaction, leading to design of structures satisfying both the strength and serviceability requirements.

**47275 BRIDGE DESIGN**
Course: SE
Three semester hours
*Prerequisites: 47150 Concrete Design 2, 47161 Steel Design 1*

The objective of this subject is to introduce the student to the Australian practice of bridge design. The assignments will require the student to analyse bridge components using manual and computerised methods and to design a selected structure in accordance with the current code of practice. On completion of the subject the student should be familiar with structural systems and methods applied to the design of typical bridges and should be capable of designing a small-to-medium span highway bridge in accordance with the Australian standard.

**47277 LOADING ON BUILDING STRUCTURES**
Course: SE
Three semester hours
*Prerequisite: 47268 Dynamics of Structures*

The aims of this subject are to familiarise students with various types of loads and phenomena responsible for inducing stresses and strains in building structures, and to develop an understanding of probabilistic concepts underlying the determination of various loads on structures for serviceability as well as strength calculations. Upon the completion of the subject the student should be able to arrive at load combinations which are likely to produce most adverse effects on a building structure.

**47278 STRUCTURAL STABILITY**
Course: SE
Three semester hours
*Prerequisite: 47151 Structural Analysis 2, 47133 Computations 2*

The objective of this subject is to study the behaviour of slender members subjected to compression and or flexure. This subject will examine the factors which contribute to the onset of buckling in single members and will develop the understanding of the behaviour of slender frames subjected to loads which cause buckling. It will enable students to apply computer based methods to analyse practical frames to assess their stability.

**47281 STEEL STRUCTURES AND CONCEPT DESIGN 2**
Course: SE
Three semester hours
*Prerequisite: 47171 Steel Structures and Concept Design 1*

The objective of this subject is to gain understanding of the behaviour of composite beams and plastically deformed steel frames and to develop familiarity with the relevant code provisions and their underlying concepts.

**47287 STRUCTURAL TESTING**
Course: SE
Three semester hours
*Prerequisites: 47137 Mechanics of Solids 2, 47151 Structural Analysis 2, 47150 Concrete Design 2*

Students are expected to familiarise themselves with techniques on contemporary instrumentation for measuring the strength and behaviour of concrete and steel structures in the field and/or in the laboratory. To provide students with information necessary for the design and application of structural models; to present techniques for the analysis of test data.

**47288 HIGH RISE BUILDINGS**
Course: SE
Three semester hours
*Prerequisite: 47277 Loading on Building Structures*

The objective of this subject is to enhance the understanding of the behaviour of structural systems with especial reference to characteristics inherent to tall buildings and to bring about coherence amongst the previously learnt knowledge.

**47301 RAILWAY ENGINEERING (Elective)**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objective of this subject is to introduce the student to the design, construction and maintenance concepts of railway track and bridges. On completion of the lecture programme the student should be able to design, independently, a branch line or a siding complex according to State Rail of NSW Standards. An understanding of track-train inter-relationships and their effect on track structure should also have been obtained.

The course also provides specific information on the design of a railway bridge structure on the basis that the student already has the knowledge to design a road bridge.

**47302 WELDING (Elective)**
Course: CE/SE
Three semester hours
*Prerequisite: 47164 Metals Technology*

The subject introduces the students to the aspects of welding which affect the efficiency of fabrication and serviceability of steel structures. It deals with the advantages and disadvantages of common welding methods, quality and strength of welds, inspection and economic considerations.

**47303 LAND DEVELOPMENT (Elective)**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The course provides information for senior engineering students interested in local government or land development projects. Students are introduced to aspects of the land development process from acquisition of raw land through to the marketing of developed land. On completing the subject the student should:

- have an understanding of the land development process and the key participants in that process;
- understand the techniques of site analysis, concept and detailed designing of land development projects;
- appreciate the scope for incorporating environmental and street management principles in the design process;
- understand the legislative requirements of land development.

The subject is structured in three modules:

**Module 1: Context of land development**

- development processes
- nature of clients
- site contexts
- market contexts
- financial contexts
- legal contexts

**Module 2: Site analysis and design**

- site analysis
- concept planning
- designing with environment in mind
- residential street layout
- subdivision design

**Module 3: Development approvals and appeals**

- financial viability
- development applications and approvals
- Section 94 contributions
- Land and Environment Court

**47304 COASTAL ENGINEERING (Elective)**
Course: CE
Three semester hours
*Prerequisite: 47175 Water Engineering*

Coastal Engineering is offered as an elective in the Water Engineering strand within the Civil Engineering Course. The main objective is to provide a general introduction to natural behaviours of water waves and their interactions with the coastline and coastal structures. Topics covered: wave generation processes and wave forecasting; wave theories and their limits of validity; wave kinematics in deep and shallow water, shoaling; wave refraction; wave reflection; wave diffraction; wave forces on walls and piles; design of breakwater and marina; measurement and statistical analysis of random waves; estimation of extreme waves; tide and other long period water level fluctuations; coastal sediment transport and shore protection methods; marine outfall for sewage disposal; physical and computer models.

**47305 RISK AND RELIABILITY ANALYSIS (Elective)**
Course: CE/SE
Three semester hours
*Prerequisite: 47113 Computations 1*

The objective of this subject is to introduce students to principles of reliability analysis and application of probability theory to engineering problems, and to gain an understanding of its significant role in all aspects of engineering planning and design, including: the formulation of engineering problems and evaluation of systems performance under conditions of uncertainty; systematic development of design criteria, explicity taking into account the significance of uncertainty; and the logical framework for risk assessment and risk-benefit trade-off analysis relative to decision making.

The principal aim to emphasize the wider roles of probability theory in engineering, with special attention on problems related to civil and structural engineering, construction management, construction management, hydrologic and water resources planning, transportation planning and wind and earthquake engineering.

The course will be concerned mainly with the practical applications and relevance of probability

concepts to engineering. The necessary mathematical concepts are developed in the context of engineering problems and through illustrations of probabilistic modelling of physical situations and phenomena in nonabstract terms.

**47997 PROFESSIONAL EXPERIENCE (Sandwich)**
**47999 PROFESSIONAL EXPERIENCE (Part-time)**
Course: CE/SE

This subject name/number is the Professional Experience subject for Civil and Structural Engineering degrees. Enrolment in it indicates that the student is currently obtaining industrial experience. 90 weeks of approved industrial experience must be gained prior to graduation.

Students must become familiar with the Faculty's industrial experience requirements and rules which are set out in this calendar under the heading "Industrial Experience Requirements", page 13.

**51131 COMMUNICATION 1**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*

The objectives of this subject are: (a) to help students understand the format, structure and conventions of technical, written and speech reporting; (b) to apply these skills to the writing of professional papers; and (c) to alert students to the principles of communication inherent in speech, writing, listening and reading situations.

**51161 COMMUNICATION 2**
Course: CE/SE
Three semester hours
*Prerequisite: 51131 Communication 1*

The objectives of this subject are: (a) to help students nearing graduation to communicate effectively in speech and writing with the wide range of people encountered not only in the workplace but also with those beyond the employing organisation; (b) to emphasise to students the difficulties of communicating technical detail to those lacking in either the expertise or the "culture of engineering'; (c) to help students articulate in a public way the concerns and viewpoints of the engineer in society; (d) to strengthen and reinforce students' understanding and techniques in technical research writing and organisational reporting.

**62178 ENGINEERING CHEMISTRY**
Course: ME/MFG
Six semester hours
*Prerequisite: Nil*

This subject aims to provide students with the basic knowledge of chemistry needed for understanding engineering materials and processes.

The subject covers the following topics: mole concept, stoichiometry, structure of the atom, atomic spectra, periodic table, chemical bonding, electrochemistry and corrosion, gas laws, change of state, colloids, solution equilibra, basic organic chemistry, polymers and the structure of solids.

**63115 ENGINEERING PHYSICS 1 (Electrical)**
Course: EE/CSE
Six semester hours

The objective of this subject is for students to master the fundamental concepts of static and dynamic mechanics, fluid mechanics and thermal physics and gain a deep understanding of the nature and application of the concepts of power and energy. For students to understand the process of scientific method, to be able to set up and conduct experiments to test hypotheses and to be able to correctly interpret results.

It is a foundation physics subject for Electrical Engineering students. It covers the fundamentals of dynamics and statics, fluid mechanics and thermal physics. Students are introduced to the basic techniques of measurement.

**63123 ENGINEERING PHYSICS 2 (Electrical)**
Course: EE/CSE
Three semester hours
*Prerequisite: 63113 Engineering Physics 1 (Electrical)*

This subject seeks to provide the student with a good basis in waves and optics, atomic and nuclear physics and magnetism which will be further developed in later subjects. Particular emphasis is placed on developing in students a deep understanding of wave phenomena in preparation for later subjects such as Electromagnetics, Fields and Waves, Power Apparatus and Systems.

**63127 ELECTRICAL ENGINEERING 1 (Mechanical)**
Course: ME/MFG
Four semester hours
*Prerequisites: 63117 Engineering Physics (Mechanical), 33122 Engineering Mathematics 1B*

This subject aims to introduce the basic theory of electricity and magnetism and the theoretical and practical aspects of electrical machines. The subject includes a study of magnetic fields and the force exerted by magnetic fields on currents, magnetic fields resulting from current flow and current flow resulting from changing magnetic fields; permanent and electromagnets; magnetic materials and circuits; transients and AC circuit theory; three-phase systems; single and three-phase transformers; DG generators and motors; three-phase induction motors and synchronous motors.

**63131 ENGINEERING PHYSICS (Civil)**
Course: CE/SE
Six semester hours
*Prerequisite: Nil*
*Corequisites: 33121 Engineering Mathematics 1A, 47117 Statics*

This subject forms the essential foundation for the Civil and Structural Engineering degrees. It seeks to provide the student with a good basis in Dynamics, Waves and Optics, Thermal Physics, and Electricity and Magnetism which will be further developed in later subjects. Students are introduced to the basic techniques of measurement.

**63132 ENGINEERING PHYSICS (Civil) (Part-time)**
Course: CE/SE
Three semester hours/two semesters
*Prerequisite: Nil*
*Corequisites: 33121 Engineering Mathematics 1A, 47117 Statics*

This subject forms the essential foundation for the Civil and Structural Engineering degrees. It seeks to provide the student with a good basis in Dynamics, Waves and Optics, Thermal Physics, and Electricity and Magnetism which will be further developed in later subjects. Students are introduced to the basic techniques of measurement.

**63133 ENGINEERING PHYSICS 3 (Electrical)**
Course: CE/SE
Three semester hours
*Prerequisites: 63123 Engineering Physics 2 (Electrical), 63634 Materials Technology*

This subject provides an introduction to the properties of materials such as conductors, dielectrics and magnetic materials. Some statistical methods for analysing complex systems are presented, and the practical relevance of these to materials with engineering applications is emphasised.

**63155 COMMUNICATION PHYSICS**
Course: EE
Three semester hours
*Prerequisites: 45144 Electronic Devices and Circuits, 45145 Engineering Statistics*
*Corequisite: 45152 Signal Theory 2*

Basic aspects of electromagnetic wave propagation and attenuation in specific media. Real boundary problems, distributed source and multiwavelength effects; involving interference, diffraction, reflection, and image formation and processing. Waveguides and optical fibres. Sources and detectors of radiation. Electro-optic, acousto-optic and integrated optoelectronics.

**63721 MATERIALS SCIENCE FOR ENGINEERS**
Course: CE/SE
Three semester hours
*Prerequisite: Nil*
*Corequisite: 62178 Engineering Chemistry*

This is the first of several subjects in the course which deal with the behaviour of civil engineering materials under various service conditions and loads. The subject provides the student with a basic understanding of properties of materials which is essential for their selection, design, use and durability. It covers the fundamentals on which more advanced materials subjects as well as design subjects in later stages are built.

**63741 MATERIALS ENGINEERING 2**
Course: ME/MFG
Four semester hours
*Prerequisites: 63704 Materials Engineering 1, 46220 Solid Mechanics 1*
*Corequisite: 46820 Engineering Statistics*

This is a design oriented subject 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 models of material behaviour based on theoretical considerations where these are known, or on empirical relationship which have been found to work in practice. Topics include fracture mechanics, fatigue, stress relaxation, creep and creep-rupture in metals and plastics, viscoelastcity, corrosion and the behaviour of adhesives and composites.

**79737 ENGINEERING LAW**
Course: MEM
Three semester hours

The objective of this subject is to introduce engineers to an overview of the Australian legal system and to the areas of law in which they may be involved.

Special emphasis will be laid on the law of contract to reflect many recent developments in this area as well as an evaluation of current trends, including the social and commercial policy issues which underlie the law, illustrating the way in which lawyers give effect to these policy considerations through the development of legal concepts.

**91349 ENVIRONMENTAL SCIENCE FOR ENGINEERS**
Course: ME/MFG
Three semester hours
*Prerequisite: Nil*

The objective of this subject is to provide a sound introduction to the principles and concepts of environmental science, so that the students may gain an understanding of ecosystem dynamics, the human-induced disturbances to which such systems are subject, and approaches aimed at avoidance and remediation of damage caused to ecosystem and global balance.

## THE STUDENTS' ASSOCIATION (SA)

The Students' Association (SA) is the elected representative body of students at the UTS - it is an organisation run by students for students. All students become members of the Students' Association upon enrolment. It is the only body in the university which can legitimately claim to truly represent the concerns, issues and problems students face on a day-to-day basis whilst at this university. All students have the right to stand for election of the SA and to vote in the annual elections. There are twenty three general representatives on the Council that makes policy for the Students' Association. The SA also has specialised portfolios and office bearers to deal with a range of issues; the environment, women, students with special needs, gay and lesbian rights, overseas students and postgraduates.

The Students' Association maintains close links with student organisations from other universities. Its political role is to defend and extend educational standards and conditions for students both within the University and the tertiary sector as a whole. Campus Committees deal with campus specific issues (St Leonards/Gore Hill, Balmain, Kuring-gai, Haymarket and Broadway). This has proved to be the most effective and equitable means of ensuring that all campuses are adequately represented in the make-up of the SA. At this level, Campus convenors carry out the directions of campus committees, which are also elected annually.

In general the SA plays a representative and advocacy role on behalf of students. The SA acts as the voice of the student body. As part of this function it produces a fortnightly newspaper, *Vertigo*, and a weekly radio show on 2SER *Student Voice*. It liaises closely with the University Union, which provides services to students (eg the cafeteria, reading and leisure areas) and the Student Services Unit, which is funded by the university to provide welfare advice and counselling loan assistance and medical services. The SA also employs specialised education staff to assist in enquiries about Austudy, HECS, appeals against exclusion and assessment grades and any other problems that students encounter at UTS. The SA has lots to offer all students - so get down to your SA and get active!

**Locations and Services**

City Campus (02) 330 1155
The main office of the SA is located on the City Campus, Broadway on Level 3A of the Tower Building (near the bar and cafeteria) and offers the following services:

- General Student representatives
- Elected office bearers - Womens' officers
- Overseas students' officers
- Special needs officers
- Gay and lesbian officers
- Environment officer
- Postgraduate officer
- Specialist education, research and welfare staff
- General student enquiries
- Academic coaching service
- Photocopying
- Funding of PERC Clubs

*Broadway Resource Centre (02) 3301161*
Also located on Level 3A and adjacent to the Union Shop, its services include:

- Photocopying
- Secondhand books
- Use of typewriters and computers
- Book binding and paper guillotining

*Haymarket Resource Centre (02) 330 3409*
This is located in Room B110 and its services include:
- Photocopying
- Secondhand books
- Typing service

*Design School Student Centre (02) 330 2958*
This is located on the Balmain Campus, Mansfield Street, Balmain and is open Tuesday to Friday and offers:
- Photocopying
- Secondhand equipment sales
- Computer facilities

*Gore Hill Resource Centre (02) 330 4040*
This is located in Room 1/18 in the Dunbar Building and its services include:
- Photocopying
- Secondhand books
- Computer facilities

*Kuring-gai Campus (02) 330 5237*
Located next to State Bank, the services offered include:
- General and campus representatives
- Specialist education, research and welfare staff
- General student enquiries
- Resource Centre

# PRINCIPAL DATES FOR 1992

## AUTUMN SEMESTER

**January**

13 Release of HSC results
20 Closing date for changes of preference of 1991 NSW HSC applicants (4.30pm)
26 Australia Day
27 Public School Holidays end
29-31 Enrolment of continuing students at City Campus

**February**

3-21 Enrolment of continuing and new students at City Campus
17-28 Enrolment at Kuring-gai Campus
25-27 University Orientation Day at City Campus
28 University Orientation Day at Kuring-gai Campus

**March**

2 Classes commence
13 Last day to enrol in a course or add subjects
27 Last day to apply for leave of absence
31 HECS Census Date

**April**

10 Last day to drop a subject without academic penalty
10 Last day to withdraw from course without academic penalty
13 Public School Holidays commence
17 Good Friday
20 Easter Monday
20-24 Vice-Chancellors' Week (non-teaching)/ Graduation period
24 Public School Holidays end
25 Anzac Day

**May**

29 Closing day for applications for Spring Semester

**June**

15 Formal examinations commence

## SPRING SEMESTER

**July**

3 End of formal examinations
6 Public School Holidays commence
6-10 Vice-Chancellors' Week (non-teaching)
17 End of Public School Holidays
27-31 Enrolment of new students

**August**

3 Classes commence
14 Last day to enrol in a course or add subjects
28 Last day to apply for leave of absence
31 HECS Census Date

**September**

11 Last day to drop a subject without academic penalty
11 Last day to withdraw from a course without academic penalty
28 Public School Holidays commence
30 Undergraduate applications close for admission in 1993
28 Vice-Chancellors' Week (non-teaching)/
- 2 Oct Graduation period

**October**

9 End of Public School Holidays

**November**

16 Formal examinations commence

**December**

4 End of formal examinations
18 Public School Holidays commence

Public Affairs and Publications Unit
University of Technology, Sydney

ISSN 1036-0670