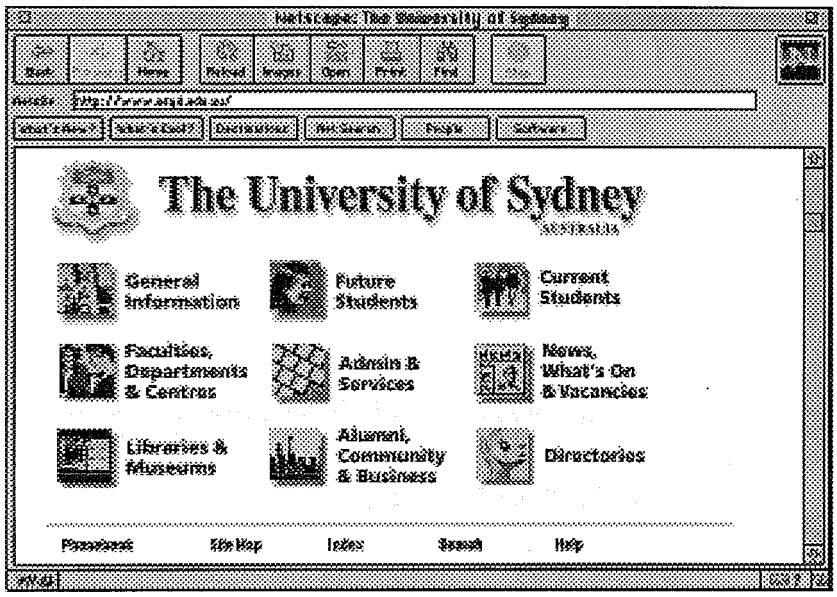
The University of Sydney

Faculty of Engineering Handbook 1998



The University's homepage tells you all about courses at Sydney, some careers they can lead to, and what university life is like. The interactive website, with video and sound clips, has links to the University faculties and departments.

You can explore the University of Sydney at **http://www.usyd.edu.au**

Faculty of Engineering Handbook 1998
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The University of Sydney
NSW 2006
Telephone (02) 9351 2222

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Semester and Vacation Dates 1998

Semester	Day	1998
March Semester lectures begin	Monday	2 March
Easter recess		
Last day of lectures	Thursday	9 April
Lectures resume	Monday	20 April
Study vacation		
1 week beginning	Monday	15 June
Examinations commence	Monday	22 June
July Semester lectures begin	Monday	27 July
Mid-semester recess		
Last day of lectures	Friday	25 September
Lectures resume	Tuesday	5 October
Study vacation		
1 week beginning	Monday	9 November
Examinations commence	Monday	16 November

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1. Message from the Dean

Welcome to the Faculty of Engineering of the University of Sydney, which is also known as the P.N. Russell School of Engineering in commemoration of its industrialist benefactor, Sir Peter Russell. Over the past one hundred and ten years about ten thousand students have preceded you along the path you have chosen to follow towards professional engineering.

An aim of this faculty is to provide the best possible education for its students, both undergraduate and postgraduate. Undergraduate teaching is one of the highest expressions of education; for us, undergraduate teaching is a great social responsibility as well as an opportunity to produce engineers of the future who are both technically competent and socially aware. We produce engineers who will be Australia's future industrial leaders.

In whichever of the five engineering branches you may choose to enrol, you will find that the engineer is concerned with applying scientific knowledge and exercising social skills. To do so with competence and assurance, we believe he or she should have a strong basis in science. Consequently, during the first two years of your course this scientific basis is laid down. This vital foundation, the soundness of which is the hallmark of the Peter Nicol Russell School, provides you with the ability you will depend on during your future professional career to appreciate the significance of new and developing technologies, and to work with them.

The engineer must operate in the real world of economic forces and social priorities. Engineering is a creative occupation: based on science applied with art and skill, and with the economic and social dimensions added. Our graduates develop the skills to thrive in the real world, with concern for and the knowledge required to deal with the important environmental issues of today.

You may have chosen to take engineering because you enjoy proficiency at mathematics and in the sciences, disciplines you probably find interesting and challenging. You perhaps have a liking for solving problems and making things. These are all characteristics of the engineer. Engineering is about meeting people too, and managing. Many engineers travel extensively; they tend to have high starting salaries and high career mobility; and they are greatly needed by the nation.

The course in engineering includes more classes and laboratory hours than most. It calls for steady and concentrated effort. Above all it is stimulating and exciting. Engineering students are a cohesive group who work and play hard, win more than their share of sporting trophies, and have a reputation for flair and initiative. This too, is the essence of engineering. I congratulate you for joining us and I wish you well in your university life and professional career.

J. A. Raper.

Professor Judy Raper
Dean

2. Guide to Departments in the Faculty

The Faculty of Engineering

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Pro Dean
Professor John Robert Booker, AO, BSc PhD DEng, FAA

Associate Dean (Postgraduate and Research)
Associate Professor Kenny C S Kwok, BE PhD *Monash,* FIEAust

Associate Dean (Undergraduate)
Associate Professor Geoff W Barton BE PhD

Secretary to the Faculty and Finance Officer
Mr Michael Whitley, BA Hons *East Anglia* MCom *U.N.S.W.,* ASA CIA FCIS

Student Administration Staff
Postgraduate Adviser — Ms Josephine Harty, BA *Macq.*
Undergraduate Adviser — Mrs Anna Maria Brancato

Executive Assistant to the Dean
Ms Evangeline Chow, BA DipEd

Executive Officer, Engineering Advancement Office
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Marketing Manager
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Computer Engineer
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Industry Liason
Dr Maurice Barton, BSc Hons *Brighton C.O.T.* MSc *Oxon* PhD *Aston,* FAIM

Faculty Librarian
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The branches of engineering

Aeronautical Engineering

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Administrative Officer Ms Yvonne Witting

Aeronautical Engineering is the study of the mathematics, physics, computer science, material science and design philosophy that go into the analysis, design, manufacture and operation of aerospace vehicles.

Aeronautical engineers find a use for their skills in research, airline maintenance and operations, aerospace design and manufacturing, in both civil and military environments. There is also good demand for graduates with aeronautical skills outside the aerospace sector.

The department offers a four-year undergraduate programme leading to a Bachelor of Engineering (Aeronautical) degree. There is also the offer of a five-year combined degree with Science, Commerce or Arts.

The Department's teaching policy if to use a combination of lectures, tutorials, laboratory, projects and industrial work experience to provide a broad range of stimuli that will impart the knowledge and art of Aeronautical Engineering.

In the *junior* year, students study basic mathematics and all of the basic sciences including computer and aerospace science.
The *intermediate* year sees the strengthening of these concepts and also the introduction of aeronautical engineering courses such as flight mechanics and dynamics.

The senior year is the most important year of the programme, as the fundamentals of flight mechanics and dynamics, aircraft materials and structures, aerodynamics and aircraft design are presented.

In the senior advanced year, more advanced study is undertaken in flight dynamics and control, aerodynamics, aircraft structures, aircraft design and propulsion. A significant proportion of the year is devoted to a thesis project where each student undertakes in-depth research into a theoretical or practical project in aeronautics with the aid of a supervisor.

The four-year programme is regularly reviewed and is accredited by the Institution of Engineers, Australia. Our honours graduates who are interested in research take positions at recognised international universities, such as MIT, Oxford, Stanford and Imperial College.

The relatively small class sizes in the final two years make for an informal and friendly atmosphere. A student branch of the American Institute of Aeronautics and Astronautics (AIAA) operates in the Department, which together with the Royal Aeronautical Society, caters to the professional needs of the students. Our student society WINDSOC operates a varied social programme.

Chemical Engineering

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Chemical engineering is concerned with industrial processes in which material in bulk undergoes changes in its physical or chemical nature. Chemical engineers design, construct, operate and manage these processes and in this they are guided by economic and environmental considerations.

Industries employing chemical engineers are generally referred to as the process industries: examples of these are the large complexes at Botany in New South Wales and Altona in Victoria, and the petroleum refineries in all mainland States; other examples are the minerals processing industries that refine Australian ores such as bauxite, nickel sulphides and rutile to produce aluminium, nickel and titanium. In addition there are the traditional metallurgical industries, steel, copper, zinc, lead, etc., as well as general processing industries producing paper, cement, plastics, paints, glass, pharmaceuticals, alcohol and foodstuffs. Allied process operations are those involving waste disposal, pollution abatement, power production and nuclear technology.

Chemical engineering studies are based on chemistry, mathematics and physics and the first two are taken to some depth. The chemical engineer must learn something of the language and principles of mechanical, electrical, and civil engineering, and of administration, and industrial relations.

Each student completes a common core of courses, fundamental to the study of chemical engineering, and also takes a number of elective courses, chosen according to his or her particular field of interest from course options listed later. Three of these introduce students to some important industries in the process field.

Minerals Engineering. For students who are interested in gaining some familiarity with the minerals processing industries.

Biochemical Engineering. For those interested in biochemicalmethods of pollution control or in any of the biochemical industries such as pharmaceuticals, fermentation or food and dairy processing.

Reservoir Engineering. These courses deal with the properties and behaviour of petroleum and natural gas reservoirs, and the strategies used in their development.

Regardless of the option chosen, the graduate will be a fully qualified chemical engineer, well prepared for a career in any of the process industries.

The Department has a number of active exchange programmes with leading Departments overseas. The exchanges, with the Royal Institute of Technology, Stockholm, and the Ecole Nationale Superieure D'Ingenieurs de Genie Chimique in Toulouse, see five or six of our final year students completing their degrees at one of these Institutions each year, with similar numbers of their students finishing their courses in Sydney. There is also an exchange programme with Iowa State University which allows one or two of our students to spend their third year there. Each of these exchange schemes includes Industrial Experience in the host country. Some financial assistance is available to approved students.

The majority of chemical engineering graduates enter industry, taking up positions in plant operation, supervision, and eventually management. Others will be engaged in plant design, construction, and commissioning work either for a large process company or one of the specialist construction firms.

There is also scope for research and development work with industry or government organisations.

Chemical engineers are also recruited by many of the larger companies for technical service and sales. Graduates may also be able to obtain positions overseas either directly or through Australian companies with overseas associations.

Civil Engineering

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Head Professor John Philip Carter
Executive Assistant to Head of School
Ms Tmne Blair, BA *U.N.S.W.*

The title Civil Engineer is given to one who invents, contrives, designs and constructs for the benefit of the community. Civil engineering covers a wide range including the conception, design, construction and maintenance of those more permanent structures and services such as roads, railways, bridges, buildings, tunnels, airfields, water supply and sewerage systems, dams, pipelines, river improvements, harbours and irrigation systems. In the broader sense civil engineers are charged with the task of producing structures and systems that give the greatest amenity for the funds expended. They have therefore to optimise their schemes in terms of technological performance, impact upon the environment and the financial resources available.
Civil engineers find employment: in government authorities whose concern is the design, construction and maintenance of public services; with consultants whose main interest is the design of civil engineering works; with contractors who carry out the construction work; and in civil engineering industries which manufacture and supply materials, plant and equipment.

In the junior and intermediate years of the course, the student is given a grounding in mathematics and the sciences with an introduction to structural theory, design, construction, and the properties of materials.

In the senior year, basic courses are givenin structures, soil mechanics, surveying, hydraulics, structural design, construction, materials and practice of civil engineering.

In the senior advanced year, the basic courses of the senior year are continued with an additional course which requires the preparation of a thesis. Honours degree students must select courses at honours level from subjects such as: structures, soil mechanics, surveying, fluids, materials and steel and concrete structures. At honours level a more extensive thesis is required. A major segment of final year studies for pass degree students are options in structures, fluid mechanics, engineering management and geomechanics.

As civil engineering is a practical profession, attention is given to this aspect throughout the course. Full use is made of the laboratories with students carrying out experiments to obtain a better understanding of behaviour under practical conditions. There is extensive use of computers in design and other exercises. During the vacation between the senior and senior advanced years, every student must obtain practical experience in a civil engineering field and must submit a satisfactory report on this experience. During the senior advanced year, students attend a two-week camp for practical surveying experience and to apply surveying methods to a project. Seminars are also held and visits to works in progress are made as opportunities arise. Students are encouraged to take a close interest in current research and investigations.

Quality Assurance: For most subjects originating in the Department of Civil Engineering, independent Quality Assurance Auditors have been appointed. These auditors have no direct teaching involvement with the subjects for which they act and are responsible for maintaining an overview of each of these subjects through to the monitoring of results. As the auditors are changed more frequently than subject content, the names of current auditors, together with those of staff responsible for coordinating and running the subjects, are available from the Department's Office.

Electrical, Telecommunications and Computer Engineering

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Head Professor David J. Hill
Administrative Officer.....

The Department of Electrical Engineering offers students the opportunity to study engineering in an exciting, innovative and relevant environment. The field of Electrical, Telecommunications and Computer Engineering is one in which there has been a history of constant improvements, developments and innovations in existing technologies, coupled with the evolution of new technologies. The Department is closely linked to the engineering industry and the units of study are of a quality to ensure that our graduates are prepared for a changing profession as we approach and pass the year 2000.
The three degree courses offered by the Department of Electrical Engineering - Electrical Engineering, Telecommunications Engineering and Computer Engineering - are four year programs (for both Pass and Honours). They can, however, be taken as five year double degree programs with Arts, Science or Commerce. Students are also able to participate in exchange programs with universities in Sweden and the USA as part of their degree program.

The degree courses include emphasis on practical problem solving, the basic theory necessary to underpin the profession through the rapid changes being made, and professional practice. There are opportunities to make contacts iri industry, including a three months practical training in industry at the end of third year.

The Electrical Engineering degree is designed to be general and allows a student to concentrate in the later years on a variety of fields such as biomedical engineering, energy engineering and automatic control as well as telecommunications and computers or take a broad selection in several areas.

The Telecommunications Engineering degree offers specialisation in the third and fourth years in the subjects electronics and optics, computer systems, electromagnetics, signal and communication systems and telecommunications software. Extensive problem-solving computer based projects, and aspects of modern workplace management, are features of the program.

The Computer Engineering degree has a greater emphasis on computer science but the core program in the first two years is almost the same as the other two degrees. This degree specialises in the third and fourth years in advanced computer systems, computer networking and software engineering. A wide range of computer oriented electives including artificial intelligence and integrated circuit design are available. Features of the program include computer based tutorials, aspects of modern workplace management principles and the development of communication skills.

Electrical, Telecommunications and Computer engineers have a wide choice of career opportunities. Prospective employers include consulting engineering firms, State and local government, computer companies, financial companies, manufacturers, builders, and research institutions such as the CSIRO or universities. Like engineering itself, the possibilities are almost limitless.

Mechanical and Mechatronic Engineering

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Mechanical Engineering is a very broad branch of professional engineering and mechanical engineers are found in almost every type of engineering activity. They are involved in power generation, transportation systems for land, sea and air, pollution control, environmental protection and, biomedical engineering. They are found in a wide range of industries which manufacture machinery and consumer goods and offer research and technical services.

Mechanical engineers design machinery, engines, vehicles, agricultural and mining equipment, ships and household appliances. They are managers who run production lines, power stations and steel mills. They design and maintain coal conveyer systems, building services, oil and gas pipelines and port loading facilities. The great diversity of applications for mechanical engineers means they are much sought after in both commercial and industrial fields.

Students have the opportunity to complete the Bachelor of Mechanical Engineering in one of two different strands — Mechanical or Mechatronics.

Mechatronics combines mechanical engineering, electronics and computing. It is the enabling technology of computer-automated manufacturing through the use of robots and automated machine tools. Mechatronics may be concerned with individual machines such as robots, or manufacturing systems automated in their entirety.

Mechatronic engineers use computers and other digital systems to control industrial processes. They bring electronic, materials and mechanical sciences together to create a diverse range of products. These range from everyday products such as cameras, washing machines, photocopiers and anti-lock car brakes, to miniaturised substitutes for human organs and to powerful and precise computer-controlled machine tools used in manufacturing.

The first two years of undergraduate study in mechanical and mechatronic engineering provide students with an introduction to engineering science, design and manufacturing methods, management, computing and electronics, so that by the end of the intermediate year, a broad field has been covered.

In third year, mechanical engineering students study in more depth the hardware, materials and manufacturing processes which are at the heart of mechanical engineering. In addition to this, mechatronics students study topics such as control, digital systems and computer technology, electronics and electrical machines. Three months' practical training in industry follows third year for all students.
The final year of mechanical and mechatronic engineering allows students to develop the professional skills that they will need after graduation. Emphasis is placed on using engineering science, up-to-date technologies and professional tools to solve practical problems. Specialisation in the final year is encouraged. Areas of specialisation include: management, thermofluids, environmental engineering, computational fluid dynamics, design, rheology, advanced materials, orthopaedic/biomedical engineering and mechatronics.

Project Engineering and Management (Civil)

The degree pm gram will be offered when resources to do so become available. As at December 1997 the following description is for information only.

Recent years have seen the dawn of a new era in both the national and international scene. On the one hand there is a perceptible trend to 'globalisation' of engineering and construction businesses. On the other, engineer-constructors and project managers are required to act as forerunners in the export drive.

The onset of the twenty-first century will demand managers with technical skills to act as entrepreneurs. The competitive market forces in the construction and engineering industries will require engineers and contractors to seek alternative ways to secure business, remain viable and experience sustained growth. This demand translates into a need for a class of engineer who can synthesise projects, analyse their impacts and act as the catalyst in their implementation.

Project engineering and management embraces the 'engineering' of all types of projects, from conception and feasibility studies through to construction and commissioning, albeit at the strategic level and through multidisciplinary teamwork. The project engineer-manager is the specialist in project processes and systems, a significant role in a society becoming increasingly dependent on the creation and managementof projects to solve its economic, environmental and social problems.

The degree program responds to the need for technologically competent people with financial, organisational and managerial skills to take the lead in Australia's future engineering and technological projects.

The course is virtually identical to the present Civil Engineering curriculum in the first year. In the second year, courses are introduced in such areas as engineering economics, engineering accounting as well as engineering construction. In the third and fourth years subjects such as network planning, contracts formulation and administration, human and industrial relations, operations research, cost engineering and estimating project formulation, value engineering and risk analysis are included.

In addition, up to 20% of all the courses taken will be electives. These are to encourage students to follow their own interests and aspirations, and at the same time expose them to as wide a variety of subjects as possible in order to prepare them as team leaders and communicators.

Graduates will be able to conceptualise, analyse and plan a range of technologies for construction and operation of engineering projects. As agents of advanced technology the graduates will be able to appreciate the human side of projects and processes. Their training will give them a better understanding of individual and group behaviour, organisational concepts, state-of-the-art planning, goal setting and other managerial know-how. In addition, they will possess project management skills that will encompass techniques for achieving project goals.

Money is the life blood of industry, and engineering is a subset of business and industrial activities. Project engineering graduates will find it intellectually rewarding to initiate projects and/or take part in the economic and monetary processes under which projects are created and executed. They will appreciate the world of finance and the intricate ways under which projects are initiated by the private and public sectors of the economy. They will also be competent enough to conduct economic appraisal of proposals, evaluate risks, undertake valuation and depreciation analyses, formulate feasible plans for project funding, and generally sell the proposal to others.

Graduates will have the capability to respond to most challenges in a resourcefulmanner, virtually from the day of graduation. They will be self-starters, communicators, adaptors, performers.

Employment opportunities for such a group is as diverse as the field of project engineering and construction management itself. As an example, the following organisations will typically find the prospective graduate a valuable asset:

- Construction companies
- Project managers/major consulting engineers/planners
- Government and public agencies/municipalities and shires
- Property developers/owners/major clients
- Industrial and mining corporations
- Management consultants/investment analysts
- Development and industrial banks.

3. Undergraduate Units of Study Descriptions

Information

Units of Study are subject to alteration

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

On the following pages details of the units of study are provided in a form which is convenient for reference. Every care has been taken to ensure that the information given is complete and accurate. However, updates are constantly ongoing and therefore variations may be made from time to time. These will be announced by the lecturer or posted on the relevant noticeboards. It is the responsibility of students, by attendance at lectures and frequent inspection of the noticeboards, to ensure that they have the latest information on any unit of study.

Textbooks

Changes sometimes occur in the selection of prescribed textbooks, or reference books, owing to supply difficulties, or the publication of new and more suitable works. Such changes will be announced by lecturers and it is prudent to check with the relevant lecturer before buying the books you expect to need.

Elective units of study in other faculties

There is provision for students to apply to the Faculty of Engineering for special permission to take any other units of study which are available in other degree programs towards their BE degrees (e g. Computer Science 3, Economics 2, etc.). Any unit of study which is not listed in the Tables of Units of Study or in the list of recommended elective units of study in this handbook is referred to as a 'non-listed' unit of study by the Faculty.

If you have a strong interest in taking a particular 'non-listed' unit of study, you should consult the relevant faculty handbook for details about it. You will also need to check whether or not there is a quota for this unit of study or any special assumed knowledge/prerequisite. You will also need to ensure that the unit of study creates no timetable clash with Engineering requirements.

If you decide that you wish to enrol in a 'non-listed' unit of study, you will need to apply for special permission to do so. Please ask to see the Chair of the Committee for Undergraduate Studies or the Faculty's Undergraduate Coordinator at enrolment time for application procedure.

Unit of Study Numbering System

The units of study available for the degree are designated Junior (First Year), Intermediate (Second Year), Senior (Third Year), Senior Advanced or Honours (Fourth Year). These names indicate the year of attendance in which the unit of study becomes available to you if you are making normal progress.

Unit of study numbers

Each unit of study has a unique code and number, comprising 4 letters followed by 4 numbers (EXAMPLE: MECH 2200). Each unit of study also has a unique and much longer numerical code allocated to it by the University for administrative purposes, however for the majority of student requirements (eg enrolment) this will not be necessary.

The first 4 letters (eg MECH, AERO) indicate the Department which teaches the unit of study. The first number of the set of 4 numbers following indicates the year of study.

EXAMPLE: MECH 2200

This is a unit of study taught by the Department of Mechanical and Mechatronic Engineering and is normally offered to Second Year (Intermediate) students.

Units of Study offered by other Faculties

Some units of study are offered by other Faculties (for example, Maths, Physics and Chemistry are offered by the Faculty of Science). Refer to the relevant degree table for a listing of all units (including prerequisite and corequisite information), and to the respective handbook for full unit description.

Aeronautical Engineering

AERO 1600 Workshop Technology

4 credit points

***May not be counted with/Additional Information: MECH** 1600*
***When Offered:** March Semester*
***Classes:** (1 lec, one 3hr lab)Avk*
***Assessment:** Assignments, practical work*

Junior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the fundamentals of vehicle manufacture, construction, servicing and repair. Students will develop skills working with machine tools and hand tools.

Syllabus summary: Fitting - measurement, measuring tools, marking tools, holding tools, hammers, cutting tool materials, cutting tool shapes, the machine tools: lathe, mill, grinder, drill, shaper, deburring and finishing operations.

Welding - Welding processes, distortions, flame cutting, resistance welding. Problems of welding aircraft materials.

Heat treatment - Definition and importance of heat treatment, forging, normalising, hardening, case hardening, stress relief.

Fasteners - Types of fasteners for aircraft, riveted, bolted, bonded, locking of fasteners.

Maintenance - Requirements for various aircraft components, engine overhaul, component life, lubrication, patches and repairs, serviceability of components.

Textbooks:

Library classification: 671

Reference book: Cutler Understanding Aircraft Structures (BSP Professional, 1988)

AERO 1900 Introductory Aeronautics

4 credit points

Classes: (2 lec, one 2hr tutAab)Avk
***Assessment:** Exam (50%), assignments (50%)*

Junior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the role of aeronautical engineers within industry along with the overlying fundamentals of aerospace vehicle design, analysis performance and operation. Students will develop skills in working in groups, communication and presentation of information, solving aeronautical based problems

Syllabus summary: Classification of aircraft, fixed wing, rotary wing, aerostats, surface effect vehicles, rockets. Glossary of terms for aircraft and their components. Brief introduction to aerodynamics, aircraft performance, dynamics of flight, airframe structures, materials and propulsion systems. The operating characteristics of modern aircraft, their uses and limitations. Modern developments in aviation. Future trends, aerospace planes, super-widebody aircraft, orbital vehicles.

Textbooks:
Reference books:

Jane's All the World's Aircraft (Annual)

Stinton The Anatomy of the Aeroplane (Collins, 1985)

AERO 2200 Introductory Aerodynamics

4 credit points

Prerequisite: *12 Credit Points of Junior Math*
May not be counted with/Additional Information: *MECH 2200, MECH2201, MECH 2500*
When Offered: *July semester*
Classes: *(1 lec, one 3hr lab)/wk*
Assessment: *assignments, practical work.*

Intermediate core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the fundamentals of fluid dynamics and its application to aircraft and related components. Students will develop a competency in tackling fluid flow problems and producing solutions for engineering applications.

Syllabus summary: Properties of fluids and gases; measurement and prediction of gas properties and behaviour; temperature, density, pressure, viscosity, speed of sound. Perfect gas laws. Definition of Newtonian fluid, non-Newtonian fluid, continuum and rarefied flows.

Fluid behaviour, governing equations, controlling non-dimensional parameters, Reynolds number, Mach number, Froude number, Weber number, Knudsen number.

Fluid statics. Governing hydrostatic equation; buoyancy; stability of floating bodies. Pressure measuring devices; barometers; manometers. Properties of the Earth's atmosphere.

Fluid dynamics. Governing conservation of mass, momentum and energy equations; continuity, Bernoulli and Euler equations. Applications in flow rate and velocity measuring devices; venturi; pitot-static tube; orifice plate. Velocity potential equation for flow modelling; internal and external flows; prediction of surface pressure distribution; production of forces by fluid; vorticity and circulation. Definition of non-dimensional force coefficients; lift, drag and pitching moment coefficients.

Introduction to viscosity and compressibility effects. Boundary layer flows; laminar and turbulent layers; skin friction coefficient; flow separation; pressure and friction drag. Supersonic flow; production of shock waves; normal and oblique shocks; shock wave tables.

Textbooks:
Reference books:

Streeter and Wylie Fluid Mechanics (McGraw-Hill 1981)

Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold, 1988)

Ower and Pankhurst The Measurement of Airflow (Pergamon, 1977)

AERO 2300 Mechanics of Solids 1

4 credit points

Prerequisite: *MATH 101F, MATH 102S*
When Offered: *July semester*
Classes: *(1 lec, one 3hr lab)Avk*
Assessment: *2hrexam and course assignments*

Intermediate core course for the degree in Aeronautical and Mechanical Engineering.

Intermediate elective course for the degree in Mechatronic and Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the fundamentals of structural analysis and its application to the general field of engineering. Students will develop the ability to tackle typical structural problems and produce solutions for applications in aeronautical, mechanical and mining engineering.

Syllabus summary: Concepts of equilibrium, compatibility, stress and strain; study of internal stress systems due to tension, bending, torsion and shear; statically determinate and indeterminate structural elements; concepts of energy methods, displacement analysis; simple buckling. Problem based applications in aerospace, mechanical, mining engineering.

Textbooks:
Fenner Mechanics of Solids (Blackwell Scientific Publication, 1989)

Library classification: 620.11

AERO 2500 Introductory Flight Mechanics and Performance

4 credit points

Prerequisite: *MATH 101F, 102S*
Wlien Offered: *March semester*
Classes: *(3 lec, one lhr tutA.ab)/wk*
Assessment: *2hr exam, assignments*

Intermediate core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the concepts of the mechanics of flight including fundamentals of aircraft performance, stability and control. Students will learn the basic concepts and be introduced to the mathematical tools used for prediction of aircraft flight mechanics.

Syllabus summary: Introduction to aircraft performance. General performance; steady level flight; balance of forces; take-off; climb; cruise; landing performance. Range calculations. Manoeuvre performance.

Origin of symmetric forces and moments. Static and manoeuvring longitudinal stability, equilibrium and control of rigid aircraft. Aerodynamic load effects of wings, stabilisers, fuselages and powerplants. Trailing edge aerodynamic controls.

Trimmed equilibrium condition; effects on performance and static stability of trim. Static margin. Effect on static stability of free and reversible controls.

Textbooks:
Reference books:

McCormick Aerodynamics, ,Aeronautics and Flight Mechanics (Wiley, 1979)

Hale Aircraft Performance, Selection and Design (Wiley, 1987)

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskam Airplane Flight Dynamics and Automatic Flight Controls (RoskamA&EC, 1979)

Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989)

AERO 2800 Aeronautical Engineering Computing

4 credit points

When Offered: *July Semester*
Classes: *(1 lec, one 3hr lab)Avk*
Assessment: *2hr exam (50%), assignments(50%)*

Intermediate core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the use of the computer as a tool for solution of problems in the field of aeronautical engineering. Students will develop skills in applying computer software algorithms to problems in this field. Students will learn the usefulness and applicability of many currently available software packages.

Syllabus summary: Application of numerical solution techniques to solve problems in engineering. Matrix formats; sparsity; bandwidth; symmetry. Matrix manipulation; multiplication; inversion; reduction. Solution of linear simultaneous equations. Calculation of Eigenvalues and Eigenvectors. Discrete Fourier transforms. Procedures for iteration; numerical integration and differentiation.

The storage of data in efficient file or memory structures. Data retrieval; sorting; collation; statistical analysis. The generation and use of random numbers.

Use and evaluation of software packages. Wordprocessors; databases; spreadsheets; mathematical symbolic manipulation; CAD/CAM; graph plotting; engineering analysis. Definitions for user-friendly interfaces; GUI's; data format requirements.

Use of the Internet as an aeronautical research tool; email; WWW; network etiquette.

Textbooks:
Reference books:

Press et al Numerical Recipes, the Art of Scientific Computing (Cambridge Press, 1986)

The Student Edition of MATLAB (Prentice-Hall, 1992)

AERO 3200 Aerodynamics 1

4.0 credit points

Prerequisite: *AERO 2200*
Wlien Offered: *March semester*
Classes: (3 lec, one lhr tut/lab)Avk
Assessment: 2hr exam(75%), assignments/lab reports(25%)

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the fundamental equations governing aerodynamics and their application to aeronautical problems. Students will gain skills in problem solving in area of fluid mechanics.

Syllabus summary: Basic equations governing aerodynamics; continuity; conservation of mass and momentum; Bernoulli, Euler and Navier-Stokes equations. Application to fluid mechanics; forces on objects in a moving fluid; pressure distribution; effects of Reynolds and Mach number. Vorticity, circulation and the production of lift; Kutta-Joukowski Law. Modelling of solid bodies in potential flow; solutions for two and three dimensional shapes; Biot-Savart Law.

Aerodynamic loading on aerofoil sections, wings, fuselages and other aircraft components. Effects on aircraft performance. Performance optimisation using
energy methods; excess power and specific energy calculations.

Textbooks:
Reference books:

McCormick Aerodynamics,, Aeronautics and Flight Mechanics (Wiley, 1979)

Streeter and Wylie Fluid Mechanics (McGraw-Hill 1981)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

Dommasch Airplane Aerodynamics (Pitman)

Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Abbott and Von Doenhoff Theory of Wing Sections (Dover 1959)

AERO 3250 Aerodynamics 2

4 credit points

Prerequisite: *AERO 2200*
When Offered: *July semester*
Classes: *(3 lec, one lhr tutAab)Avk*
Assessment: *2hr exam(75%), assignments/lab reports(25%)*

Senior core course for the degree in Aeronautical Engineering

Obj ectives/Outcomes: To develop an understanding of the fundamental equations governing aerodynamics and their application to aeronautical problems. Students will gain skills in problem solving in area of wing theory, boundary layers and gas dynamics.

Syllabus summary: Basic gas dynamics; steady one-dimensional flow including friction and heat transfer; shock waves. Introduction to steady two-dimensional supersonic flow.

Viscous effects; introduction to boundary layer theory; heat transfer and skin friction. Prediction of aerodynamic drag.
Classical two-dimensional aerofoil theories; Joukowskimapping; thin aerofoil theory. Classical three-dimensional wing theory; lifting-line; lifting surface theory. Calculation and use of aerodynamic derivatives; aerodynamics of control surfaces.

Textbooks:
Reference books:

McCormickAerodynamics, Aeronautics and Flight Mechanics (Wiley, 1979)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

Dommasch Airplane Aerodynamics (Pitman)

Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Liepmann and Roshko Elements of Gas Dynamics (Wiley 1957)

Schlichting Boundary Layer Theory (McGraw Hill, 1960)

AERO 3300 Aircraft Structures 1

4 credit points

Prerequisite: *AERO 2300*
When Offered: *March semester*
Classes: *(3 lec, one lhr tut/lab)/wk*
Assessment: *2hrexam, assignmentsAab reports*

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the fundamentals of structural strength estimation. Students will gain skills in problem solving in the area of aircraft structural analysis.

Syllabus summary: Solid mechanics; stress and strain; linear elasticity; strain energy. Plane stress systems. Elastic vibration and buckling.

Structural analysis; airframe structures. Loads and reactions in airframes. Analysis of multi-cell box beams and tubes. Analysis of rings.

Textbooks:
Reference books:

Timoshenko Strength of Materials, Part I and II (Van Nostrand)

Langtiaar Energy methods in Applied Mechanics (Wiley)

Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

Megson Aircraft Structures for Engineering Students (Edward Arnold, 1972)

Library Classification:

620.11, 628.13, 629.13, 630.1

AERO 3350 Aircraft Structures 2

4 credit points

Prerequisite: *AERO 2300*
WJien Offered: *July semester*
Classes: *(3 lec, one lhr tut/lab)Avk*
Assessment: *2hr exam, assignmentsAab reports*

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: lb develop an understanding of the fundamentals of structural strength estimation. Students will gain skills in problem solving in the area of aircraft structural analysis.

Syllabus summary: Solid mechanics; thermal stresses and plasticity; applications in plane stress systems.

Structural analysis; elementary analysis of plates and stiffened panels and shells. Analysis of complex frameworks; introduction to displacement methods of analysis.

Textbooks:
Reference books:

Drucker Introduction to the Mechanics of Deformable Bodies (McGraw-Hill)

Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

Library Classification:

620.11, 629.13, 630.1

AERO 3400 Aircra ft Design 1

4 credit points

Prerequisite: *MECH 2400*
Wlien Offered: *March semester*
Classes: *(1 lec, one 3hr tut)Avk*
Assessment: *exam, tut assignments, major and minor design projects.*

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the procedures for design. Students will gain skills in designing aircraft components.

Syllabus summary: Introduction to design; the process of aircraft design; safety and its implications; component design; structural analysis.

Textbooks:
Reference books:

Svennson Introduction to Engineering Design (UNSW Press,1981)

Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

AERO 3450 Aircraft Design 2

4 credit points

Prerequisite: *MECH 2400*
WJien Offered: *July semester*
Classes: *(1 lec, one 3hr tut)Avk*
Assessment: *Exam, tut assignments, major and minor design projects.*

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the procedures for design. Students will gain skills in designing aircraft components.
Syllabus summary: Optimisation; design for manufacture; joints and fasteners; vibration; fatigue; human factors, the art of design; social responsibilities.

Textbooks:
Reference books:

Svennson Introduction to Engineering Design (UNSW Press,1981)

Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

AERO 3500 Flight Mechanics 1

4 credit points

Prerequisite: *AERO 2500*
Classes: *(3 lec, one lhr tutAab)Avk*
Assessment: *exam, assignments.*

Senior core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of dynamic behaviour of aircraft in flight. Students will gain skills in problem solving in the area of flight vehicle motion.

Syllabus summary: Axis systems for the description of aircraft motion. Axis transformations. The general equations of flight vehicle motion.

State-Space forms of the longitudinal and lateral-directional equations of aircraft motion. Nonlinear differential equations. Trim and perturbation equations. Linearisation about trim conditions. Linearised equations of longitudinal and lateral-directional motion.

Laplace transforms and their application o aeronautical dynamic system analysis. Eigenvalues and eigenvectors and their relation to the stability and behaviour of aeronautical systems.

Static lateral-directional equilibrium and stability. Introduction to lateral-directional control.

Linear approximation of aerodynamic derivatives and the influence of aircraft components on stability derivatives.

Longitudinal and lateral-directional dynamic stability. Frequency domain dynamic stability analysis. Time domain analysis and solutions for the flight path of a rigid body aircraft; response to control inputs.

Textbooks:
Reference books:

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskam Airplane Flight Dynamics and Automatic Flight Controls (RoskamA&EC, 1979)

Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989)

AERO 3501 Flying Operations

2 credit points

Prerequisite: *AERO 2500, AERO 2200*
Classes: *Part-week course held mid-semester vacation*
Assessment: *[attendance]*

Senior elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop a hands on feel of the dynamic behaviour of aircraft in flight. Students will gain skills in flying, navigation and aircraft operating procedures.

Syllabus summary: Flying instruction covering: level flight; turns; stall; take-off; landing; circuits; night flying; navigation, both visual and using instruments; emergency procedures and safety.

AERO 3550 Flight Mechanics 1

4 credit points

Prerequisite: *AERO 2500*
When Offered: *July Semester*
Classes: ***4*** *lecturesAvkwith associated tutorials*
Assessment: *Written exam at end of sent and course assignments*

Senior core course for the degree in Aeronautical Engineering.

Syllabus summary: Axis systems for the description of aircraftmotion. Axis transformations. The general equations of flight vehicle motion.

State-space forms of the longitudinal and lateral-directional equations of aircraft motion. Nonlinear differential equations. Trim and perturbation equations. Linearisation about trim conditions. Linearised equations of longitudinal and lateral-directional motion.

Laplace transforms and their application to aeronautical dynamic system analysis. Eigenvalues and eigenvectors and their relation to the stability and behaviour of aeronautical systems.

Static lateral-directional equilibrium and stability. Introduction to lateral-directional control.

Linear approximation of aerodynamic derivatives and the influence of aircraft components on stability derivatives.

Longitudinal and lateral-directional dynamic stability. Frequency domain dynamic stability analysis. Time domain analysis and solutions for the flight path of a rigid-body aircraft; response to control inputs.

Textbooks:
Reference books:

Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989)

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskem Airplane Flight Dynamics and Automatic Flight Controls (RoskamA&EC, 1979)

AERO 3600 Aviation Technology

4 credit points

Classes: *(one 2hr lec, one 2hr tut/l.ab)/wk*
Assessment: *exam(50%), assignments(50%).*

Senior elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the background processes that are required for the design, manufacture and operation of aircraft. Students will gain skills in aerospace component manufacture, design, testing and operation.

Syllabus summary: Survey of current practice in aviation measurement and instrumentation. Introduction to pressure, force, velocity and displacement transducers; accelerometers; anemometers; temperature sensors and strain gauges. Use of computer data acquisition systems; signal processing; filtering; A/D conversion. Digital data formats; storage requirements and accuracy limitations. Signalpostprocessing; mean ; standard deviation; analysis using FFT's; random decrement. Calibration of sensors.

Manufacturing processes; automated machining; techniques for manufacture of non-metal components; manufacture using composite materials; properties of sealants and adhesives. Fasteners. Introduction to CAD and NC machining.

Aeronautical material and hardware standards. Civil aviation regulations and airworthiness directives. Aircraft weight and balance control. In-service structural integrity checking. Systems standards.

Textbooks:
Reference books:

CASA Civil Aviation Orders, parts 100 to 103.

Cutler Understanding Aircraft Structures (PSP professional, 1988)

AERO 3601 Aviation Operation and Management

3 credit points

Wlien Offered: *July semester*
Classes: *(one 3hr lec/tut)Avk. This course is given by visiting lecturers who are currently associated with the aerospace industry. The availability of the course is not guaranteed each year.*
Assessment: *assignments.*

Senior elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the current state of aerospace manufacturing for the Australian aviation industry. Students will gain skills in aerospace engineering management.
Syllabus summary: Principles and practice of aviation and airline management. Discussion and analysis of airline operations. Flight safety and airworthiness standards.

Textbooks:
Reference books:

To be advised by the Lecturer.

AERO 4200 Aerodynamics 3

3 credit points

Prerequisite: *AERO 3250*
When Offered: *March Semester*
Classes: (2 lec, one lhr tut/lab)/wk
Assessment: *2hr exam(50%), assignmentsAab reports(50%)*

Senior Advanced core course for the degree in Aeronautical Engineering
Objectives/Outcomes: To develop an understanding of modern applications of aerodynamic theory. Students will gain skills in problem solving using state of the art methods for air and fluid flows.

Syllabus summary: Panel method techniques for the solution of inviscid two and three dimensional flows. Vortex lattice; doublette/vortex panel methods. Linearised compressibility corrections. Modelling of complete aircraft configuration.

Aerofoil section boundary layer theory; pressure gradient effects; transition from laminar to turbulent flow; laminar separation bubbles; stalled flow. Calculation of aerofoil drag using viscous/inviscid flow interaction.

Investigation of aerofoil and wing behaviour in the wind tunnel. Application of wind tunnel corrections. The effect of aspect ratio and wing sweep. Effect on wing loading of control surfaces; fuselage; tailplane. Estimate of downwash effects.

Steady two-dimensional supersonic flow; shock waves; normal and oblique; method of characteristics. Two-dimensional supersonic aerofoils. Introduction to three-dimensional effects.

Textbooks:
Reference books:

McCormick Aerodynamics, .Aeronautics and Flight Mechanics (Wiley, 1979)

Pankhurst and Holder Wind Tunnel Technique (Wiley)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

Abbott and Von Doenhoff Theory of Wing Sections (Dover 1959)

Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Anderson Fundamentals of Aerodynamics (McGraw-Hill, 1986)

Thompson Compressible Fluid Dynamics (McGraw-Hill)

AERO 4201 Propulsion

4 credit points

Prerequisite: *MECH **3201***
When Offered: *March Semester*
Classes: *(3 lec, one lhr tut/lab)/wk*
Assessment: *2hr exam(50%), assignmentsAab reports(50%)*

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the modern techniques used for aircraft propulsion. Students will gain skills in problem solving for aircraft propulsion systems ranging from propellers, gas-turbine engines to rockets.

Syllabus summary: Propulsion unit requirements subsonic and supersonic flight; thrust components, efficiencies, additive drag of intakes. Piston engine components and operation. Propeller theory. Operation, components and cycle analysis of gas turbine engines; turbojets; turbofans; turboprops; ramjets. Components: compressor; fan; burner; turbine; nozzle. Efficiency of components; off-design considerations. Operation, components and thermodynamics of rocket motors. Dynamics of rocket flight; orbital velocity; staging. Future directions; minimisation of noise and pollution; sub-orbital propulsion systems; scram-jets; hybrid engines.

Textbooks:
Reference books:

McCormick Aerodynamics,, Aeronautics and Flight Mechanics (Wiley, 1979)

Glauert The Elements of Aerofoil and Airscrew Theory (C.U.P.)

Kerrebrock Aircraft Engines and Gas Turbines (MIT Press, 1977)

Archer and Salazsy Introduction to Propulsion (Prentice-Hall 1996)

AERO 4250 Aerodynamics 4

3 credit points

Prerequisite: *AERO 3250*
Wlien Offered: *July semester*
Classes: (2 lec, one lhr tutAab)Avk
Assessment: *2hr exam(25%), assignments/lab reports(75%)*

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of modern applications of aerodynamic theory. Students will gain skills in problem solving using state of the art methods for air and fluid flows.
Syllabus summary: Unsteady supersonic one-dimensional flow. Hypersonic flow; real gas effects.

Introduction to the use of CFD for transonic flow.

Solution of internal and external problems in aerodynamics using finite element methods. Direct simulation method (DSMC); rarefied flow; near-continuum solutions.

Textbooks:
Reference books:

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979.)

Anderson Fundamentals of Aerodynamics (McGraw-Hill, 1986)

Thompson Compressible Fluid Dynamics (McGraw-Hill)

John Gas Dynamics (Allyn and Bacon, 1984)

Bird Rarefied Gas Dynamics 2nd Ed (Oxford UP, 1995)

AERO 4290 Rotary Wing Aerodynamics

4 credit points

Prerequisite: *AERO 3250*
Wlien Offered: *March Semester*
Classes: *(3 lec, one lhr tutAab)Avk*
Assessment: *course assignments and a written examination*

Senior Advanced elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the theory of flight, design and analysis of helicopters, autogyros and other rotary wing aircraft. Students will gain an appreciation of the extra difficulties involved when the vehicle flow is cyclic in nature.

Syllabus summary: Introduction to rotary wing aircraft; vertical flight performance; forward flight performance; blade motion and control; dynamics of rotors; rotorcraft stability; rotor blade design.

Textbooks:
Reference books:

Bramwell Helicopter Dynamics (Arnold)

Gessow and Myers Aerodynamics of the Helicopter (Mcmillan)

AERO 4291 Advanced Computational Aerodynamics

3 credit points

Prerequisite: *AERO 3250*
Wlien Offered: *July Semester*
Classes: *(2 lec, one lhr tutAab)/wk*
Assessment: *course assignments*

Senior Advanced elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop a specialist knowledge in the field of Compational Fluid Dynamics including an appreciation of the coding of Aerodynamics problems using these computer analysis systems.

Syllabus summary: Explicit methods; implicit finite difference and finite volume methods. Extensions to the basic method to capture shock wave effects. Computation of one and two dimensional flows. Benchmarking of computationalresults against known flow solutions.

Textbooks:
Reference books:

CAJ Fletcher Computational Techniques for Fluid Dynamics Vol 1 and 2 (Springer-Verlag,1992)

AERO 4292 Aeroelasticity

3 credit points

Prerequisite: *AERO 3250*
Wlien Offered: *July Semester*
Classes: *(2 lec, one lhr tutAab)Avk*
Assessment: *course assignments*

Senior Advanced elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop a specialist knowledge in the field of unsteady aerodynamics. The develop familiarity with the techniques for predicting airflow/structure interactions for high speed vehicles.

Syllabus summary: Advanced two and three dimensional panel method techniques; calculation of oscillatory flow results; prediction of aerodynamic derivatives. Pressure distributions for complete aircraft configuration. Unsteady subsonic flow analysis of aircraft; calculation of structural modes. Structural response to gusts; aeroelasticity; flutter and divergence.

Textbooks:
Reference books:

Abbott and Von Doenhoff Theory of Wing Sections. (Dover,1959)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall, 1979)

Fung An Introduction to Theory of Elasticity (Dover, 1969)

AERO 4300 Aircraft Structures 3

4 credit points

Prerequisite: *AERO 3350*
May not be counted with/Additional Information: *AERO 4301 Applied Numerical Stress Analysis*
When Offered: *March semester*
Classes: *(3 lec, one lhr tutAab)Avk*
Assessment: *2hr exam, assignmentsAab reports*

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of modern techniques for the estimation of structural strength. Students will gain skills in problem solving using state of the art methods in aircraft structural analysis.

Syllabus summary: Finite element method analysis of problems in structural behaviour; elastic; static; dynamic; thermal effects; transient; non-linear. Modelling structures using one, two and three dimensional elements.

Textbooks:
Reference books:

Brush and Almroth Buckling of Bars, Plates and Shells (McGraw-Hill)

Cook Concepts and Applications of Finite Element Analysis (Wiley, 1981)

Cox Design of Structures of Least Weight (Pergamon, 1965)

Heubner The Finite Element Method for Engineers (Wiley Interscience)

Madag Metal Fatigue: Theory and Design (Wiley)

Roark Formulae for Stress and Strain (McGraw-Hill-Kogakusha)

Stanley Strength Analysis of Aircraft Structures (Dover)

Timoshenko and Woinowsky-Kreiger Theory of Plates and Shells (McGraw-Hill-Kohgakusha)

Washizu Variational Methods in Elasticity and Plasticity (Pergamon)

Zienkiewicz The Finite Element Method in Engineering (McGraw-Hill)

Library Classification:

620, 620.11, 624.17

AERO 4301 Applied Numerical Stress Analysis

6 credit points

Prerequisite: *MECH 3310 Mechanics of Solids 2.*
May not be counted witlilAdditional Information: *AERO 4300 Aircraft Structures 3*
Classes: *2 lec/wk plus prac classes*
Assessment: *one 2hr exam. Class work is assessed*

Senior Advanced elective unit of study.

Syllabus summary: The finite element method. Philosophy. Matrix algebra. Matrix analysis of structures. Generalisation of the finite element method in elasticity for static, dynamic and thermal analysis. Rod elements. Beams. Triangular elements for plane stress. Natural coordinate systems. Introduction to plate and shell theory. Theories and analysis in structural stability. Three dimensional elements. Modelling strategies. Isoparametric elements, accuracy and convergence. Applications of finite element modelling in solid mechanics. Practical modelling of real structures will be done; a 'hands-on' approach will be taken.

Textbooks:
Reference book

Cook Concepts and Applications of Finite Element Analysis (Wiley, 1989)

AERO 4350 Aircraft Structures 4

4 credit points

Prerequisite: *AERO 3350*
May not be counted witlt/Additional Information: *AERO 4301 Applied Numerical Stress Analysis*
WJien Offered: *July Semester*
Classes: *(3 lec, one lhr tutAab)Avk*
Assessment: *2hr exam, assignments/lab reports*

SeniorAdvanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of modern techniques for the estimation of structural strength. Students will gain skills in problem solving using state of the art methods in aircraft structural analysis.

Syllabus summary: Plates and shells. Optimum structures. Buckling of Bars, plates and shells; imperfection sensitivity. Structural dynamics. Structural fatigue; principles and practice.

Textbooks:
Reference books:

Brush and Almroth Buckling of Bars, Plates and Shells (McGraw-Hill)

Cook Concepts and Applications of Finite Element Analysis (Wiley, 1981)

Cox Design of Structures of Least Weight (Pergamon, 1965)

Heubner The Finite Element Method for Engineers (Wiley Interscience)

Madag Metal Fatigue: Theory and Design (Wiley)

Roark Formulae for Stress and Strain (McGraw-Hill-Kogakusha)

Stanley Strength Analysis of Aircraft Structures (Dover)

Timoshenko and Woinowsky-Kreiger Theory of Plates and Shells (McGraw-Hill-Kohgakusha)

Washizu Variational Methods in Elasticity and Plasticity (Pergamon)

Zienkiewicz The Finite Element Method in Engineering (McGraw-Hill)

Library Classification:

620,620.11,624.17

AERO 4400 Aircraft Design 3

6 credit points

Prerequisite: *AERO 3450*
When Offered: *March semester*
Classes: *(1 lec, one 3hr design class)Avk*
Assessment: *Design projects.*

SeniorAdvanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the application of design to the modern aerospace industry. Students will gain an overview of how to manage a design team and will also gain skills in carrying out detailed design problems.

Syllabus summary: Design requirements. Sourses of information for aircraft design. Configuration design: performance, weight and balance, propulsion. Aerodynamic design: lift, drag and control. Structural design: loads, materials. Philosophies of design and analysis.

System design: requirements and specification. System design procedures, systems integration.

Textbooks:
Reference books:

Torenbeek Synthesis of Subsonic Airplane Design (Delft UP)

Roskam Airplane Design (Roskam A&EC)

AERO 4490 Advanced Aircraft Design

4 credit points

Prerequisite: AERO 3450
Classes: *(one 3hr design class)Avk*
Assessment: *Design projects.*

Senior Advanced elective course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the application of design to the modern aerospace industry. Students will gain an overview of how to manage a design team and will also gain skills in carrying out detailed design problems.

Syllabus summary: Advanced designmethods. Methods of processing information for aircraft design. Detailed configuration design: performance, weight and balance, propulsion. Aerodynamic design: lift, drag and control. Advanced structural design: loads, materials. Weight estimation and fulfilling of regulatory requirements.

Advanced system design: modern aircraft requirements and specification. Glass cockpit design, systems integration and validation.

Textbooks:
Reference books:

Torenbeek Synthesis of Subsonic Airplane Design (Delft UP)

Roskam Airplane Design (Roskam A&EC)

AERO 4500 Flight Mechanics 2

6 credit points

Prerequisite: *AERO 3500*
Wlien Offered: *March Semester*
Classes: *(4 lec, 1 tut)Avk*
Assessment: *see Dept*

Senior Advanced Core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the application of flight mechanics to modern aircraft systems. Students will gain skills in problem solving in the areas of dynamic aircraft behaviour, control systems and aircraft handling.

Syllabus summary: Sources of flight dynamic modelling data.

Dynamic systems analysis techniques. Modelling and analysis of aircraft dynamic motions. Effects of inertial coupling between longitudinal and lateral-directional degrees of freedom. Gyroscopic motion.

Aircraft response to deterministic and stochastic inputs. Extended aircraft models. Sources of stochastic inputs and their characteristics.

Mechanics and models of aircraft control systems, sensors, components and devices. Motion measurement, signal analysis and conditioning.

Applications of closed loop control; modification of aircraft dynamic characteristics, stability and handling; guidance, manoeuvre control and navigation. Reference input signal characteristics and design. Transient response to control inputs.

Transfer functions for complete aircraft and control systems; stability and response characteristics of the closed loop system. Aircraft handling qualities description, specification and modification.

Textbooks:
Reference books:

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskam Airplane Flight Dynamics and Automatic Flight Controls (Roskam A&EC, 1979)

D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4590 Advanced Flight Mechanics

3 credit points

Prerequisite: *AERO 3500*
Classes: *(2 lec, 1 tut)Avk*
Assessment: *see Dept*

Objectives/Outcomes: To develop an understanding of the application of flight mechanics and control systems to modern aircraft. Students will gain skills in problem solving in the areas of dynamic aircraft behaviour, control systems and aircraft handling.

Syllabus summary: Overview of aircraft dynamic system modelling. Identification of dynamic systems. Model structure. Introduction to parameter estimation techniques. Application to estimation of aircraft static, dynamic and control derivatives.

Aircraft state estimation. State estimation in the presence of noise and modelling errors. Introduction to Kalman filtering.
Overview of applications of digital flight control systems. Review of classical continuous system controller characteristics and control system design. Discretised dynamic system characteristics. Controllability and observability. Modern control techniques and their application to guidance, control, navigation and structural-dynamic control problems. Common control system design software.

Textbooks:
Reference books:

Stevens and Lewis Aircraft Control and Simulation (Wiley, 1992)

Roskam Airplane Flight Dynamics and Automatic Flight Controls (Roskam A&EC, 1979)

D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4600 Practical Experience

0 credit points

When Offered: *July semester*
Classes: ***12*** *weeks ofprac work experience*
Assessment: *Written report.*

Senior Advanced core course for the degree in Aeronautical Engineering
Objectives/Outcomes: To develop skills in the application of engineering theory to real industry situations. To gain experience in the actual practice of engineering.

Syllabus summary: Each student is required to work as an employee of an approved engineering organisation and to submit a satisfactory written report of his or her work. Normally 12 weeks of practical work experience (375 hours minimum) is required and this is undertaken after the completion of some or all of the prescribed Senior core courses and before enrolment in the final year of study. The University Careers and Appointments Service is available to assist students to obtain suitable employment.

AERO 4900 Thesis or Design Project

10 credit points

Prerequisite: *40 Credit Points of Senior Subjects*
May not be counted with/Additional Information: *AERO 4910 Honours Thesis*
Classes: *Literature survey, design, expt and/or analysis work over whole year.*
Assessment: *A bound thesis document is to be submittedfor assessment.*

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the practice of aeronautical engineering. Students will gain skills in design, analysis and management by undertaking a significant research project.

Each student is required to conduct one piece of experimental, theoretical or design workin greater detail than is possible in ordinary classes and to write a thesis presenting the results of these investigations. The student is expected to design and construct (where possible) any special piece of apparatus or model that may be necessary.

AERO 4910 Honours Thesis

14 credit points

Prerequisite: *40 Credit Points of senior subjects, WAM of credit average or above in Senior year subjects.*
May not be counted with/Additional Information: *AERO 4900 Thesis*
Classes: *Literature survey, design, expt and/or analysis work over whole year.*
Assessment: *A bound thesis document is to be submittedfor assessment.*

AERO 4910 Honours Thesis 14 Credit Points

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop an understanding of the practice of aeronautical engineering. Students will gain skills in design, analysis and management by undertaking a significant research project.

Each student is required to conduct one piece of experimental, theoretical or design workin greater detail than is possible in ordinary classes and to write a thesis presenting the results of these investigations.

The student is expected to design and construct (where possible) any special piece of apparatus or model that may be necessary.

The level of originality for an Honours thesis is greater than that required for the ordinary thesis course. This coursemust be completed successfully for the award of Honours in the Aeronautical stream of Batchelor of Engineering.

AERO 4920 Seminar

2 credit points

Prerequisite: *40 Credit Points of Senior Subjects*
When Offered: *July Semester*
Classes: A mini-conference held at the end of a week midway through the semester.
Assessment: Oral presentation evaluated by peers and staff.

Senior Advanced core course for the degree in Aeronautical Engineering

Objectives/Outcomes: To develop skills in the presentation of engineering ideas. To gain skills in communication.

Each student is required to present a seminar on a selected topic. Students are also expected to take part in the discussion sessions following each presentation.

Chemical Engineering

CHNG 1001 Chemical Engineering Applications

4 credit points

Classes: One (2 hr) lecture/tutorialperweekplus one (3 hr) laboratory or plant visit per week for one semester.
Assessment: Laboratory reports (30%), industrial visits (10%), lecture reports (15%), final examination (45%).

Junior core unit of study for the degree in Chemical Engineering.

What Is Chemical Engineering? - Obtain some overview of Chemical Engineering; of the process industries in Australia; of what chemical engineers do and the challenges they face. Meet some chemical Engineers.

Laboratory - Find out about the construction, methods of fabrication, selection of materials of construction, and the operation of common chemical process plant hardware; giving attention to the importance of costs, safety, operability and reliability. Learn about thekey steps in engineering communication.

Industrial Practice: Understand how chemical engineering works in practice by seeing what real plants and their equipment look like, what these plants do, and why. Student will develop skills in equipment handling; in communication, written and oral; in individual and group working; in peer assessment.

Syllabus summary:

(a) What is chemical engineering? A survey of the nature of chemical engineering, of the nature of the Australian process industries, and of the main professional activities of chemical engineers. Lectures are given by invited speakers from government, industry and academia. Visits to works in the Sydney region are undertaken with tutorial exercises based on these visits.

(b) Chemical engineering applications laboratory. An appreciation of (i) the methods and materials of construction of items of process equipment, (ii) the role of this equipment in building up an entire chemical processing plant, (iii) its operation and maintenance and (iv) safety requirements and procedures. Students will dismantle, reassemble and operate items of process equipment. They will present written answers to questions, supplemented by drawings of process flowsheets, diagrams of dismantled equipment, and discussions of heat and mass balances and of process parameter values.

Textbooks:
Library Classification: 660

CHNG 1101 Chemical Engineering 1A

4 credit points

May not be counted with/Additional Information: *Chemical Engineering Science 2; Chemical Engineering Science Auxiliary*
Classes: Two (Ihr) lectures; plus one (2 hr) tutorial per week for one semester.
Assessment: One 3hr exam at end of Sem plus continuous assessment of assignments

Junior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: This is a first course in chemical engineering calculations. It aims to teach students how they should formulate and solve mass balances on chemical process systems. It also introduces students to introductory flowsheet analysis.

Syllabus: The course consists of a series of tutorial exercises by which students are exposed to a range of typical problems on process systems; and then some larger projects which allow students to apply the approaches and procedures that they have learned to more realistic and complex applications.

The lectures introduce and complement the tutorials. Topics covered in the lectures include: unit systems and unit conversion; properties of fluids; mass balance calculations on flow systems; combustion processes; calculation of equilibrium compositions of reacting systems; vapour pressure and humidity.

Textbooks:
Library Classification: 660.28

CHNG 1102 Chemical Engineering 1B

4 credit points

Prerequisite: *CHNG 1101 Chemical Engineering IA*
May not be counted with/Additional Information: *Chemical Engineering Science 2; Chemical Engineering Science Auxiliary*
Classes: Assignments; final examination.
Assessment: *Assignments; final examination.*

Junior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: This is a first course in chemical engineering calculations. It aims to teach students how they should formulate and solve energy balances on chemical process systems.

It completes the analysis of typical industrial flowsheets by including both mass and energy balances.

Syllabus: The course consists of a series of tutorial exercises by which students are exposed to arangeof typical problems on process systems; and then some larger projects which allow students to apply the approaches and procedures that they have learned to more realistic and complex applications.

The lectures introduce and complement the tutorials. In addition, the lectures cover the following topics: the First Law of Thermodynamics applied to flow systems; thermodynamic properties: enthalpy, internal energy, heat capacities; calculations for ideal gas and liquid systems; thermochemistry; adiabatic flame temperature; equilibrium in adiabatic reactors; heats of solution and mixing.

Textbooks:
Library Classification:660.28; 660.29

CHNG 1201 Chemical Process Case Studies

4 credit points

When Offered: *July semester*
Classes: *4 hours oflectures/tutorials per week for one semester.*
Assessment: *Tutorials, assignments, final examination.*

Junior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

• The chemistry of industrial processes.

• The economic aspects of the industry.

• Process flowsheets.

• Modern environmental concerns.

Syllabus summary: An introduction to the major processes of the modern chemical industry. An overview of the process chemistry involved, the process flowsheet, together with design, control and optimisation needs. The economic and environmental constraints that shape the industry. The case study format will be used to develop a number of professional skills in the student - team work, use of library and computer resources and presentation skills.

Textbooks:
Library Classification: 660

CHNG 1301 Computing for Chemical Engineers

4 credit points

Classes: *One (1 hr) lecture and one (2 hr) tutorial per week for one semester.*
Assessment: *Tutorial assessment and a final examination*

Junior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop a basic understanding of personal computers and their use in solving engineering problems.

Syllabus summary: Introduction to personal computers. Use of spreadsheet packages for carrying out data manipulation, numerical calculations and graphing. Application to chemical engineering problems.

CHNG 2101 Chemical Engineering 2A

4 credit points

Classes: Two lectures and one tutorial per week; three laboratory sessions in total.
Assessment: *Laboratory reports; project reports; final examination.*

Intermediate core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: This course seeks to introduce students to basic concepts of fluids handling relevant to the process industries. Students will meet simple equipment design problems in this area and will apply their understanding to measurements and analysis of laboratory plant. Satisfactory completion of the course will prepare students for more advance courses in fluids and in the integration of fluid flow with heat and mass transfer.
Students will develop generic skills in:

• technical problem solving

• scaling and thinking non-dimensionally

• operating and analysing process plant.

Syllabus summary: Fluid statics - applications to pressure measurement; forces on storage vessels. Inviscid flow theory - Bernoulli's equation; flow friction; flow measurement. Laminar flow - force balance; analytical solutions for velocity profile. Turbulent flow - dimensional analysis, friction factor. Pumping - ideal pumps; pump selection; net positive suction head. Pipe networks.

Textbooks:
Library Classification: 620.1; 660.2

CHNG 2102 Chemical Engineering 2B

4 credit points

Wlien Offered: *July Semester*
Classes: Two lectures and one tutorial per week; three laboratory sessions in total.
Assessment: *Laboratory reports; project reports; design competition; final written examination.*

.Intermediate core unit of study for the degree in Chemical Engineering.
Objectives/Outcomes: This course seeks to introduce students to basic concepts of how heat energy is transferred, especially to and from fluids; similarly the concept of mass transfer and its conceptual relationship to heat transfer is introduced. This course introduces the concept of chemical engineering rate processes and their importance in selecting and designing process equipment; students willmeet simple equipment design problems in this area and will develop their understanding through measurements and analysis of laboratory plant. Satisfactory completion of the course will prepare students for more advanced courses in fluids and in the integration of fluid flow with heat and mass transfer. A light-hearted design exercise brings the student body together, encouraging them to apply their understanding to unusual problems and to think laterally.

Students will develop generic skills in:

• technical problem solving

• scaling and thinking non-dimensionally

• operating and analysing process plant

• working in small groups on unusual problems.

Syllabus summary: Heat transfer: Conduction; convection - the heat transfer coefficient, dimensional analysis. Correlations for pipe flow, external flows, natural convection. The overall heat transfer coefficient. Simple heat exchangers.

Mass Transfer: Diffusion; convection - the mass transfer coefficient, dimensional analysis, analogy with heat transfer. Correlations. The overall mass transfer coefficient. Mass transfer in dilute absorbers. Simultaneous heat and mass transfer.

Textbooks:
Library Classification: 536.2; 621.402; 660.2

CHNG 2301 Chemical Engineering Computations

4 credit points

Prerequisite: *MATH 1701 Differential Calculus and Linear Algebra; MATH 1702 Integral Calculus and Statistics; CHNG 1301 Computing for Chemical Engineers*
Classes: 4hrs lec & tut/wk
Assessment: *Tutorials, assignments and one final examination*

Intermediate core unit of study for the degree in Chemical Engineering

Objectives/Outcomes: To develop an understanding of:

• Chemical engineering problem analysis.

• Computational techniques in problem solving.

• Software applications.

Students will develop skills in:

• Using computers.

• Solving engineering problems.

• Developing and using computer software.

Syllabus summary: The need and role of numerical computations in chemical engineering. Solving linear and nonlinear algebraic equations. Curve-fitting and interpolation of data. Numerical differentiation and integration. Solution of ordinary differential equations. Principles of optimisation. Use of software packages. Review and extension of first-year statistics and computing with an emphasis on chemical engineering applications.

Textbooks:
Library Classification: 660; 517.6.

CHNG 2501 Fundamentals of Environmental Chemical Engineering

4 credit points

Classes: *4 hours of lectures/tutorials per week for one semester.*
Assessment: Tutorials, assignments, final examination

Intermediate core unit of study for the degree in Chemical Engineering.

To develop an understanding of:

• Environmental pollutants and their effects.

•Analysis of pollution problems and their control.

• Processes and technologies to reduce impact on environment.

Students will develop skills in:

• Engineering problem solving.

• Work in groups on supervised projects.

• Report writing and presentation.

Syllabus summary: Overview of environmental pollution. Introduction to environmental pollutants and their regulation. Engineering concepts of importance to the analysis and resolution of environmental problems. Environmental transport processes. Environmental processes relevant to air pollutants. Air pollution source control technologies. Environmental processes relevant to water pollutants. Water pollution source control technologies. Environmental processes relevant to soil/ sediment pollutants. Soil/sediment pollution remediation and control.

Textbooks:
Library Classification: 574.5, 660, 628.

CHNG 3001 Chemical Engineering Laboratory

4 credit points

Prerequisite: *CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B*
Classes: *Laboratory sessions as scheduled.*
Assessment: *Written laboratory reports (including skills assessment in planning and executing experiments) and oral presentation of work.*

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop skills in the following:

• the planning and conducting of laboratory-scale experiments.

• report writing and oral presentations.

Syllabus summary: This laboratory course complements the various "Unit Operations" courses in Senior Year.

As part of the preparation for any experiment, a student will be expected to undertake the following:

• become familiar with the background theory

• understand the operation of the experimental apparatus

• define the experimental aim, the range of measurements to be made and how these measurements will be processed.

Considerable importance is attached to the analysis and interpretation of the experimental data and to the writing of a clear, logical and concise technical report.

Textbooks:
Library Classification: 660

CHNG 3101 Unit Operations (Heat Transfer)

4 credit points

Prerequisite: *CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B*
Classes: *One (1 hr) lecture and one (2 hr) tutorial per week for one semester*
Assessment: *Tutorial work, project report, and a final examination*

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of how basic heat-transfer theory is applied to the performance analysis and design of heat-transfer equipment.

Syllabus summary: Revision of overall heat-transfer coefficient. Fouling factors.

Heat exchanger performance analysis and effectiveness - NTU approach. Design and rating problems.

Plate and frame heat exchangers.

Shell-and-tube heat exchangers: 1-2,2-4 contacting schemes. Thermal analysis. Estimation of heat-transfer rates and pressure drop. Practical considerations in design and selection.

Condensation heat-transfer mechanisms. Nusselt analysis. Correlations. Design and practical applications.

Boiling heat-transfer mechanisms. Nucleate and flow boiling. Evaporators and reboilers.

Radiation fundamentals. Black and non-black radiation and absorption. Radiation interchange between black and grey bodies. Electrical analogies. Reradiating surfaces. Gas radiation. Furnace calculations.

CHNG 3102 Unit Operations (Mass Transfer)

4 credit points

Prerequisite: *CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering* **25**
Classes: *Two (1 hr) lectures and one (1 hr) tutorial per week for one semester.*
Assessment: *Tutorial assignments (both individually and in small groups) and a final examination*

Senior core unit of study for the degree in Chemical Engineering

To develop an appreciation of several industrially important mass transfer operations (such as drying, distillation, gas absorption and extraction).

• To be able to analyse and design equipment used for such mass transfer operations.

Syllabus summary: The industrial importance of mass transfer operations. Mass transfer as an equilibrium stageprocess. Vapour-liquid equilibrium (ideal and non-ideal), x-y and T-x-y diagrams. Flash distillation. Analysis and design of binary distillation columns as equilibrium stage processes. McCabe-Thiele diagrams. Analysis and design of other mass transfer operations (such as gas absorption) as equilibrium stage processes. Computer-based physical property packages and mass transfer calculations.

CHNG 3103 Unit Operations (Particle Mechanics)

4 credit points

Prerequisite: *CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering* ***2B***
Classes: *Three (1 hr) lectures/tutorials per week for one semester.*
Assessment: *Assignments, and a filial examination*

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the following:

• The characteristics of particles.

• The processing of particulate systems.

Syllabus summary: Introduction to particulate systems, particle size and shape parameters, size distributions and statistical properties, test sieve analysis. Screening, particle-screen mechanics, efficiency of screening. Size reduction, energy requirements, classical laws, product size distribution. Motion of a particle in a fluid, terminal velocity, hindered settling. Phase separations, classification, elutriation, thickening, cyclones, centrifuging. Motion of fluids in particle beds, filtration, filters.

Textbooks:
Library Classification: 620.4, 660.28

CHNG 3104 Unit Operations (Fluid Mechanics)

4 credit points

Prerequisite: *CHNG 2101 Chemical, Engineering 2A*
Classes: *Four hours oj'lectures andtutorials perweekforone semester.*
Assessment: Tutorial assignments and final examination.

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

• non-Newtonian flows

• compressible fluid flow

• other fluid flows.

Students will develop skills in:

• solving problems in non-Newtonian flow

• solving problems in compressible fluid flow

• understanding the unusual phenomena in some non-Newtonian and compressible flow situations

• designing power inputs to agitated vessels.

Syllabus summary: Non-Newtonian fluids. Models of non-Newtonian fluids; power law fluids, Bingham plastics. Velocity distribution and pressure drop in pipes. Compressible flow in nozzles and pipes. Isothermal and adiabatic flow; critical pressure conditions. Maximum flow through nozzles and pipes. Maximum entropy and Mach number, shock waves. Two-phase flow, flow regimes, calculation of pressure drop in pipes. Mixing in agitated vessels. Turbine power characteristics in tanks.

Textbooks:
Library Classification: 660.28

CHNG 3105 Thermodynamics 1

4 credit points

Prerequisite: *CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering* ***2B***
Classes: *Two (Ihr) lectures plus one (1 hr) tutorial per week for one semester*
Assessment: *Assignments; final examination*

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The major objectives are:

(i) To perform energy analyses of process flowsheets.

(ii) To estimate the thermodynamic properties of fluids.

Specifically, this involves solving the energy equation for equipment items such as: valves, pumps, compressors, turbines, heaters and coolers, reactors and burners; and for flowsheets and cycles made up of those equipment items.

Syllabus: First and second laws of Thermodynamics; thermodynamic properties: enthalpy, internal energy, entropy, exergy. Applications in the analysis of typical energy intensive processes: heat engines; refrigeration cycles; liquefaction processes; compressible flow.

Estimation of thermodynamic properties of pure components, using (i) first-order fluid models, (ii) charts and tables, and (iii) equations of state. P-V-T relationships forreal gases; methods based on the principle of corresponding states; 2- and 3-parameter equations of state; the fundamental property relationships; calculation of residual enthalpies and entropies using volume-explicit equations of state (e.g. the virial equation in volume-explicit form); application of pressure-explicit equations of state in computer methods for property prediction.

Textbooks:
Library Classification: 660.29; 621.4; 536.7

CHNG 3106 Thermodynamics 2

4 credit points

Prerequisite: *CHNG 3105 Thermodynamics 1*
Classes: *Two (Ihr) lectures plus one (1 hr) tutorial per week for one semester*
Assessment: *Assignments; final examination*

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The major objectives are:

(i) To understand the theoretical basis for equilibrium in multiphase systems and reacting systems.

(ii) To introduce the thermodynamic concepts: chemical potential, fugacity, activity, and excess properties.

(iii) To predict the behaviour and compositions of liquids and vapours in equilibrium.

(iv) To predict the composition of systems in chemical equilibrium.

Syllabus: Criteria for equilibrium. Extension of the fundamental property relationship to multicomponent systems. Thermodynamic properties: Gibbs Free Energy, chemical potential, fugacity; calculation of fugaciti.es of pure components from equations of state. Clausius-Clapeyron equation.

Phase equilibrium: Equilibrium diagrams for low pressure ideal and non-ideal solutions; equilibrium diagrams for high pressure systems; calculation of dew points, bubble points; isothermal and adiabatic flash. Estimation of K-values using: ideal solution fugacities, activity coefficients, chart data. Basis of computer methods for calculating Re-values.

Solution properties: Liquid models; partial molal properties; excess properties; activity coefficients. Stability of liquid solutions.

Chemical equilibrium: Calculation of chemical equilibrium constants from thermodynamic data (enthalpies and free energies of formation). Calculation of equilibrium compositions and conversion for homogeneous and heterogeneous systems.

Textbooks:
Library Classification: 660.29; 536.7

CHNG 3107 Reaction Engineering 1

4 credit points

Classes: *Three hours per week of scheduled group work; occasional lectures.*
Assessment: *Two projects and interviews; final written examination.*

Senior core unit of study for the degree in Chemical Engineering.
Objectives/Outcomes: The technical objective in this course is to develop students' understanding in basic design considerations for chemical reactor design, and in carrying out the necessary design calculations.

Students will develop generic skills in:

• tackling open-ended problems requiring a synthesis of material learned previously with new learning;

• working cooperatively in self-managed groups;

• application of computational techniques to unfamiliar problems.

Syllabus summary: Homogeneous and heterogeneous reaction kinetics; development of rate laws. Methods for analysis and interpretation of reaction rate data. Volume change effects. Steady-state behaviour of isothermal ideal reactors: batch; plug flow; continuous stirred tank; packed-bed reactors for catalysed reactions.

Textbooks:
Library Classification: 660.28

CHNG 3301 Process Modelling

4 credit points

Prerequisite: CHNG 2301 Chemical Engineering Computations
Classes: Two (1 hr) lectures and one (1 hr) tutorial per week for one semester.
Assessment: Tutorial assignments (individually and in small groups) and a final examination.

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an appreciation for the following:

• The different techniques used to develop and solve process models.

• The way process models are used in industry.

• The role of modern computer software in process modelling.

Syllabus summary: Uses for process modelling (such as process optimisation). Physical modelling and the role of dimensionless correlations. Empirical modelling (line of best-fit; variable transformations; multilinear regression). Linear programming. Steady-state and dynamic mechanistic (heat and mass balance based) modelling. Numerical methods relevant to model solution. Use of software packages in process modelling.

CHNG 3302 Process Control 1

4 credit points

Classes: 4 hrs/week of lectures and tutorials for one semester.
Assessment: Tutorial assignments and a filial examination.

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: It is expected that students will understand the principles of dynamic modelling and the basics of process control.

Syllabus summary: The role of control in chemical processes. Development of dynamic models. Analytical and numerical solution of dynamic models. Laplace transforms. Transfer functions. Dynamic analysis of first-order, second-order and higher order systems. Introduction to feedback control. Types of controllers. Closed-loop characteristic equation. Stability analysis. Controller design. Process reaction curve method. Use of MATLAB.

Textbooks:
Library Classification: 660

CHNG 3401 Project Economics

4 credit points

Classes: Two (1 hr) lectures and one (1 hr) tutorial per week for one semester.
Assessment: Tutorial assignments plus a final examination

Senior core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop a basic understanding of the role that economic considerations have in industrial projects.

Syllabus summary: The assessment of projects using economic criteria: taxation, capital and depreciation; manufacturing costs and capital cost determination. Comparison of alternatives, allowing for risk and uncertainty, project finance.

CHNG 3601 Materials and Corrosion

4 credit points

WJien Offered: July Semester
Classes: 2hr of lec & tut/wk
Assessment: One 2hr exam

Senior core course for the degree in Chemical Engineering.

Syllabus summary: The major forms of corrosion and the mechanisms by which they occur. Aqueous corrosion. Chemical and electrochemical thermo-dynamics of corrosion, stability diagrams. Electrode kinetics. Polarisation. Application to corrosionkinetics. Passivation. Corrosion types protection and case studies. Materials selection and design. High temperature corrosion and oxidation.

Textbooks:
Textbook:

Fontana Corrosion Engineering 3rd edn (McGraw-Hill, 1986)

Reference books:

Uhlig and Revie Corrosion and Common Control 3rd edn (Wiley, 1985)

Pourbaix Atlas of Electrochemical Equilibria in Aqueous Solutions (NACE, 1974)

CHNG 4001 Practical Experience

0 credit points

Prerequisite: 28 credit points of Senior courses
Classes: There are no formal classes. Students are required to obtain 10 weeks of practical work experience before entering their Senior Advanced Year.
Assessment: By submission of a report of approximately 2500 words .on the industrial experience undertaken. The report will cover the nature of the industry, the company's organisational relationships both internally and externally and a technical section devoted to the work performed by the student. The report is to be submitted before the end of the first week of the Senior Advanced academic year.

Senior Advanced core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To obtain first-hand experience of the way chemical engineering skills are employed in an industrial context.

Syllabus summary: Each student is required to work as an employee of an approved organisation and to submit a report on that work. The employment undertaken must be relevant to Chemical Engineering and should be discussed before acceptance with a member of the Department of Chemical Engineering. While the responsibility for obtaining satisfactory employment rests with the student, the Department, through the Chemical Engineering Foundation, and the Careers and Appointments Service will assist wherever possible.

CHNG 4002 Thesis

8 credit points

Prerequisite: Students should have completed (or be enrolled in) all other Senior Advanced core courses.
Classes: No formal classes. The thesis supervisor will be available for discussion at agreed times but the student is expected to work on his/ her own initiative.
Assessment: Written thesis and seminar.

Senior Advanced core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To obtain an understanding of how to define, undertake and report on an open-ended piece of supervised research work.

Syllabus summary: Students are asked to write a thesis based on a modest (but significant) research project, which is very often some aspect of a staff member's research interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies, or the design, construction, and testing of equipment.

In undertaking the project, the student will learn how to examine published and experimental data, set objectives, organise aprogramof work, and analyse results and evaluate these in relation to existing knowledge. The thesis will be judged on the extent and quality of the student's original work and particularly on how critical, perceptive, and constructive he or she has been, in assessing his/her own work and that of others.

Students are required to give a seminar, explaining the aims and achievements of their thesis.

CHNG 4003 Advances in Chemical Engineering A

4 credit points

Classes: *Two (Ihr) lectures plus one (1 hr) tutorial per week for one semester.*
Assessment: *Assignments; final examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The objective of this course is to provide students with exposure to the latest developments in research and technology.

Syllabus: This course will discuss the impact of current research and new technology on the profession of chemical engineering. It will address the changes that are taking place in industrial processes as a result of these new technologies. The syllabus details will change from time as time as specialist lecturers become available.

CHNG 4004 Advances in Chemical Engineering B

4 credit points

Classes: *Two (Ihr) lectures plus one (1 hr) tutorial per week for one semester.*
Assessment: *Assignments; final examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The objective of this course is to provide students with exposure to the latest developments in research and technology.

Syllabus: This course will discuss the impact of current research and new technology on the profession of chemical engineering. It will address the changes that are taking place in industrial processes as a result of these new technologies. The syllabus details will change from time as time as specialist lecturers become available.

CHNG 4005 Laboratory Projects in Unit Operations

4 credit points

Prerequisite: *CHNG 3001 Chemical Engineering Laboratory*
Classes: *Five hours per fortnight oflaboratory classes for one semester.*
Assessment: *Project reports, oral presentation and general skill shown in planning and executing laboratory experiments.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop skills in executing appropriate experimental testing procedures and the presentation of results in oral and written form, together with teamwork skills.

Syllabus summary: This laboratory course extends the range of experiments illustrating the principles and application of heat and mass transfer, particle mechanics and reaction engineering. Two laboratory experiments will be undertaken by students during the semester, and two written reports and two oral presentations will be required from each student. The same level of preparation is required for this course as for CHNG 3001 Chemical Engineering Laboratory. Specifically, students are required to: (1) familiarise themselves with the background theory; (2) understand the operation of the experimental apparatus and the correspondence between the apparatus and that described in the background theory; and (3) define the experimental aim, range of measurements to be made and how these measurements will be processed in the light of the background theory and the aim of the experiment.

CHNG 4006 Professional Option

2 credit points

Prerequisite: *Passed at least 144 credit points.*
Classes: *There are no formal classes for this course.*
Assessment: *See Syllabus description*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The objective of this course is to provide students with experience in how to prepare and present a technical report.

Syllabus: This course requires a student to carry out an assignment related to the profession of chemical engineering - this will normally consist of a discussion of the design or operation of an industrial process. The discussion will be presented in the form of a written report, as a seminar, or both.

CHNG 4101 Separation Processes

4 credit points

Prerequisite: *Unit Operations (all four components).*
Classes: *Four hours of lectures andtutorials per week for one semester.*
Assessment: *Tutorial assignments and final written examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

- multicomponent distillation;
- separation in non-ideal liquid systems;
- membranes and treatment of waste water.

Students will develop skills in:

- solving multicomponent distillation problems;
- investigating azeotropes;
- developing process flowsheets for difficult separation systems;
- solving wastewater cleanup problems.

Syllabus summary: Multicomponent distillation: history and introduction. Phase equilibria in multicomponent systems. K values for ideal and non-ideal systems, batch distillation. Computer methods of solution including Naphtali-Sandholm method. Flowsheeting packages for multicomponent distillation. Overall column efficiencies. Tray layout. Optimal column design. Membrane separation: introduction, types of membranes, separating ability and equipment. Packed distillation columns: capacity and HETP. Environmental applications; steam stripping of volatile organic component from aqueous waste liquids. Flowsheeting packages and phase equilibria in environmental systems. Practical distillation for tray and packed columns following the Kister methods.

Textbooks:
Library Classification: 660.2842

CHNG 4102 Transport Phenomena

4 credit points

Classes: *4 hrs/week consisting of a mixture of lectures and practical sessions.*
Assessment: *In-class assessments, assignments and project work*

Senior Advanced elective unit of study for the degree in Chemical Engineering

Objectives/Outcomes: To develop an understanding of the equations which govern momentum, heat and mass transfer and ways of solving them.

Students will develop skills in:

- model formulation
- solving ordinary and partial differential equations
- unifying heat, mass and momentum transfer concepts

Syllabus summary: Constitutive equations for momentum, heat and mass transfer. Analogies between momentum, heat and mass transfer. Diffusion, forced convection and natural convection laminar and turbulent flow. Solution of flow problems using a computational package.

Textbooks:
Library Classification: 530.136

CHNG 4103 Advances in Polymer Engineering

4 credit points

Classes: 3 hrs of lectures/tutorials per week for one semester.
Assessment: Tutorials, assignments, final examination

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

• How polymeric resins are manufactured.

• Polymer properties in engineering application.

• Polymer processing in manufacturing.

• How polymers are recycled.

Students will develop skills in:

• Laboratory and conceptual work.

•Verbal and written communication (project work).

• Solving engineering problems involving polymers.

Syllabus summary: Basic structure and properties of polymers. Application of chemical engineering fundamentals including reaction engineering and kinetics to produce polymer resins from monomers. Engineering principles of polymer processing and shaping by extrusion, injection moulding, blow moulding, calendering and film blowing to obtain value-added products such as sheets, tubes, car parts, bottles, fibres for clothes, etc. Case studies with nylon, polyester, polyethylene will be treated in detail. Selecting polymers for engineering applications based on chemical, mechanical, thermal and flow behaviour. Recycle and reuse of polymers.

Textbooks:
Library Classification: 668.9, 620.1, 547.7.

CHNG 4104 Reaction Engineering 2

4 credit points

Prerequisite: CHNG 3107 Reaction Engineering 1
Classes: Two (1 hr) lectures and one (2 hr) tutorial per week
Assessment: Tutorials (20%), assignment (20%) and a final examination (60%).

Senior elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes:

• Extend knowledge of homogeneous, isothermal, ideal reactors undertaking single reactions to non-isothermal reactions, multiple reactions, heterogeneous reactions and non-ideal reactors.

• Further develop problem solving skills by a tutorial based course where the problems solving requires the student to:

(a) Refine the problem statement.

(b) Set up the equations which define the system.

(c) Select the appropriate numerical method/computer package to solve the equations.

(d) Present and discuss the results obtained and their implications with respect to the problem statement.

Syllabus summary: Temperature effects; multiple reaction(s); non-ideal reactor(s); heterogeneous reactions; non-catalytic, catalytic, multiphase reactions.

Textbooks:
Library Classification: 660

CHNG 4105 Advanced Topics in Thermodynamics

4 credit points

Prerequisite: CHNG 3105 Thermodynamics 1; CHNG 3106 Thermodynamics 2
Classes: Two (lhr) lectures plus one (1 hr) tutorial per week for one semester.
Assessment: Assignments; final examination.

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the theoretical concepts underlying thermodynamics and its application in the estimation of equilibrium fluid properties.

Syllabus: Criteria for equilibrium in multicomponent and reacting systems. Thermodynamic properties: Helmholtz and Gibbs free energies, chemical potential and fugacity. Accurate property listings for pure components.

Equations of state for mixtures. Phase equilibrium calculations based on single-fluid models and two-fluid models. Critical properties: estimation of fluid properties near the critical point. Solution properties: liquid models; excess properties; activity coefficients; heats of solution. Fluid models based on group contribution methods.

Selection of appropriate models for property estimation from packages available in process simulators.

Textbooks:
Library Classification: 536.7; 660.29

CHNG 4201 Chemical Engineering Design 1

4 credit points

Prerequisite: All four components of Unit Operations.
Classes: 4 hours of lectures and tutorials per week for one semester.
Assessment: Tutorial assignments and a final examination.

Senior Advanced core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

• concepts in process flowsheeting

• use of computer packages

• optimisation of the process; heat exchanger networks.

Students will develop skills in:

• development of the process flowsheet

• solving flowsheet problems using computer packages

• designing heat exchanger networks

• awareness of cost optimisation.

Syllabus summary: Introduction to process design. Process flowsheet development. Unit operation library models. Equations of state and thermodynamic models. Design philosophy. Use of computer flowsheeting packages. Optimisation of a flowsheet. Steady-state and dynamic process simulations. Heat exchanger networks. Energy integration within the process. Distillation trains, process synthesis and cost optimisation.

Textbooks:
Library Classification: 660.281

CHNG 4202 Chemical Engineering Design 2

8 credit points

Prerequisite: Unit Operations (all four components); CHNG 3105 Thermodynamics 1; CHNG 3106 Thermodynamics 2; CHNG 3401 Project Economics
Classes: Approximately 8 hours of informal classes, design and library work per week for one semester.
Assessment: Design report and contribution to design group.

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of:

• full chemical engineering design study;

• preparation of a full design report.

Students will develop skills in:

• designing a complete chemical plant;

• working in a design group;

• interacting with a consultant;

• writing a design report.

Syllabus summary: The preparation of a detailed design project: flowsheet selection, heat and mass balances, detailed equipment design and costing, hazard assessment and hazard operability studies, environmental impact and project financial analysis.

Textbooks:
Library Classification: 660.2842

CHNG 4203 Major Industrial Project

24 credit points

Prerequisite: *Passed at least 144 credit points. Students wishing to do this unit of study are required to discuss the matter with the Head of Department prior to enrolment.*
May not be counted with/Additional Information: *CHNG 4002 Thesis; CHNG 4201 Chemical Engineering Design 1; CHNG 4401 Project Engineering; CHNG 4402 Process Plant Risk Management*
Wlien Offered: *March semester*
Classes: *Tliere are no formal classes for this unit of study.*
Assessment: *Written report on the project undertaken (see syllabus summary), and other oral and written presentations as specified.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

The objective of this unit of study is to provide students with experience in carrying out a major project within an industrial environment, and in preparing and presenting detailed technical reports (both oral and written) on their work.

Syllabus: This unit of study consists of the following four components:

(1) Project. This is the major component of this unit of study. The project will encompass many of the features of CHNG 4002 Thesis, but will be larger in scope. The student will be required to submit a bound report to both the University and any company involved.

(2) Case Studies in Project Management

(3) Case Studies in Hazard and Environmental Impact Analysis

(4) Case Studies in Process Design and Simulation

The student is expected to show a proficiency in each of these components comparable with that which would be achieved in the mutually exclusive units of study given above.

CHNG 4301 Advanced Fluid Dynamics Modelling

4 credit points

Classes: *Four hours per week consisting of a mixture of lectures and practical sessions.*
Assessment: *Assignments and project work.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of current computational models of fluid flow and its associated physics.

Students will develop skills in:

• using a CFD package;

• breaking a complex problem into simpler pieces;

• solving real problems.

Syllabus summary: This course will familiarise students with modern developments in computational fluid dynamics (CFD) modelling. It will contain a review of the basic equations and introductions to mesh generation, solution methods, graphical analysis of results, turbulence modelling, multiphase flows, combustion, non-Newtonian flow and chemical reactions. The course will comprise a mixture of theory and practical use of a CFD package.

Textbooks:
Library Classification: 532.050151

CHNG 4302 Reservoir Engineering

4 credit points

Prerequisite: *CHNG 3103 Unit Operations (Particle Mechanics); CHNG 3104 Unit Operations (Fluid Mechanics)*
Classes: *Two (lhr) lectures plus one (1 hr) tutorial per week for one semester*
Assessment: *Assignments; final examination*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Introducing chemical engineering students to methods used in predicting and managing the behaviour of oil and gas reservoirs.

Reservoir engineering analysis applies also to other important areas such as: the migration and treatment of pollutants in soils and sediments; the recovery of methane from coal seams and landfill; heap leaching of low-grade ores; and in-situ leach mining.

Syllabus: Properties of porous media: porosity, permeability. Physics of single and two-phase flow through porous media. Single-phase flow: steady-state flow in one and two dimensions; area sweep efficiencies inregular arrays of wells; flow through parallel layers: communicating and non-communicating layers; miscible displacement processes; the convective-dispersion equation. Unsteady-state flow: well testing.

Two phase systems: saturation, capillary pressure, relative permeability, fractional flow. Multiphase flow: Buckley-Leverett solution to the two-phase convection equation; simulation methods; partially miscible displacement processes. Application of the method of characteristics to partially miscible multicomponent displacement processes (specifically: three-component, two-phase systems).

Introduction to enhanced oil recovery.

Textbooks:
Library Classification: 553.28; 622.18-3

CHNG 4303 Optimisation Techniques

4 credit points

May not be counted with/Additional Information: *CHNG 4305 Process Systems Engineering*
Classes: *Two (1 hr) lectures and one (1 hr) tutorial per week for one semester*
Assessment: *Tutorial work, project reports and a final examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop skills in formulating and solving optimisation problems relevant to chemical engineering.

Syllabus summary: Problem, objective function and constraint formulation. Analytical and numerical search methods for single variable and multivariable systems. Linear systems and linear programming. Flowsheet optimisation. Multi-objective function systems.

CHNG 4304 Process Control 2

4 credit points

Prerequisite: *CHNG 3302 Process Control 1*
Classes: Four hours of lectures, tutorial and laboratory workperweek for one semester.
Assessment: Tutorial assignments, laboratory reports and a whole semester project.

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: It is expected thatstudents will become familiar with a variety of advanced control strategies, their experimental application, as well as receiving training in Distributed Control System configuration and use.

Syllabus summary: Frequency response analysis and design. Advanced process control strategies: Cascade control. Model-based control strategies: Delay compensation, Feedforward control, Multivariable control, IMC control design and model predictive control strategy. Benefits of process control. New trends in process control. Laboratory experiments and PC laboratory in Process Control.

Textbooks:
Library Classification: 660

CHNG 4305 Process Systems Engineering

4 credit points

May not be counted with/Additional Information: *CHNG 4303 Optimisation Techniques*
Classes: Two (1 hr) lectures and one (1 hr) tutorial per week for one semester.
Assessment: *Tutorial work, project reports and a final examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop skills in integrating process modelling, simulation, design, optimisation and control concepts.

Syllabus summary: Introduction to process systems engineering. Cost-benefit analysis. Process modelling (steady-state and dynamic) and simulation. An introduction to the techniques of systematic process design. Process optimisation (theory and applications) and advanced control concepts. Available computer packages for these various applications.

CHNG 4401 Project Engineering

4 credit points

Classes: *4 hours of lectures, seminars and discussions per week for one semester.*
Assessment: *Tutorial assignments, seminar presentations and a final examination.*

Senior Advanced core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To obtain an appreciation of the techniques employed in the successful management of an industrial project.

Syllabus summary: Principles of project management. Management of large projects or a portfolio of small projects - including planning techniques, organisation and control. Management of commissioning and start-up of process plant, and of plant maintenance. Preparation and delivery of oral presentations on technical subjects. Introduction to occupational safety, safety management systems, management of environmental performance, safety during shutdowns, quality assurance and principles of Total Quality Management. The concept of 'completed staff work'. Introduction to process plant production management. Individual and team approaches to solving standard and open-ended problems.

Textbooks:
Library Classification: 660

CHNG 4402 Process Plant Risk Management

4 credit points

Classes: *Two (1 hr) lectures and one (1 hr) tutorial per week for one semester.*
Assessment: *Tutorial work, project reports and a final examination.*

Senior Advanced core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the central concepts underlying risk management, and the quantification and reduction of such risks in the engineering field.

Syllabus summary: Inevitability of risk. Types of hazards to people, the environment and property. Risk criteria or targets. Systematic hazard identification. Dimensions of risk. Quantification of consequences and frequency of hazardous incidents. Assessment of risks, risk contours. Role of the human factor. Inherent safety and risk reduction by engineering and management approaches. Insurance, community and legal relationships. Case studies.

CHNG 4403 Engineering Business Skills

4 credit points

Classes: *Three hours per week of group work with a (nominated) company for one semester.*
Assessment: *Group report and a final examination.*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: This course is built around the Young Achievement Australia course "Business Skills for Tertiary Students" which aims to give students an insight into modern management concerns and resolution skills.

Syllabus summary: Participants in this program will be exposed to a range of business issues including the following:

• the factors affecting business outcomes;

• the importance of cash flow management;

• the core requirements of any enterprise team (whatever its size);

• leadership and management skills;

• how specialist areas of expertise can combine to reach a common goal;

• the advantages and disadvantages of risk-taking, and ways of coping with both;

• strategies for achieving (and communicating) clear expectations, objectives and requirements in business and the community.

CHNG 4501 Biochemical Engineering

8 credit points

Prerequisite: *BCHM2101 Genes and Proteins Theory; BCHM2102 Molecules, Metabolism and Cells Theory; MICR 2007 Microbiology for Engineers A; MICR 2008 Microbiology for Engineers B*
Classes: *2x2 hr/week Lectures*
4 x 12 hr/semester Laboratories
6 x 1 hr Tutorials
Assessment: *Assignments (15%), laboratory workf 15%), design study (15%) and final examination (55%).*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Obj ectives/Outcomes:

1. Understand the history and scope of the biotechnology industry.

2. Identify the role of biochemical engineering in the industrial application of biotechnology and its development.

3. Provide an understanding of the major fundamental aspects of biochemical engineering.

4. Use this fundamental understanding to study some selected industrial applications.

Syllabus summary: Fundamentals: History of biochemical engineering; review of metabolism; quantification of cell growth and metabolism; modelling of microbial growth; fermenter design, sterilisation, aeration; bioseparations.

Applications: Industrial yeast production and brewing; amino acid production; cheese manufacture; computer applications; animal/plant cell technology; genetic engineering; wastewater treatment; biotechnology regulation.

Textbooks:
Library Classification: 660

CHNG 4502 Advanced Topics in Environmental Engineering A

4 credit points

Prerequisite: *All four components of Unit Operations; CHNG 3106 Thermodynamics 2*
Classes: *Two (lhr) lectures plus one (1 hr) tutorial per week for one semester.*
Assessment: *Assignments; final examination*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: The application of chemical engineering methods and principles to the problems of pollution prevention and control.

Syllabus: Both courses (A and B) are aimed at developing quantitative descriptions of environmental rate and transport processes. These processes include chemical partitioning, reactions, and convective/ dispersive transport in air, water and soil. The specific syllabus for each course will be redefined from time to time. Course topics will be drawn from:

Air pollution: Sources and types of air pollution; atmospheric chemistry and ozone depletion; control and removal of sulphur and nitrogen oxides; transport, dispersion and reaction in the atmosphere; vapour emissions from landfills and surface impoundments.
Water pollution: Sources and types of water pollution; equilibria in aqueous phases; interactions between aqueous phase and sediments in lakes and estuaries; dispersion of contaminants in rivers and lakes; physio-chemical and biological treatment processes; pollution from leaching processes in tailings dumps and landfills.

Soils and Sediments: Sources and types of pollution in soils and sediments; physics of movement of groundwater and contaminants in porous media; oily phase migration in soils; in-situ remediation of contaminated soils and sediments.

Textbooks:
Library Classification: 336.7; 551.5; 574.5-9; 614.7

CHNG 4503 Advanced Topics in Environmental Engineering B

4 credit points

Prerequisite: *All four components of Unit Operations; CHNG 3106 Thermodynamics* 2
Classes: *Two (lhr) lectures plus one (1 hr) tutorial per week for one semester.*
Assessment: *Assignments; final examination*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: An appreciation of the application of chemical engineering methods and principles to the problems of pollution prevention and control.

Syllabus: Both courses (Advanced Topics in Environmental Engineering A and B) are aimed at developing quantitative descriptions of environmental rate and transport processes. These processes include chemical partitioning, reactions, and convective and/or dispersive transport in air, water and soil. The specific syllabus for each course will be adjusted from time to time with topics drawn from the areas described under CHNG 4502 Advanced Topics in Environmental Engineering A.

Textbooks:
Library Classification: 336.7; 551.5; 574.5-9; 614.7

CHNG 4504 Environmental Impact Assessment

4 credit points

Classes: *3 hrs lectures and tutorialsperweekfor one semester. Several days of fieldwork*
Assessment: *Two assignments (50%), final examination (50%)*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: An introduction to:

• the range and nature of the environmental impacts of new developments;

• the basic principles in assessing these and how to apply them to specific cases;

• the context in which such assessments are made;

• the preparation of good environmental impact statements.

Syllabus summary: The nature of environmental protection; air, water, noise pollution and waste disposal; hazard analysis; limnology, marine and terrestrial ecology; urban and regional planning; aesthetics; economic framework; social and political factors; environmental legislation and its implementation; environmental impactreports, case studies; field work.

Textbooks:
Library classification: 333.714

CHNG 4505 Bioremediation

4 credit points

Classes: *Two (2 hr) lectures/tutorials perweekfor one semester*
Assessment: *Assignments (20%), project work (40%) and a final examination (40%).*

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes:

1. Understand the role of microorganisms in the treatment of solid, liquid and gaseous wastes.

2. Understand the range of bioremediation techniques available and the practical benefits and limitations of bioremediation.

3. Apply the above knowledge to address a series of environmental problems by supervised project work.

Syllabus summary: Bioremediation techniques (economics, legislation, computer-based design); Waste characteristics; Bioavailablity/ bioactivity; Metabolism (major metabolic pathways); Metabolism (degradation of aliphatic, aromatic, halogenated compounds, genetic manipulation); Reactor systems; Anaerobic digestion; Aerobic treatment processes; Biological nutrient removal; Bioremediation technologies (composting, landfill, sludge disposal); Monitoring efficacy of bioremediation; Biofiltration; Artificial wetlands; Bioleaching/sulfate reducing bacteria.

Textbooks:
Library Classification: 660

CHNG 4601 Advanced Particle Mechanics

4 credit points

Prerequisite: All four components of "Unit Operations"
Classes: 3hrs lec & tut/wkfor one semester
Assessment: Assignments and final examination

Senior Advanced elective course for the degree in Chemical Engineering.

Syllabus summary:

• Bulk solids flow: properties of bulk granular material; stress analysis of solids; testing of granular material; flow properties; design of bunkers; flow rate predictions; calculation of flow parameters of hoppers.

• Fluidisation: Applications; types of fluidisation; incipientfluidisation; theory of bubble rise; bubble formation; fluid-bed reactors.

• Conveying: Pneumatic and hydraulic conveying of solids: regimes, models and equipment (including blowersand pumps.

Textbooks:
Library classification: 621.86; 660.2

CHNG 4602 Mineral Processing (Extractive Metallurgy)

4 credit points

Prerequisite: Unit Operations (all four components)
Classes: Three hours of lectures/tutorials per week for one semester; field trips as arranged.
Assessment: Class assignments, tutorials and a final examination.

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the fundamental principles of metal extraction from naturally occurring compounds (minerals) and/or recycled materials, and the technology to yield a commercial end-product, with due regard for the environment.

Students will develop skills in:

• devising strategies to achieve extraction process objectives, within the constraints imposed by social, economic and physical environments;

• working in groups;

• verbal and written communication.

Syllabus summary: Mineral beneficiation and its relationship to smelting practice. Rationale in the metallurgical processing of complex ores and waste products. Principles of extraction and recovery in pyrometallurgy, hydrometallurgy and electrometallurgy. Alternatives in mining and minerals beneficiation - in situ leaching, dump and heap leaching. Mineral stability. Thermodynamics of reduction. Ellingham diagrams. Roasting of sulphides. Matte smelting and converting. Refining techniques. Hydrometallurgical processing of low-grade ores and electrowinning.

Textbooks:
Library Classification: 669

CHNG 4603 Mineral Processing (Mineral Dressing)

4 credit points

Prerequisite: Unit Operations (all four components)
Classes: Three hours of lectures, tutorial and laboratory classes per week for one semester. Field trips as arranged.
Assessment: Tutorial work, laboratory reports and a final examination.

Senior Advanced elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes: To develop an understanding of the various techniques used in mineral dressing.

Syllabus summary: Mineralogy and its relationship to mineral liberation and beneficiation. Metallurgical balances. Data reconciliation. Mineral processing unit operations, principles - comminution, concentration, heavy media separation, jigging, magnetic separation, electrodynamic and electrostatic separation, tabling and film concentrators. Flotation - surface chemistry. Collector and modifier action. Electrokinetic phenomena. Oxide and sulphide ore flotation. Depressants and selective flotation. Flotation kinetics. Ore sorting. Tailings dams.

Civil Engineering

CIVL 1001 Civil Engineering 1

4 credit points

Prerequisite: Assumed standard of knowledge. Mathematics 3 unit course and a satisfactory knowledge of 2 unit Chemistry or the Chemistry component of the 3 or 4 unit Science HSC course and of the 2 unit Physics course or the Physics component of the 3 or 4 unit Science HSC course.
Classes: (lec: 13hrs, lec/tut-13hrs and lab/drawing office: 26hrs)for one sem.
Assessment: Specified assignments and one 3hr exam at end of course

Junior core course for the degree in Civil Engineering. Elective course for the other branches.

Objectives: To provide a basic introduction to Civil Engineering.

Outcomes: A basic understanding of some aspects of Civil Engineering including Structural Engineering, Engineering Construction, Geomechanics, Hydraulics and Engineering Communications.
Syllabus summary: (a) Engineering Projects - Introduction to the planning, design, construction and operation of engineering projects. Economic and non-economic evaluation of projects.

(b) Elements of Engineering Science - Structures, geomechanics, materials, hydraulics and water resources, environment, systems, management.

(c) Communications - Freehand and scale drawing, engineering plans, shop drawings, techniques for producing drawings. Preparation of reports, verbal and written.

Textbooks:
Reference books:

RrickAn Introduction to Engineering - Concept, Methods and Issues (John Wiley and Sons).

Morris Engineering - A Decision Making Process (Houghton Mifflin Company).

Hogan and Firkins Economical Structural Steelwork (Australian Institute of Steel Construction).

Brown Getting Across (Edward Arnold).

Institution of Engineers, Australia The Australian Engineering Handbook, Part 1 - Basic Principles and Techniques (I.E. Aust.).

Thompson Organization and Economics of Construction (McGraw-Hill).

Strunk and White The Elements of Style (Macmillan).

Concrete Institute of Australia Recommended Practice - Reinforced Concrete Detailing Manual (CIA).

Dandy and Warner Planning and Design of Engineering Systems (Unwin Hyman).

Eagleson Writing in Plain English (Aust. Govt. Publishing Service).

Library classification: 620.0023, 658.15, 658.4, 744, 808

CIVL 1002 Computational Engineering

3 credit points

May not be counted with/Additional Information: *COMP 101F Introductory Programming and COMP 102S Introductory Computer Science*

When Offered: *luly semester*

Classes: *(1 lecture & one 2 hr computer lab session)Avk*

Assessment: *One 2 hr exam at end of semester plus assessment of computer exercises during semester.*

Junior core course for the degree in Civil Engineering, Mechanical Engineering and Aeronautical Engineering. COMP 101F Introductory Programming and COMP 102S Introductory Computer Science or MECH 1810 Computational Engineering IB are acceptable alternatives.

Objectives: To provide an introduction to a computer language an to the logic of programming.

Outcomes: Students should obtain an understanding of the logic of computer programming and be able to write computer programs to solve engineering problems.

Syllabus summary: Introduction to the use of personal computers. Programming of engineering problems. Use of compilers, debugging, object-oriented coding, code optimisation. Programming environments, code documentation, flow charts, program design and philosophy.
FORTRAN language components: Program structures FORTRAN 90. Variables and Data types, Statements, Keywords, Intrinsic Functions, Arithmetic Operations, Program Control, Logical Operations, Input/ Output, Text Manipulation, Formatting, Functions and Subroutines. Specialised functions for personal computers. Comparison of language structure with other PC programming languages.

Engineering applications: Problems of significance to civil, mechanical and aeronautical engineering.

Textbooks:

References:

Hahn Fortran 90 for Scientists and Engineers (Edward Arnold 1993)

Press et al Numerical Recipes, the Art of Scientific Computing (FORTRAN Ed) (Cambridge Press, 1986).

Ellis, Philips and Lahey FORTRAN 90 Programming (Addison Wesley 1994).

Nyhoff, Sanford and Leestma FORTRAN 90 for Engineers and Scientists (Prentice Hall 1997).

Library classification: U001, U005 (Fisher Library)

CIVL 1003 Computer Graphics

3 credit points

Corequisite: *Either CIVL 1002 Engineering Programming or COMP 10IF, COMP 102S Computer Science.*

May not be counted with/Additional Information: *MECH 1800 Computational Engineering IA and MECH 1801 Computational Engineering 1C*

Wlien Offered: *March semester*

Classes: *(1 lecture & one 2 hr computer lab session)Avk*

Assessment: *One 2 hr exam at end of semester plus assessment of computer exercises during semester.*

Junior core course for the degree in Civil Engineering. MECH 1800 Computational Engineering IA and MECH 1801 Computational Engineering 1C are acceptable alternatives.

Objectives: To introduce computer graphics and to highlight the application of graphics to the solution of engineering problems.
Outcomes: Students should have knowledge of how to present visual images and graphics and the applications of computer graphics to engineering problems.

Syllabus summary: Introduction to the matrix and graphics functions of MATLAB: Matrix manipulation, flow control, function and script files, object hierarchies including high and low level graphics functions, object properties, plotting functions and colour maps.
Fundamentals of computer graphics: Viewing objects in two and three dimensions, theory of transformations, data structures, perspective and parallel projections, hidden surfaces and colour theory.

Textbooks:

D. Hanselman and B. Littlefield Mastering Matlab Prentice-Hall, 1996.

D.M. Etter Engineering Problem Solving with Matlab 2nd ed., 1997.

F.S. Hill, MacMillan Computer Graphics 1990.

VB. Anand Computer Graphics and Geometric Modelling for Engineering John Wiley & Sons, 1993.

Library classification: U006 (Fisher Library)

CIVL 1201 Statics

4 credit points

Corequisite: *MATH 1701, MATH 1702*

Assumed Knowledge: *Mathematics 3 unit course at the HSC*

May not be counted with/Additional Information: *MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics, MECH 1501 Engineering Statics.*

Wlien Offered: *July semester*

Classes: 26hrs lec and 26hrs tut

Assessment: *Class test during semester and one 2hr exam at end of semester.*

Junior core course for the degree in Civil Engineering.

Objectives: To introduce basic concepts of static equilibrium and the calculation of forces and moments in statistically determinate structures.
Outcomes: It is expected that students will be able to analyse simple pin jointed structures, draw free body diagrams and compute moments in beams.

Syllabus summary: Basic concepts: scalars and vectors; units. Statics of the rigid body; forces and moments; system isolation; free body diagrams, and equilibrium criteria. Principle of virtual work; friction, distributed force systems; beams with distributed loads, statically determinate pin-jointed structures.

Textbooks:

Meriam Engineering Mechanics Vol. 1, Statics, SI version (Wiley, 1980).

Library classification: U531-2,U620-1 (Fisher Library)

CIVL 1406 Engineering Geology

5 credit points

May not be counted with/Additional Information: *GEOL1002*

Classes: *39 hrs lec, 26hrs lab. Field excursions in the Sydney region, as appropriate.*

Assessment: *Practical laboratory work, assignment, and a combined theory andpractical exam.*

Junior core course for the degree in Civil Engineering, unless the course GEOL 1002 has been completed.

Course objectives: to introduce basic geology to civil engineering students.

Expected outcomes: Students should develop an appreciation of geologic processes as they influence civil engineering works and acquire knowledge of the most important rocks and minerals and be able to identify them.

Syllabus summary: Geological concepts relevant to civil engineering and the building environment. Introduction to minerals; igneous, sedimentary and metamorphic rocks, their occurrence, formation and significance. General introduction to physical geology and geomorphology, structural geology, plate tectonics, and hydrogeology. Associated laboratory work on minerals, rocks and mapping.

Textbooks:
Textbooks:

West Geology Applied to Engineering.

or

A. Holmes Principles of Physical Geology 4th Edition.

Reference books:

As indicated during classes.

CIVL 2004 Engineering Communications 1

2 credit points

When Offered: *March semester*
Classes: *12hrs lec, 14hrs discussion/oral presentation*
Assessment: *Based on three written reports and three oral presentations. Extra credit for some or all oral presentations may be givenforverifiable public speaking activities with the students 'section of the Institution of Engineers, Australia, the University of Sydney Debating Society or equivalent organisation. Students are encouraged to engage in these activities*

Intermediate core course for the degree in Civil Engineering.

Objectives: To develop effective written and oral communication skills.

Outcomes: Ability to make written and oral presentations on topics of general, technical and/or social significance to small peer groups.

Syllabus summary: 12 hours of lectures on effective report writing and oral presentation. Written reports and oral presentation on three topics of general, technical and/or social significance of 5, 10 or 15 minutes duration. Oral presentation in groups of eight students in a lecture or round-table discussion format.

Library classification: 808, 658.45.

Textbooks:
Library classification: 808, 658.45

CIVL 2101 Properties of Materials

4 credit points

Prerequisite: *CHEM 1401 Chemistry IE*
Classes: *lec: 40hrs and lab approx. 12hrs*
Assessment: *One 3hr exam covering the whole syllabus. Satisfactory lab work is a prerequisite for passing the exam.*

Intermediate core course for the degree in Civil Engineering.

Objectives: To develop an understanding of the relationship between microstructure and mechanical properties of metals and cement based materials.

Outcomes: Ability to select the materials best suited for a particular application.

Syllabus summary: Production, solidification and bonding in metals. Elastic-plastic deformation of metals. Microstructural effects relating to mechanical properties of metals. Welding. Hydrogen embrittlement, lamellar tearing. Fatigue and brittle fracture.

Hardened cement paste, mortar, concrete, timber, masonry. Cements and their hydration, minerals and other admixtures in concrete, mix design.

Textbooks:
Textbooks:

Campbell-Allen and Roper Concrete Structures: Materials Maintenance and Repair (Longman Scientific and Technical)- preferred text.

SorokaPortland CementPaste and Concrete (MacmillanAustralia, 1979)

Akroyd Concrete - Its Properties and Manufacture (Pergamon)

and/or

Troxell Composition and Properties of Concrete 2nd edn (McGraw Hill).

U.S. Bureau of Reclamation Concrete Manual

Czernin Cement Chemistry and Physics for Civil Engineers (Lockwood).

Relevant SAA Specifications.

Reference books:

As advised by lecturer.

Library classification: U620.11-19 (Fisher Library)

CIVL 2202 Structural Mechanics

5 credit points

Prerequisite: *MATH 1051 Mechanics and CIVL 1201 Statics.*
Classes: *lec: 39hrs, tut: 26hrs.*
Assessment: *Class assignments and one 3hr closed-book exam covering the whole syllabus at the end of semester.*

Intermediate core course for the degree in Civil Engineering.

Objectives: To provide a basic understanding of the principles of elementary stress and stiffness analyses of simple structural elements under static loading and to be able to use these principles to analyse simple structural elements using hand computation methods.

Outcomes: Proficiency in basic methods of simple structural analysis and interpretation of results.

Syllabus summary: Review of basic statics; elementary elasticity, geometric properties of plane areas, axial loading, flexure in beams, shear stresses in beams, uniform torsion, bending deflections, elementary instability, influence lines, triangulated frames and trusses, combined stresses, continuum mechanics - stresses and strains in 2D, failure theories for materials.

Textbooks:
Textbooks:

Megson Strength of Materials for Civil Engineering 2nd edn (Arnold).

Reference books:

Gordon Structures (Penguin, 1978).

Shanley Mechanics of Materials student edn (McGraw-Hill, 1967).

Library classification: U624.17 (Fisher Library)

CIVL 2203 Structural Design

4 credit points

Prerequisite: *MATH 1051 Mechanics and CIVL 1201 Statics.*
Corequisite: *CIVL 2202 Structural Mechanics.*
When Offered: *July Semester*
Classes: *26hrs lec, 26hrs design classes*
Assessment: *Design class assignments and one 3hr closed book exam covering the whole syllabus on steel and concrete design at the end of semester.*

Intermediate core course for the degree in Civil Engineering.

Objectives: To provide a basic understanding of design concepts and the design of steel and concrete elements to current code criteria.

Outcomes: Proficiency in the design of simple structural elements in steel and concrete.

Textbooks:
Textbooks:

SAA HB2.2 - Australian Standards for Civil Engineering Students: Part 2: Structural Engineering.

or

SAA AS4100 - Steel Structures Code

SAA AS3600 - Concrete Structures Code and

SAA AS 1170 - Loading Code, Parts 1 and II

Buckle The Elements of Structures 2nd edn (Pitman International)

Schodek Structures (Prentice-Hall)

Reference books:

Cowan The Design of Reinforced Concrete student edn (Sydney U.P.).

Ferguson Reinforced Concrete Fundamentals student edn (Wiley).

Gordon Structures - or Why Things Don't Fall Down (Pelican).

Park and Paulay Reinforced Concrete Structures (Wiley).

Trahair and Bradford Behaviour and Design of Steel Structures 2nd edn (Chapman and Hall).

Warner, Rangan and Hall Reinforced Concrete (Pitman).

Library classification: U624.182: U624.183 (Fisher Library)

CIVL 2407 Engineering Geology 2

5 credit points

Prerequisite: *Either GEOL1002 or CIVL 1406 Engineering Geology*
Classes: *39hrs lec, 26hrs lab. Field Excursions in the Sydney area, as appropriate.*
Assessment: *Practical lab work, assignment, plus one 3hr exam at the end of the semester.*

Intermediate core course for the degree in Civil Engineering, unless the two Geology 2 courses Plate Tectonics and Materials GEOL 2001 and Resource Exploration 2 GEOL 2002 have both been completed.

Course objectives: To introduce and emphasise the role of geology in civil engineering projects.

Expected outcomes: Students should gain an appreciation of the importance of geology in the planning and execution of civil engineering projects, and be able to apply their knowledge of geology to the solution of soil and rock engineering problems.

Syllabus summary: Application of geological principles and practices to solving problems in civil engineering. Surface and sub-surface geological, geophysical and remote sensing techniques for evaluation of ground conditions. Introductory rock mechanics, clay mineralogy and behaviour. Natural materials for construction purposes.

Textbooks:
Textbooks:

T. West Geology Applied to Engineering.

Reference books:

P.J.N. Pells (ed.) Engineering Geology of the Sydney Region (Balkema).

Library classifications: 552, 624.15

CIVL 2601 Fluids 1

5 credit points

Prerequisite: *MATH 1701, MATH 1702.*
WJien Offered: *March Semester*
Classes: *26hrs lec, 39hrs lab/tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of semester. Satisfactory laboratory and tutorial performance is also a requirement. Credit will be given for laboratory and tutorial submissions, as indicated at the commencement of the course.*

Intermediate core course for the degree in Civil Engineering.

Objectives: To develop an understanding of: patterns of movement of fluid particles and associated force and energy relationships; applications of basic concepts to cases of fluids in containers and conduits.

Outcomes: Students should gain the ability: to determine fluid movements and forces in pipes and open channels and around bodies in fluid streams.

Syllabus summary: Fluid statics. Equations of motion. Velocity patterns. One dimensional flow principles. Flow measurements. Viscous and turbulent flow. Resistance to flow of fluids. Flow in closed conduits. Open channel flow.

Textbooks:
Douglas, Gasiorek and Swatffield Fluid Mechanics (Pitman).

Hydraulics Data Sheets (Department of Civil Engineering, University of Sydney).

Robertson and Crowe Engineering Fluid Mechanics (Wiley).

Rouse Elementary Mechanics of Fluids (Dover).

Streeter and Wylie Fluid Mechanics (McGraw-Hill).

Young Munson and Okiishi A Brief Introduction to Fluid Mechanics (Wiley).

Vennard and Street Elementary Fluid Mechanics (Wiley).

Library classification: 532

CIVL 2801 Engineering Construction 1

4 credit points

Classes: *26hrs lec & 26hrs tut*
Assessment: *One 3hr written examination at the end of the semester; a major assignment per group of students, and any other assessment as advised at the commencement of the course.*

Intermediate core course for the degree in Civil Engineering. Elective course for other branches.

Objectives: To gain an understanding of the fundamentals of engineering construction including systems and methods/in construction of excavation, embankments and other earthworks, hauling and associated operations.

Outcomes: Students should develop basic competency in earthwork engineering and economic optimisation of related construction, including proposing and analysing systems and methods, estimation of probable output, unit cost and productivity evaluation.

Syllabus summary: Introduction to the framework under which construction projects are formulated and analysed; construction engineering fundamentals; construction systems related to excavation, hauling and embankment construction, including selection and evaluation of plant and methods as well as the expected output and cost; introduction to construction operations management.

Textbooks:
Textbooks:

Lecture Notes for Engineering Construction 1 (Department of Civil Engineering, The University of Sydney).

Reference books:

Peurifoy and Ledbetter Construction Planning Equipment and Methods (McGraw-Hill).

Atlas Copco Atlas Copco Manual (Atlas Copco Co.).

CAT Caterpillar Performance Handbook (CAT Publication).

Church Handbook of Excavation.

Havers, et al (editors) Handbook of Heavy Construction.

Library classification: 624.0202, 624.6/A

CIVL 3005 Engineering Communications 2

2 credit points

Prerequisite: *CIVL 2004 Engineering Communications 1.*
Classes: *26hrs discussion/oral presentation*
Assessment: *Based on written reports and oral presentations. Extra creditfororal presentation may be givenfor verifiable public speaking activities with the students' section of the Institution of Engineers, Australia, or the University of Sydney Debating Society, or equivalent organisation. Students are encouraged to engage in these activities.*

Senior core course for the degree in Civil Engineering.

Objectives: To develop effective written and oral communication, interpersonal skills, and advocacy of civil engineering.

Outcomes: Ability to argue in writing and orally for (or against) topics of general, technical and/or social significance.

Syllabus summary: Information searches including use of electronic data bases. Dealing with the media. Written reports and oral presentation on topics of general, technical and/or social significance.

Effective group communication and teamwork.

Textbooks:
Library classification: 808, 658.45

CIVL 3102 Materials Aspects in Design

4 credit points

Prerequisite: *CIVL 210i Properties of Materials*
Classes: *lec 40hrs, lab: 12hrs*
Assessment: One 3hr exam covering the whole syllabus.

Senior core course for the degree in Civil Engineering.

Objectives: To relate the mechanical properties of metals and cement-based materials to the design of structures made from these materials.

Outcomes: Ability to predict the influence of material properties upon the response of the structure under service conditions.

Syllabus summary: Fracture aspects in the design and use of concrete and reinforced concrete structures. Fracture, fatigue, fire and corrosion aspects in the design and use of metal structures. Durability and serviceability aspects in the design and use of concrete and reinforced concrete structures. Two laboratory sessions on failure modes of RC beams, one laboratory session on electron microscopy, one field trip.

Textbooks:
Textbooks:

Campbell-Allen and Roper Concrete Structures: Materials Maintenance and Repair (Longman Scientific and Technical)- preferred text.

Soroka Portland Cement Paste and Concrete (Macmillan Australia, 1979)

Akroyd Concrete - Its Properties and Manufacture (Pergamon)

and/or

Troxell Composition and Properties of Concrete 2nd edn (McGraw Hill).

U.S. Bureau of Reclamation Concrete Manual

Czernin Cement Chemistry and Physics for Civil Engineers (Lockwood).

Relevant SAA Specifications.

Reference books:

As advised by lecturer.

Library Classification: 620.11 - 620.19

CIVL 3204 Structural Analysis

6 credit points

Prerequisite: *CIVL 2202 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations.*
Wlten Offered: *March semester*
Classes: *42hrs lec & 42hrs tut*
Assessment: *One 3hr exam at end of semester plus assessment of assignments*

Senior core course for the degree in Civil Engineering.

Objectives: To provide an understanding of the principles of (a) the force and displacement methods for analysing redundant trusses and beams, and (b) the lower and upper bound methods for the plastic analysis of beams and frames. To be able to apply computer methods to structural analysis and to check the validity of such solutions.

Outcomes: To be able to apply the manual methods of analysis taught in the course to simple structures. To be able to apply and check computer analyses of structures.

Syllabus summary. Analysis of statically redundant trusses and frames using the force and displacement methods. Internal forces and deflections of statically redundant trusses and frames. Lack of fit. Virtual work principles: principle of virtual forces and principle of virtual displacements. Computer methods for analysing plane frames and trusses. Programs PRFSA and PTSA. Plastic analysis of beams and frames. Upper and lower bound theorems.

Textbooks:
Textbooks:

BHP Hot Rolled and Structural Product Handbook

Bradford, Bridge and Trahair Worked Examples for Steel Structures (AISC, 1992).

Standards Australia Specification - current editions

AS 1170 Parts 1 and 2 Loading Code, and

AS4100 Steel Structures Code, or

ASHB2.2 Structural Engineering Standards

Trahair and Bradford Behaviour and Design of Steel Structures (Chapman and Hall, 1991).

Reference books:

AISC Design Capacity Tables for Structural Steel

Bresler et al. Design of Steel Structures (Wiley).

Gaylord and Gaylord Design of Steel Structures IS edn (McGraw-Hill).

Lothers Advanced Design in Steel Structures (Longmans).

McGuire Steel Structures (Prentice Hall).

Other books as indicated in the classes

Library classification: 624.17

CIVL 3205 Concrete Structures 1

6 credit points

Prerequisite: *CTVL 2202 Structural Mechanics.*
Corequisite: *CTVL 3102 Material Aspects in Design and CTVL 3204 Structural Analysis.*
Classes: *42hrs lec, 42hrs tut/lab/drawing office*
Assessment: *Two 3hr exams plus design project.*

Senior core course for the degree in Civil Engineering.

Objectives: To provide a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis and design of reinforced concrete (including an understanding of capabilities and limitations); to provide basic design training in a simulated professional engineering environment.

Outcomes: Proficiency in basic methods of reinforced concrete analysis and interpretation of results; proficiency in basic reinforced concrete design.

Syllabus summary: The behaviour and design of reinforced concrete members and structures.

Behaviour - introduction, material properties, 'elastic' analysis (stresses/deformations) effects of creep and shrinkage, ultimate strength of beams (flexure/shear/torsion), ultimate strength of beams (flexure/shear/torsion), ultimate strength of columns (short and slender), introduction to behaviour of reinforced concrete slabs, introduction to prestressed concrete.

Design - design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl. Earthquakes,), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings.

Textbooks:
Textbooks:

Warner et al. Reinforced Concrete (Pitman).

Standards Australia Specification - current editions

AS1170 Loading Code - Parts 1, 2 and 4

AS3600 Concrete Structures Code

AS HB2.2 Structural Engineering Standards

Reference books:

Park and Paulay Reinforced concrete Structures

Warner and Faulkes Prestressed Concrete (Longman Cheshire).

Concrete Design Handbook (Cement and concrete Association of Australia).

Reinforced Detailing Handbook (Concrete Institute of Australia)

Library classification: 624:183

CIVL 3206 Steel Structures 1

6 credit points

Prerequisite: *CIVL 2202 Structural Mechanics*
Corequisite: *CIVL 3102 Materials Aspects in Design, CIVL 3204 ' Structural Analysis.*
Wlien Offered: *July semester*
Classes: *42hrs lec, 42hrs tutAab/drawing office*
Assessment: *One 2hr exam at the end of each semester plus assessment of design assignments.*

Senior core course for the degree in Civil Engineering.

Objectives: To provide a basic understanding of the behaviour and design of steel members and structures.

Outcomes: The development of some of the skills required for the design of practical steel structures.

Syllabus summary: The behaviour and design of steel members and structures - design concept loads and load combinations, strength, stability and serviceability criteria, safety and reliability, practical steel structures, properties of cross-sections, local buckling, elastic beams, plastic beams, tension members, compression members, effective lengths and elastic in-plane frame buckling, lateral buckling of beams, in-plane bending of beam-columns, lateral buckling of beam-columns, biaxial bending of beam-columns, bolted and welded connections.

Textbooks:
Textbooks:

(AISC) Economical Structural Steelwork.

GJ. Hancock & M.J. Clarke U3.235 Steel Structures 1 printed lecture notes.

BHP Hot Rolled and Structural Products Handbook.

Standards Australia Specifications - current editions

AS1170 Parts 1 and 2 Loading Code, and

AS4100 Steel Structures Code; or

ASHB2.2 Structural Engineering Standards.

Reference books:

AISC Design Capacity Tables for Structural Steel.

Trahair and Bradford Behaviour and Design of Steel Structures (Chapman & Hall, 1991).

Library classification: 624.17, 624.182

CIVL 3207 Risk and Reliability Analysis

2 credit points

Prerequisite: *MATH 1701, MATH 1702, CIVL 2202 Structural Mechanics, CIVL 2203 Structural Design.*
When Offered: *March Semester*
Classes: *16hrs lec; 12hrs tut*
Assessment: *One 3hr exam plus assignments*

Senior core course for the degrees in Civil Engineering.

Objectives: To provide a basic understanding of the principles of statistical decision theory, probabilistic risk assessment and structural reliability analysis; to develop an understanding in basic methods of risk and reliability analysis, including event trees, fault trees and decision trees and First Order Second Moment methods of structural reliability analysis; to develop an understanding of the principles of reliability-based design.

Outcomes: Understanding of basic methods of risk and reliability analysis and interpretation of results.

Syllabus summary: Review of basic statistical methods of analysis (including significance testing, and linear regression); probability concepts, B ayes' Theorem, statistical decision theory, preposterior analysis; probability measures, types of uncertainty, principles of probabilistic risk assessment, event trees, risk acceptance criteria; structural safety and reliability; First Order Second Moment methods of reliability analysis, the Safety Index, the design point, reliability based design, simulation methods, system effects.

Textbooks:
Reference books:

Blockley (ed.) Engineering Safety (McGraw-Hill, 1992).

Madsen, Krenk and Lind Methods of Structural Safety (Prentice-Hall, 1986).

Melchers Structural Reliability Analysis and Prediction (Ellis Horwood/ Wiley, 1987).

Library classification: 624.171

CIVL 3401 Soil Mechanics A

4 credit points

Prerequisite: *CIVL 2202 Structural Mechanics.*
When Offered: *March semester*
Classes: *26hrs lec, 26hrs lab/tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of semester. Satisfactory laboratory performance is also a requirement. Credit will be given for laboratory and tutorial submissions, as indicated at the commencement of the course.*

Senior core course for the degree in Civil Engineering.

Objectives: To develop an understanding of: the nature of soils as engineering materials; the common soil classification systems; the importance of water in the soil and the engineering effects of water movement; the factors controlling soil settlements.

Outcomes: Students should gain the ability: to predict the engineering behaviour of soils based on soil classification; to quantify the effects of water in the soil; to predict soil settlement.

Syllabus summary: Soil structure and engineering classification of soils, compaction, effective stress concept, analysis of steady state seepage, one dimensional consolidation theory, stresses beneath loaded areas, analysis of soil settlement.

Textbooks:
Reference books:

CR. Scott An Introduction to Soil Mechanics and Foundations.

R.F. Craig Soil Mechanics.

Library classification: 624.151.

CIVL 3402 Soil Mechanics B

4 credit points

Prerequisite: *CIVL 2202 Structural Mechanics.*
Corequisite: *CIVL 3401 Soil Mechanics A*
When Offered: *July Semester*
Classes: *26hrs lec, 26hrs lab/tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of semester. Satisfactory laboratory performance is also a requirement. Credit will be given for laboratory and tutorial submissions, as indicated at the commencement of the course*

Senior core course for the degree in Civil Engineering.

Objectives: To develop an understanding of the concept of soil strength, and how this can be used in estimating the stability of soil constructions.

Outcomes: Students should gain an understanding of: the strength of soil masses and the factors that control the strength; the basic theories of bearing capacity and slope stability. In particular, students should gain the ability to: interpret soil strength tests; predict the strength and stability of soil.

Syllabus summary: Shear strength of soils. Earth pressure theories. Elementary bearing capacity theory. Slope stability analysis.

Textbooks:
Reference books:

CR. Scott An Introduction to Soil Mechanics and Foundations.

J.H. Atkinson An Introduction to the Mechanics of Soils and Foundations: Through Critical State Soil Mechanics.

R.F. Craig Soil Mechanics.

Library classification: 624.151

CIVL 3501 Surveying 1

4 credit points

Prerequisite: *MATH 1701, MATH 1702.*
Classes: *lec: 28hrs, fieldwork/pract.: 24hrs.*
Assessment: *fieldwork, reports, tutorials, and one 3hr exam attheend of the course.*

Senior core course for the degree in Civil Engineering.

Objectives: To introduce students to basic distance, angle, and height measurement; to give students sufficient knowledge to achieve basic computational, analytical, and interpretational skills based on the measurements; to introduce students to basic electronic field equipment; to give students an insight into future trends in measurement technologies.

Outcomes: Students should gain ability to: undertake basic angle and distance measurement; undertake appropriate calculations and checks involving observed data; understand errors associated with measurement, select the correct measurement alternatives for simple measurement problems.

Syllabus summary: Introduction to engineering surveying, distance measurement, angle measurement, levelling, measurement errors, traversing, topographic surveys, optical distance measurement, error analysis, electronic surveying equipment, future surveying technologies.

Textbooks:
J. Fryer, M. Elfick, R. Brinker, P. Wolf Elementary Surveying (Harper Collins Publishers).

J. Uren and W.F. Price Surveying for Engineers (MacMillan).

Library classification: 526.9.

CIVL 3602 Fluids 2

4 credit points

Prerequisite: *CIVL 2601 Fluids 1*
Classes: *26hrs lec, 26hrs prac work/tut*
Assessment: *one 3hr exam covering the whole syllabus at the end of semester. Credit will be given for practical work and tutorial submissions, as indicated at the commencement of the course.*

Senior core course for the degree in Civil Engineering.

Objectives: To develop an understanding of: theory and practical aspects of analysis of fluid behaviour in pipes and open channels, and of fluid machines.

Outcomes: Students should gain the ability: to calculate heads and flows through pipe and open channel systems for steady and for unsteady conditions; and to determine machine requirements for various systems.

Syllabus summary: Dimensional analysis and similitude, floating vessels, open channel flow, pipe networks, floating vessels, hydro and aero-foils, pumps and turbines, compressible flow and unsteady flows.

Textbooks:
Textbooks:

Douglas, Gasiorek and Swatffield Fluid Mechanics (Pitman).

Hydraulics Data Sheets (Department of Civil Engineering, University of Sydney).

Robertson and Crowe Engineering Fluid Mechanics (Wiley).

Rouse Elementary Mechanics of Fluids (Dover).

Streeter and Wylie Fluid Mechanics (McGraw-Hill).

Young Munson and Okiishi A Brief Introduction to Fluid Mechanics (Wiley).

Vennard and Street Elementary Fluid Mechanics (Wiley).

Library classification: 532

CIVL 3701 Transportation Engineering and Planning

2 credit points

When Offered: *July Semester*
Classes: *26hrs lec*
Assessment: *one 2hr exam and assignment.*

Senior core course for the degree in Civil Engineering. Senior elective course for the degree in Mechanical Engineering.

Objectives: To introduce students to the civil engineering aspects of the main modes of transport and their effects on the environment.

Outcomes: An appreciation will be gained of the basic requirements of the main transport modes in the design of facilities, along with environmental effects and the acquisition of transport planning information.

Syllabus summary: Functions of railway track components and track properties. Rail classification yards. Airport general layout, runway and terminal design. Design of ports and port structures in relation to ships and cargo handling. Containerisation and container facilities. Data collection and presentation for transport planning; gravity models. Environmental factors and impact assessment. Geometric design of roads. Road pavement design: flexible and rigid.

Textbooks:
Reference books:

Hay Introduction to Transportation Engineering (Wiley).

Wright and Ashford Transportation Engineering - Planning and Design (Wiley, 1989).

IC AO Airport Planning Manual.

Rural Road Design (Austroads 1989).

Pavement Design (Austroads 1992).

Library classification: 385, 625, 627, 711.

CIVL 3802 Engineering Construction 2

4 credit points

Prerequisite: *CIVL 2801 Engineering Construction 1.*
When Offered: *March Semester*
Classes: *26hrs lec & 26hrs tut*
Assessment: *A number of assignments, including both oral andwritten presentations, will make up 90 marks, a site visit reportwill be assessed formally and will make the balance 10 marks (total 100 marks).*

Senior core course for the degree in Civil Engineering, elective for other branches of engineering.

Objectives: To gain a working knowledge of building structures and heavy construction engineering, including planning, cost estimating and optimisation of construction operations related to building structures, underground structures, quarry operations, temporary structures and associated aspects. The objectives are to be achieved by active participation in a number of projects and preparation of plans for the same.

Outcomes: Students should develop basic competency in planning, engineering, optimisation and cost estimation of operations in civil engineering and building construction, including design of construction systems and temporary works.

Syllabus summary: Fundamentals of tunnelling in soft and hard rock, ground improvement, piling and excavation support design,

construction systems for multi-storey structures, vertically-formed concrete structures, construction water supply and dewatering, production of natural and crushed rock aggregates, pavement design fundamentals and construction, safety in construction, quality management of construction works. This course will be run through a problem-based learning approach.

Textbooks:

Textbooks: Hand-outs will be given during the currency of the course

Reference books:

Peurifoy and Ledbetter Construction Planning Equipment and Methods (McGraw-Hill).

Ratay (editor), 2nd Ed Handbook of Temporary Structures in Construction (McGraw-Hill).

Brockenbrough, et al, (editors) Highway Engineering Handbook (McGraw-Hill).

Havers, et al (editors) Handbook of Heavy Construction.

Numerous other reference books which will address specific segments of the course, such as design and engineering of temporary structures or tunnelling.

Library classification: 624.0202, 624.6/A

CIVL 4006 Thesis 1

6 credit points

Corequisite: *A senior core course in the field of the subject*
Classes: *literature survey and experimental work*
Assessment: *Submitted typed thesis and oral presentation*

Senior Advanced core course for the degree in Civil Engineering. The course CIVL 4012 Thesis Honours (10 units) may be substituted for this core course.

Objectives: To be able to carry out research on a selected topic.

Outcomes: To plan and carry out experimental or data gathering work, to be able to interpret the results of this work and be able to present the findings in a clear and logical fashion.

Syllabus summary: A study, in groups of 2 or 3 students of a selected topic in Civil Engineering. Detailed information sheets are available from the Department of Civil Engineering at the beginning of Sem 1.

CIVL 4007 Thesis 2

4 credit points

Corequisite: *CIVL 4006 Thesis 1*
Wlien Offered: *July semester*
Classes: *52hrs of study*
Assessment: *Submitted typed thesis and oral presentation*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: As for CIVL 4006 Thesis 1.

Outcomes: As for CIVL 4006 Thesis 1.

Syllabus summary: Additional study of the topic selected for CIVL 4006 Thesis 1.

CIVL 4008 Practical Experience

0 credit points

Prerequisite: *Prereq 28 cp of Senior courses*
Wlien Offered: *March Semester*
Classes: *12wkspractical work experience (375hrs minimum)*
Assessment: *A written report*

Senior Advanced core course for the degree in Civil Engineering.

Objectives: To expose students to Engineering Practice and provide working experience in the field of engineering.

Outcomes: Students will gain first hand experience of working in an Engineering environment, will see how engineering companies are organised and will be exposed to problem solving in a commercial environment.

Syllabus summary: Each student is required to work as an employee of an approved engineering organisation and to submit a satisfactory written report of his or her work. Normally 12 weeks of practical work experience (375 hours minimum) is required and this is mainly undertaken after the completion of some or all of the prescribed Senior core courses and before enrolment in the final year of study. The University Careers and Appointments Service is available to assist students to obtain suitable employment.

Textbooks:

Reference book

Eagleson Writing in Plain English (Aust. Govt Publishing Service)

CIVL 4010 Civil Engineering Camp

4 credit points

Prerequisite: *CTVL 3501 Swveying 1.*
Wlien Offered: *July Semester*
Classes: *The civil engineering camp is carried out as a live-in camp over a 10-day period at a nominated location off-campus.*
Assessment: *No formal exam; assessment is based on field work activities, oral presentations and reports which are submitted during the camp period*

Senior Advanced core course forthe degree in Civil Engineering.

Objectives: To give students experience" at gathering dimensional information and using that information in design considerations; to give students experience in project design in a practical situation; to give students the opportunity to experience project management in a practical situation; to develop student skills in working as a group member on an engineering project team; to develop oral and written presentation skills. . . . . .

Outcomes: Students should develop an understanding of: dimensional control in a project situation; total proj ect management considerations; real world design problems; project presentation skills; group relationships; time management skills.

Syllabus summary: The activities involve work directed towards an integrated civil engineering project. A number of survey tasks are carried out to provide the necessary design information. At the camp, each group will be given responsibility for one component of an overall project. Oral presentation and design submissions form an integral part of the camp activities.

CIVL 4011 Professional Practice

4 credit points

Wlien Offered: *July Semester*
Classes: ***26hrs*** *lec,* ***26hrs*** *tut*
Assessment: *Project and assignment work including an oral presentation*

Senior Advanced core course for the degree in Civil Engineering.

Objectives: To provide final year students with an appreciation of professional matters which will influence the way they will work as professional engineers.

Outcomes: Knowledge of occupational health and safety act; knowledge of procedures for quality assurance both in design and construction; understanding of industrial relations issues; understanding of basic civil engineering contracts; awareness of ethical issues related to the engineering profession, and the social responsibility of engineers.

Syllabus summary: The lectures will be delivered by practising engineers and other experts in the following subject areas: (a) Social responsibility in engineering, social and environmental issues and ethics of engineering practice; (b) Industrial relations, legal contracts and law; (c) Occupational health and safety, and quality assurance; (d) quality assurance; (e) engineering contracts and documentation.

Textbooks:

Reference material:

As advised during course and

Tagg et al. Civil Engineering Procedure (Thomas Telford).

Wearne Civil Engineering Contracts (Thomas Telford).

Library classification: 658, 624.0685, 344, 624, 343, 346

CIVL 4012 Thesis Honours

10 credit points

Corequisite: *A Senior core course in the field of the thesis.*
Classes: *104 hrs study*
Assessment: *Submitted typed thesis and oral presentation.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To be able to carry out original research on a selected topic.

Outcomes: To plan and carry out original theoretical and/or experimental work, to be able to interpret the results of this work and be able to present the findings in a clear and logical fashion.

Syllabus summary: A study, in groups of two students, of a selected topic in Civil Engineering. Detailed information sheets are available from the Department of Civil Engineering at the beginning of the semester.

CIVL 4103 Advanced Materials

4 credit points

Prerequisite: *CIVL 3102 Materials Aspects in Design*
Classes: *40 hrs lec & 12 hrs lab/tut*
Assessment: *One 3 hr exam plus assignments.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: to develop an understanding of advanced cement-based and metallic materials for new and challenging applications.

Outcomes: Ability to select advanced cement-based and metallic materials for use under demanding service conditions for which their traditional counterparts may be less suitable.

Syllabus summary: Advanced cementitious materials, fibre-reinforced concrete. Modern ceramics andmechanisms for their toughening. High strength steels, stainless steels, multiaxial fatigue, impact strength of materials, stress corrosion cracking in metals. Thermal properties of mass concrete, dynamic effects on concrete properties, statistical analysis and interpretation of concrete data. Durability problems of prestressed and post-tensioned members. The laboratory sessions are held in the Microscope Unit and familiarise students with transmission and scanning microscopy, microanalysis and image analysis.
Textbooks:
Library Classification: 620.11 - 620.19

CIVL 4104 Materials Honours

4 credit points

Prerequisite: *CIVL 3102 Materials Aspects in Design*
Wlien Offered: *July Semester*
Classes: *40hrs and lab/tut: 12hrs.*
Assessment: *One 3hr exam plus assignments.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: to develop an understanding of advanced cement-based and metallic materials for new and challenging applications.

Outcomes: Ability to select advanced cement-based and metallic materials for use under demanding service conditions for which their traditional counterparts may be less suitable. Introduction to research aspects in advanced materials.

Syllabus summary: Advanced cementitious materials, fibre-reinforced concrete. Modern ceramics andmechanisms for their toughening. High strength steels, stainless steels, multiaxial fatigue, impact strength of materials, stress corrosion cracking in metals. Thermal properties of mass concrete, dynamic effects on concrete properties, statistical analysis and interpretation of concrete data. Durability problems of prestressed and post-tensioned members. The laboratory sessions are held in the Microscope Unit and familiarise students with transmission and scanning microscopy, microanalysis and image analysis. Exposure to research development in advanced materials.

Textbooks:
Reference books:

Campbell-Allen and Roper Concrete Structures: Materials Maintenance and Repairs (Longman Scientific & Technical).

Others to be advised.

Library Classification: 620.11 - 620.19.

CIVL 4208 Finite Element Methods

4 credit points

Prerequisite: *CIVL 3204 Structural Analysis.*
When Offered: *March Semester*
Classes: *26hrs lec & 26hrs tut*
Assessment: *Classwork, assignments and one 3hr exam*

Senior Advanced core course for the degree in Civil Engineering.

Objectives: To provide an understanding of the basics of finite element analysis and how to apply this to the solution of engineering problems.

Outcomes: A knowledge of methods of formulating finite element equations, basic element types, the use of finite element methods for solving problems in structural and continuum analysis and the use of finite element packages.

Syllabus summary: Introduction to finite elements, analysis of bars, beams and assemblages. Analysis of elastic continua, in plane stresses in plates, plane strain problems, plate bending. Elastic settlement analysis. Finite element analysis of vibrations and stability, use and testing of finite element packages.
Textbooks:
Reference books:

Zienkiewicz The Finite ElementMethod 3rd edn (McGraw-Hill, 1977).

Bathe and Wilson Numerical Methods in Finite Element Analysis (Prentice Hall, 1976).

Cook Concepts and Applications of Finite element Analysis (John Wiley, 1974.

Textbooks:

As prescribed during the course

Library Classification: 624.176, 624.02, 624.171

CIVL 4209 Bridge Engineering

4 credit points

Prerequisite: *CIVL 3205 Concrete Structures 1 and CIVL 3206 Steel Structures* ***1***
Classes: *26hrs lec & 26hrs tut*
Assessment: *Basedon submittedwork, seminar presentations and one 3hr exam*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of the key issues in the design, construction and maintenance of bridges.

Outcomes: An appreciation of the relevance of all other courses of study to the practice of all aspects of Bridge Engineering.

Syllabus summary: Highway and railway bridge loading; influence lines; analysis; transverse load distribution; computer modelling of bridges; effects of temperature and concrete creep and shrinkage; bridge bearings; selection of structural forms; standardised bridge systems, skew and curved bridges, bridge foundations; construction methods; case studies of significant bridges.

Textbooks:
Reference books:

NAASRA Bridge Design Specification

Australian and New Zealand Railway Conferences Railway Bridge Design Manual

Library classification: 624.2-8

CIVL 4210 Concrete Structures 2

4 credit points

Prerequisite: *Prereq CIVL 3205 Concrete Structures 1*
May not be counted with/Additional Information: *CIVL 4217 Concrete Structures Honours*
Classes: *28hrs lec, 28hrs tut*
Assessment: *One 3hr exam plus assessment of selected assignments*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop a depth in understanding of the fundamental behaviour and design of concrete and composite members and structures.

Outcomes: The development of design skills that will lead to reliable and economical designs of both practical and more complex structures.

Syllabus summary: Practical aspects of reinforced concrete, prestressed concrete and composite steel-concrete members and structures - non-linear behaviour, load-moment-curvature relationships, strength of beams, columns and beam columns, moment redistribution, ultimate strength of concrete slabs, yield line analysis of slabs, strip equilibrium analysis of slabs, the analysis of time-dependent effects in concrete structures models of concrete creep and shrinkage, design of composite t-beams, designof composite slabs incorporating profiled steel sheeting, design of composite columns.

Textbooks:
Textbooks:

Warner et al. Reinforced Concrete (Pitman).

Warner and Faulkes Prestressed Concrete (Longman Cheshire).

Standards Australia Specification - current editions

AS2327 Part 1 Composite Structures Code

AS 1170 Parts 1 and 2 Loading Code, and

AS3600 Concrete Structures Code, or

AS HB2.2 Structural Engineering Standards.

Reference books:

Lin and Burns Design of Prestressed Concrete Structures (Wiley).

Park and Gamble Reinforced Concrete Slabs (Wiley).

Other books as indicated in classes.

Library classification: 624-17, 624.183

CIVL 4211 Structural Dynamics

4 credit points

Prerequisite: *CIVL 3204 Structural Analysis*
May not be counted with/Additional Information: *CIVL 4216 Structural Dynamics Honours*
Classes: *26hrs lec, 26 hrs tut*
Assessment: *One 3hr exam and assignments.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To provide an understanding of the dynamic behaviour of structural systems and wind loads on structures.

Outcomes: To be able to determine the natural frequency of simple structural systems manually and complex systems using computer analyses; to be able to perform analyses for the effects of forced vibration and structural damping; to be able to perform wind analyses on low and high rise structures.

Syllabus summary: Introductory structural dynamics, natural frequency, free and forced vibration, structural damping. Single and multi-degree of freedom systems, finite element dynamic analysis, consistent mass matrix, damping matrix, free vibration, forced vibration, wind loading on structures.

Textbooks:
William T. Thomson Theory of'Vibration with Applications 2nd Ed. (Allen & Unwin, 1983).

Clough & Penzien Dynamics of Structures (McGraw-Hill Book Co., 1993).

'Vibrations in Civil Engineering', Postgraduate Course, Department of Civil Engineering, The University of Sydney, May, 1981.

AS 1170.2-1989 SAA Loading Code Part 2: Wind Loads (Standards Australia).

Aynsley, Melbourne andVickery Architectural Aerodynamics (Applied Science Publishers).

Narayanan and Roberts Ed. Structures Subjected to Dynamic Loading (Elsevier Applied Science).

Holmes, Walker and Melbourne A Commentary on the Australian Standard for Wind Loads (Australian Wind Engineering Society).

Library Classification: 624.171, 624.176 (Fisher Library)

CIVL 4212 Steel Structures 2

4 credit points

Prerequisite: *Prereq CIVL 3206 Steel Structures 1*
May not be counted with/Additional Information: *CIVL 4213 Steel Structures Honours*
When Offered: *March Semester*
Classes: *28hrs lec, 28hrs tut*
Assessment: *One 3hr exam at end of the semester plus assessment of assignment work.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop a working knowledge of the behaviour and design of steel structures beyond a basic competency.

Outcomes: Proficiency in the design of steel structures.

Syllabus summary: Three of the 4 subjects will be available: (1) Bending and torsionin steel structures - behaviour, analysis and design; (1) Local buckling behaviour and design; (3) Flexural-torsional buckling - behaviour and design of beams; (4) Shell structures - behaviour and membrane analysis.

Textbooks:
Textbooks:

Trahair and Bradford Behaviour and Design of Steel Structures (Chapman & Hall, 1991).

Trahair Flexural-Torsional Buckling of Structures (Spon, 1993).

Standards Australia AS4100 - Steel Structures (1990).

Gibson Thin Shells (Pergamon, 1980).

Vinson the Behaviour of Plates and Shells (Wiley, 1974).

Reference books:

Bulson Stability of Flat Plates (Chatto &Windus, 1970).

Hancock Design of Cold-Formed Structures (AISC, 1994).

Kraus Thin Elastic Shells (Wiley, 1967).

Calladine Theory of Shell Structures (CUP, 1983).

Other books as indicated during classes.

Library Classification: 624.17, 624.182

CIVL 4213 Steel Structures Honours

4 credit points

Prerequisite: *Prerequisite: CIVL 3206 Steel Structures 1*
May not be counted with/Additional Information: *CIVL 4212 Steel Structures 2*
When Offered: *March Semester*
Classes: *lec: 28hrs, tut: 28hrs.*

Assessment: One 3hr exam at end of the semester plus assessment of assignment work.

Senior Advanced elective course for the degree in Civil Engineering.

Obj ectives: To develop a working knowledge of the analysis, behaviour and design of steel structures beyond a basic competency.

Outcomes: Proficiency in the analysis and design of steel structures.

Syllabus summary: Three of the 4 subjects will be available: (1) Elastic and plastic analysis and design for bending and torsion in steel structures; (2) Elastic local buckling of plates, behaviour and design of plate web girders; (3) Flexural-torsional buckling - behaviour, analysis, and design; ■ (4) Shell structures - behaviour, analysis, and design.

Textbooks:

Textbooks:

Trahair and Bradford Behaviour and Design of Steel Structures (Chapman & Hall, 1998).

Trahair Flexural-Torsional Buckling of Structures (Spon, 1993).

Steel Structures (1990) - Standards Australia AS4100

Gibson Thin Shells (Pergamon, 1980).

Vinson The Behaviour of Plates and Shells (Wiley, 1974).

Reference books:

B ulson Stability of Flat Plates (Chatto & Windus, 1970).

Hancock Design of cold-Formed Structures (AISC, 1994).

Kraus Thin Elastic Shells (Wiley, 1967).

Calladine Theory of Shell Structures (CUP, 1983).

Other books as indicated during classes.

Library Classification: 624.17, 624.182

CIVL 4214 Advanced Finite Elements Honours

4 credit points

Corequisite: *CIVL 4208 Finite Element Methods*
Wlien Offered: *July Semester*
Classes: *lec: 26hrs and tut: 26hrs*
Assessment: Class work, assignments and one 3hr exam.

Senior Advanced elective course for the degree in Civil Engineering.

Syllabus summary: Advanced elastic analysis, high order elements, isoparametric elements. Analysis of seepage and consolidation. Boundary element analysis, analysis of plates and shells. Advanced topics, computational techniques.

Textbooks:

Textbooks:

As prescribed during the course

Reference books:

Crouch and Starfield The Boundary Element in Solid Mechanics (Allen &Unwin, 1983)

Zienkiewicz The Finite Element Method (McGraw-Hill, 1977)

CIVL 4215 Finite Element Applications Honours

4 credit points

Teacher/Coordinator: *Assoc. Prof. Ansourian, Dr Clarke, Prof. Carter, Prof. Small*
Corequisite: *CIVL 4208 Finite Element Methods*
Classes: *26hrs lec & 26hrs tut.*
Assessment: Class work, assignments and one 3hr exam.

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To provide a knowledge of the theory of various finite element techniques and their applications.

Outcomes: Competence in using finite element packages for solving engineering problems along with an appreciation of the theory on which these analyses are based.

Syllabus summary: Advanced elastic analysis, high order elements, isoparametric elements. Analysis of seepage and consolidation. Boundary element analysis, analysis of plates and shells. Advanced topics, computational techniques.

Textbooks:

Reference books:

Bathe Finite Element Procedures in Engineering Analysis (Prentice-Hall, 1982)

Cheung Finite Strip Method in Structural Analysis (Pergamon, 1976)

Cook Concepts and Applications of Finite Element Analysis (Wiley, 1981)

Zienkiewicz The Finite Element Method (McGraw-Hill, 1989)

Relevant computer manuals

Library classification: 624.171

CIVL 4216 Structural Dynamics Honours

4 credit points

Teacher/Coordinator: *Assoc. Prof Kwok, Prof. Hancock*
Prerequisite: *CIVL 3204 Structural Analysis*
May not be counted with/Additional Information: *CIVL 4211 Structural Dynamics*
"When Offered: *July semester*
Classes: *26hrs lec and 26hrs tut.*
Assessment: *One 3hr exam.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To provide an understanding of the dynamic behaviour of structural systems and wind loads on structures.

Outcomes: To be able to determine the natural frequency of simple structural systems manually and complex systems using computer analyses; to be able to perform analyses for the effects of forced vibration and structural damping; to be able to perform wind analyses on low and high rise structures.

Syllabus summary: Structural dynamics, wind loading on structures. Finite element dynamic analysis, consistent mass matrix, damping matrix, free vibration, forced vibration, Eigenvalue routines.

Textbooks:

William T. Thomson Theory of Vibration with Applications 2nd Ed. (Allen & Unwin, 1983).

Clough & Penzien Dynamics of Structures (McGraw-Hill Book Co., 1993).

'Vibrations in Civil Engineering', Postgraduate Course, Department of Civil Engineering, The University of Sydney, May, 1981.

AS 1170.2-1989 SAA Loading Code Part 2: Wind Loads (Standards Australia).

Narayanan and Roberts Ed. Structures Subjected to Dynamic Loading, (Elsevier Applied Science).

Aynsley, Melbourne andVickery ArchitecturalAerodynamics (Applied Science Publishers).

Holmes, Walker and Melbourne A Commentary on the Australian Standard for Wind Loads (Australian Wind Engineering Society).

Sirniu and Scanlan Wind Effects on Structures (Wiley).

Library classification: 624.171, 624.176

CIVL 4217 Concrete Structures Honours

4 credit points

Teacher/Coordinator: *Prof. Ansourian, Dr Reid*
Prerequisite: *CIVL 3205 Concrete Structures **1***
Classes: *4hrAvk including lec and tut.*
Assessment: *One 3hr exam.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of the principles of analysis

and design of: (i) composite reinforced concrete and steel beams, columns and slabs; (ii) reinforced concrete beams, frames and slabs, accounting for moment redistribution due to plasticity; and (iii) prestressed concrete structures.

Outcomes: Understanding of theoretical principles of advanced analysis and proficiency in basic techniques of advanced design of reinforced concrete structures (including composite and prestressed structures).

Syllabus summary: (a) Composite structures: shear connection, full and partial interaction. Simply supported and continuous beams, columns and slabs.

(b) Reinforced concrete structures: non-linear behaviour moment redistribution, ultimate strength of slabs (strip equilibrium and yield-line analysis.

(c) Prestressed concrete structures: analysis and design for strength and serviceability.

Textbooks:

Park and Paulay Reinforced Concrete Structures (Wiley, 1975).

Warner and Faulkes Prestressed Concrete (Longman Cheshire, 1988).

Australian Standard for Concrete Structures AS3600-1988.

Library Classification: 624.183

C1VL 4403 Environmental Geotechnics

4 credit points

Prerequisite: *CNL 3401 Soil Mechanics A, CNL 3402 Soil Mechanics B.*
Wlien Offered: *July Semester*
Classes: *52hrs lec/tut*
Assessment: Tutorial and assignment submissions, as indicated at the commencement of the course.

Senior Advanced elective course for the degree in Civil Engineering. Assessment: Objectives: To develop an understanding of the geotechnical aspects of the design and management of industrial and domestic waste disposal systems.

Outcomes: Students should gain an understanding of: the role of geotechnics in the design of waste management systems; current design methods and technologies. In particular, they should be able to predict: likely interactions between waste and soil; of pollutant movement in the ground, and be able to evaluate strategies for the containment of industrial and domestic wastes and mine tailings.

Syllabus summary: Landfill design, including clay mineralogy, effects of chemicals on soil permeability, flow rates through membranes, effect of punctures, composite liners, mechanisms of mass transport, diffusion, dispersion, advective transport, sorption, predicting transport time, solutions to advection-dispersion equation, design of liners, stability of clay liners on slopes, design of covers, infiltration rates. Tailings disposal, including types of tailings dams, design of dams, water balances, rehabilitation.

Textbooks:

Reference books:

S. G. Vick Planning, Design and Analysis of Tailings Dams (Wiley).

M.R. Hausmann Engineering Principles of Ground Modification.

R.K. Rowe, R.M. Quigley & J.R. Booker Clayey Barrier Systems for Waste Disposal Facilities.

Library classification: 624.151

CIVL 4404 Foundation Engineering

4 credit points

Prerequisite: *CIVL 3401 Soil Mechanics A, CNL3402 Soil Mechanics* ***B.***
Classes: *52hrs lec/tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of semester. Credit will be givenfo r tutorial and assignment submissions, as indicated at the commencement of the course*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of: current methods used in the investigation and design of foundations on soils and rocks; the limitations of these methods.

Outcomes: Students should gain an understanding of: the designprocess in foundation engineering; the role of site investigation and field testing; the need to deal with uncertainty. In particular, they should develop the ability to: interpret the results of a site investigation; to use soils data to design simple foundations, and develop an appreciation of the interaction between soils, the foundation system and the supported structure.

Syllabus summary: Site investigation and field measurements. Behaviour, selection and design of shallow foundations. Strip andraft foundations. Pile foundation analysis and design. Foundations onrock.

Textbooks:

Reference books:

Tomlinson Foundation Design and Construction (Pitman).

Peck et al. Foundation Engineering(Wiley).

Poulos and Davis Pile Foundation Analysis and Design (Wiley).

Fleming et al. Piling Engineering (Halstead Press).

Das Principles of Foundation Engineering (PWS - Kent).

Library classification: 624.151.

CIVL 4405 Soil Engineering Honours

4 credit points

Prerequisite: *CNL 3401 Soil Mechanics A, CNL 3402 Soil Mechanics* ***B.***
Corequisite: *CIVL 4404 Foundation Engineering*
When Offered: *July semester*
Classes: *39hrs lec and 13hrs tut.*
Assessment: *One 3 hour examination covering the whole syllabus at the end of semester.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop understanding of advanced analytical techniques that are useful for the solution of problems in geotechnics.

Outcomes: Students should be able to make predictions of soil and foundation behaviour using these advanced techniques and gain familiarity with their limitations.

Syllabus summary: Critical State Soil Mechanics, three-dimensional consolidation and settlement analysis, analysis of soil-structure interaction, foundation dynamics.

Textbooks:

Reference books:

Atkinson and Bransby The Mechanics of Soils - An Introduction to Critical State Soil Mechanics (McGraw-Hill, 1978).

Mitchell Fundamentals of soil Behaviour 2nd Ed. (John Wiley & Sons, 1993).

Poulos Marine Geotechnics (Unwin Hyman, 1988).

Library classification: 624.151.

CIVL 4502 Surveying 2

4 credit points

Prerequisite: *CIVL 3501 Surveying 1.*
When Offered: *March Semester*
Classes: *32hrs lec, 20hrs fieldwork and tut*
Assessment: *Fieldwork, reports, tutorials, and one 3hr exam at the end of the course*

Senior Advanced elective course for the degree in Civil Engineering.Objectives: To introduce students to precisemeasurement technologies, processes, computational procedures, and interpretive skills; to give students a high level of understanding of automated electronic measuring systems; to introduce students to data handling, manipulation, and presentation at a project level.

Outcomes: Students should gain the ability to: undertake precise measurement procedures for determining position, extent and stability of points and structures; use advanced electronic measurement equipment; handle and manipulate data in electronic form; analyse data and determine the magnitude of errors.

Syllabus summary: CAD and database applications, electronic distance measurement, precise angle measurement, high precision engineering surveys, geodetic surveying, global positioning systems, geographic information systems, photogrammetry and remote sensing.

Textbooks:

J. Fryer, M. Elfick, R. Brinker, P. Wolf Elementary Surveying (Harper Collins Publishers).

or

J. Uren and W.R Price Surveying for Engineers (MacMillan).

or

J. Muskett Site Surveying (Blackwell Science).

Library Classification: 526.9

CIVL 4503 Surveying Honours

4 credit points

Corequisite: *CIVL 4502 Surveying 2*
Classes: (26hrs lec and 26hrs tut/lab) for one sem.
Assessment: Fieldwork and one 3hr exam at end of course.

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To introduce students to precise measurement technologies, processes, computational procedures, and interpretive skills; to give students a high level of understanding of automated electronic measuring systems; to introduce students to data handling, manipulation, and presentation at a project level; to develop instrument calibration skills; to develop adjustment skills; and to develop project planning skills.

Outcomes: Students should gain the ability to: undertake precise measurement procedures for determining position, extent and stability of points and structures; use advanced electronic measurement equipment; handle and manipulate data in electronic form; analyse data and determine the magnitude of errors; implement appropriate planning to control errors; be familiar with future trends inmeasurement technology (GPS, RS); and understand the environmental application of modern measurement technology.

Syllabus summary: CAD and database applications, electronic distance measurement, precise angle measurement, high precision engineering surveys, geodetic surveying, global positioning systems, geographic information systems, photogrammetry, remote sensing, error ellipse, least squares adjustment, calibration of electronic surveying equipment.

Textbooks:

J. Fryer, M. Elfick, R. Brinker, P. Wolf Elementary Surveying (Harper Collins Publishers).

J. Uren and W.F. Price Surveying for Engineers (MacMillan).

J. Muskett Site Surveying (Blackwell Science).

CIVL 4603 Environmental Fluids 1

4 credit points

Wlien Offered: *March Semester*
Classes: *26hrs lec, 26hrs tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of the semester. Satisfactory performance in tutorials is also a requirement. Credit will be given for tutorial submissions, as indicated at the beginning of the course*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of: basic meteorological principles; the principles of hydrology; the importanceof flood routing; the principles of flood mitigation; irrigation requirements; evaporation and reservoir design.

Outcomes: Students will be able to: list the key factors which affect the climate of Australia; describe intensity-frequency-duration curves and explain their use; calculate design rainfall intensities; calculate peak flows from catcrimentsjdeterminerunoffhydrographs for various storm durations and intensities; state the principles of flood routing and perform flood routing calculations; assess surface runoff and infiltration in catchment; list and utilise design procedures for storage and service reservoirs; calculate reservoir safe yield; determine evaporation from reservoirs and evapo-transpiration from catchments.

Syllabus summary: Elements of meteorology; precipitation measurement and analysis; design rainfall intensities; hydrographs; peak discharge calculations; evaporation and transpiration, infiltration and groundwater; surface runoff, flood routing.

Textbooks:

Textbook:

Australian Rainfall and Runoff (I.E. Aust., 1987).

Reference books:

Raudkivi Hydrology (Pergamon)

Raudkivi and Callander Analysis of Groundwater Flow (Edward Arnold).

Library classification: 551.48

CIVL 4604 Environmental Fluids 2

4 credit points

When Offered: *July Semester*
Classes: *26hrs lec, 26hrs tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of the semester. Satisfactory performance in class assignments is also a requirement. Credit will be given for assignment submissions, as indicated at the beginning of the course*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of: ocean wave generation, transmission and coastal effects; the principles of sediment transport; break-water design, fluid-structure interaction; flood detention basins and advanced flood routing techniques.

Outcomes: Students will be able to: list and describe the major parameters affecting ocean wave generation; describe the processes of ocean wave transmission; calculate energy transfer by waves; describe the behaviour of waves in shallow water; explain the fundamental principles of sediment transport; describe sediment transport processes in rivers; describe coastal sediment transport processes; explain basic performance requirements for breakwaters, and factors considered in their design; describe several fluid structures, together with associated fluid-structure interaction, including, but not limited to, spillways, stilling basins, bridge piers, water supply intakes; describe design considerations for flood detention basins; explain the principles of river routing and discuss the applications of flood modelling techniques and programs.

Syllabus summary: Coastal processes. Sediment transport. Breakwater design. Fluid structure interaction. Flood effects.

Textbooks:

Reference books:

To be advised during the course.

Library Classification: 627.58, 551.36

CIVL 4605 Water Resources Engineering

4 credit points

When Offered: *July Semester*
Classes: *26hrs lec, 26hrs tut*
Assessment: *One 3hr exam covering the whole syllabus at the end of the semester. Satisfactory performance in class assignments is also a requirement. Credit will be given for assignment submissions, as indicated at the beginning of the course*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of: the assessment methods for water quality; physical biological and chemical treatmentmethods; water storage and distribution systems; management principles for water resources, including water re-use; irrigation techniques and demands; hydro-power systems.

Outcomes: Students will be able to: state the requirements of water quality for various purposes; detail the physical methods of water treatment; detail the biological methods used in water treatment; detail the chemical methods used in water treatment; design multi-node water distribution networks; explain the design principles of water supply for high-rise buildings; describe water conservation methods and management principles for water use, including storm water detention and treatment; explain 'grey water' re-use techniques and their applications; describe various irrigation methods and associated hydraulic design; design small scale hydro-power installations.

Syllabus summary: Water quality; water purification methods; water reticulation; water resource management; irrigation and hydro-power.

Textbooks:

Reference books:

As indicated during classes

Library classification: 628.1

CIVL 4606 Environmental Fluids Honours

4 credit points

Prerequisite: *CIVL 3602 Fluids 2.*
May not be counted with/Additional Information: *CIVL 4604 Environmental Fluids 2*
Wlien Offered: *July semester*
Classes: *26hrs, tut: 26hrs.*
Assessment: *One 3hr exam covering the whole syllabus at the end of the semester. Satisfactory performance in class assignments is also a requirement. Credit will be given for assignment submissions, as indicated at the beginning of the course.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop an understanding of: the methods of analysis of the turbulent flow of fluids; fluid flow in open channels under complex conditions; aspects of fluid-structure interaction; ocean waves and their effect on offshore structures; advanced flood analysis techniques.

Outcomes: Students will be able to: apply the Navier-Stokes equations to a range of different flow systems; describe the behaviour of flows in open channels near channel transitions; detail open channel surface profiles under sub- and super-critical flow conditions; describe several types of fluid structures, together with fluid-structure interaction, including, but not limited to, spillways, stilling basins, bridge piers, water supply intakes; list and evaluate the parameters affecting ocean wave generation and transmission; describe the behaviour of waves in shallow water and explain energy transfer by waves; calculate forces exerted on structures subjected to wave action; describe design considerations for flood detention basins; explain the principles of river routing and discuss the applications of flood modelling techniques and use of computer programs.

Syllabus summary: Advanced fluid mechanics, waves, flood analysis, advanced open channel flow and aspects of fluid engineering.

Textbooks:

Reference books:

As advised during the course.

Library classification: 627.58, 551.36

CIVL 4803 Engineering Management

4 credit points

When Offered: *July Semester*
Classes: *26hrs lec, 26hrs tut*
Assessment: *One 3hr written examination at the end of the semester, covering the whole syllabus; a major project assignment covering the project planning and documentation segment; class test during the semester and credit which may be givenfor any coursework as advised at the commencement of the course*

Senior Advanced core course for the degree in Civil Engineering, elective for other branches of engineering.

Objectives: To develop an understanding of conceptualisation and management of engineering and construction projects including: economic modelling, appraisal and optimisation; economic analysis of public sector projects; project sensitivity and risk analysis and risk management techniques; value engineering; work study and related techniques; planning, scheduling and cost engineering of project; project documentation design and presentation.

Outcomes: Students should develop an understanding of the fundamentals of project conceptualisation, appraisal, planning and optimisation plus ability to: model and analyse basic economic problems in engineering and construction projects including formulation of objective criteria; analyse, interpret and present the results; quantitatively evaluate field productivity and method study, aspects of team management and design and presentation of professional documentation.

Syllabus summary: Introduction to project conceptualisation and development; stages in project life cycle; techniques of project appraisal including comparison of alternatives, valuation, depreciation and capitalisation method; sensitivity and risk analysis and management of risks; value engineering; work study and related concepts and techniques; pre- and post-tender planning, cost engineering, critical path method of scheduling; resource levelling and associated project management techniques.

Textbooks:

Textbooks: No single textbook covers the entire syllabus of this course. Material handed out during the sessions will be relevant.

Recommended Reference books:

Grant, Lreson and Leavenworth Principles of Engineering Economy (J. Wiley & Sons).

Canada, Sullivan and White Capital Investment Analysis for Engineering and Managers (Prentice Hall, 1996, USA).

Shtub, Bard and Globerson Project Management Engineering, Technology and Implementation, (Prentice Hall, 1994, USA).

Badiru and Pulate Comprehensive Project Management: Integrating Optimization Models, Management Principles, and Computers (Prentice Hall, 1995, USA).

Thompson Organisation and Economics of Construction (McGraw-Hill).

Turner Handbook of Project-based Management (McGraw-Hill).

Library classification: 624.068, 658.01518, 692.5-8

CIVL 4804 Project Procedures

4 credit points

Wlien Offered: *July Semester*
Classes: *26hrs lec & 26hrs tut*
Assessment: *Based on submitted work and one 3hr exam*

Senior Advanced elective course for the degree in Civil Engineering.

Syllabus summary:

(a) Cost engineering and estimating—Elemental estimating for cost planning and value engineering, work measurement and bills of quantities; computer aided estimating; cost monitoring of construction projects; tender preparation and documentation.

(b) Industrial legislation and awards.

(c) Contract law and documentation.

Textbooks:
Library Classification: 692.5

CIVL 4805 Project Formulation

4 credit points

Wlien Offered: *July Semester*
Classes: Tutorials/Workshops -52 hours
Assessment: *No formal exam; assessment will be based on submitted documents and adequacy of oral presentation to a board of review.*

Senior Advanced elective course for the degree in Civil Engineering, elective for other branches.

Objectives: To develop an understanding of conceptualisation, formulation, analysis and documentation of building and civil engineering projects and products; To gain skills in the preparation of a business plan/tender for a project or product, including technical, commercial and legal aspects and statutory approvals.

Outcomes: Students should develop an understanding of the fundamentals of project conceptualisation, appraisal, planning and optimisation plus ability to: model and analyse basic financing and cash flow requirements, risk analysis and management plan, marketing and sales plan, and design of professional documentation and presentation to a board of review.

Syllabus summary: The course will integrate the technical, commercial and managerial aspects of the formulation of a project or product. Technical design and specification will be carried out to the point where it can be shown that the concept is technically sound; technical innovation in the design concept for commercial edge will be encouraged. Students will be cast in the role of competing entrepreneurs faced with the exploitation of a business opportunity related to specific building and civil engineering projects and products. Groups will develop competitive proposals embodying business plans and demonstrating the technical and financial feasibility of the project and appropriate legal and managerial arrangements and corporate structure for the proposed enterprise. The course will be conducted through workshops and with the participation of leading professionals from building, engineering, legal and financing industries.

Textbooks:
Library classification: 624.068, 658.01518, 692.5-8

CIVL 4901 Civil Engineering Design

4 credit points

Prerequisite: *CIVL 3205 Concrete Structures 1, CIVL 3206 Steel Structures 1*
Wlien Offered: *March Semester*
Classes: *13hrs lec & 39hrs of drawing office work*
Assessment: *No formal exam; assessment will be based on submissions*

Senior Advanced core course for the degree in Civil Engineering.

Objectives: To give students an appreciation of the role of the designer in the development of Civil Engineering projects.

Outcomes: Students will have developed an understanding of the design philosophy. They will gain this through their involvement in a number of exercises which cover the design sequence from concept to documentation.

Syllabus summary: The design sequence including definition, value and criteria selection; generation of proposals; analysis of proposals; selection of design; development of details of a particular design selected. Feasibility studies and examination of existing works. Study of design projects by stages, including details of some aspects.

The course is under the direction of an engineer in professional practice in cooperation with members of the academic staff. Lectures on specific aspects of design are supplemented by visits to construction, testing and manufacturing sites. Lectures and exercises on architectural design and practice and their relationship to civil engineering are included in the course.

Textbooks:
Reference books:

The course is of a wide-ranging nature, and all text and reference books previous and current courses have relevance. In addition, reference will be made to many codes and guides to practice, of which the following list covers only the structural field:

Current SAA Codes, Manuals and Specifications, particularly

AS4100 - Steel Structures Code

AS3600 - Concrete Structures Code

AS 1554 - Manual Welding, Part I

AS1170 - Loading Code, Parts I and E

AS1511 - High Strength Structural Bolting Code

MAI Steel Structures

N.A.A.S.R.A. Bridge Design Specification

AS 1720 - Timber Engineering Code

(Purchase of separate codes is recommended)

Library classification: 624:15, 624:177, 624.18,624.25, 625.72, 627.2, 627.3, 627.8.

CIVL 4902 Civil Engineering Design Honours

4 credit points

Corequisite: *CIVL 4901 Civil Engineering Design*
When Offered: *July semester*
Classes: *13hrs lec and 39hrs of drawing office work.*
Assessment: *No formal exam; assessment will be based on submitted work.*

Senior Advanced elective course for the degree in Civil Engineering.

Objectives: To develop design skills for students who have shown an aptitude for design.

Outcomes: Students will not feel daunted by complex design challenges. They will have developed their own design challenges. They will have developed their own design philosophy by working through more complex design assignments.

Syllabus summary: Aspects of the design cycle from concept to detailed design documentation are explored by way of selected project design assignments.

Design assignments will have a complexity requiring the selection and use of advanced analytical techniques and the interpretation of results, for incorporation in the design.

The course will be conducted by a practicing professional engineer and will draw on the specialist expertise of academic staff.

Textbooks:
Text and reference books:

Advice will be given in class at the commencement of each assignment.

Library classification: 624:15, 624:177, 624.18,624.25, 625.72, 627.2, 627.3, 627.8.

Electrical Engineering

ELEC 1001 Introductory Electrical Engineering

4 credit points

Corequisite: *MATHS 1001 Differential Calculus and Linear Algebra.*
May not be counted with/Additional Information: *ELEC 1101 Science, Technology'and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology*
When Offered: *July semester*
Classes: *Two lec/wk and nine 3hr lab/tut.*
Assessment: *One 2hr exam at end of sent; lab reports; and mid-sem tests.*

Junior core unit of study for the degrees in Civil Engineering, Project Engineering and Management (Civil) and Mechanical and Mechatronic Engineering.

Syllabus summary: Electricity: definitions and conventions. SI units. Charge and energy conservation laws. Electrical energy sources. Ohm's law. Voltage and current measurements. Conductivity and resistance. Power dissipation. Kirchhoff's laws. Current and voltage dividers. Potentiometers. Measurement of resistance. Thevenin's theorem. Loop currents and node voltages. Reciprocity theorem. Linearity and principle of superposition. Voltage-to-current source conversion. Delta-star conversion. Loading effect of a voltage source. Combined voltage supply circuits. Time varying voltages and currents. Average and effective values. Energy dissipation and storage. Capacitance, inductance. Steady-state DC behaviour of capacitors and inductors. Natural response of first order circuits. Transients. C and L response to square and triangular voltages.

Alternating current quantities. Magnitude, period, frequency and phase. Complex algebra. AC behaviour of resistance, inductance and capacitance. Introduction to AC circuits. RL and RC series circuits. Impedence concept. Phasor and locus diagrams. Equivalent series and parallel impedences. Admittance. Power in AC circuits. Power triangle. Power factor. RLC series circuit behaviour. Series resonance. Introduction to AC network.

Analysis. RLC parallel circuit. Parallel resonance. Series-parallel circuits. Introduction to filters. Single phase transmission line. Domestic distribution. Wiring and grounding. Dual-voltage AC supply. Power factor correction. Nonlinear circuit elements. Introduction to semiconductors. Diodes. Transistors. V-I characteristics.. Nonlinear circuit analysis. Load line and operating point.

ELEC 1101 Electrical Engineering 1

7 credit points

May not be counted with/Additional Information: *Digital and Electronics Technology (Science Faculty), U 1.500 Introductory Electrical Engineering, and U2.502 Electrical Technology*
Assessment: *Presentations, reports and assignments plus a Ihr exam and two 2hr exams at the end of Sem 1, and two 2hr exams at the end of Sem 2*

Junior core course for the degree in Electrical Engineering.

Syllabus summary: The course consists of three modules:

Introductory Electronic Systems (6 units): has three contact hours per week over the year. An integrated course, it combines computer-based problem solving and simulation with linear DC circuits, DC switching, transients, AC circuits, frequency response, non-linear circuits, operational amplifier functions and electrical safety. The supporting laboratories include instrumentation and computer-based instrument emulation.

Introductory Digital Systems (6 units): has three contact hours per week over the year. An integrated course, it combines construction and manufacturing techniques for digital systems, schematic capture, simulation and printed circuit board software with number representation, combinatorial logic design, sequential logic design, registers, counters, ROM and RAM elements Generic Array Logic (GAL) integrated circuits and synchronous sequential circuits. The associated laboratories include a team-based digital design, construct and test project.

Communication Skills (2 units): has 2 contact hours per week over the first semester. The course includes reinforcement of skills in English expression and report writing, while introducing the necessary elements of engineering drawing, graphical drawing, spreadsheets, graphics, document preparation and document control. The course provides a framework for the introduction of total quality management (TQM) concepts.

ELEC 1101 Science, Technology and Engineering

6 credit points

Prerequisite: *Advisory prerequisites HSC Maths 3 unit, HSC Physics 2 unit*
May not be counted with/Additional Information: *ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology*
WJien Offered: *March semester*
Classes: *Six contact hours per week combining lectures, laboratory work, computing, tutorials and presentations*
Assessment: *Presentations, reports and assignments plus two 2hr exams at the end the semester.*

Junior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: This course focuses on concepts and student skills. The majority of the contact hours involve learning in a hands on environment. The course consists of material from three areas:

Communication Skills: Human communication; technical skills in written, numeric and graphical communication; computer communication tools such as word processors, spread sheets, charting and drawing packages; and management of people, documents and projects.

Analogue Circuits: Linear DC circuit elements and laws, and series and parallel circuits; concepts of equivalent circuits; operational amplifiers and circuits; electrical measurement tools; safety issues; and computer based simulation of circuits.

Digital Circuits: Number systems and codes; logic gates and Boolean algebra; combinatorial logic circuits; and digital arithmetic.

ELEC 1102 Introductory Electrical Circuits

6 credit points

Prerequisite: *Advisory prerequisites MATHS 1001 Differential Calculus and Linear Algebra, ELEC 1101 Science, Technology and Engineering.*
May not be counted with/Additional Information: *ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology*
When Offered: *July semester*
Classes: *Six contact hours per week combining lectures, laboratory work, computing, tutorials and projects.*
Assessment: *Presentations, reports and assignments plus two 2hr exams at the end of the semester.*

Junior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: This course focuses on technical knowledge and skills. About two thirds of the contact hours involve laboratory, tutorial and project work. The course consists of material from two areas:

Electrical Circuits: Network analysis; capacitors and inductors; first order circuits and transient responses; step responses; complex numbers, phasors, impedance and admittance; steady state analysis;

frequency analysis; frequency response of RLC circuits; filters; AC power, reactive power and power factor.

Computer Circuits: Sequential logic, including counters and registers; synchronous sequential circuits; programmable logic devices; introduction to microprocessors, databuses, tristate signals, memories and interfacing; MSI logic circuits; and a major project.

ELEC 2001 Electrical and Electronic Engineering

6 credit points

Prerequisite: ELEC 1001 Introductory Electrical Engineering.
*May **not be counted with/Additional Information:** ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2601 Microcomputer Systems.*
***WJien Offered:** March semester*
Classes: Sem 1: (3 lec & 3hrs lab/tut)Avk
Assessment: One 3hr exam at end Sem 1 plus lab reports and mid-semester tests

Intermediate core unit of study for the degrees in Mechanical and Mechatronic Engineering.

Syllabus summary: Polyphase energy generation. Three phase systems. Star and delta connected systems. Balanced and unbalanced loads. Magnetic fields. Solenoid and toroid. Magnetic circuit calculations. AC excitations of a magnetic circuit. Magnetising curve. Hysteresis and eddy current losses. Ideal and real transformers. Model and phasor diagram of a transformer.

Principle of electromagnetic energy conversion. Production of arotating magnetic field. Principles of AC machines. Synchronous machines. Induction motors. Equivalent circuits. Slip-torque characteristics. Methods of starting and speed control. DC machines. Shunt-existed generator. Shunt- and series-connected motors. Efficiency of DC machines.

Semiconductor devices: Diode, BIT and FET characteristics. Small-signal models. Basic circuits. Amplifiers and biasing; rectifiers. Linear power supplies. Thyrisor devices, applications to motor control.

Operational amplifiers: Characteristics, ideal and real. Feedback. Design with op amps: inverting, non-inverting and differential amplifiers; integrator and differentiator; simple filters, comparator and Schmitt trigger.

Digital electronics: Numbering systems. Gates and combinational logic. Latches, synchronous and asynchronous counters. Flip-flops and memory. TTL and CMOS logic families. Practical design examples.

Microprocessor fundamentals: architecture of a standard 8-bit microprocessor. Instruction set and addressing modules. Assembly language programming. Clock and reset circuits. Memory and I/O interfacing.

ELEC 2002 Electrical Technology

4 credit points

***Prerequisite:** MATHS 1001 Differential Calculus and Linear Algebra.*
***May not be counted with/Additional Information:** ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits , and ELEC 1001 Introductory Electrical Engineering.*
***Wlien Offered:** July Semester*
Classes: 2 lec/wk and nine 3hr tut/lab sessions
Assessment: One 2hr exam at end ofsem; lab reports; and mid-sem tests

Intermediate core unit of study for the degrees in Chemical and Aeronautical Engineering.

Syllabus summary: Basic AC and DC circuits. Elementary electronics. Operational amplifiers. Diodes and transistors. Electromechanical energy conversion. Principles of electric energy generation and distribution. Elementary digital systems.

ELEC 2101 Circuit Analysis

4 credit points

***May not be counted with/Additional Information:** Mutually exclusive with U2.471 IntroductoryMechatronics, U2.502ElectricalTechnology, U2.504 Electrical and Electronic Engineering*
Classes: Slec/wkplus 36hrs of lab/tut
Assessment: Two 2hr exams plus reports and assignments

Intermediate core course for the degree in Electrical Engineering.

Syllabus summary: Circuits and energy conversion—Transient and steady state responses of electric circuits. Complex frequency analysis, phasors. Laplace transform, transfer functions and frequency response. Transformers. Two port networks. Introduction to energy conversion; balanced three phase circuits. Modelling and simulation using Matlab.

Digital systems—Computer architecture and assembly language programming. Microprocessor and microcontroller systems, memory and IO interfacing, serial and parallel communications; real time control; system design decision, implementation and debugging.

Engineering development and structure—Engineering in history; early electical engineering; engineering in Australia; industry and the economy; Australian economy in a world context; electrical engineering and economic development.

ELEC 2401 Electronic Devices and Circuits

4 credit points

***Prerequisite:** Advisory prerequisite ELEC 1102 Introductory Electronic Circuits.*
***May not be counted with/Additional Information:** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology.*
***When Offered:** July semester*
***Classes:** (Two lec and an average of 2 hrs lab/tut) per week*
***Assessment:** Lab work and a 2hr exam at end of semester.*

Intermediate core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Basics of semiconductors, diodes, transistors; small-signal and large-signalmodels, rectification, biasing, gain; FET and BJT circuits, introduction to operational amplifiers.

ELEC 2501 Signals and Communications

4 credit points

***Prerequisite:** Advisory prerequisites MATH 1001 Differential Calculus and Linear Algebra, and MATH 1003 Integral Calculus and Discrete Mathematics, and ELEC 1102 Introductory Electronic Circuits.*
***When Offered:** July semester*
***Classes:** (Two lec and an average of 2 hrs lab/tut) per week*
Assessment: Lab, assignments and a 2hr exam at end of semester.

Intermediate core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Time and frequency representations of elementary signals and periodic and non-periodic signals. Fourier series and transform. Linear systems: impulse and frequency response. System functions of analog filters. Communication system fundamentals: channels, baseband communication of analog signals and binary data, amplitude and frequency modulation and demodulation.

ELEC 2601 Microcomputer Systems

4 credit points

Prerequisite: *Advisory prerequisites ELEC 1102 Introductory Electronic Circuits.*
May not be counted with/Additional Information: *ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology*
When Offered: *March semester*
Classes: *(Two lec and an average of 2 hrs lab/tut) per week*
Assessment: *Lab, assignments and a 2hr exam at end of semester.*

Intermediate core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Computer architecture and assembly language programming. Microprocessor and microcontroller systems, memory and IO interfacing, interrupts and interrupt handling. Serial and parallel communications. Elements of real time control; CPU and memory security and protection. System design, implementation and debugging.

ELEC 3101 Circuit Theory and Design

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2101 Circuit Analysis, MATH 2005 Fourier Series and Differential Equations*
When Offered: *July Semester*
Classes: *(2 lec and one 2hr tut)Avk*
Assessment: *Assignments, labs and an exam at the end of semester.*

ELEC 3101 Circuit Theory and Design 4 Credit Pts

Senior elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: The main aim of the course is to teach the theory and design of active and passive analog filters. Topics covered include: Review of network functions; approximation techniques such as Butterworth, Chebyshev characteristics; filter sensitivity to parameters; passive network synthesis; active RC filters; switched capacitor filters.

ELEC 3102 Engineering Electromagnetics

4 credit points

Prerequisite: *Advisory prerequisites (PHYS 2203 Physics2EE orPHYS 2002 Physics (Technological) B) and ELEC 2101 Circuit Analysis*
When Offered: *March Semester*
Classes: *(2 lec &2hr lab/tut)Avk*
Assessment: *Questions in lect/tut and a 2hr exam at end of semester.*

ELEC 3102 Engineering Electromagnetics 4 Credit Pts
Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering) and Telecommunications Engineering and Senior elective unit of study for Computer Engineering.

Syllabus summary: Transmission lines (circuit theory is used to derive wave phenomena) - revision of circuit elements and static fields; Maxwell's Equations in integral form; distributed circuits, characteristic impedance, waves in transmission lines, steady state and transient behaviour, reflections, Voltage Standing Wave Ratio, impedance transformation, and matching. Fields and waves (Maxwell's equations are used to derive wave phenomena) - revision of boundary problems; Maxwell's equations in differential form; plane waves and the analogy with transmission lines, reflection of waves at boundaries, atmospheric wave propagation, propagationin waveguides, waveguide components, radiation patterns of antennas and arrays; numerical methods.

ELEC 3103 Electrical Engineering Design

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2501 Signals and Communications, and ELEC 2601 Microcomputer Systems.*
When Offered: *July Semester*
Classes: *(1 lec & one 2hr lab)Avk*
Assessment: *Lab, assignments and a lhr exam at end of semester.*

Senior elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: This is a laboratory based unit where the topics involve a number of areas such as instrumentation, communications, sensing, lighting, thermal design and protection. The aim is to develop an integrated approach using basic concepts drawn from the major disciplines of Electrical and Electronic Engineering.

ELEC 3201 Fundamentals of Electrical Energy Systems

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2101 Circuit Analysis.*
When Offered: *July Semester*
Classes: *(2 lec & lhr lab/tut)Avk*
Assessment: *Assignments, a quiz and a 2hr exam at end of semester.*

ELEC 3201 Fundamentals of Electrical Energy Systems 4 Credit Pts
Senior core unit of study for Electrical Engineering and Senior elective unit of study for Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Systems consisting of electromechanical converters (electricalmachines), electrochemical converters (batteries, fuel cells) and electronic converters as well as basic circuit elements. An introduction to conventional and alternative renewable/non-renewable energy sources, energy transmission, markets and distribution. Basic techniques of systems modelling and analysis including per unit systems, transformers, lines, interference, power flows, transients, balanced faults, control of real and reactive power. Applications to household, transport, industrial and high voltage systems. Use of MATLAB as a modelling and simulation tool.

ELEC 3202 Power Electronics and Drives

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC2401 Electronic Devices and Circuits. Prereq U2.510 Electrical Engineering 2*
May not be counted with/Additional Information: *Mutually exclusive with U3.474 Electrical Machines and Drives*
When Offered: *July Semester*
Classes: *(2 lec & one 2hr lab/tut)Avk*
Assessment: *Lab reports, assignments and one 2hr exam at end of Sem*

Senior elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Applications and historical context, principles of electronic control of power flow, power semiconductors, phase controlled rectifiers and derivatives, AC-AC phase control, DC-DC converters, DC-AC converters.

Electromagnetic transducers, rotating magnetic field principles, synchronous machines, induction machines, electronically controlled machine operation.

ELEC 3301 Signals and Systems

4 credit points

Prerequisite: *Advisory prerequisites MATH 2005 Fourier Series and Differential Equations, and ELEC 2501 Signals and Communications.*
May not be counted with/Additional Information: *MATH3103 Signal Processing and MATH 3809 Signal Processing (Advanced).*
Wlien Offered: *March Semester*
Classes: *(2 lec & 2hr lab/tut)Avk*
Assessment: Lab reports, assignments and one 2hr exam at end of Sem

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Continuous-time and discrete-time signals: classification and properties. Basic properties of systems: linearity, time-invariance, causality, stability. Linear time-invariant (LTI) systems: the convolution sum and convolution integral, characterisation by differential and difference equations, impulse response, singularity functions.

Fourier series for continuous-time and discrete-time signals: definition, properties and effects of symmetry, periodic signals and LTI systems. Fourier transform for continuous-time and discrete-time signals: definition and properties, the generalised transform. Frequency response of LTI systems, linear and non-linear phase, Bode plots. Introduction to filtering.

Sampling: impulse train sampling, the sampling theorem, reconstruction of signals, effects of undersampling.

Laplace and z-transforms: definitions of bilateral and unilateral transforms, properties, pole-zero maps, analysis of LTI systems, transfer functions.

ELEC 3302 Fundamentals of Feedback Control

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3301 Signals and Systems*
May not be counted with/Additional Information: *MECH 3800 Systems Control and CHNG 3302 Process Control.*
Wlien Offered: *July Semester*
Classes: *(2 lec & 2hrs of lab or tut work)/wk*
Assessment: Performance in lab/tut and a 2hr exam at the end of semester.

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: History and review of control. Modelling of physical processes; state variables and differential equations. Dynamic response; review of Laplace transform, transfer functions and block diagrams, poles and zeros. Design specifications in the time domain. Basic feedback principles; effect of feedback on sensitivity and disturbance rejection, steady state accuracy and stability; the Routh criterion; proportional, integral and derivative control. Design using the rootlocus; rules for sketching rootlocus; lead and lag compensators; analogue and digital implementation of controllers. Frequency response design methods; the Nyquist stability criterion; design specifications in the frequency domain, gain and phase margins; compensator design. An introduction to state space for single input single-output systems; eigenvalues, zeroes and transfer functions; introduction to state variable feedback and design of estimators.

ELEC 3401 Electronic Devices and Circuits

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2401 Electronic Devices and Circuits and ELEC 2101 Circuit Analysis.*
When Offered: *March Semester*
Classes: *(2 lec & one 2hr lab)Avk*
Assessment: *Lab and a 2hr exam at end of semester*

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Basics and models of semiconductor devices (diode, JFET, MOSFET and BJT), IC fabrication (bipolar and MOS), amplifier frequency response, current sources and mirrors, power amplifiers, operational amplifiers and applications, power supplies, oscillators and phase locked loops.

ELEC 3402 Communications Electronics

2 credit points

Prerequisite: *Mutually exclusive with U3.476 Industrial Electronics; Prereq U2.510 Electrical Engineering 2; Coreq U3.511 Circuit Theory, U3.512 Signals and Systems*
When Offered: *July Semester*
Classes: *(2 lec & one 3hr lab class or tut)Avk*
Assessment: *One 3hr exam at end of each semplus lab report marks*

Senior core course for the degree in Electrical Engineering and the degree in Electrical Engineering (Information Systems Engineering).

Syllabus summary: Revision of devices, diode, BJT, FET, MOSFET circuits and op. amps, measuring instruments and techniques. Advanced device models. Differential pair, Darlington pair, cascode, multitransistor amps. Bootstrapping. IC bias. Frequency response, gain-bandwidth product. Feedback, effect on input and output impedances and gain, stability, compensation, gain and phase margins. Oscillators sinusoidal, phase-shift, Wien bridge, Colpitts, multivibrators, crystal oscillators. Power supplies/power electronics—linear, switched mode, protection. Tuned amplifiers, simple op. amp. filters. Power amplifiers, class A,B,AB,C, protection, output driver power dissipation. SPICE models. IC layout and fabrication, analogue IC design HF amplifier and oscillator design, s-parameters, striplines.

ELEC 3403 Switching Devices and High Speed Electronics

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3401 Electronic Devices and Circuits.*
When Offered: *July Semester*
Classes: ***(2*** *lec and* ***2*** *hr lab/tut) per week*
Assessment: *Practical work and a 2hr exam at end of semester.*

Senior core unit of study for Electrical Engineering (Information Systems Engineering) and Computer Engineering and Senior elective unit of study for Electrical Engineering and Telecommunications Engineering.

Syllabus summary: Solid state physics, PN and metal-semi junctions, semiconductor devices, digital devices (TTL, Schottky TTL, nMOS and CMOS), inverter and basic gates, output stage (open drain andtri-state), metastability and latchup in CMOS, logic family characteristics (voltagelevels, noisemargins, power and switching speed), interfacing logic familes, protection and opto-isolators, digital circuits (switch debouncing, driving relays, reset circuits, oscillators), high speed analogue interfacing (transmission line effects and termination, inductive loads, line drivers, RFI, crosstalkand shielding.

ELEC 3501 Communications

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.*
Wlien Offered: *July Semester*
Classes: *(2 lec and 2 hr lab/tut) per week.*
Assessment: *Lab reports, assignments and an exam at end of semester.*

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Communication Systems Overview, system components. Digital modulation techniques, Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), time division multiplexing, adaptive PCM, deltamodulation. Baseband Transmission of Digital Signals, binary PAM system, baseband pulse shaping, Nyquist criteria, raised cosine filters, duobinary baseband PAM system, eye diagram. Line Coding, on-off signalling, bipolar signalling, return-to-zero signalling, pseudo-ternary signalling, split phase signalling, HDB codes. Equalizers, zero forced equalizers, minimum mean squared error equalizers, decision feedback equalizers, adaptive equalizers. Bandpass Digital Transmission, amplitude shift keying, phase shift keying, frequency shift keying, Quadrature Phase Shift (QPSK) keying. Error Control Coding, binary block codes, encoding and decoding. Information Theory, information and entropy, information rate, source coding, discrete channels, noise and signal-to-noise ratio, channel capacity calculations. Noise, Fading and Matched Filters, external noise sources, device noise sources (thermal, shot, partition,etc), quantisation noise, noise bandwidth, noise temperature, noise figure, channel attenuation and path loss, fading (multipath, doppler) and reduction of fading effects, matched filters and optimal receivers. Noise in Modulation Schemes, noise in digital transmission, error probabiHties for baseband and bandpass modulation schemes.

ELEC 3601 Digital Systems Design

4 credit points

Prerequisite: *Advisory prerequisite ELEC 2601 Microcomputer Systems.*
Wlien Offered: *July semester*
Classes: *Two lec per week and nine 3 hr lab sessions.*
Assessment: *Laborato ry performance and 2 hr exam at end of semester*

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering

Syllabus summary: Structure of digital systems, programmable logic, erasable programmable logic devices (EPLD), field programmable gate arrays (FPGA), state machine design, datapath functions, computer arithmetic, serial and parallel arithmetic-logic-units, computer design, computer upgrade design exercise, design for testability, boundary scan testing, IEEE Test Access Port, floating-point arithmetic, IEEE Standard Floating-point Arithmetic, arithmetic pipe-lines, digital systems design project, specification languages, simulation.

ELEC 3602 Programming for Engineering

4 credit points

Prerequisite: *Advisory prerequisite COMP 2004 Programming Practice*
May not be counted with/Additional Information: *COMP 3100 Software Engineering.*
Wlien Offered: *March Semester*
Classes: *(2 lec and 2 hr lab/tut) per week*
Assessment: *Lab mark and an exam at end of semester.*

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering) and Telecommunications Engineering.

Syllabus summary: Introduction to Software Engineering: software design process; software testing and maintenance; configuration management. Software techniques: software prototyping; numerical methods; table driven routines; optimisation; multitasking; mutithreading; parallel programming.

ELEC 3701 Management for Engineers

4 credit points

When Offered: *March Semester*
Classes: *(2 lec & one Ihr tut)Avk*
Assessment: *Tutorials, assignments and a 2hrexam at end of semester.*

Senior core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Engineers and management; Microeconomics; Macroeconomics; Managerial decision making; Behaviour of people in organisations; Human resource management for engineers; Strategic management; Accounting and management; Operations management; Marketing for engineers; The legal environment of business; Industrial relations; Engineering project management.

ELEC 3801 Fundamentals of Biomedical Engineering

4 credit points

Prerequisite: *Advisory prerequisite ELEC 2401 Electronic Devices and Circuits or ELEC 2001 Electrical and Electronic Engineering.*
Wlien Offered: *March Semester*
Classes: *(Two lec and an average of 2 hours lab/tut) per week*
Assessment: *Lab reports and one 2hr exam at end of semester*

Senior elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering, Computer Engineering and Mechanical Engineering.

Syllabus summary: Physiology and anatomy of respiratory, cardiovascular, central nervous and musculo-skeletal systems. Cell biology -membrane physiology and biochemistry, glucose metabolism. Operational amplifiers, active filters, electrodes. Electrocardiogram, vector cardiogram, defibrillation, pacemakers. Electroencephalogram, electromyogram, electroneurogram. Introduction to diagnostic imaging systems - principles of CT scanning, ultrasonic, nuclear and magnetic resonance imaging. Biomedical signal processing - sampling, A/D and D/A conversion, digital filters, ECG detection methods and systems.

ELEC 4201 Electrical Systems Modelling and Analysis

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3201 Fundamentals of Electrical Energy Systems.*
Wlien Offered: *March Semester*
Classes: (2 *lec & 2hr tut)Avk*
Assessment: *Assignments and a 2hr exam at end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: A broad range of topics will be presented related to electrical systems analysis, with aparticular focus on electric power systems. Modelling of power system components. Analysis of power systems under normal operating conditions. Faults and protection. Transmission line transients. An introduction to various aspects of transient stability, voltage and long-term stability, dynamic stability. The electric power systems of the 21st century. Introduction to software packages such as EUROSTAG, EMPT.

ELEC 4202 Advanced Power Electronics and Drives

4 credit points

When Offered: *July Semester*
Classes: (2 lec & lhr/lab/tut)/wk
Assesstnent: One 2hr exam at end of Sem 2 and assignments

Senior Advanced elective course for the degree in Electrical Engineering

Syllabus summary: Modern power semiconductor devices 'smart power'; design analysis and simulation of power electronic circuits, digital firing control; recent machine developments; DC and AC drives, analysis, control; digital techniques for control, protection and data logging; applications.

ELEC 4203 Electrical Systems Control

4 credit points

Wlien Offered: *July Semester*
Classes: (2 lec & lhr tut)Avk
Assessment: Assignments and one 2hr exam at the end of Sem 2

Senior Advanced elective course for the degree in Electrical Engineering and the degree in Electrical Engineering (Information Systems Engineering).

Syllabus summary: Application of control theory to a selection of electrical systems such as power systems, drives, and robotic and vehicle systems. Control issues such as voltage, frequency and power regulation, protection, stability, reliability and security. Industrial controllers. Digital control and microcontrollers. Aspects of adaptive control, robust control. Supervisory control and data acquisition (SCADA) systems.

ELEC 4301 Computer Control System Design

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3302 Fundamentals of Feedback Control.*
Wlien Offered: *March Semester*
Classes: (2 lec &2hr lab/tut)/wk
Assessment: Assignments, lab reports and one 2hr exam at end of Sem

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: State variable description of systems, canonical forms, relation to transfer functions, solution of the state equation, eigenvalues and eigenvectors. Regulator design using state feedback, controllability. State estimators, observability. Design of servomechanisms with non-zero command inputs. Introduction to optimal regulator design. Non-linear phenomena and their effect on design. Describing functions, limit cycles. Phase plane analysis, trajectories, linearisation of non-linear differential equations, equilibrium points and their classification. Sampled data systems. Discrete signals and sampling, discrete transfer functions. Discrete equivalents for continuous controller. Discrete models for sampled data systems, pulse transfer functions for feedback systems. Direct digital design by transform methods.

ELEC 4302 Image Processing and Computer Vision

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 4303 Digital Signal Processing.*
Wlien Offered: *July Semester*
Classes: (Two lec and a 1-Hr tut) per week.
Assessment: Assignments and a 2hr exam at end of semester.

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Mathematical preliminaries: two-dimensional (2D) signals and systems, image models and image transformation, image digitalisation; visual perception, sampling, quantisation and colour representation. Image enhancement and restoration; histogram modelling, spatial and transform operations, filtering, deconvolution and extrapolation. Image compression: predictive methods, transform coding, vector, quantisation and fracta based methods. Image reconstruction: Radon transform and projection theorem computer tomography (CT) and magnetic resonance imaging (MRI) systems and three-dimensional (3D) imaging. Image analysis and computer vision; edge detection and boundary extraction, region and object representation, image segmentation and pixel classification, texture analysis and scene detection and matching.

ELEC 4303 Digital Signal Processing

4 credit points

Prerequisite: *Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.*
When Offered: *March semester*
Classes: (2 lec & 2hr lab/tut)Avk
Assessment: Lab reports, assignments and one 2hr exam at end of Sem

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering and Senior Advanced elective unit of study for Electrical Engineering.

Syllabus summary: Discrete Time Signals and Systems: Time domain and frequency domain representations, Difference equations, Stability analysis, Magnitude and phase response, Linear phase systems, Z-transform. Discrete Fourier Transform: Properties of DFT, Circular and linear convolutions, Fast Fourier transform (FFT), Decimation in time algorithm, Decimation in frequency algorithm. Digital Filter Structures: I/O relations of linear discrete systems, Discrete form Realization, Cascaded/Parallel 2nd order sections, Ladder structures.

FIR Filter Design: Windowing method, DFT/Windowing method, Frequency sampling method, Optimal FIR filters. HR Filter Design: Impulse invariant transformation, Bilinear transformation, Butterworth filters, Chebyshev filters, Elliptic filters, Phase modification, Computer aided design techniques. Advanced Topics: 2-Dimensional signal processing, adaptive filtering.

ELEC 4401 Electronic Design

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3301 Signals andSystems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits.*
When Offered: *March semester*
Classes: (2 lec & one 2hr lab/tut)Avk
Assessment: Assignments and/or quizzes, lab work and a 2hr exam at end of semester.

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering) and Senior Advanced elective unit of study for Electrical Engineering, Telecommunications Engineering and Computer Engineering.

Syllabus summary: Electronic design practice, passive and active component models, electronic circuit analysis, linear and nonlinear circuits for digital and analogue communication systems, operational amplifier circuits in practice, theory and application of phase locked loops, integrated circuit techniques, electronic filter design and implementation, analog-digital conversion techniques, distortion and noise in electronic circuits, special topics in electronic design.

ELEC 4402 Integrated Circuit Design

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.*
WJien Offered: *March Semester*
Classes: *(2 lec & one 2hr tutAab)Avk*
Assessment: *A design project and one 2hr exam at the end of Sem 1*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Technology (IC production process, design rules, layout). Design automation and verification (DRC, circuit extraction, simulation and hardware design languages). Basic digital building blocks (inverters, simple logic gates, transmission gates, propagation delays, power dissipation and noise margins). Digital circuits and systems (PLAs, dynamic circuits, RAM, ROM, microprocessors, systolic arrays). Semicustom design (gate arrays and standard cells). Analog VLSI (switches, active resistors, current sources and mirrors, voltage, current references, amplifiers, DAC, ADC, continuous time filters, switch capacitor circuits, analog signal processing circuits.

ELEC 4501 Data Communication Networks

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3501 Communications*
Wlien Offered: *March Semester*
Classes: *(2 lec & one 2hr lab/tut)Avk*
Assessment: *Assignments, lab work and one 2hr exam at end of Sem 1*

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering) and Telecommunications Engineering and Senior Advanced elective unit of study for Electrical Engineering and Computer Engineering.

Syllabus summary: Networking principles. Multiplexing - FDM, TDM, STDM, CDM. Network topologies and circuit, packet and message switching concepts. Introductory queuing and traffic theory for circuit switched and packet switched networks. Local area network architectures. Network protocols - the 7 layer ISO/OSI model, physical, data link, and network layer implementations in LANs and public networks. Upper layer protocols. Optical fibre networks and architectures. Multi-channel optical communication systems. Introduction to FDDI, DQDB and interworking of LANs with wide area high speed networks. Comprehensive broadband networks for user access. Standards.

Textbooks:
Stallings. Data and Computer Communications (Maxwell Macmillan Int., 1995)

Tannenbaum Computer Networks (Prentice Hall, 1996)

ELEC 4502 Digital Communication Systems

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3501 Communications*
Wlien Offered: *March Semester*
Classes: *(2 lec & one 2hr lab/tut)Avk*
Assessment: *Assignments, lab work and one 2hr exam at end of Sem 1*

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering) and Telecommunications Engineering and Senior Advanced elective unit of study for Electrical Engineering and Computer Engineering.

Syllabus summary: Digital communications principles and performance criteria. Digitally modulated signals: non-linear modulation methods, continuous phase FSK, continuous phase modulation. Modulated carrier data transmission: QPSK, QAM, MFSK, MSK. Trellis coded modulation and modem technologies. Spread spectrum, including frequency hopping and CDMA principles. Optical communication systems - single and multi-channel systems, performance criteria and systems analysis. Satellite communications systems. Cellular mobile radio systems.

Textbooks:
Haykin Communication Systems (John Wiley, 1994)

ELEC 4503 Error Control Coding

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3501 Communications.*
When Offered: *March Semester*
Classes: *(2 lec & Ihr lab/tut)/wk*
Assessment: *Assignments and a 2hr exam at end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Error control coding principles, linear algebra, linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording, convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission, multidimensional codes, turbo codes.

ELEC 4505 Error Control Coding

4 credit points

Prerequisite: *Coreq U4.558 Digital Communication Systems*
When Offered: *March Semester*
Classes: *(2 lec & lhr tut)Avk*
Assessment: *Assignments and one 2hr exam at end of Sem 1*

Senior advanced elective course for the degree in Electrical Engineering and Electrical Engineering (Information Systems Engineering).

Syllabus summary: Error control coding principles, linear algebra, linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording, convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission, multidimensional codes.

ELEC 4601 Computer Design

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.*
When Offered: *March Semester*
Classes: *(2 lec & one 2hr lab/tut)Avk*
Assessment: *One 2hr exam at end of Sem 1, assignments, lab reports*

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering) and Computer Engineering and Senior Advanced elective unit of study for Electrical Engineering and Telecommunications Engineering.

Syllabus summary: Digital systems design process. Design cycle. Top down design. Specification. Functional design. Structural design. Testing. Hardware description languages. VHDL. Digital systems architectures. Processors, buses and I/O devices. Bus interconnections, synchronous, asynchronous and semi-synchronous buses. Bus interconnections - Case study 1. Memory and I/O interface design. Static and Dynamic memory design. Memory interfacing. Interrupts. Vectored interrupts. Interrupt controllers. Parallel interface design.

Serial interface design. Bus arbitration. Processor interfacing. IBM PC interfacing - Case study 2. High speed digital systems. Nonidealrties of digital logic. Circuit construction (prototyping, PCBs, connectors etc.) for high speed and noise immunity.

ELEC 4602 Real Time Computing

4 credit points

Prerequisite: *Advisory prerequisitse ELEC 3601 Digital Systems Design, and ELEC 3602 Engineering Software or COMP 3100 Software Engineering.*
Wlien Offered: *March Semester*
Classes: *(2 lec & one 2hr lab/tut)Avk*
Assessment: *One 2hr exam at the end of Sem 1, plus lab and assignments*

Senior Advanced core unit of study for Electrical Engineering (Information Systems Engineering) and Computer Engineering and Senior Advanced elective unit of study for Electrical Engineering and Telecommunications Engineering.

Syllabus summary: Hard real time and embedded systems, as applied to engineering, manufacturing and automation. Timing and scheduling: periodic vs aperiodic processes, hard vs soft deadlines, predictability and determinacy, granularity, rate monotonic and earliest deadline scheduling. Real-time systems and software, imlementation of real-time control. Real-time languages and their features. Real time Operating Systems. Real time Software Design. Embedded Systems: overview, signal flow, interfacing. Reliability and fault tolerance in hardware and software. SCADA and DCCS. Some case studies.

ELEC 4701 Project Management

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3701 Management for Engineers.*
Wlien Offered: *March Semester*
Classes: *(1 lec & one 2hr tut)Avk*
Assessment: Assignments and in-course involvement, and a 2hr exam at end of semester.

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: The New Technology Based Firm (NTBF) and its role in wealth and job creation. The innovation process, entrepreneurship, the business plan and new venture creation. Research and development, intellectual property, patents, product development and marketing. Relevant legal, liability and commercial issues.

ELEC 4702 Practical Experience

0 credit points

Classes: *See assessment*
Assessment: Assessment in this unit of study is by the submission, within the first two weeks of the February semester, of a written (hand or typed) report of about 2500 words of the industrial experience undertaken in accordance with regulations. This report is to be general in nature, indicating the overall structure of the company, the areas that the student becamefamiliarwith andtheir relationship to the firm andfinally, what the student did. Detailed material may be incorporated as appendices if desired, and the student should have the report vetted beforehand by a responsible officer of the company.

Senior Advanced core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: It is necessary for the student to obtain industrial experience of 12 weeks' duration. This experience is normally gained at the end of Senior year before entering Senior Advanced Year. The work which is acceptable to the Faculty may range from process-type work in a large industrial complex, where many different engineering processes and labour management relations may be observed, to semi professional or research work with small specialist companies.

The responsibility rests with the student to obtain work acceptable to the Faculty, although the University, through the Department of Electrical Engineering and the Careers and Appointments Service, will assist as much as possible. The student is required to inform the Department of Electrical Engineering of any work arrangements made and to obtain approval of these arrangements from the Department.

ELEC 4703 Thesis

12 credit points

Prerequisite: *Prerequisite A minimum of 36 credit points from Senior or Senior Advanced units of study.*
Classes: *Tliere are no formal classes. The bulk of the work will be carried out during the July semester with some preparatory work in the February semester.*
Assessment: *Thesis, final presentation and interim progress submissions*

Senior Advanced core unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Each student is required to select a topic, carry out background searches, experimental investigations, and to document such achievements and conclusions as are appropriate. The subject requires a consistent and significant effort eqivalent to one or two hours per week in Semester 1, and two days per week in Semester 2.

ELEC 4801 Biomedical Engineering Systems

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3801 Fundamentals of Biomedical Engineering.*
When Offered: *July Semester*
Classes: *(Two lec and a 2hr lab/tut) per week*
Assessment: *Assignments, lab and a 2hr exam at end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering, Computer Engineering and Mechanical Engineering.

Syllabus summary: Advanced medical imaging - X-ray, ultrasound, magnetic resonance imaging (MRI), nuclear imaging, confocal microscopy, computed tomography (CT). Medical image processing - pattern recognition, image compression, chromosome analysis. Functional electrical stimulation - bladder and bowel control, cerebellar and mid-brain stimulation, limb control, walking in paraplegics. Advanced intrumentation - automated blood pressure measurement and control, automated anaesthesia, artificial insulin injectors, biophotonics and optical fibre sensors. Laboratory experiments - respiratory measurements, blood pressure measurement, image processing and pattern recognition.

ELEC 5201 Electrical Systems Control

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3302 Fundamentals of Feedback Control, and ELEC 4201 Electrical Systems Modelling and Analysis.*
When Offered: *July semester*
Classes: *(Two lec and a Ihr tut) per week.*
Assessment: *Assignments and a 2hr exam at end of semester.*

ELEC 5201 Electrical Systems Control 4 Credit Pts
Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.
Syllabus summary: Application of control theory to a selection of

electrical systems such as power systems, drives, and robotic and vehicle systems. Control issues such as voltage, frequency and power regulation, protection, stability, reliability and security. Industrial controllers. Digital control and microcontrollers. Aspects of adaptive control, robust control. Supervisory control and data acquisition (SCADA) systems.

ELEC 5202 Advanced Power Electronics and Drives

4 credit points

Prerequisite: *Advisory prerequisite ELEC 3202 Power Electronics and Drives.*
When Offered: *July semester*
Classes: *(Two lec and a 1hr lab/tut) per week.*
Assessment: *Assignments and a 2hr exam at end of semester*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Modern power semiconductor devices; "smart power'; design analysis and simulation of power electronic circuits, digital firing control; recent machine developments; DC and AC drives, analysis, control; digital techniques for control, protection and data logging; applications.

ELEC 5301 Non-linear and Adaptive Control

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3302 Fundamentals of Feedback Control, and ELEC 4301 Computer Control System Design.*
When Offered: *July Semester*
Classes: *2 lec & one 2hr tut per week*
Assessment: *Assignments, labs and an exam at the end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Modelling by physical equations and input-output structures; concepts of linear, nonlinear, optimal, adaptive and robust control. Nonlinear systems analysis review and extensions, stability theory, oscillations and geometric concepts. Feedback linearisation, sliding mode and passivity-based control. Model-reference adaptive control and self-tuning regulators. Other advanced control strategies, supervisory control, fuzzy control and neural networks.

ELEC 5302 Fuzzy Systems

4 credit points

When Offered: *July Semester*
Classes: *(2 lec & one lhr lab/tut)Avk*
Assessment: *Assignments and one 2hr exam at end of Sem*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.
Syllabus summary: Mathematical backgrounds: ordinary set theory, uncertainty and linguistic variables, fuzzy sets, algebra of fuzzy sets, membership functions. Fuzzy control: approximate reasoning, fuzzy logic, fuzzification, defuzzification, fuzzy associative memory, fuzzy system design, a fuzzy controlled vehicle, advanced fuzzy controllers, fuzzy-nerual systems. Other applications: fuzzy pattern recognition, fuzzy image transform coding, fuzzy knowledge based systems.
Textbooks:
Reference books:

Kaufmann Fuzzy Mathematical Models in Engineering and Management Science (North Holand, 1988)

BezdekPattern Recognition with Fuzzy Objection Function Algorithms (Plenum Press, 1981)

Pedrycz Fuzzy Control and Fuzzy Systems (Research Studies Press, Wiley, 1989)

Koskok Neural Networks and Fuzzy Systems (Prentice Hall, 1992)

ELEC 5501 Advanced Communication Networks

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3501 Communications, and ELEC 4501 Data Communication Networks.*
Wlien Offered: *July semester*
Classes: *(2 lec and lhr tut)Avk*
Assessment: *assignments, reports and one 2hr exam at end of semester*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: ISDN architecture and organisation, common channel signalling system 7. Concepts of broadband, metropolitan and wide area networks. Network technologies, asynchronous mode transfer, fast packet switching, FDDI, DQDB. Multimedia communications networks. Telecommunications and computer network software design, network standards, and management. Principles, design and practice of terrestrial mobile networks, GSM, CPT and PCN. System and network reliability. Future trends in network demand and technologies.

ELEC 5502 Satellite Communication Systems

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3 501 Communications, and ELEC 4502 Digital Communication Systems.*
Wlien Offered: *July semester*
Classes: *(Two lec and a lhr tut) per week.*
Assessment: *Assignments and a 2hr exam at end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.
Syllabus summary: Introduction to satellite communication, satellite link design, propagation characteristics of fixed and mobile satellite links, channel modelling, access control schemes, system performance analysis, system design, mobile satellite services, global satellite systems, national satellite systems, mobile satellite network design, digitalmodem design, speech codec design, error control codec design, low earth orbit communication satellite systems.

ELEC 5503 Optical Communication Systems

4 credit points

Prerequisite: *Advisory prerequisites ELEC 3402 Communications Electronics, and ELEC 3501 Communications.*
When Offered: *July semester*
Classes: *(Two lec and a lhr tut) per week.*
Assessment: *Lab, assignments and a 2hr exam at end of semester.*

ELEC 5503 Optical Communication Systems 4 Credit Pts

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Introduction to optical fibre communications, optical fibre transmission characteristics, semiconductor and fibre laser signal sources, optical transmitters, direct and external modulation, optical amplifiers, optical repeaters, fibre devices and multiplexers, fibre nonlinearity, optical detectors, optical receivers and regenerators, sensitivity and error rate performance, photonic switching and processing, lightwave local area networks, multi-channel multiplexing techniques, optical fibre communication systems.

ELEC 5601 Advanced Real Time Computing

4 credit points

Prerequisite: *Advisory prerequisite ELEC 4602 RealTime Computing.*
WJten Offered: *July semester*
Classes: *(2 lec & one 2hr tut)Avk*
Assessment: Lab mark and a 2hr exam at the end of semester.

ELEC 5601 Advanced Real Time Computing 4 Credit Pts
Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Modelling of real-time systems, design techniques, analysis and prediction of real-time behaviour, advanced scheduling techniques, simulation, verification and validation, communications, distributed real-time systems, reliability and fault tolerance, hardware architectures, CASE tools for real-time systems. Standards for real-time languages and operating systems.

ELEC 5602 Advanced Computer Architecture

4 credit points

Prerequisite: *Advisory prerequisites ELEC 4601 Computer Design and (COMP 2001 Computer Systems or COMP 2901 Computer Systems Adv).*
May not be counted with/Additional Information: *Mutually exclusive with COMP 2901 Computer Systems (Advanced), and COMP 295F Comp uter Systems-EE Adv.*
Wlien Offered: *July semester*
Classes: *(2 lec & one 2hr tut)Avk*
Assessment: *Lab mark and a 2hr exam at the end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Quantitative Principles of Computer Design, Performance assessment, Scalable Performance. Memory Organization, Cache and VM, Interleaving Shared and Distributed Memory. Pipelines, Superscalar processors. Parallel processors, Multithreading, Cache Coherency, Allocation and Scheduling, Load Balancing. Interconnection Networks, Network Properties, Shared and Distributed Memory Systems, Message Routing. Dataflow, Object Oriented, Multimedia and Hybrid Architectures.

ELEC 5603 Biologically Inspired Signal Processing

4 credit points

Wlien Offered: *July semester*
Classes: *(2 lec & one lhr tut)Avk*
Assessment: *Assignments and one 2hr exam at end of Sem*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Introduction to artificial intelligence, review of knowledge representation techniques. Introduction to artificial neural networks. Artificial neural networks training algorithms. Neural networks training strategies. Hardware implementation s of neural networks. Analog and digital very large scale integration friendly learning algorithms. Applications: intracardiac electrogram classification, optical character recognition.

Textbooks:
Textbook:

Jabri, Coggins and Flower Adaptive Analog Neural Systems (Chapman and Hall, 1995)

ELEC 5604 Adaptive Pattern Recognition

4 credit points

When Offered: *July semester*
Classes: *(2 lec & one lhr lab/tut)/wk*
Assessment: *Assignments and one 2hr exam at end of Sem*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Mathematical preliminaries: probability theory, random vectors, decision theories. Statistical approaches: feature extraction, nonlinear mapping, quadratic and linear classifiers, nonparametric estimation and classification. Fuzzy set approach: operations on fuzzy sets, the use of fuzzy sets in pattern recognition. Neural-net implementations: generalised perception, associative memories, self-organised neural nets, integrated neural-net computing environment, linking of symbolic and numeric processing.

ELEC 5605 Advanced Digital Engineering

4 credit points

Prerequisite: *Advisory prerequisite ELEC 4601 Computer Design*
When Offered: *July semester*
Classes: ***(2*** *lec & lhr tut/lab)/wk*
Assessment: *Assignments and one 2hr exam at end of Sem*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: Advanced HDL skills for FPGA and ASIC design. CAD methodologies for design verification. Prototyping very high speed systems, reconfigurable prototypes. Testing, debugging and design for testability. Design methodologies for low power, high speed, small area or low cost. Assessment and selection of vendor technologies. System design exercise. Management of team designs.

ELEC 5606 Multimedia Systems and Applications

4 credit points

Prerequisite: *Advisory prerequisites (ELEC 3602 Engineering Software or COMP 3100 Software Engineering), and ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.*
When Offered: *July semester*
Classes: *(2lec and one 2hr lab/tute)/wk*
Assessment: *Lab Mark and a 2hr exam end of semester.*

Senior Advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Telecommunications Engineering and Computer Engineering.

Syllabus summary: This course covers the design and implementation of interactive networked multimedia processing and communication applications. The course will cover principles of switched networks, local area networks, wide area networks and their interoperability. Standards and protocols will be studied as as examples, including the International Telecommunications Union (ITU) H.320 and H.323 series for conferencing, and H.324 for telephony. Video and audio coding principles will be covered and associated protocols and standards studied.

ELEC 5607 Hardware/Software Co-Design

4 credit points

Prerequisite: *Advisory prerequisites: ELEC 3601 Digital Systems Design, and ELEC 3602 Programming for Engineering, or COMP 310F Software Engineering*
Classes: *(2 lec and 2hr lab/tut) per week*
Assessment: *Lab mark and one exam at end of semester*

Senior advanced elective unit of study for Electrical Engineering, Electrical Engineering (Information Systems Engineering), Computer

Engineering and Telecommunications Engineering.

Advisory prerequisites ELEC 3601 Digital Systems Design, and (ELEC 3602 Programming for Engineering, or COMP 3100 Software Engineering).

Classes (July semester) (2 lec and 2 hr lab/tut) per week

Assessment Lab mark and an exam at end of semester.

Syllabus summary: Hardware Specification; Software Specification; CAD tools Review of Operating System Principles; Review of Computer Bus and I/O Systems; Interrupts and DMA; I/O Device Abstraction; Device Drivers; Microcode Design.

Mechanical Engineering

MECH 1500 Mechanical Engineering 1

6 credit points

May not be counted with/Additional Information: *Mutually exclusive with: MECH 1501 Engineering Statics*
Classes: *Statics: 1 x 2hrplus lxlhr lecture-tute session/week Professional Eng: 2 x Ihr lecture-tute per week*
Assessment: *In class assessments, exam, assignments*

Junior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: Professional Engineering (2 Cr): structure and management of engineering projects, engineering project planning, engineering economics. Engineering management issues, total quality management, ethics, liability, environment, health, etc. Development of both verbal and written communication skills. Accessing information technology.

Statics (4 Cr): scalar and vectors; units and dimensional homogeneity. Statics of a rigid body; forces and moments; free body diagrams in two and three dimensions; resultants of forces and moments. Equilibrium of rigid bodies, trusses, frames and machines; statically determinate pin-jointed structures. Distributed forces, centroids of lines, areas and volumes; cables. Friction, wedges, screws; flexible belts.

Objectives: To develop an understanding of

- the role of professional engineers and their responsibilities

- the basic methods required to perform static engineering mechanics calculations.

Expected outcomes: Students will develop skills in

- engineering management techniques

- working in groups

- verbal and written communication

- solving problems in static engineering structures.

Textbooks:
Bedford and Fowler Engineering Mechanics: Statics (vol 1) SI Edition, Addison Wesley.

Library Classification: 531.64

MECH 1501 Engineering Statics

4 credit points

May not be counted with/Additional Information: *MECH 1500 Mechanical Engineering 1*
Classes: *1 x Ihrplus 1 x lhr lec-tut sessionAvk*
Assessment: In *class assessment, assignments, exam*

Junior core unit of study for the degree in Aeronautical Engineering

Syllabus summary: Scalar and vectors; units and dimensional homogeneity. Statics of a rigid body; forces and moments; free body diagrams in two and three dimensions; resultants of forces and moments. Equilibrium of rigid bodies, trusses, frames and machines; statically determinate pin-jointed structures. Distributed forces, centroids of lines, areas and volumes; cables. Friction, wedges, screws; flexible belts.

Objectives: To develop an understanding of:

- the basic methods required to perform static engineering mechanics calculations

Expected outcomes: Students will develop skills in:

- solving problems in static engineering structures.

Textbooks:
B edford and Fowler, Engineering Mechanics: Statics (vol 1) SI Edition, Addison Wesley

Library Classification: 531.64

MECH 1510 Kinematics and Dynamics

6 credit points

May not be counted with/Additional Information: *MATH 1051 Mechanics IE*
Classes: 2 *x 2hr lec-tut/wk*
Assessment: *Assignments, in class assessment, exam*

Junior core unit of study for the degrees in Mechanical and Mechatronic Engineering and Junior elective unit of study for the degree in Aeronautical Engineering.

Syllabus summary: Particle motion; cartesian, normal and tangential, and polar coordinate systems; relative motion; work, energy and power; mass flows and variable mass systems; momentum of particles and systems of particles; collisions and the coefficient of restitution. Gearing, fundamental law of toothed gearing, parallel axis gear trains, epicyclic gear trains, tubular analysis of planetary trains, free body diagrams, power transmission.

Objectives: To develop: an understanding, and competence in, performing basic engineering mechanics calculations; problem-solving skills in team work

Expected outcomes: Students will develop problem-solving skills in engineering mechanics.

Textbooks:
Bedford and Fowler, Engineering Mechanics: Dynamics (vol 2) SI Edition, Addison Wesley.

Library Classification: 531.3

MECH 1600 Manufacturing Technology

4 credit points

May not be counted with/Additionallnformation: *Mutually exclusive with: AERO 1600 Workshop Technology*
Classes: *One 3 hour lab per week*
Assessment: *Practical work*

Junior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary:

(a) Fitting — Measurement, measuring tools, marking tools, testing tools, holding tools, hammers, cutting tools, bolts and studs, tapping and screwing, reaming and scraping.

(b) Machining —Various metals and their machinability, cutting tool materials, cutting tool shape, the machine tools: lathe, mill, grinder, drill, shaper, deburring and finishing operations.

(c) Welding —Various welding processes, distortions, flame cutting, resistance welding. Practical work in gas welding and arc welding.

(d) Heat treatment, blacksmithing and forging— Definition and importance of heat treatment, and the process of forging, normalising hardening, case hardening.

(e) Founding — Materials used in the foundry, moulding and core making, the casting process.

Safety requirements: All students are required to comply with the safety regulations. Students who fail to do this will not be permitted to enter the workshops. In particular, approved industrial footwear must be worn, and long hair must be protected by a hair net. Safety glasses must be worn at all times.

Objectives: To develop an understanding of a range of machining and manufacturing processes required to make mechanical components

Expected outcomes: Students should develop skills in machining and manufacturing methods through practical experience.

Textbooks:
Library Classification: 671.

MECH 1800 Computational Engineering 1A

7 credit points

May not be counted with/Additional Information: *MECH 1801 Computational Engineering 1C*
Classes: Lectures and Computer labs
Assessment: In-class assessment, assignments, exam

Junior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: CAD (2 Cr): Elements of solid modelling systems; basic spatial concepts. The manufacture and assembly of machine components. Kinematics interaction and modelling, with examples taken from machinery.

Mechatronic Design (2 Cr): Introduction to the design of mechatronic systems. Elements of mechatronic systems; actuators, sensors. Industrial examples.

Matlab: Introduction to Matlab, basic features; array operations; graphing; relations and logical operations. Linear algebra. Applications in mechanics and numerical analysis. Tool boxes.

MSOffice: Introduction to spread sheet calculations, data structures, graphing. Applications in numerical analysis. Objectives: To introduce engineering design concepts in the context of a computational environment

Expected outcomes: Students will develop skills in

- problem-solving with Matlab

- solving problems with spread sheets

- understanding spatial concepts in design

- solving engineering mechanics problems with a solid modelling package

- use of mechatronics elements.

Textbooks:
SolidWorks Course Notes, from Wentworth Copy Centre

The Student Edition of Matlab (Prentice Hall, 1995)

Excerpt from Etter, Engineering problem solving with Matlab (Prentice Hall, 1993)

Library Classification: 620.0042

MECH 1801 Computational Engineering 1C

5 credit points

May not be counted with/Additional Information: *MECH 1800 Computational Engineering IA*
Classes: *Lectures and Computer labs*
Assessment: *In-class assessment, assignments, exam*

Junior core unit of study for the degree in Aeronautical Engineering

Syllabus summary: CAD (2 Cr): Elements of solid modelling systems; basic spatial concepts. The manufacture and assembly of machine components. Kinematics interaction and modelling, with examples taken from machinery

Matlab: Introduction to Matlab, basic features; array operations; graphing; relations and logical operations. Linear algebra. Applications in mechanics and numerical analysis. Tool boxes.

MSOffice: Introduction to spread sheet calculations, data structures, graphing. Applications in numerical analysis.

Objectives: To introduce engineering design concepts in the context of a computational environment

Expected outcomes: Students will develop skills in

- problem-solving with Matlab

- solving problems with spread sheets

- understanding spatial concepts in design

- solving engineering mechanics problems with a solid modelling package.

Textbooks:
SolidWorks Course Notes, from Wentworth Copy Centre

The Student Edition of Matlab (Prentice Hall, 1995)

Etter Engineering problem solving with Matlab (Prentice Hall, 1993)

Library Classification: 620.0042

MECH 1810 Computational Engineering 1B

3 credit points

May not be counted with/Additional Information: *MECH 1801 Computational Engineering 1C*
Classes: *1 hr lec and 2 hr labAveek*
Assessment: *One 11/2 hr exam and computer exercises*

Junior core unit of study for the degree in Mechatronic Engineering

Syllabus summary: C (Mechatronic students): Introduction to programming, program design, program structures, data types, program control. Preprocessor, tokens, storage classes and types. Basis I/O. Assignment: arithmetic, relational and bit manipulation operators. Control flow: if and switch statements. Arrays, for, do and while loops. Pointers and character strings. Functions, parameter passing. Derived storage classes, structures, unions and bit fields. File I/O. Software project management, debugging techniques, user interfaces.

Objectives: To provide the basic computational tools in the context of engineering applications currently being studied.

Expected outcomes: Students will develop skills in the design and implementation of C programs to solve engineering problems.

Textbooks:
Kernihan and Ritchie The C programming Language 2nd edn (Prentice Hall, 1988)

McConnell Code Complete (Microsoft Press, 1994)

MECH 2200 Thermofluids

6 credit points

May not be counted with/Additional Information: *MECH 2201 Thermodynamics 1*
Classes: (3 lec and one 3hr lab or tut)Avk
Assessment: *One 2 hr exam, one 11/2 hr exam, assignments and laboratory work*

Intermediate core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary:

(a) Thermodynamics (4 Cr) — concepts, work and heat, property of substances, 1st law of thermodynamics, control mass and control volume analysis of power and refrigeration cycles; thermal efficiency, entropy and 2nd law of thermodynamics, reversible and irreversible processes, isentropic efficiency.

(b) Fluids (2 Cr)—fluid properties, pressure, shear, hydrostatics, forces, moments, buoyancy, stability, continuity equations, streamlines, Euler, Bernoulli equations, linear momentum, propulsion, angularmomentum, turbomachinery, dimensional analysis, boundary layers, pipe flow and friction.

Objectives: The understanding of fluids and thermodynamics fundamentals.

Expected outcomes: To be able to analyse engineering problems involving fluid flow, power systems, engine and refrigeration cycles.

Textbooks:

Cengel and Boles, Thermodynamics, an Engineering Approach, 2nd edn (McGraw Hill)

Potter and Wiggert, Mechanics of Fluids, Prentice-Hall.

Library Classification: 536.7, 621.4,532., 620.106

MECH 2201 Thermodynamics 1

4 credit points

May not be counted with/Additional Information: *MECH 2200 Thermofluids*

Classes: *(2 lec and one 3hr lab/tut)Avk*

Assessment: *Assessment: one 2hr exam, assignments and laboratory work.*

Intermediate core unit of study for the degree in Aeronautical Engineering

Syllabus summary: Thermodynamics — concepts, work and heat, property of substances, 1st law of thermodynamics, control mass and control volume analysis of power and refrigeration cycles; thermal efficiency, entropy and 2nd law of thermodynamics, reversible and irreversible processes, isentropic efficiency.

Objectives: The understanding of thermodyanics fundamentals.

Expected Outcomes: to be able to understand engineering problems involving power systems, engine and refrigeration cycles.

Textbooks:

Cengel and Boles, Thermodynamics, an Engineering Approach, 2nd edn (McGraw Hill)

Library Classification: 536.7, 621.4

MECH 2300 Materials 1

4 credit points

Prerequisite:

May not be counted with/Additional Information: *CIVL 2101 Properties of Materials*

Classes: *2 lectures and 1 hr tut/wkplus three 3 hr lab sessions*

Assessment: *One 2 hr exam plus assignment work*

Intermediate core unit of study for the degrees in Mechanical Engineering and Aeronautical Engineering

Syllabus summary: Materials classification; understanding materials properties and their relation to structure as a function of forming methods and heat treatment processes; materials behaviour in service; selection criteria and case studies for engineering applications.

Objectives: To understand the classification of engineering materials, their properties in relation to microstructure

Expected outcomes: Students should be able to appreciate the properties of a range of engineering materials and how and why these are connected with microstructures and forming and treatment methods.

Textbooks:

Textbooks:

CaUister Jr Materials Science and Engineering - An Introduction 3rd edn (John Wiley, 1994)

Reference books:

Ashby and Jones Engineering Materials 1-An Introduction to their Properties and Applications (Pergamon, 1981)

Ashby and Jones Engineering Materials 2-An Introducjtion to Microstrucjtures, Processing and Design(Pergamon, 1986)

Bailey The Role of Microstructure in Metal (Metallurgical Services, 1966)

Bailey Introductory Practical Metallography (Metallurgical Services, 1966)

Bailey The Structure and Strength of Metal (Metallurgical Services, 1967)

John Understanding Phase Diagrams (Macmillan, 1974)

Library Classification: 620, 624, 666-679.

MECH 2400 Mechanical Design 1

6 credit points

Classes: (2 *lec/wk, plus 2 x 2hr drawing office sessions)Avk*

Assessment: *assignments and quizzes.*

Intermediate core unit of study for the degrees in Mechanical and Mechatronic Engineering and Aeronautical Engineering.

Syllabus summary:

(a) Machine Drawing — freehand sketching of machine components. Drafting techniques and standard drawing methods. Orthogonal projections and sections. Dimensioning, tolerancing, conventional symbols, detail and assembly drawings and descriptive geometry.

(b) Machine Design—engineering innovation, creativity. Teamwork. Design process, problem specification, conceptual techniques and design evaluation. Ergonomic manufacturing and assembly considerations.

Detail design of components including: design loads, failure and factor of safety; calculation approach and presentation conventions; stress effects in shape definition and material selection; introduction to engineering hardware including fasteners, bearings and mechanical power transmission. Introduction to involute gears and gear trains (including epicyclic).

Objectives: To develop an understanding of:

- the need for and use of standard drawings in the communication and definition of parts and assemblies
- creativity
- the design process from initial idea to finished product
- methods use to analyse designs
- standard components

Expected outcomes: Students will develop skills in:

- working in teams
- freehand sketching and drafting practices
- idea generation methods
- design analysis techniques and layout
- design development and testing
- written and graphical communication.

Textbooks:

Boudny Engineering Drawing (McGraw-Hill)

SHTGLEY & MISCHKE Mechanical Engineering Design (McGraw-Hill)

Library Classification: 621.815

MECH 2500 Engineering Dynamics 1

4 credit points

Prerequisite: *(MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics*

Classes: *Two lec/wk, three 3 hr lab sessions and ten 2 hr tutorials*

Assessment: *Exam and assignments*

Intermediate core unit of study for the degree in Mechanical and Mechatronic Engineering and Aeronautical Engineering.

Syllabus summary: Planar mechanisms, linkages, mobility; instant centres of rotation, Kennedy's theorem; velocity and acceleration polygons. Kinematics of rigid bodies, frames of reference, velocity and acceleration, rotating frame of reference, relative velocity and acceleration, gyroscopic acceleration. Kinetics of rigid bodies, linear momentum and Euler's first law; angular momentum and Euler's second law; centre of mass; moments of inertia, parallel axis andparallel plane theorems, principal axes and principal moments of inertia,

rotation about an axis; impulse and momentum; work and energy, kinetic and potential energies. Applications to orbital and gyroscopic motion. Introduction to Lagrangianmethods.

Objectives: To develop an understanding of the basic methods required to perform rigid body dynamics calculations.

Expected outcomes: Students will develop skill in analysing planar mechanisms, and in performing rigid body dynamics calculations.

Textbooks:
Reference:

Smith and Smith Mechanics 2nd edn (Wiley, 1990)

Mabie and Reinholtz Mechanisms and Dynamics of Machinery 4th edn (Wiley, 1987)

Shigley and Uicker Theory of Machines and Mechanisms International edn

(McGraw-Hill, 1981)

Bedford and Fowler Engineering Mechanics: Dynamics (Vol. 2)

SI Edition, Addison Wesley

Library Classification: 621.8

MECH 2500 Engineering Dynamics 1

4 credit points

Prerequisite: *(MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics*
Classes: *Two lec/wk, three 3 hr lab sessions and ten 2 hr tutorials*
Assessment: *Exam and assignments*

Untermediate core unit of study for the degree in Mechanical and Mechatronic Engineering and Aeronautical Engineering.
Syllabus summary: Planar mechanisms, linkages, mobility; instant centres of rotation, Kennedy's theorem; velocity and acceleration polygons. Kinematics of rigid bodies, frames of reference, velocity and acceleration, rotating frame of reference, relative velocity and acceleration, gyroscopic acceleration. Kinetics of rigid bodies, linear momentum and Euler's first law; angular momentum and Euler's second law; centre of mass; moments of inertia, parallel axis andparallel plane theorems, principal axes and principal moments of inertia, rotation about an axis; impulse and momentum; work and energy, kinetic and potential energies. Applications to orbital and gyroscopic motion. Introduction to Lagrangian methods.
Objectives: To develop an understanding of the basic methods required to perform rigid body dynamics calculations.

Expected outcomes: Students will develop skill in analysing planar mechanisms, and in performing rigid body dynamics calculations.

Textbooks:
Reference:

Smith and Smith Mechanics 2nd edn (Wiley, 1990)

Mabie and Reinholtz Mechanisms and Dynamics of Machinery 4th edn (Wiley, 1987)

Shigley and Uicker Theory of Machines and Mechanisms International edn

(McGraw-Hill, 1981)

Bedford and Fowler Engineering Mechanics: Dynamics (Vol. 2)

SI Edition, Addison Wesley

Library Classification: 621.8

MECH 2700 Mechatronics 1

6 credit points

Classes: *3 hr lectures and a 3 hr labAvk*
Assessment: 2 *hr exam plus project work*

Intermediate core unit of study for the degree in Mechatronic Engineering

Syllabus summary: Mechatronic Systems: General principles of mechatronic systems. Components of systems: basic sensor devices and sensor conditioning; actuation devices including basic electrical servos, pneumatics and hydraulics; essential principles in control and regulation.

Embedded Computing: Principles of common industrial control computers including PLCs and single-board computers.

Applications: Detailed case studies of mechatronic systems with examples from manufacturing, automobile systems and other areas.

Objectives: To provide an introduction to mechatronics principles and an appreciation of the working of mechatronic systems.

Expected outcomes:

• A broad understanding of the main components of mechatronic systems.

• Understanding of the principles involved in computer controlled machinery, including sensing, acuation and control.

• Practical knowledge of the development of simple embedded computer programs

• Understanding of the practical application of mechatronic systems in applications such as manufacturing, automobile systems and robotics.

Textbooks:
To be advised

Library Classification: 670.427, 629.89, 629.895, 621.2, 629.804

MECH 3200 Thermal Engineering 1

7 credit points

Prerequisite: *MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1*
May not be counted ■with/Additional Information: *MECH 3201 Thermodynamics 2*
Classes: *(3 lec and 2x1 hr tut)Aveek and laboratory work*
Assessment: *two 2hr exams, assignments and laboratory reports.*

Senior core unit of study for the degree in Mechanical Engineering.

Syllabus summary: Thermodynamics (70%): Availability, statistical entropy and second law of thermodynamics, generalised charts for properties, engine characteristics, gas mixtures, psychrometry, air conditioning and refrigeration, thermodynamics of combustion.

Heat transfer (30%): Plane and cylindrical conduction convection, thermal networks, fins, heat exchangers, LMTD and NTU methods, unsteady conduction, forced and natural convection heat transfer coefficients, dimensional analysis, radiation introduction.

Objectives: To develop an understanding of the basic principles of heat transfer, thermodynamic cycles, gas mixtures, combustion and chemical equilibrium.

Expected outcomes: Ability to tackle and solve a range of heat transfer, thermodynamics and fluid flow problems including: (i) finned heat exchangers, cooling by fluids, quenching, insulation, and solar radiation; (ii) complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures.

Textbooks:
Incropera and DeWitt Fundamentals of Heat and Mass Transfer (Wiley)

Cengel and Boles Thermodynamics, and Engineering Approach (McGraw-Hill) 2nd Edn

Library Classification: 536.7, 621.4, 536.2

MECH 3201 Thermodynamics 2

4 credit points

Prerequisite: *MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1.*
May not be counted with/Additional Information: *MECH 3200 Thermal Engineering 1.*
Classes: (2 lec and 1 x 1 hr tut)Aveek and laboratory work.
Assessment: *one 2hr exam, assignments and laboratory reports.*

Senior year core unit of study for the degree in Aeronautical Engineering

Syllabus summary: Thermodynamics: availability, statistical entropy and second law of thermodynamics, generalised charts for properties, engine characteristics, gas mixtures, psychrometry, air conditioning and refrigeration, thermodynamics of combustion.

Objectives: To develop an understanding of the basic principles of thermodynamic cycles, gas mixtures, combustion and chemical equilibrium.

Expected outcomes: Ability to tackle and solve a range of complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures.

Textbooks:
Textbook:

Cengel and Boles Thermodynamics, an Engineering Approach (McGraw-Hill) 2nd Edn.

Library Classification: 536.7, 621.4

MECH 3210 Fluid Mechanics

4 credit points

Prerequisite: *MECH 2200 Thermofluids, AERO 2200 Introductory Aerodynamics*
Classes: *3hrAveek + laboratory sessions*
Assessment: *Assignments, laboratory and 2 hr exam*

Senior year core unit of study for the degree in Mechanical Engineering

Syllabus summary: Navier-Stokes equations — derivation, significance and fundamental importance.

Pipe flow - Bernoulli, shear losses, minor losses, networks.

Pumps - pump types, characteristics, applications.

Potential flow — stream function and potentials, Laplace's Equation, some basic building blocks. Flow around a cylinder, lift, drag, etc.

Boundary layers — derivation of equations, solution procedures for Laminar case, introduce the concept of turbulence, transition.

Turbulence — concept, properties of turbulence, eddy viscosity, more advanced approaches.

Turbulent flow near a wall—law of the wall, pipe flow velocity profiles.

Channel flow — flow in a channel, weir, hydraulic jump, etc.

Compressible flow — sound waves, normal shock, nozzle flow, shock tube.

Objectives: To be able to solve problems involving pipe flow, pumps, free surface flow, boundary layers, drag, lift and turbulent flow.

Expected outcomes: an intuitive understanding of force and energy balances in fluid mechanics. Ability to design pipe networks and determine pump requirements; to determine and optimise the drag on streamlined and bluff bodies, to apply basic turbulence models.

MECH 3300 Materials 2

4 credit points

Prerequisite: *MECH 2300 Materials 1 & AERO 2300 Mechanics of Solids 1*
Classes: *2 lec/wkplus 1 tut/wk & two labs*
Assessment: *One 2 hr closed book exam plus assignments and lab reports as specified at the commencement of the semester.*

Senior core unit of study for the degrees in Aeronautical and Mechanical Engineering

Syllabus summary: Short-term and long-term mechanical properties, introductory fracture and fatigue mechanics, dislocations, polymers and polymer composite materials, ceramics and glasses, structure-property relationships, selection of materials in mechanical design.

Objectives: (a) To understand the relationship between properties of materials and their microstructures; and (b) to improve mechanical design based on knowledge of mechanics and properties of materials.

Expected outcomes: Students should gain the capabilities to select proper materials for simple engineering design.

Textbooks:
Textbooks:

Lecture notes

Reference books:

Ashby & Jones Engineering Materials 1 (Butterworth Heinemann)

Ashby & Jones Engineering Materials 2 (Butterworth Heinemann)

Higgins Properties of Engineering Materials (Edward Arnold)

Gallister, Jr.Materials Science and Engineering-An Introduction (John Wiley & Sons)

Bolton Engineering Materials Technology (Butterworth Heinemann)

Ashby Materials Selection in Mechanical Design (Pergamon Press)

Library Classification: 620-624, 666-679

MECH 3310 Mechanics of Solids 2

4 credit points

Prerequisite: *AERO 2300 Mechanics of Solids 1 and MATH 2005.*
Classes: *2 lec/wkplus **2** tut/wk*
Assessment: *One two hour examination plus assignments and a lab in the semester.*

Senior year core unit of study for the degree in Mechanical Engineering

Syllabus summary: Stress and strain, linear elasticity and fundamental plasticity, primary solution strategy, introduction to variational methods, introduction to numerical stress analysis, case studies.

Objectives: To understand how to evaluate the behaviour of solid materials subjected to stress and deformation
Expected outcomes: Students should gain the ability to analyse simple engineering problems in terms of strength, stress, and deformation in relation to properties of materials.

Textbooks:
Textbooks:

Lecture notes

Reference books:

Chakrabarty Theory of Plasticity (McGraw-Hill, 1987)

Chandrupatla and Belegundu Introduction to Finite Elements in Engineering (Prentice Hall, 1991)

Courtney Mechanical Behaviour of Materials (McGraw-Hill Publishing Company, 1990)

Crandall, Dahl and Lardner An Introduction to the Mechanics of Solids (McGraw-Hill, 1978)

Johnson and Mellor, Engineering Plasticity (D. VanWostrand Company Ltd, 1973)

Timoshenko and Goodier Theory of Elasticity (McGraw-Hill, 1951)

MECH 3400 Design 2A

4 credit points

Prerequisite: *MECH 2400 Mechanical Design 1*
Classes: *2 lectures & one 1 hr drawing office sessionAvk*
Assessment: *Assignments and quizzes*

Senior year core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: The following areas of design are usually included, together with others which may be added: Introduction to weld practice, strength analysis of welded joints leading to more extensive weldments. Principles and applications in the design of a spatial structure. Review of failure mechanism and fatigue analysis. Power screws and preloaded bolted joints. The application of the spreadsheets to design calculations and optimal analyses. Bolted joints in shear and bearing. The uses and examinations of shafts. Introduction to Computer Aided Design packages which may include a wire frame and a solid modeller. Belt and drives. Couplings and power transmission components.

Objectives: To provide students with techniques with which they can analyse classes of machine components. To demonstrate that these techniques have common underlining principles which may be applied with various degrees of precision. To make the student aware of the range of machinery that has thus far been invented and developed and how this process is continuing. To provide an understanding of the functions of the design engineer in a company structure and the effectiveness of management techniques in ensuring successful designs.

Expected outcomes: Students will be able to set up mathematical models representing the stresses, deflection and fatigue life expectancy of a range of machine components. This will provide the student with the means of applying the underlining principles to new parts and assemblies. To be able to function in a team, set up communication links, distribute work load and make adjustments leading to desired conclusions.

Textbooks:
Textbook:

Shigley Mechanical Engineering Design (McGraw-Hill) latest edn

Reference books:

R C Juvinall, Fundamentals of Machine Component Design (Wiley) 2nd edn

Orlov Fundamentals of Machine Design Vol I to V (M.I.R. Moscow)

Library classification: 621.815, 001.6443

MECH 3410 Design 2B

4 credit points

Prerequisite: *MECH 2400 Mechanical Design 1.*
Classes: *2 lectures & one 1 hr drawing office sessionAvk*
Assessment: *Assignments and quizzes*

Senior year core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: The following areas of design are usually included, together with others which may be added: 3 Dimensional drawings and solid models. Application programming from within a CAD system. Scheduling design and manufacturing tasks, Analysis of springs. Evolution and selection of CAD system for design and drafting applications. Hydrodynamic bearings. Gears and gear drives. Clutches and brakes. Open ended projects that utilises many elements of the unit of study.

Objectives: To provide students with techniques with which they can analyse classes of machine components. To demonstrate that these techniques have common underlining principles which may be applied with various degrees of precision. To make the student aware of the range of machinery that has thus far been invented and developed and how this process is continuing. To provide an understanding of the functions of the design engineer in a company structure and the effectiveness of management techniques in ensuring successful designs.

Expected outcomes: Students will be able to set up mathematical models representing the stresses, deflection and fatigue life expectancy of a range of machine components. This will provide the student with the means of applying the underlining principles to new parts and assemblies. To be able to function in a team, set up communication links, distribute work load and make adjustments leading to desired conclusions.

Textbooks:
Textbooks:

Shigley Mechanical Engineering Design (McGraw-Hill) latest edn

Reference books:

R C luvinall, Fundamentals of Machine Component Design (Wiley) 2nd edn

Orlov Fundamentals of Machine Design Vol I to V (M.I.R. Moscow)

Library classification: 621.815, 001.6443

MECH 3500 Engineering Dynamics 2

4 credit points

Prerequisite: *MECH 2500Engineering Dynamics 1 and(MATH2001 & MATH 2005)*
Classes: ***2*** *lec and 1 tut/wkplus laboratory sessions*
Assessment: *One 2 hr exam, assignments and laboratory work.*

Senior core unit of study for the degrees in Mechanical and Mechatronic and Aeronautical Engineering

Syllabus summary: Vibration of machines and structures. Modelling of linear and nonlinear mechanical systems; equations of motion; state-space representation; numerical solution. Linear system analysis in the frequency and time domains; transfer functions. Matrix formulation for multi-degree-of-freedom systems; natural frequencies; modal analysis. Introduction to the analysis of vibration and whirl of simple distributed systems such as beams and shafts.

Objectives: To provide techniques from mechanics and system theory applicable to the dynamics of machines and structures.

Expected outcomes:

(a) Competence in modelling the dynamics of mechanical systems, setting up their equations of motion and solving them numerically or analytically.

(b) Familiarity with the occurrence, isolation and measurement of mechanical vibration.

Textbooks:
Reference books:

Rao Mechanical Vibrations (Addison-Wesley, 1995)

Inman Engineering Vibration (Prentice-Hall, 1996)

Dimarogonas Vibration for Engineers (Prentice-Hall, 1996)

Ogata System Dynamics (Prentice-Hall, 1992)

Etter Engineering Problem Solving with MATLAB (Prentice-Hall)

Library Classifications: 531.32, 620.1, 620.101, 620.3, 620.37

MECH 3500 Engineering Dynamics 2

4 credit points

Prerequisite: *Prereq U2.000Mathematics 2 and U2.412Engineering Dynamics*
May not be counted with/Additional Information: *Mutually exclusive with U3.450 System Dynamics and Control*
Classes: *(3 lectures & 2 tutorials)Avk*
Assessment: *Written exam at end ofsem and course assignments*

Senior core course for the degree in Aeronautical Engineering.

Syllabus summary:

(a) Dynamics component of course U3.450 System Dynamics and Control, delivered by Mech Eng Dept

(b) Static and manoeuvring longitudinal stability, equilibrium and control of rigid symmetric aircraft.

Origin of symmetric forces and moments. Aerodynamic load effects of wings, stabilisers, fuselages and powerplants. Trailing edge aerodynamic controls.

Trimmed equilibrium condition. Effects on performance and static stability of trimmed equilibrium.

The concept of static margin. Effects on static stability of free and reversible controls.

Manoeuvring longitudinal stability and the concept of manoeuvre margin. Effects on manoeuvring stability of free and reversible controls.

Textbooks:

Reference books:

Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989)

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskem Airplane Flight Dynamics and Automatic Flight Controls (RoskamA&EC, 1979)

MECH 3600 Manufacturing Engineering

6 credit points

Prerequisite: *MECH 1600 Manufacturing Technology*
Classes: lec: 3hrs/wk; plus an average of 2hrs/wk for tut, lab and industrial visits.
Assessment: *One 2 hr exam plus labs, poster and industrial visits*

Senior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: Manufacturing processes — several manufacturing processes will be considered from the points of view of fundamentals of the process, limitations on the production rates and runs and product quality, general purpose and specialised machinery, automation, numerical control and computer-aided manufacture. Processes considered include machining, casting, powder metallurgy, metal working, welding, polymer processing, blending and composite manufacture.

Manufacturing systems —• economics of automation, flexible manufacturing, Just in Time, group technology, materials requirements planning, quality control, introduction of new technology, human factors, plant layout.

Objectives: To understand some fundamental manufacturing processes and systems

Expected outcomes: Students will learn how to manufacture mechanical parts and understand the principles, merits and disadvantages of some commonly used manufacturing techniques.

Textbooks:

Textbooks

Lecture notes

Reference books:

S. Kalpakjran Manufacturing Processes for Engineering Materials 2nd edn (Addison-Wesley Publishing Co., 1991)

E. DeGarmo, J.T. Black and R.A. Kohser Materials and Processes in Manufacturing 7th edn (Macmillan Publishing Co., 1990)

MECH 3600 Industrial Management

5 credit points

When Offered: *July Semester*
Assessment: *To be announced*

Senior core course for the degree in Aeronautical Engineering.

Syllabus summary (Preliminary):

Microeconomics, the Australian business environment, the role of government, accounting systems and procedures, the accounting cycle, financial statements, internal performance, financial structures, intellectual property, contract law, legal obligations of business, capital budgeting and investment analysis, introduction to contract administration.

Textbooks:

Reference books:

Stanley How to Read and Understand a Balance Sheet (Schwartz & Wilkinson, Melbourne)

The Small Business Handbook (Small Business Development Corp., Victoria)

Eyre Mastering Basic Management (Macmillan)

Stoner, Collins and Vetton Management in Australia (Prentice-Hall)

Blank and Tarquin Engineering Economy (McGraw-Hill)

MECH 3610 Project

2 credit points

Classes: *One hrAweekfor team consultations and several lectures on relevant topics; presentations in final two weeks of Semester*
Assessment: *On the basis of progressive contribution to the group effort and on the quality of the final presentations.*

Senior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: Team building, considerations of conceptual design, economic analysis, project management outline, environmental impact and consideration of benefits to society in major projects. This part of the unit of study will culminate in team presentations.

Objectives: To plan a multidisciplinary project, to consider technical, managerial, economic, environmental and societal factors in bringing a project from concept to conclusion and to make a verbal presentation.

Expected outcomes: Students will learn how to work in a team, to plan and assign responsibilities and to achieve common objectives. Tasks will include information searches, conceptual planning and design and consideration of all the complexities of modern project planning.

MECH 3620 Industrial Management

5 credit points

Classes: 3 hrs/wk
Assessment: *Coursework (group project, essay, report) and examination*

Senior core unit of study for the degrees in Mechanical and Mechatronic Engineering and a Senior elective unit of study for the degree in Aeronautical Engineering

Syllabus summary: The Australian and international business environment, macro and microeconomics, the role of government, financial management, innovation, legal obligations of business, marketing and business planning, strategic management, human resource management, project management, Quality Assurance, operations management, industrial hazard management and prevention, social and ethical responsibility of engineers.

Objectives: To develop an understanding of the principles and practices of industry; to provide an overview of the various issues facing an industrial organisation, and of the basic approaches to their management; to understand the changing nature and effects of globalisation onAustralia's economic performance, the competitiveness of Australian firms, and the generation of employment and wealth; to gain an insight into the importance of innovation at all levels and functions of all organisations, and of the ways of developing people-skills and organisational styles to promote innovation; to develop the broader skills required by employers of engineers.

Expected outcomes: The knowledge and awareness for engineers to professionally function in a changing industrial and economic environment; the skills to work and communicate effectively in teams.

Textbooks:

Textbook: Samson, D. Management for Engineers, Longman, 1995

Library classification: 658.256

MECH 3700 Mechatronics 2

5 credit points

Prerequisite: MECH 2700 Mechatronics 1
Classes: 2 hr lectures plus a 3 hr labAvk
Assessment: 2 hr exam plus project work

Senior core unit of study for the degree in Mechatronic Engineering.

Syllabus summary: Mechatronics Systems Architectures: Single processor systems, multiple and distributed processing systems, special purpose architectures (DSPs etc) and their application.

Development of Advanced Mechatronic Systems: Use of multi-tasking, message passing and multi-threading in environments such as NT and/ or Unix. Objected oriented programming in languages such as C++.

Design of Modern Mechatronic Systems: Standard interfacing of sensor and actuation systems; ADC/DAC, SSI, parallel, Can Bus etc. Organisation of components and overall design issues including safety, verifiability, modularity, etc. Analysis of detailed case study.
Objectives: To provide an advanced understanding of modern industrial mechatronics systems.

Expected outcomes: - Understanding of modern hardware and software architectures as related to the design of mechatronic systems.

- Practical knowledge of the design and implementation of mechatronic systems, including organisation, safety and reliability and interaction with hardware components.

Textbooks:
Textbooks: An extensive list of reference books will be distributed

Library Classification: 004.22, 004.35, 005.133

MECH 3800 Systems Control

4 credit points

Prerequisite: MATH 2001 and MATH 2005
Classes: 2 lec and 1 tut/week plus laboratory sessions.
Assessment: One 11/2 hr exam, assignments and laboratory work.

Senior core unit of study for the degrees in Mechanical and Mechatronic Engineering

Syllabus summary: A number of case studies based on practical examples will be presented. The unit of study will concentrate on linear systems and will be based on classical control theory. Topics covered will include system modelling, time and frequency response, stability, root locus and Bode diagrams, and control using computers. Computer programs Matlab and Sirnulink will be used to illustrate the concepts presented in the lectures and for the design and simulation exercises associated with the case studies.

Objectives: To introduce the methods used for the analysis and design of feedback control systems.

Expected outcomes: Students will be able to develop a mathematical model and design a suitable feedback controller for a wide range of physical systems. Students will also be able to examine the behaviour of these physical systems and the performance of their controllers using computer simulations.

Textbooks:
Reference books:

G. F. Franklin, J. D. Powell and A. Emami-Naeini, "Feedback Control of Dynamic Systems", Addison-Wesley

A. K. Ogata, "Modern Control Engineering", Prentice-Hall

B. C. Kuo, "Automatic Control Systems", Prentice-Hall

N. S. Nise, "Control Systems Engineering", Benjamin/Cummings

Library classifications: 629.8, 629.83, 629.8312, 629.832

MECH 4100 Thesis

12 credit points

Prerequisite: 36 credit points of Senior units of study.
Classes: n/a
Assessment: Examination of thesis

Senior Advanced core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus summary: In the Senior Advanced year of the unit of study, each candidate works towards and writes an undergraduate thesis, at least one copy of which should be submitted in completed form (see below) before a date to be announced, which is normally notlater than the last day in November.

Towards the end of each academic year a list of suggested topics and supervisors for thesis work is published for the information of current Senior year students. Each prospective Senior Advanced year student is then required to consult with some or all of the prospective supervisors, who will select students for their topics.

In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or of a partly original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his or her practical work and the general layout of the thesis itself.

Theses should be typewritten — with text, diagrams, graphs, photographs, etc., properly displayed — and not less than one copy should be submitted, permanently bound between hard covers for the departmental library, on or before the due date. Students are responsible for supplying their own paper, typewriting, diagrams, and binding, but in certain circumstances assistance may be given with the more difficult problems of photography, diagram duplication, etc. It is recommended that the size of the paper be A4.

It is customary in most investigational work for the worker to develop a set of index cards to keep track of his or her references.

Each thesis writer may be called upon at the year's end to show some evidence of his or her activities in this respect.

The Charles Kolling Prize may be awarded for the best graduation thesis.

Objectives: To involve students in a research or major design project and give them the opportunity to conduct systematic investigations.

Expected outcomes: Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

MECH 4110 Professional Engineering

4 credit points

Prerequisite: 36 credit points of Senior units of study.
Classes: lectures/consultations/student presentations — 4hrAveekfor one semester.
Assessment: student assignments/presentations and 2hr exam.

Senior Advanced core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus summary: Project management: specific aspects of project management including initial establishment of projects and design criteria, and capital cost estimating. Design management: topics will cover design integration, codes and standards, specification preparation, and sources of information. Plant engineering management: the areas will include decision making, computerised maintenance, understanding unit operations, environment protection measures, engineering as an element in the cost of production, continuous improvement, provision of plant and ancillary services, and the engineer as a trainer.

Objectives: To impart knowledge resulting in a more global approach to the practice of engineering and engineering management, as well as to provide a vehicle for improving communication skills.

Objectives: lb impart knowledge resulting in a more global approach to the practice of engineering and engineering management, as well as to provide a vehicle for improving communication skills.

Expected outcomes: A good understanding of the management of projects and engineering plants.

MECH 4120 Professional Communication

4 credit points

Prerequisite: *completion of industrial experience.*
Classes: *some instructional sessions will be arranged to provide basic techniques for preparation and presentation of technical material to an audience by audio-visual means and in report writing.*
Assessment: *satisfactory performance in the seminar as assessed by the participants and in a written report on industrial experience.*

Senior Advanced core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus summary: During the latter part of the year, one or two whole days are set aside for the presentation of student addresses at a public conference. Each final year student, usually in consultation with his or her thesis supervisor, prepares an abstract of the seminar for distribution one week in advance of the conference. Although it is not obligatory, the subject for the seminar is normally closely related to the student's thesis work; thus it tends to deal in depth with some relatively narrow technical field. At the conference (where the audience comprises senior, senior advanced and postgraduate students, departmental staff and visitors), oral presentation of the thesis is followed by critical discussion under formal chairmanship.

The industrial experience report must be submitted early in Semester 1. The report is assessed on content and presentation in accordance with details that are distributed in the previous semester. The report should contain a section on management.

Objectives: To improve student competence and confidence in developing and presenting a formal technical presentation, and enhance student abilities and experience in technical report writing.

Expected outcomes: (i) the ability to structure and deliver a competent and informative technical presentation; (ii) the ability to present structured observations and reflections in the mode of a formal written report.

MECH 4130 Practical Experience

0 credit points

Prerequisite: *28 credit points of Intermediate units of study.*
Classes: 12 *weeks of practical work experience.*
Assessment: *will be on a Pass/Fail basis. Marks will not be given. (This unit of study will not contribute to the weighted averages used to determine Honours.)*

Senior Advanced core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus summary: Each student is required to work as an employee of an approved engineering organisation and to submit a satisfactory written report of his or her work. Normally 12 weeks of practical work experience (375 hours minimum) is required and this is undertaken after the completion of some or all of the prescribed Senior core units of study and before enrolment in the final year of study. The University Careers and Appointments Service is available to assist students to obtain suitable employment. This unit of study must be passed in order to graduate.

Objectives: To give students the opportunity to work in an engineering organisation and gain some professional experience.

Expected outcomes: A better appreciation of the role of engineers in the workplace.

MECH 4200 Thermal Engineering 2

4 credit points

Prerequisite: *MECH 3200 Thermal Engineering 1.*
Classes: *3 hrs lec/tut/wk*
Assessment: *tut work, projects and/or exams.*
Senior Advanced elective unit of study.

Syllabus summary: Air conditioning technology (2 Cr) — Heat load estimation, applied psychometrics, air handling equipment, refrigeration equipment, systems, control, energy conservation and management in buildings.

Combustion engineering (2 Cr) — Mass and energy balances, equilibrium, partial equilibrium and non-equilibrium products, simple reactor theory, chemical kinetics, premised and diffusion flames, heterogeneous combustion, pollutant formation, combustion systems.

Objectives: To develop a good understanding of the principles of combustion and air conditioning with special emphasis on a range of engineering applications.

Expected outcomes: Students should be able to (i) perform analyses of simple reacting systems and predict temperatures and species concentrations, and (ii) perform a complete design of air conditioning systems including thermal load calculations, ducting, control and equipment selection.

Textbooks:
Reference books:

S R Turns "An Introduction to Combustion" McGraw-Hill 1996

MECH 4210 Computational Fluid Dynamics

4 credit points

Prerequisite: *MECH 3210 Fluid Mechanic*
Classes: *2 lectures and one tutorial per week*
Assessment: *tut work, projects and one 2hr exam.*

Senior Advanced elective unit of study.

Syllabus summary: Conservation equations of fluid flow; boundary conditions, classification of flow problems. Numerical solution schemes based on pressure correction; the SIMPLE algorithm and its variants, convection schemes. Solution of the resulting algebraic equations. Turbulence modelling; implementation of boundary conditions in turbulent flow. Coupled heat transfer: convection, combustion, radiation heat transfer. Multiphase flow. Introductions to compressible flow, the physical significance of hyperbolic equations; characteristic based methods; FCT and TVD schemes. Pitfalls to avoid in CFD.
Objectives: To give students an understanding of basic Navier-Stokes solution methods and turbulence models.

Expected outcomes: Ability to write a simple Navier-Stokes solver and to use a state-of-the-art CFD package.

Textbooks:
Reference books:

Fletcher Computational Techniques for Fluid Dynamics, vols I and 2 (Springer, 1988)

Patankar Numerical Heat Transfer and Fluid Flow (Hemisphere, 1983)

MECH 4220 Environmental Engineering

6 credit points

Prerequisite: *24 credit points of Senior units of study.*
May not be counted with/Additional Information: *CHNG 4504 Environmental Impact Assessment and MECH 4230 Environmental Acoustics andNoise Control if Acoustics forms part of MECH 4220.*
Classes: *5hrs/wk plus 2 Saturday field-trips*
Assessment: One 2hr and one 1.5hr exam, plus assignments

Senior Advanced elective unit of study.

Syllabus summary: The unit of study will consist of the following components depending on availability of lecturers.Environmental acoustics and noise control—Basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations. Computational methods in acoustics.

Environmental impact assessment — The nature of environment protection, fundamentals of air, water and noise pollution, solid waste disposal, limnology, marine and terrestrial ecology, aesthetics, urban and regional planning. Social and economic factors, legislation and its administration, preparation of environmental impact reports. Air pollution and its control — sources, dispersion, meteorology, photochemical smog formation, measurements, introduction to modelling, particles and aerosols, control equipment.

Objectives: To acquaint students with the methods engineers use to assess and deal with the environmental consequences of industry and other human activities, with particular emphasis on impact assessment and noise.

Expected outcomes: Students will appreciate the social, economic, and legislative aspects of environmental protection. They will understand the requirements of an environmental impact statement. They will be able to make the calculations and measurements necessary to estimate acoustic noise levels in machinery, buildings and the outside environment and to make recommendations as to how best to reduce them.

Textbooks:
Textbook:

A. Gilpin Environmental Impact Assessment (Cambridge UP, 1995)

Environmental Planning and Assessment Act 1979, No. 203

Environmental Planning and Assessment Regulation, 1980

Reference books:

Bies and Hansen Engineering Noise Control (Allen and Unwin, 1988)

Hassall and Zaveri Acoustic Noise Measurement (Bruel and Kjaer, 1988)

G. Kiely "Environmental Impact Assessment".

Other books as advised during classes

Library Classification: 534.8, 620.23, 620.8, 628.1

MECH 4230 Environmental Acoustics and Noise Control

2 credit points

Prerequisite: *24 credit points of Senior units of study.*
May not be counted -with/Additional Information: *MECH 4220 Environmental Engineering if Acoustics forms part of MECH 4220*
Classes: *2 lec and 1 tut/w*
Assessment: *one 1.5hr exam*

Senior Advanced elective unit of study.

Syllabus summary: Basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations. Computational methods in acoustics.

Objectives: To acquaint students with the methods engineers use to assess and deal with the environmental noise due to industry and other human activities.

Expected outcomes: Students will appreciate the social, economic, and legislative aspects of environmental noise. They will be able to make the calculations and measurements necessary to estimate sound levels and noise in machinery, buildings and the outside environment and to make recommendations as to how best to reduce them.

Textbooks:
Reference books:

Bies and Hansen Engineering Noise Control (Allen & Unwin, 1988)

Hassall and ZaveriAcoustic Noise Measurement (Bruel & Kjaer, 1988)

Library classification: 534.8, 620.23

MECH 4310 Advanced Engineering Materials

6 credit points

Prerequisite: *MECH 3300 Materials 2.*
May not be counted with/Additional Information: *MECH 4311 Advanced Aerospace Materials.*
Classes: *3 lec/wkplus 3 tut & labAvk*
Assessment: *One **2** hr exam, one project report, assignments and lab reports as specified at the commencement of the semester.*

Senior Advanced elective unit of study.

Syllabus summary: Postyield fracture mechanics, embrittlement, creep rupture, damage tolerance, structure integrity and reliability, thin film science and technology, advanced polymer matrix composites, toughening mechanisms, processing and manufacturing, superalloys, advanced joining methods.

Objectives: To understand (a) how to conduct failure diagnosis of engineering structures, (b) how to define the relationship between properties and microstructures of advanced engineering materials, and (b) ho w to improve mechanical design with the knowledge of mechanics and properties of materials.

Expected outcomes: Students should gain the capabilities: (a) to conduct failure diagnosis of simplified failure cases of engineering structures, (b) to define structure-property relationships of advanced engineering materials, and (c) to improve the performance of engineering structures through tailoring materials microstructure and manufacturing processes.

Textbooks:
Textbooks

Lecture notes

Reference books:

Ashby, Materials Selection in Mechanical Design (Pergamon, 1993)

Atkins and Mai, Elastic and Plastic Fracture (Ellis Horwood, 1985)

Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)

Chawala, Composite Materials (Springer-Verlag, 1987)

Crawford, Plastic Engineering (second edition, MaxweH-Macmillan, 1987)

Davidge, Mechanical Behaviour of Ceramics (C.U.P., 1979)

Eckold, Design and Manufacture of Composite Structures (McGraw-Hill, 1994)

Gibson, Principles of Composite Material Mechanics (McGraw-Hill, 1994)

Richerson, Modern Ceramic Engineering (M. Dekker, 1982)

Harris, Engineering Composite Materials (Institute of Metals, 1986)

Jones, Engineering Materials 3 -Materials Failure Analysis (Pergamon, 1993)

MECH 4311 Advanced Aerospace Materials

4 credit points

Prerequisite: *MECH 3300 Materials 2.*
May not be counted with/Additional Information: *MECH 4310 Advanced Engineering Materials*
Classes: *3 lec/wkplus 3 tut & lab/wk*
Assessment: *One 2 hr exam plus assignments and lab reports as specified at the commencement of the semester.*

Senior Advanced elective unit of study

Syllabus summary: Postyield fracture mechanics, embrittlement, creep rupture, damage tolerance, structure integrity and reliability, thin film science and technology, advanced polymer matrix composites, toughening mechanisms, processing and manufacturing, superalloys, advanced joining methods.

Objectives: To understand (a) how to conduct failure diagnosis of engineering structures, (b) how to define the relationship between properties and microstructures of advanced engineering materials, and (b) how to improve mechanical design with the knowledge of mechanics and properties of materials.

Expected outcomes: Student should gain the capabilities: (a) to conduct failure diagnosis of simplified failure cases of engineering structures, (b) to improve the performance of engineering structures through tailoring materials micro structure and manufacturing processes.

Textbooks:
Textbooks

Lecture notes

Reference books:

Ashyby Materials Selection in Mechanical Design (Pergamon, 1993)
Atkins and Mai Elastic and Plastic Fracture (Ellis Horwood, 1985)
BroekElementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)
Chawala Composite Materials (Springer-Verlag, 1987)
Crawford Plastic Engineering (second edition, MaxweH-Macmillan, 1987)
Davidge Mechanical Behaviour of Ceramics (C.U.P., 1979)
Eckold Design and Manufacture of Composite Structures (McGraw-Hill, 1994)
Gibson Principles of Composite Materials Mechanics (McGraw-Hill, 1994)
Harris Engineering Composite Materials (Institute of Metals, 1986)
Jones Engineering Materials 3 -Materials Failure Analysis (Pergamon, 1993)
Richerson Modern Ceramic Engineering (M Dekker, 1982)

MECH 4400 Advanced Design

6 credit points

Prerequisite: *MECH 3410 Mechanical Design 2B.*
Classes: *3hrs/wk*
Assessment: *Assessment is based upon one major design project and several minor design tasks, complemented by one-on-one discussions during the year with each student in relation to these design activities.*

Senior Advanced elective unit of study.

Syllabus summary: The unit of study draws together the various subjects studied and introduces the student to the practical aspects of design in the commercial environment, with the encouragement of directindustry contacts. As well as design for function and mechanical and structural integrity, consideration is given to manufacturing possibilities, to economic, environmental and human aspects, and to professional responsibility and liability.

Expected outcomes: Students should be able to undertake with a measure of confidence basic design tasks likely to be encountered in early industrial employment, and should have an appreciation of and some familiarity with the many aspects associated with such an activity.

Objectives: To develop a fuller understanding of and familiarity with the practical design processes expected in industry, including application of the knowledge obtained from other units of study studied.

MECH 4510 Machine Vibration and Monitoring

3 credit points

Prerequisite: *MECH 3500 Engineering Dynamics 2*
Classes: *3 hrs/wk including tutorials and practical sessions*
Assessment: *one **2** hr exam plus assignments*

Senior Advanced elective unit of study.

Syllabus summary: Review of dynamics, including modal analysis of lumped and continuous systems and appropriate methods for nonlinear systems. Aspects of applied problems, especially the dynamics of rotating machinery, the measurement of vibration and condition monitoring of machines. Some aspects of random vibrations, including measurement and prediction of failure.
Objectives: To acquaint students with:

- the types of vibration which can arise in machinery
- mathematical models which can be used to analyse vibration
- vibration measuring devices and analysis of measurements
- machine condition monitoring by vibration measurements

Expected outcomes: Students will be able to identify the causes of damaging vibration from measurements and analysis, predict the likelihood of failure due to vibration, and determine how to deal with it in order to minimise cost and loss of production.

MECH 4600 Industrial Engineering

6 credit points

Prerequisite: *MATH 2001 andMATH2005 andMECH3620 Industrial Management*
May not be counted with/Additional Information: *MECH 4620 Industrial Ergonomics, MECH 4630 Introduction to Operations Research, and MECH 4610 Industrial and Engineering Management*
Classes: *3 lec/wkplus associated tut and lab work and industrial visits.*
Assessment: *assignments plus exams.*

Senior Advanced elective unit of study

Syllabus summary:

Industrial ergonomics —refer to syllabus summary for MECH 4620 Industrial Ergonomics.

Operations research — refer to syllabus summary for MECH 4630 Introduction to Operations Research.

Industrial and Engineering Management—total quality management, production planning and control, costing and pricing, inventory management and control, management reporting systems, value analysis, problem resolution strategies, dispute management, project management, contract administration, marketing management, business planning, the management of engineering enterprises, professional engineering skills.

Objectives: To develop an understanding of:

- principles and practices of industrial and engineering management
- effects of globalisation on Australia's economic performance, and the competitiveness of Australian firms
- insight into the importance of innovation
- roles appropriate to governments
- ergonomics
- information handling
- safety
- training
- work performance
- the role of operations research in modern industry
- problem formulation and analysis techniques for operations research problems
- the importance of reliability analysis in part and system designs
- the use of maintenance and repair to extend the useful life of systems

Expected outcomes: Students should develop skills and abilities in:

• the application of problem solving solutions to management issues

• an appreciation of the interrelationships and complexities associated with themanagement of a modern industrial organisation

• the development of logical, thoughtful and creative presentations concerning industrial management

• ergonomic analysis

• information processing

• consideration of the workspace

• consideration of the workers and their skills

• the solution of a range of operations research and reliability problems.

Textbooks:
Textbook:

Samson Management for Engineering (Longmans)

Reference books:

Hicks Introduction to Industrial Engineering and Management Science (McGraw- Hill, 1977)

Harding Production Management 2nd edn (MacDonald & Evans, 1974)

Hussey Introducing Corporate Planning (Pergamon, 1972)

Currie Work Study 4th edn (Pitman, 1977)

Heyde Concise MODAPTS (AAPTS&R, 1975)

Koontz et al. Management 7th edn (McGraw-Hill, 1980)

Hunt Managing People at Work (McGraw-Hill, 1979)

Blakemore The Quality Solution (Australian Business Library, Vic.)

Kotler, Fitzroy, Shaw Australian Marketing Management (Prentice-Hall)

Macnamara Australian Marketing and Promotion Handbook (Australian Business Library)

Case Studies in Australian Strategic Management

Other books may be advised

MECH 4610 Industrial and Engineering Management

2 credit points

Prerequisite: *MECH 3620 Industrial Management*
May not be counted with/Additional Information: *MECH 4600 Industrial Engineering*
Classes: *2hrs lec and tut/wkplus industrial visits.*
Assessment: *assignments and one 2hr exam.*

Senior Advanced elective unit of study

Syllabus summary: Total quality management, production planning and control, costing and pricing, inventory management and control, management reporting systems, value analysis, problem resolution strategies, dispute management, project management, contract administration, marketing management, business planning, the management of engineering enterprises, professional engineering skills.

Objectives: To develop an understanding of:

• principles and practices of industrial and engineering management

• effects of globalisation on Australia's economic performance, and the competitiveness of Australian firms

• insight into the importance of innovation

• roles appropriate to governments

Expected outcomes: Students should develop skills and abilities in:

• the application of problem solving solutions to management issues

• an appreciation of the interrelationships and complexities associated with the

• management of a modern industrial organisation

• the development of logical, thoughtful and creative presentations concerning industrial management.

Textbooks:
Textbook:

Samson D., Management for Engineering (Longmans)

Reference books:

As for MECH 4600

MECH 4620 Industrial Ergonomics

2 credit points

May not be counted with/Additional Information: *MECH 4600 Industrial Engineering.*
Classes: *2 hrs lec/tut/wkplus associated lab work*
Assessment: *assignment*

Senior Advanced elective unit of study.

Syllabus summary:

(a) Lectures — History and scope of ergonomics; biomechanics; receiving and processing information; presentation of information; anthropometry and seating; ergonomic aspects of noise; human factors in safety; selection, skill and training; industrial lighting; fatigue, shiftwork and the organisation of work; absenteeism; mental health and automation; design of equipment and workspace; biomechanics of handling materials; ergonomic job analysis; personal factors in work performance.

(b) Laboratory •— Demonstration of protective clothing and equipment. Methods of measurement of work environment. Climatic chamber.

Objectives: To introduce ergonomics and increase awareness of ergonomics issues;

To provide information about humans particularly in the workplace.

Expected outcomes: Students will have sufficient practical information to allow them to optimise the human-environment performance in the workplace.

Textbooks:
Reference books:

As advised during classes

Library Classification: 150, 331.1, 611, 612, 620, 658

MECH 4630 Introduction to Operations Research

2 credit points

Prerequisite: *MATH 2001 and MATH 2005*
May not be counted with/Additional Information: *MECH 4600 Industrial Engineering*
Classes: *1 lec and 1 tut/wk*
Assessment: *one 2hr paper plus assignments.*

Senior Advanced elective unit of study

Syllabus summary: Method and history of operations research: broad aims; general problem approach.

Inventory control problems, with constant and random demand. Allocation problems; linear programming; transportation problem. Introduction to reliability analysis; component and system reliability; effect of maintenance and repair.

Objectives: To develop an understanding of:

• the role of operations research in modern industry problem formulation and analysis techniques for operations research problems

• the importance of reliability analysis in part and system designs

• the use of maintenance and repair to extend the useful life of systems

Expected outcomes: Students should develop skills in:

• the solution of a range of operations research and reliability problems.

Textbooks:
Reference books:

Daellenbach, George and McNickle Introduction to Operations Research Techniques (Allyn and Bacon, 1984)

Taha Operations Research —An Introduction (Macmillan, 1976)

Lewis Introduction to Engineering Reliability (Wiley, 1987)

Library Classification: 658

MECH 4700 Robotic Systems

4 credit points

Prerequisite: *MECH3500Engineering Dynamics 2 andMECH3800 Systems Control.*
Classes: *(2 lec and one 2hr lab/tut)Avk*
Assessment: one 11/2 hr exam plus assignment, project and lab work.

Senior Advanced elective unit of study

Syllabus summary: Overview of robotics: definitions, arm configurations. Kinematics and dynamics of robot manipulators. Control of robots. Programming languages. Sensors. Robot applications. System design, and integration of robots with other automated machinery.

Objectives: To introduce aspects of design, control and use of industrialrobots.

Expected outcomes: Students should gain an appreciation for the important factors that need to be considered in the selection and use of robots for industrial applications.

Textbooks:
Reference books:

Fu, Gonzalez and Lee, "Robotics: control, sensing, vision and intelligence", McGraw-Hill McKerrow, "Introduction to Robotics", Addison-Wesley.

Asada, H and Slotine, J.-J.E. Robot Analysis and Control. John Wiley, 1985.

Craig, J.J. Introduction to Robotics: Mechanics and Control. Addison-Wesley, 1986.

MECH 4710 Microprocessors in Engineered Products

6 credit points

Prerequisite: *ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits.*
Classes: *(3 lec and one 2hr lab/tut)Avk.*
Assessment: *project and assignment work, plus one 2 hr exam. Satisfactory performance in project and assignment work is required,*

Senior Advanced elective unit of study

Syllabus summary: Specific requirements for microprocessor-based products. Problem definition and system design. CPU, memory and interface circuits. Tools for design, development and testing of prototype systems. The unit of study will include a major project, where groups of students design, develop and commission a microprocessor-based product.

Objectives: To provide experience, confidence and basic competence in the design and implementation of microprocessor-based products and instruments. To impart a detailed knowledge of the software and hardware architecture of a typical modern microcontroller, and an understanding of the use of these resources in product design. To give experience with modern cross-development tools. To provide experience of working in aproject team to prototype a realistic product to meet a specification.

Expected outcomes: The student will have a detailed knowledge of the software and hardware architecture of a modern microcontroller. This knowledge will include an in-depth understanding of the relationship between assembly language, high-level language, and the hardware, of the utilisation and interfacing of microcontroller hardware resources, and of the design and development of software comprised of multiple interrupt-driven processes. The student will have the competence to develop prototype microprocessor-based products.

Textbooks:
Textbook:

Peatman Design with microcontrollers (McGraw Hill)

Reference books:

An extensive reference list will be distributed

Library Classification: 629.398, 629.895, 621.3815, 621.38195, 001.6425,005.1

MECH 4720 Sensors and Signals

6 credit points

Prerequisite: *MECH 3500 Engineering Dynamics 2 & MECH 3800 Systems Control &*
ELEC 3601 Digital Systems Design & ELEC3401 Electronics Devices & Circuits.
Classes: *3hrs lec, Ihr tut and 2hrs labAvk*
Assessment: *Laboratory work and one 3 hour exam.*

Senior Advanced elective unit of study.

Syllabus summary: This unit of study comprises three equal parts: Devices, Signals and Systems. Devices deals with sensors and the interfacing of sensors to computers and machines. Signals deals with the modeling, conditioning and analysis of sensor signals. Systems deals with the use of sensor signals in control and systems design, with reference to key mechatronics applications:

(a) Devices: Process and machine instrumentation: sensor types (temperature, pressure, force, proximity) and properties; interfacing considerations, hardware and applications.

Automotive, aerospace and robotic sensors: sensor types (accelerometers, gyroscopes, lasers, ultrasonics, radar) and measurement principles; interfacing considerations, hardware and applications.

One 6-hour laboratory on sensor interfacing example.

(b) Signals: Introduction to signals and noise as stochastic processes; signal characterisation, signal conditioning. Signal analysis in the time domain; signal analysis in the frequency domain; modeling and processing of signals; introduction to estimation theory.

Two 2-hour computer laboratories; signal characterisation and signal modeling.

(c) Systems: Signal processing systems, hardware and software; special purpose and digital signal processing hardware; introduction to data fusion theory. Condition monitoring; reliability and fault detection. Example applications; process monitoring and automotive systems.

One 10-hour computer laboratory on system design.

Objectives: To provide and understanding of essential sensor data processing algorithms and an understanding of a variety of different sensor technologies.

Expected outcomes: Understanding of common signals and the means of processing and interpreting sensory information. An appreciation of available sensor technolgoies and where they may be used.

MECH 4730 Computers in Real Time Control and Instrumentation

6 credit points

Prerequisite: *ELEC 3601 Digital Systems Design & ELEC 3401 Electronics Devices & Circuits.*
Classes: *(3 lec and one 2hr lab/tut)Avk*
Assessment: *Project and assignment work, plus 2 hr exam. Satisfactory performance in project and assignment work is required*

Senior Advanced elective unit of study

Syllabus summary: Review of sensing, analogue and digital electronics. Signal conditioning and data acquisition. Overview of the IBM PC architecture. Programming for interactive control using both assembly language and the high level language C. Timers, interrupts. Asynchronous tasks; data communication. Structured data; structures in C. Cooperative multi-tasking, real time operating systems. Design of interactive graphical displays; man-machine communication.

Objectives: Microcomputer and microprocessor system, operating in real time have become very common components in today's engineering applications. The objective of this unit of study is to teach the fundamentals of real time software and to build competence in the engineering use of such systems through lectures emphasising standard computer architectures, programming, and through intensive laboratory work with microcomputer systems interacting with experimental mechatronic processes.

Expected outcomes: The student will have a basic knowledge of the hardware components available in a microcomputer system and a detailed knowledge of facilities and capabilities typically present in a professional real time operating system. The student will have the competence to design, implement and debug interrupt-driven multitasking systems with graphical user interfaces.

Textbooks:
Textbook:

Auslander DM, Tham CH, Real Time Software for Control, (Prentice Hall, 1990)

Library reference number: 629.8955133 1, Engineering Reserve

Reference Book

A reference list will be distributed.

MECH 4800 Computational Methods for Partial Differential Equations

4 credit points

Prerequisite: *MATH 2001 and MATH 2005.*
Classes: *2 lec/wk with associated tut andprac sessions*
Assessment: *assignments.*

Senior Advanced elective unit of study.

Syllabus summary: Finite difference techniques for elliptic, parabolic and hyperbolic partial differential equations. Method of weighted residuals (Galerkin, least-squares, etc.). The finite volume method. The use of these methods in the effective computer solution of engineering problems in fluid dynamics, heat transfer and other areas.

Objectives: To give students practise in writing programs to solve linear PDEs. To provide sufficient theory so they understand why their programs (or commercial software) sometimes may not give the "right" answer.

Expected outcomes: Students will be able to set up and solve the common PDEs arising in Mechanical Engineering, using several of the following methods: finite differences, finite elements, boundary elements, finite volumes, weighted residuals. Students will appreciate the commonalities linking the equations in different fields, and linking the various solution methods.

Textbooks:
Reference books:

Press et al. Numerical Recipes (Cambridge, 1986)

Zienkiewicz and Morgan Finite Elements and Approximations (Wiley, 1983)

Library Classification: 515.35, 532.05, 620.0042.

MECH 4900 Orthopaedic Engineering

4 credit points

Prerequisite: *MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids* 2.
Classes: *4hrs of tut/lab classesAvk*
Assessment: *one 2hr exam*

Senior Advanced elective unit of study

Syllabus summary: Musculoskeletal anatomy, physiology and function, including basic medical terminology, anatomy and physiology, normal and abnormal joints, bones, cartilage, ligaments and tendons. Introduction to orthopaedic injuries, including fractures, bone healing, fracture fixation, electrical stimulation of bone healing. Overview of the design, manufacture and use of artificial ligaments, hip, knee and shoulder joint prosthesis, bone cement, finite element modelling of prostheses, material considerations, testing of orthopaedic implants, failure of implants.

Objectives: To introduce students to the biomechanics of the musculo-skeletal system and to the fundamentals of biomedical engineering as applied to orthopaedic devices used for the replacement and repair of the diseased or damaged skeleton.

Expected outcomes: Students will become acquainted with the physical properties of human bones and joints. They will understand how the skeleton functions as an engineering structure. They will learn the physical characteristics of the materials from which the musculoskeletal system is fabricated and be able to adapt basic engineering principles to the design and fabrication of prosthetic joints and to other devices used for replacement and repair of bones and joints.

MECH 4910 Biomaterials and Biomechanics

4 credit points

Prerequisite: 36 credit points of Senior units of study.
Classes: 4hrs of lecture/tut/lab per week
Assessment: continual assessment and exam.

Senior Advanced elective unit of study

Syllabus summary: Introduction to biomaterials, characteristics of materials, including mechanical testing and advanced analysis techniques, metallic, polymeric, ceramic, composite implant materials and their properties; structure/property relationships to biological materials and the study of 'biomimetics' (mimicry of biological materials), tissue response to implants, soft tissue replacement, hard tissue replacement and laboratory testing of biomaterials and biological materials.

Introduction to biomechanics, modelling the human body from the macroscopic level to the microscopic level, soft tissue mechanics — non-linear and viscoelastic descriptions, muscle mechanics, joint mechanics, kinematics and dynamics of human gait (gait analysis), biomechanics of cells, physiological fluid flow, biomechanics of injury, functional and mechanical response of tissues to mechanical loading.

Objectives: To gain abasic understanding of themajor areas of interest in both the biomaterials and biomechanics fields, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems.

Expected outcomes: Students should be able to:

• Apply static and dynamic mechanical analyses to the human body to describe motion.

• Understand the mechanical behaviour of biological tissues and the types of models used to describe this behaviour.

• Understand all the factors involved in the selection of a biomaterial for tissue replacement, including mechanical, biocompatibility, material property and fixation factors.

• Improve their written and oral communication skills in a technical setting.

The students should gain a basic understanding of the major areas of current research in both the biomaterials and biomechanics fields, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems.

Textbooks:
Reference books:

J.B. Park and R.S. Lakes Biomaterials An Introduction (Plenum Press, 1992)

J. Black Orthopaedic biomaterials in research and practice (Churchill Livingstone, 1988)

Y.-C. Fung Biomechanics of Living Tissues (Springer-Verlag)

Units available in all branches

ENGG 4001 Innovation and International Competitiveness

4 credit points

Classes: (1 lec/1 seminar)Avk
Assessment: Essay, group project case study, assignments andwritten exam

Senior elective course for the degree in all branches of Engineering.

Syllabus summary: The course is designed to provide students with an understanding of the forces of international competition that are setting the rules for the future of private and public sector organisations in which engineers are employed. Introduction to challenges of modern management; understanding of the new rules of international competitiveness; effects of globalisation on Australia's economic performance; the competitiveness of Australian firms; the generation of employment and wealth; the changing requirements on the engineer; the engineer as manager and strategist; the role of innovation in business management; product innovation and commercialisation.

Textbooks:
Text and reference books:

See list supplied by lecturer

Table 1 - Aeronautical Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Aeronautical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.					
Core Units of Study - Aeronautical Engineering					
Junior					
MATH 1701	Differential Calculus and Linear Algebra	**6**	**AK:** HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1702	Integral Calculus and Statistics	**6**	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MECH 1501	Engineering Statics	**4**		MECH 1500 Mechanical Engineering 1	
ELEC 1001	Introductory Electrical Engineering	**4**	C: MATHS 1001 Differential Calculus and Linear Algebra.	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology	July
AERO 1600	Workshop Technology	**4**		MECH 1600	March
MECH 1801	Computational Engineering 1C	**5**		MECH 1800 Computational Engineering 1A	
CIVL 1002	Computational Engineering	**3**		COMP 101F Introductory Programming and COMP 102S Introductory Computer Science	July
AERO 1900	Introductory Aeronautics	**4**			
Intermediate					
MATH 2001	Vector Calculus and Complex Variables	**4**	- P: Mathematics 1702 or 1703 or 1792 or 1793 .	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	**4**	P: Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	**4**	P: Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
AERO 2300	Mechanics of Solids 1	**4**	P: MATH 101F, MATH 102S		July
AERO 2200	Introductory Aerodynamics	**4**	P: 12 Credit Points of Junior Math	MECH 2200, MECH 2201, MECH 2500	July
AERO 2500	Introductory Flight Mechanics and Performance	**4**	P: MATH 101F.102S		March
MECH 2201	Thermodynamics 1	**4**		MECH 2200 Thermofluids	

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 2300	Materials 1	4		CIVL 2101 Properties of Materials	
MECH 2400	Mechanical Design 1	6			
MECH 2500	Engineering Dynamics 1	4	P: (MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics		
Senior					
MECH 3201	Thermodynamics 2	4	P: MECH 2200 Thermofiuids or MECH 2201 Thermodynamics 1	MECH 3200 Thermal Engineering 1	
MECH 3300	Materials 2	4	P: MECH 2300 Materials 1 & AERO 2300 Mechanics of Solids 1		
MECH 3500	Engineering Dynamics 2	4	P: MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005)		
AERO 3200	Aerodynamics 1	4.0	P: AERO 2200		March
AERO 3250	Aerodynamics 2	4	P: AERO 2200		July
AERO 3300	Aircraft Structures 1	4	P: AERO 2300		March
AERO 3350	Aircraft Structures 2	4	P: AERO 2300		July
AERO 3400	Aircraft Design 1	4	P: MECH 2400		March
AERO 3450	Aircraft Design 2	4	P: MECH 2400		July
AERO 3500	Flight Mechanics 1	4	P: AERO 2500		
Senior Advanced					
AERO 4200	Aerodynamics 3	3	P: AERO 3250		March
AERO 4250	Aerodynamics 4	3	P: AERO 3250		July
AERO 4201	Propulsion	4	P: MECH 3201		March
AERO 4300	Aircraft Structures 3	4	P: AERO 3350	AERO 4301 Applied Numerical Stress Analysis	March
AERO 4350	Aircraft Structures 4	4	P: AERO 3350	AERO 4301 Applied Numerical Stress Analysis	July
AERO 4400	Aircraft Design 3	6	P: AERO 3450		March
AERO 4500	Flight Mechanics 2	6	P: AERO 3500		March
AERO 4900	Thesis or Design Project	10	P: 40 Credit Points of Senior Subjects	AERO 4910 Honours Thesis	
AERO 4910	Honours Thesis	14	P: 40 Credit Points of senior subjects, WAM of credit average or above in Senior year subjects.	AERO 4900 Thesis	

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
AERO 4920	Seminar	2	P: 40 Credit Points of Senior Subjects		July
AERO 4600	Practical Experience				July

Resolutions of the Faculty of Engineering relating to Table 1

Degree Eligibility:

To be eligible for the degree of BE (Aeronautical) or combined degrees BE (Aero)/BSc; BE (Aero)/BCom and BE(Aero)/BA, students must satisfy the following requirements:

a. Pass all core subjects as detailed in the above table. Core total is 160 credit points;

b. Complete **either:** a minimum of 32 credit points of additional approved elective units of study (for BE degree) or; The requirements for a combined degree as set out in the Joint Resolutions of the Faculty of Engineering and the Faculties of Science, Economics and Arts.

c. Complete a period of practical experience (approximately 12 weeks), usually undertaken in the vacation period between years 3 and 4 of the course. A report on this work must be submitted and approved to satisfy this requirement.

Acceptable Alternative Units of Study:

Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students considering doing Advanced options should seek advice from their Department before enrolling.

Recommended Elective Units of Study for BE (Aero)

Junior: BE

CHEM 1401	Chemistry IE				
MECH 1510	Kinematics and Dynamics	6		MATH 1051 Mechanics IE	
PHYS 1202	Physics IE				

Junior: BE/BSc

PHYS 1001	Physics (Regular)	6	AK: HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1002	Physics (Fundamentals)	6	AK: No assumed knowledge of Physics	May not be counted with Physics 1001 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
COMP 1001	Introductory Programming	6	AK: HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
CHEM 1101	Chemistry 1A	6	P: Akn HSC Mathematics 2 unit course; and the Chemistry component of the 4-unit or 3-unit HSC Science course, or 2-unit Chemistry	May not be counted with Chemistry 1001 or 1901 or 1903 Recommended concurrent unit of study: Preferred — Mathematics 1701 or 1791; otherwise — Mathematics 1711	February & July
CHEM 1102	Chemistry IB	6	P: Prereq Chemistry 1101 or a Distinction in Chemistry 1001 or equivalent; Chemistry 1101 may be taken as a corequisite	May not be counted with Chemistry 1002 or 1902 or 1904 Recommended concurrent unit of study: Preferred — Mathematics 1702 or 1703 or 1792 or 1793; otherwise — Mathematics 1704 or 1712	July
BE: Intermediate					
MATH 2051	Linear Programming and Boundary Value Problems	2			
MATH 2052	Numerical Methods	2			
AERO 2800	Aeronautical Engineering Computing	4			July
BE/BSc: Intermediate					
PHYS 2001	Physics (Technological) A	8	P: Qual 12 credit points of Junior Physics or Physics IE Prereq 12 credit points of Junior Mathematics other than Mathematics 1711 and 1712 or Credit or better in Mathematics 1711 and 1712	May not be counted with Physics 2101 or 2103 or 2901 This is a qualifying unit of study for Senior Physics	Febraary
PHYS 2002	Physics (Technological) B	8	P: Qual 12 credit points of Junior Physics or Physics IE Prereq 12 credit points of Junior Mathematics other than Mathematics 1711 and 1712 or Credit or better in Mathematics 1711 and 1712	May not be counted with Physics 2102 or 2104 or 2902 This is a qualifying unit of study for Senior Physics	July
CHEM 2301	Chemistry 2A	8	P: Qual Chemistry 1102 or 1902 or 1904 Prereq 6 credit points of Junior Mathematics	May not be counted with Chemistry 2001 or 2101 or 2201 or 2502 or 2901	February
CHEM 2302	Chemistry 2B	8	P: Prereq Chemistry 2001 or 2101 or 2201 or 2301 or 2502	May not be counted with Chemistry 2202 or 2902	July
COMP 2001	Computer Systems	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2901 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February
COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
COMP 2003	Languages and Logic	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902 and Mathematics 1703 or 1704 or 1793 or 1794	May not be counted with Computer Science 2903 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
Senior					
AERO 3501	Flying Operations	2	P: AERO 2500, AERO 2200		
AERO 3600	Aviation Technology	4			
MECH 3620	Industrial Management	5			
AERO 3601	Aviation Operation and Management	3			July
Senior Advanced					
AERO 4290	Rotary Wing Aerodynamics	4	P: AERO 3250		March
AERO 4291	Advanced Computational Aerodynamics	3	P: AERO 3250		July
AERO 4292	Aeroelasticity	3	P: AERO 3250		July
AERO 4490	Advanced Aircraft Design	4	P: AERO 3450		
AERO 4590	Advanced Flight Mechanics	3	P: AERO 3500		
MECH 4311	Advanced Aerospace Materials	4	P: MECH 3300 Materials 2	MECH 4310 Advanced Engineering Materials	

Notes:

1) Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions;
2) Approved elective units of study from Departments other than Aeronautical Engineering may be considered subject to the approval of the Head of Department.
3) Prerequisites are shown in the above table for AERO courses only. Prerequisites for service courses given by other faculties and departments can be found in the tables for those departments.

Table 1 - Aeronautical Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Candidates for the degree of Bachelor of Engineering in Aeronautical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.

Core Units of Study - Aeronautical Engineering

Junior

MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1702	Integral Calculus and Statistics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MECH 1501	Engineering Statics	4		MECH 1500 Mechanical Engineering 1	
ELEC 1001	Introductory Electrical Engineering	4	C: MATHS 1001 Differential Calculus and Linear Algebra.	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology	July
AERO 1600	Workshop Technology	4		MECH 1600	March
MECH 1801	Computational Engineering 1C	5		MECH 1800 Computational Engineering 1A	
CIVL 1002	Computational Engineering	3		COMP 101F Introductory Programming and COMP 102S Introductory Computer Science	July
AERO 1900	Introductory Aeronautics	4			

Intermediate

MATH 2001	Vector Calculus and Complex Variables	4	P: Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	4	P: Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
AERO 2300	Mechanics of Solids 1	4	P: MATH 101F, MATH 102S		July
AERO 2200	Introductory Aerodynamics	4	P: 12 Credit Points of Junior Math	MECH 2200, MECH 2201, MECH 2500	July
AERO 2500	Introductory Flight Mechanics and Performance	4	P:MATH 101FJ02S		March
MECH 2201	Thermodynamics 1	4		MECH 2200 Thermofluids	

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 2300	Materials 1	4		CIVL 2101 Properties of Materials	
MECH 2400	Mechanical Design 1	6			
MECH 2500	Engineering Dynamics 1	4	P: (MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics		
Senior					
MECH 3201	Thermodynamics 2	4	P: MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1	MECH 3200 Thermal Engineering 1	
MECH 3300	Materials 2	4	P: MECH 2300 Materials 1 & AERO 2300 Mechanics of Solids 1		
MECH 3500	Engineering Dynamics 2	4	P: MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005)		
AERO 3200	Aerodynamics 1	4.0	P: AERO 2200		March
AERO 3250	Aerodynamics 2	4	P: AERO 2200		July
AERO 3300	Aircraft Structures 1	4	P: AERO 2300		March
AERO 3350	Aircraft Structures 2	4	P: AERO 2300		July
AERO 3400	Aircraft Design 1	4	P: MECH 2400		March
AERO 3450	Aircraft Design 2	4	P: MECH 2400		July
AERO 3500	Flight Mechanics 1	4	P: AERO 2500		
Senior Advanced					
AERO 4200	Aerodynamics 3	3	P: AERO 3250		March
AERO 4250	Aerodynamics 4	3	P: AERO 3250		July
AERO 4201	Propulsion	4	P: MECH 3201		March
AERO 4300	Aircraft Structures 3	4	P: AERO 3350	AERO 4301 Applied Numerical Stress Analysis	March
AERO 4350	Aircraft Structures 4	4	P: AERO 3350	AERO 4301 Applied Numerical Stress Analysis	July
AERO 4400	Aircraft Design 3	6	P: AERO 3450		March
AERO 4500	Flight Mechanics 2	6	P: AERO 3500		March
AERO 4900	Thesis or Design Project	10	P: 40 Credit Points of Senior Subjects	AERO 4910 Honours Thesis	
AERO 4910	Honours Thesis	14	P: 40 Credit Points of senior subjects, WAM of credit average or above in Senior year subjects.	AERO 4900 Thesis	

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
AERO 4920	Seminar	2	P: 40 Credit Points of Senior Subjects		July
AERO 4600	Practical Experience				July

Resolutions of the Faculty of Engineering relating to Table 1

Degree Eligibility:

To be eligible for the degree of BE (Aeronautical) or combined degrees BE (Aero)/BSc; BE (Aero)/BCom and BE(Aero)/BA, students must satisfy the following requirements:

a. Pass all core subjects as detailed in the above table. Core total is 160 credit points;

b. Complete **either:** a minimum of 32 credit points of additional approved elective units of study (for BE degree) or; The requirements for a combined degree as set out in the Joint Resolutions of the Faculty of Engineering and the Faculties of Science, Economics and Arts.

c. Complete a period of practical experience (approximately 12 weeks), usually undertaken in the vacation period between years 3 and 4 of the course. A report on this work must be submitted and approved to satisfy this requirement.

Acceptable Alternative Units of Study:

Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students considering doing Advanced options should seek advice from their Department before enrolling.

Recommended Elective Units of Study for BE (Aero)

Junior: BE

CHEM 1401	Chemistry IE				
MECH 1510	Kinematics and Dynamics	6		MATH 1051 Mechanics IE	
PHYS 1202	Physics IE				

Junior: BE/BSc

PHYS 1001	Physics (Regular)	6	AK: HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1002	Physics (Fundamentals)	6	AK: No assumed knowledge of Physics	May not be counted with Physics 1001 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
COMP 1001	Introductory Programming	6	AK: HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
CHEM 1101	Chemistry 1A	6	P: Akn HSC Mathematics 2 unit course; and the Chemistry component of the 4-unit or 3-unit HSC Science course, or 2-unit Chemistry	May not be counted with Chemistry 1001 or 1901 or 1903 Recommended concurrent unit of study: Preferred — Mathematics 1701 or 1791; otherwise •— Mathematics 1711	February & July
CHEM 1102	Chemistry IB	6	P:Prereq Chemistry 1101 or a Distinction in Chemistry 1001 or equivalent; Chemistry 1101 may be taken as a corequisite	May not be counted with Chemistry 1002 or 1902 or 1904 Recommended concurrent unit of study: Preferred — Mathematics 1702 or 1703 or 1792 or 1793; otherwise — Mathematics 1704 or 1712	July
BE: Intermediate					
MATH 2051	Linear Programming and Boundary Value Problems	2			
MATH 2052	Numerical Methods	2			
AERO 2800	Aeronautical Engineering Computing	4			July
BE/BSc: Intermediate					
PHYS 2001	Physics (Technological) A	8	P: Qual 12 credit points of Junior Physics or Physics IE Prereq 12 credit points of Junior Mathematics other than Mathematics 1711 and 1712 or Credit or better in Mathematics 1711 and 1712	May not be counted with Physics 2101 or 2103 or 2901 This is a qualifying unit of study for Senior Physics	February
PHYS 2002	Physics (Technological) B	8	P: Qual 12 credit points of Junior Physics or Physics IE Prereq 12 credit points of Junior Mathematics other than Mathematics 1711 and 1712 or Credit or better in Mathematics 1711 and 1712	May not be counted with Physics 2102 or 2104 or 2902 This is a qualifying unit of study for Senior Physics	July
CHEM 2301	Chemistry 2A	8	P: Qual Chemistry 1102 or 1902 or 1904 Prereq 6 credit points of Junior Mathematics	May not be counted with Chemistry 2001 or 2101 or 2201 or 2502 or 2901	February
CHEM 2302	Chemistry 2B	8	P: Prereq Chemistry 2001 or 2101 or 2201 or 2301 or 2502	May not be counted with Chemistry 2202 or 2902	July
COMP 2001	Computer Systems	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2901 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February
COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
COMP 2003	Languages and Logic	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902 and Mathematics 1703 or 1704 or 1793 or 1794	May not be counted with Computer Science 2903 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
Senior					
AERO 3501	Flying Operations	2	P: AERO 2500, AERO 2200		
AERO 3600	Aviation Technology	4			
MECH 3620	Industrial Management	5			
AERO 3601	Aviation Operation and Management	3			July
Senior Advanced					
AERO 4290	Rotary Wing Aerodynamics	4	P: AERO 3250		March
AERO 4291	Advanced Computational Aerodynamics	3	P: AERO 3250		July
AERO 4292	Aeroelasticity	3	P: AERO 3250		July
AERO 4490	Advanced Aircraft Design	4	P: AERO 3450		
AERO 4590	Advanced Flight Mechanics	3	P: AERO 3500		
MECH 4311	Advanced Aerospace Materials	4	P: MECH 3300 Materials 2	MECH 4310 Advanced Engineering Materials	

Notes:

1) Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions;
2) Approved elective units of study from Departments other than Aeronautical Engineering may be considered subject to the approval of the Head of Department.
3) Prerequisites are shown in the above table for AERO courses only. Prerequisites for service courses given by other faculties and departments can be found in the tables for those departments.

Table 2 - Chemical Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Chemical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units of study offered by faculties other than Engineering.					
Core Units of Study - Chemical Engineering					
Junior					
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791.	February
MATH 1702	Integral Calculus and Statistics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MATH 1052	Introductory Mechanics (2)	4			
CHEM 1101	Chemistry 1A	6	AK: HSC Mathematics 2 unit course; and the Chemistry component of the 4-unit or 3-unit HSC Science course, or 2-unit Chemistry	May not be counted with Chemistry 1001 or 1901 or 1903 Recommended concurrent unit of study: Preferred — Mathematics 1701 or 1791; otherwise — Mathematics 1711	February & July
CHEM 1102	Chemistry IB	6	P: Chemistry 1101 or a Distinction in Chemistry 1001 or equivalent; Chemistry 1101 may be taken as a corequisite	May not be counted with Chemistry 1002 or 1902 or 1904 Recommended concurrent unit of study: Preferred — Mathematics 1702 or 1703 or 1792 or 1793; otherwise — Mathematics 1704 or 1712	July
CHNG 1001	Chemical Engineering Applications	4			
CHNG 1101	Chemical Engineering 1A	4		Chemical Engineering Science 2; Chemical Engineering Science Auxiliary	
CHNG 1102	Chemical Engineering IB	4	P: 1101 Chemical Engineering 1A	Chemical Engineering Science 2; Chemical Engineering Science Auxiliary	
CHNG 1201	Chemical Process Case Studies (2)	4			July
CHNG 1301	Computing for Chemical Engineers	4			
Intermediate					
MATH 2001	Vector Calculus and Complex Variables (3)	4	P: Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	4	P: Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2005	Fourier Series and Differential Equations	4	P: Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
MATH 2051	Linear Programming and Boundary Value Problems (3)	2			
MATH 2052	Numerical Methods (3)	2			
AERO 2300	Mechanics of Solids 1 (2) (5)	4	P: MATH 101F, MATH 102S		July
ELEC 2002	Electrical Technology	4	P: MATHS 1001	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits , and ELEC 1001 Introductory Electrical Engineering.	July
CHNG 2101	Chemical Engineering 2A	4			
CHEM 2101	Chemistry 2 (Environmental)	8	P: Qual Chemistry 1102 or 1902 or 1904 and Prereq 6 credit points of Junior Mathematics	May not be counted with Chemistry 2001 or 2201 or 2301 or 2502 or 2901	February
CHNG 2102	Chemical Engineering 2B	4			July
CHNG 2301	Chemical Engineering Computations	4	P: MATH 1701; MATH 1702 ; CHNG 1301		
CHNG 2501	Fundamentals of Environmental Chemical Engineering	4			
Senior					
CHNG 3001	Chemical Engineering Laboratory	4	P: CHNG 2101; CHNG 2102. See note (6)		
CHNG 3101	Unit Operations (Heat Transfer)	4	P: CHNG 2101; CHNG 2102		
CHNG 3102	Unit Operations (Mass Transfer)	4	P: CHNG 2101; CHNG 2102		
CHNG 3103	Unit Operations (Particle Mechanics)	4	P: CHNG 2101; CHNG 2102		
CHNG 3104	Unit Operations (Fluid Mechanics)	4	P: CHNG 2101		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
CHNG3105	Thermodynamics 1	4	P: CHNG 2101; CHNG 2102		
CHNG 3106	Thermodynamics 2	4	P: CHNG 3105		
CHNG 3107	Reaction Engineering 1	4			
CHNG 3301	Process Modelling	4	P: CHNG 2301		
CHNG 3302	Process Control 1	4			
CHNG 3401	Project Economics	4			
CHNG 3601	Materials and Corrosion	4			July
Senior Advanced					
CHNG 4001	Practical Experience (7)		P: 28 credit points of Senior courses	'"Normally taken during vacation between Senior and Senior Advanced Years.	
CHNG 4002	Thesis	8	P: Students should have completed (or be enrolled in) all other Senior Advanced core courses.		
CHNG 4201	Chemical Engineering Design 1	4	P: All four components of Unit Operations.		
CHNG 4202	Chemical Engineering Design 2	8	P: Unit Operations (all four components); CHNG 3105; CHNG 3106; CHNG 3401		
CHNG 4401	Project Engineering	4			
CHNG 4402	Process Plant Risk Management	4			

Notes to Table 2:

(1) For core units offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.

(2) Students doing any of the combined degree options (ie BE/BSc; BE/BCom and BE/BA) will be ***exempt*** from **Junior** core units of study MATH 1052 and CHNG 1201, and **Intermediate** core units of study ELEC 2002 and AERO 2300.

(3) Students doing the **BE/BCom** degree would *replace:* Intermediate core units: MATH 2001, MATH 2051 and MATH 2052 **with:** STAT 2002, 4 credit points and STAT 2004, 4 credit points.

(4) Acceptable alternatives are CHEM 2001 and CHEM 2201.

(5) Students who wish to specialise in the **biochemical** applications of chemical engineering should select the following units of study:

Intermediate Year: BCHM 2101 and BCHM 2102 in place of: ELEC 2002 and AERO 2300.

Senior Year: MICR 2007 and MICR 2008. Note that one or more of the Senior core units of study may need to be deferred until the following year.

Senior Advanced Year: The elective unit of study CHNG 4501.

(6) In the case of prerequisites and corequisites, "Chem Eng 2" is taken to mean CHNG 2101 and CHNG 2102. The term "Unit Operations" is taken to mean the four units of study CHNG 3101, CHNG 3102, CHNG 3103 and CHNG 3104.

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Resolutions of the Faculty of Engineering relating to Table 2

Bachelor of Engineering in Chemical Engineering

Candidates for the degree of Bachelor of Engineering in Chemical Engineering are required to complete all the core units of study in Table 2 (total 172 credit points) They are also required to gain at least 20 elective credit points, at least 12 of which must come from the Year 4 electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below.

Combined Degree (Bachelor of Engineering in Chemical Engineering with either a Bachelor of Arts, Bachelor of Commerce or Bachelor of Science)

Candidates commencing in one of the combined degree options (that is, Bachelor of Engineering in Chemical Engineering with either a Bachelor of Arts, Bachelor of Commerce or Bachelor of Science) are, from 1998 onwards, required to complete all the core units of study in Table 2 except where specific exemptions are noted. They are also required to gain at least 4 elective credit points, all of which must come from the Year 4 electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below. *This total of 160 credit points is only sufficient to be awarded a Bachelor of Engineering in Chemical Engineering as part of an approved combined degree program.*

Acceptable Alternative Units of Study:

Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing Advanced options should seek advice from their Department before enrolling.

Recommended Elective Units of Study for BE (Chemical)

Intermediate					
ASNE 1001	Asian Studies 1A	4			
ASNE 1002	Asian Studies IB	4			
BCHM 2101	Genes and Proteins Theory	4	P: Qual 6 credit points of Junior Chemistry which must include one of CHEM 1101, 1102, 1901, 1902, 1903, 1904 or, with the permission of the Head of Department, exceptional performance in CHEM 1001 or 1002	May not be counted with Agricultural Chemistry 2001 or Biochemistry 2101 or 2901	February
BCHM 2102	Molecules, Metabolism and Cells Theory	4	P: Qual BCHM 2001, 2101 or 2901	May not be counted with Agricultural Chemistry 2001 or Biochemistry 2102 or 2902	July
Senior					
MICR 2007	Microbiology for Engineers A	4			
MICR 2008	Microbiology for Engineers B	4			
ASNE 2001	Asian Studies 2A	4	P: ASNE1001 and ASNE1002		
ASNE 2002	Asian Studies 2B	4	P: ASNE1001 and ASNE1002		
Senior Advanced					
IREL 1001	Macro Industrial Relations	6			March
ASNE 3001	Asian Studies 3A	4	P: ASNE2001 and ASNE2002		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ASNE 3002	Asian Studies 3B	4	P: ASNE2001 and ASNE2002		
ENGG 4001	Innovation and International Competitiveness	4			
CHNG 4003	Advances in Chemical Engineering A	4			
CHNG 4004	Advances in Chemical Engineering B	4			
CHNG 4005	Laboratory Projects in Unit Operations	4	P: CHNG 3001		
CHNG 4006	Professional Option	2	P: Passed at least 144 credit points		
CHNG 4101	Separation Processes	4	P: Unit Operations (all four components)		
CHNG 4102	Transport Phenomena	4			
CHNG 4103	Advances in Polymer Engineering	4			
CHNG 4104	Reaction Engineering 2	4	P: CHNG 3107		
CHNG 4105	Advanced Topics in Thermodynamics	4	P: CHNG 3105; CHNG 3106		
CHNG 4203	Major Industrial Project	24	P: Passed at least 144 credit points. Students wishing to do this unit of study are required to discuss the matter with the Head of Department prior to enrolment.	CHNG 4002 Thesis; CHNG 4201 Chemical Engineering Design 1; CHNG 4401 Project Engineering; CHNG 4402 Process Plant Risk Management	March
CHNG 4301	Advanced Fluid Dynamics Modelling	4			
CHNG 4302	Reservoir Engineering	4	P: CHNG 3103; CHNG 3104		
CHNG 4303	Optimisation Techniques	4		CHNG 4305 Process Systems Engineering	
CHNG 4304	Process Control 2	4	P: CHNG 3302		
CHNG 4305	Process Systems Engineering	4		CHNG 4303 Optimisation Techniques	
CHNG 4403	Engineering Business Skills	4			
CHNG 4501	Biochemical Engineering	8	P: BCHM 2101; BCHM 2102; MICR 2007; MICR 2008		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
CHNG 4502	Advanced Topics in Environmental Engineering A	4	P: All four components of Unit Operations; CHNG 3106		
CHNG 4503	Advanced Topics in Environmental Engineering B	4	P: All four components of Unit Operations; CHNG 3106		
CHNG 4504	Environmental Impact Assessment	4			
CHNG 4505	Bioremediation	4			
CHNG 4601	Advanced Particle Mechanics	4	P: All four components of "Unit Operations"		
CHNG 4602	Mineral Processing (Extractive Metallurgy)	4	P: Unit Operations (all four components)		
CHNG 4603	Mineral Processing (Mineral Dressing)	4	P: Unit Operations (all four components)		
DESC 6001	Computer-Based Design	3			July

Notes:

Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions. Choices and combinations of elective units of study are subject to approval by the Head of Department.

(1) The term "Unit Operations" is taken to mean the four units of study CHNG 3101, CHNG 3102, CHNG 3103 and CHNG 3104.

(2) This elective is not available to students doing a BE/BCom combined degree.

(3) This elective course can be taken as an acceptable alternative to a number of Senior Advanced core units of study. Students must seek approval from the Head of Department to enrol in this unit of study.

(4) Recommended units of study for students wishing to specialise in the biochemical applications of chemical engineering.

Table 3 - Civil Engieering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Candidates for the degree of Bachelor of Engineering in Civil Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units offered by faculties other than Engineering.

Core Units of Study - Civil Engineering					
Junior					
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1702	Integral Calculus and Statistics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MATH 1051	Mechanics IE	6			
CHEM 1401	Chemistry IE	6			
CTVL 1406	Engineering Geology	5		GEOL 1002	
CIVL 1001	Civil Engineering 1	4	AK: Mathematics 3 unit course and a satisfactory knowledge of 2 unit Chemistry or the Chemistry component of the 3 or 4 unit Science HSC course and of the 2 unit Physics course or the Physics component of the 3 or 4 unit Science HSC course.		
CIVL 1201	Statics	4	AK: Mathematics 3 unit course at the HSC C: MATH 1701, MATH 1702	MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics, MECH 1501 Engineering Statics	July
CIVL 1002	Computational Engineering	3		COMP 101F Introductory Programming and COMP 102S Introductory Computer Science	July
CIVL 1003	Computer Graphics	3	C: Either CIVL 1002 Engineering Programming or COMP 101F, COMP 102S Computer Science	MECH 1800 Computational Engineering 1A and MECH 1801 Computational Engineering 1C	March
ELEC 1001	Introductory Electrical Engineering	4	C: MATHS 1001 Differential Calculus and Linear Algebra	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology	July
Intermediate					
MATH 2001	Vector Calculus and Complex Variables	4	P: Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	4	P: Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2051	Linear Programming and Boundary Value Problems (3)	2			
MATH 2052	Numerical Methods	2			
CIVL 2407	Engineering Geology 2	5	P: Either GEOL 1002 or CIVL 1406 Engineering Geology		
CIVL 2101	Properties of Materials	4	P:CHEM 1401 Chemistry IE		
CIVL 2202	Structural Mechanics	5	P: MATH 1051 Mechanics and CIVL 1201 Statics		
CIVL 2601	Fluids 1	5	P: MATH 1701, MATH 1702		March
CIVL 2004	Engineering Communications 1	2			March
CIVL 2203	Structural Design	4	P: MATH 1051 Mechanics and CIVL 1201 Statics C: CIVL 2202 Structural Mechanics.		July
CIVL 2801	Engineering Construction 1	4			
Senior					
CIVL 3102	Materials Aspects in Design	4	P: CIVL 2101 Properties of Materials		
CIVL 3204	Structural Analysis	6	P: CIVL 2202 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations		March
CIVL 3205	Concrete Structures 1	6	P: CTVL 2202 Structural Mechanics C: CIVL 3102 Material Aspects in Design and CIVL 3204 Structural Analysis.		
CIVL 3206	Steel Structures 1	6	P: CIVL 2202 Structural Mechanics C: CIVL 3102 Materials Aspects in Design, CIVL 3204 Structural Analysis.		July
CIVL 3401	Soil Mechanics A	4	P: CIVL 2202 Structural Mechanics		March
CIVL 3402	Soil Mechanics B	4	P: CIVL 2202 Structural Mechanics C: CIVL 3401 Soil Mechanics A		July
CIVL 3501	Surveying 1	4	P: MATH 1701, MATH 1702		
CIVL 3602	Fluids 2	4	P: CIVL 2601 Fluids 1		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
CIVL 3701	Transportation Engineering and Planning	2			July
CIVL 3005	Engineering Communications 2	2	P: CIVL 2004 Engineering Communications 1		
CIVL 3207	Risk and Reliability Analysis	2	P: MATH 1701, MATH 1702, CIVL 2202 Structural Mechanics, CIVL 2203 Structural Design		March
CIVL 3802	Engineering Construction 2	4	P: CIVL 2801 Engineering Construction 1		March
Senior Advanced					
CIVL 4006	Thesis 1	6	C : A senior core course in the field of the subject		
CIVL 4008	Practical Experience		P: 28 cp of Senior courses		March
CIVL 4010	Civil Engineering Camp	4	P: CIVL 3501 Surveying 1		July
CIVL 4803	Engineering Management	4			July
CIVL 4011	Professional Practice	4			July
CIVL 4901	Civil Engineering Design	4	P: CIVL 3205 Concrete Structures 1, CIVL 3206 Steel Structures 1		March

Notes to Table 3:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.

Resolutions of the Faculty of Engineering relating to Table 3

Degree Eligibility

Candidates for the degree of Bachelor of Engineering in Civil Engineering are expected to complete all the core units of study in Table 3 (162 credit points). They are also required to gain at least 30 credit points from the elective units of study listed under "Resolutions of the Department of Civil Engineering". Of the 30 elective units of study, at least 20 of these must be from Senior Advanced Units of Study.

Candidates commencing one of the combined degree options from 1998 onwards (that is, Bachelor of Engineering in Civil Engineering with either a Bachelor of Arts, Bachelor of Science or BacheJopof Commerce) are required to complete all of the core units of study in Table 3 (162 credit points). This total of 162 credit points is only sufficient to be awarded a Bachelor of Engineering in Civil Engineering as part of an approved combined degree program. The remaining credit points for the combined degree will be taken in the appropriate Faculty (Arts, Science or Economics) and candidates should refer to the Joint Resolutions of the Faculty of Engineering and the relevant Faculty for requirements.

Note: Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students considering doing Advanced options should seek advice from their Department before enrolling.

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Acceptable Alternative Units of Study

Pursuant to Resolution 3, the Faculty has prescribed the following acceptable alternatives to core units of study listed in Table 3:

Core Unit of Study	*Acceptable Alternative*
CHEM 1401	CHEM 1101 *and;* CHEM 1102
CIVL 1406	GEOL 1001 *and;* GEOL 1002
CIVL 1002	COMP 1001 *and;* COMP 1002
CIVL 1003	COMP *200land;* COMP 2002 *and;* COMP 2003 *and;* COMP 2004 *or;* MECH 1800and; MECH 1810
CIVL 1201	MECH 1500 *or;* MECH 1501
ELEC 1001	PHYS 1202 *or;* PHYS 1001 *and;* PHYS 1003 *or;* ELEC 2002
CIVL 2407	GEOL 2001 *and;* GEOL 2002 *and;* GEOL 2003
CIVL 4006	CrVL 4012

Recommended Elective Units of Study for the BE (Civil)

Junior

PHYS 1202	Physics IE		C: MATH 1051		
COMP 1001	Introductory Programming	6	AK: HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July
GEOL 1001	Earth and Its Environment	6	AK: No previous knowledge of Geology assumed	See prerequisites for Intermediate Geology	February
GEOL 1002	Earth Processes and Resources	6	AK: No previous knowledge of Geology assumed		July
MECH 1600	Manufacturing Technology	4		*Mutually exclusive with:* AERO 1600 Workshop Technology	

Intermediate

ASNE 1001	Asian Studies 1A	4			
ASNE 1002	Asian Studies IB	4			
ARPH 1001	Introduction to Archaeology	6		Students may take no more than 64 senior credit points in a subject area.	March
ARPH 1002	Archaeology of Australia	6			July
DESC 6001	Computer-Based Design	3		Not available every year	July
DESC 6002	Understanding Design	3			Contact Dept

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
DESC 9020	CAD in Design	3			
DESC 9030	Database Management Systems for Design	3			
COMP 1000	Information Technology Tools	6			February & July
Senior Advanced					
IREL 1001	Macro Industrial Relations	6	36 credit points of Senior units of study and CIVL 4008		March
CIVL 4007	Thesis 2	4	CIVL 4006 Thesis 1		July
CIVL 4208	Finite Element Methods	4	CIVL 3204 Structural Analysis		March
CHNG 4504	Environmental Impact Assessment	4	24 Senior credit points of study		
MECH 4220	Environmental Engineering	6	24 credit points of Senior units of study	CHNG 4504 Environmental Impact Assessment and MECH 4230 Environmental Acoustics and Noise Control if Acoustics forms part of MECH 4220.	
CIVL 4209	Bridge Engineering	4	CIVL 3205 Concrete Structures 1 and CIVL 3206 Steel Structures 1		
CIVL 4210	Concrete Structures 2 .	4	CIVL 3205 Concrete Structures 1	CIVL 4217 Concrete Structures Honours	
CIVL 4211	Structural Dynamics	4	CIVL 3204 Structural Analysis	CIVL 4216 Structural Dynamics Honours	
CIVL 4212	Steel Structures 2	4	CIVL 3206 Steel Structures 1	CIVL 4213 Steel Structures Honours	March
CIVL 4403	Environmental Geotechnics	4	CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B		July
CIVL 4404	Foundation Engineering	4	CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B		
CIVL 4502	Surveying 2	4	CIVL 3501 Surveying 1		March
CIVL 4603	Environmental Fluids 1	4			March
CIVL 4604	Environmental Fluids 2	4			July
CIVL 4605	Water Resources Engineering	4			July
CIVL 4804	Project Procedures	4			July
CIVL 4805	Project Formulation	4			July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 4630	Introduction to Operations Research	2	P: MATH 2001 and MATH 2005	MECH 4600 Industrial Engineering	
CIVL 4103	Advanced Materials	4	P: CIVL 3102 Materials Aspects in Design		
ARCH 6009	The Building Industry in Australia	3			Contact Dept
GEOL 2004	Environmental Geology: Hazards	4	P: 24 credit points of Science units of study	See prerequisites for Senior Geology	February
GEOL 2005	Environmental Geology: Resources	4	P: 24 credit points of Science units of study	See prerequisites for Senior Geology	July
CIVL 4012	Thesis Honours	10	C: A Senior core course in the field of the thesis.		
CIVL 4104	Materials Honours	4	P: CIVL 3102 Materials Aspects in Design		July
CIVL 4213	Steel Structures Honours	4	P: CIVL 3206 Steel Structures 1	CIVL 4212 Steel Structures 2	March
CIVL 4215	Finite Element Applications Honours	4	C: CIVL 4208 Finite Element Methods		
CIVL 4216	Structural Dynamics Honours	4	P: CIVL 3204 Structural Analysis	CIVL 4211 Structural Dynamics	July
CIVL 4217	Concrete Structures Honours	4	P: CIVL 3205 Concrete Structures 1		
CIVL 4405	Soil Engineering Honours	4	P: CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B C: CIVL 4404 Foundation Engineering		July
CIVL 4503	Surveying Honours	4	C:CTVL 4502 Surveying 2		
CIVL 4606	Environmental Fluids Honours	4	P:CIVL 3602 Fluids 2	CIVL 4604 Environmental Fluids 2	July
CIVL 4902	Civil Engineering Design Honours	4	C: CIVL 4901 Civil Engineering Design		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Notes:

1) Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.

2) For the BE degree (Civil), students must take at least 20 elective units of study at Senior Advanced level, however, 2 x 4 credit point units of study (other than Honours units of study) may be replaced by at least 8 credit points available elsewhere in the Faculty of Engineering and subject to the approval of the Head of Civil Engineering.

3) Honours candidates replace the core unit of study CIVL 4006 Thesis by CIVL 4012 Thesis Honours and must also enrol in CIVL 4208 Finite Element Methods, as well as 12 credit points of elective units of study at Honours level and at least 8 credit points of other units of study at Senior Advanced level.

4) Recommended elective streams are:

Construction Engineering and Management Stream: IREL 1001, CIVL 4502, CIVL 4804, CIVL 4805, MECH 4630

Structural Engineering Stream: CIVL 4209, CIVL 4208, CIVL 4210, CIVL 4211, CIVL 4212

Environmental Stream: CIVL 4403, CIVL 4603, CIVL 4604, CIVL 4605, CHNG 4504 (or MECH 4220)

Geotechnical Engineering Stream: CIVL 4208, CIVL 4403, CIVL 4404, GEOL 2004, GEOL 2005

Table 4 - Computer Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Computer Engineering, and candidates for the combined degree courses of Bachelor of Engineering in Computer Engineering with Bachelor of Art or Bachelor of Science or Bachelor of Commerce, are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study as prescribed by the Faculty. See note (1) relating to core units offered by faculties other than Engineering.					
Core Units of Study - Computer Engineering					
Junior					
COMP 1001	Introductory Programming	6	P: Akn HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Prereq Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1703	Integral Calculus and Discrete Mathematics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1702 or 1704 or 1712 or 1792 or 1793 or 1794	July
PHYS 1001	Physics (Regular)	6	P: AKn HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1203	Physics 1EE (2)	4			
ELEC1101	Science, Technology and Engineering	6	P: Advisory prerequisites HSC Maths 3 unit, HSC Physics 2 unit	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	March
ELEC1102	Introductory Electrical Circuits	6	P: Advisory prerequisites MATHS 1001 Differential Calculus and Linear Algebra, ELEC 1101 Science, Technology and Engineering.	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	July
Intermediate					
COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February
COMP 2003	Languages and Logic	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902 and Mathematics 1703 or 1704 or 1793 or 1794	May not be counted with Computer Science 2903 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
MATH 2001	Vector Calculus and Complex Variables (3)	4	P: Prereq Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	4	P: Prereq Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Prereq Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
PHYS 2203	Physics 2EE	4			
ELEC 2101	Circuit Analysis			Mutually exclusive with U2.471 Introductory Mechatronics, U2.502 Electrical Technology, U2.504 Electrical and Electronic Engineering	
ELEC 2401	Electronic Devices and Circuits	4	P: Advisory prerequisite ELEC 1102 Introductory Electronic Circuits	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology.	July
ELEC 2501	Signals and Communications	4	P: Advisory prerequisites MATH 1001 Differential Calculus and Linear Algebra, and MATH 1003 Integral Calculus and Discrete Mathematics, and ELEC 1102 Introductory Electronic Circuits.		July
ELEC 2601	Microcomputer Systems	4	P: Advisory prerequisites ELEC 1102 Introductory Electronic Circuits.	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology	March
Senior (1)					
COMP 3007	Networked Systems (3)	4	P: Qual Computer Science 2004 or 2904 Prereq Computer Science 2001 or 2901 and 2002 or 2902	May not be counted with Computer Science 3907	February
COMP 3009	Operating Systems (3)	4	P: Qual Computer Science 2004 or 2904 Prereq Computer Science 2001 or 2901 and 2002 or 2902	May not be counted with Computer Science 3909	February
COMP 3100	Software Engineering (3)	4	P: Qual Computer Science 2002 or 2902 Prereq Computer Science 2004 or 2904	May not be counted with Computer Science 3800	February
ELEC 3301	Signals and Systems	4	P: Advisory prerequisites MATH 2005 Fourier Series and Differential Equations, and ELEC 2501 Signals and Communications.	MATH 3103 Signal Processing and MATH 3809 Signal Processing (Advanced).	March
ELEC 3302	Fundamentals of Feedback Control	4	P: Advisory prerequisite ELEC 3301 Signals and Systems	MECH 3800 Systems Control and CHNG 3302 Process Control.	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 3401	Electronic Devices and Circuits	4	P: Advisory prerequisites ELEC 2401 Electronic Devices and Circuits and ELEC 2101 Circuit Analysis.		March
ELEC 3403	Switching Devices and High Speed Electronics	4	P: Advisory prerequisite ELEC 3401 Electronic Devices and Circuits.		July
ELEC 3501	Communications	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		July
ELEC 3601	Digital Systems Design	4	P: Advisory prerequisite ELEC 2601 Microcomputer Systems.		July
ELEC 3701	Management for Engineers	4			March
Senior Advanced					
ELEC 4303	Digital Signal Processing	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		March
ELEC 4601	Computer Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4602	Real Time Computing	4	P: Advisory prerequisitse ELEC 3601 Digital Systems Design, and ELEC 3602 Engineering Software or COMP 3100 Software Engineering.		March
ELEC 4702	Practical Experience				
ELEC 4703	Thesis	12	P: Prerequisite A minimum of 36 credit points from Senior or Senior Advanced units of study.		

Notes to 'Table 4:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.

(2) PHYS 1003 is an acceptable alternative to PHYS 1203.

(3) Students who have completed one or more of these units of study towards the Bachelor of Science degree shall, in their place, complete an equivalent number of credit points from units of study in the table of recommended elective units of study for BE (Computer Engineering) or such other units of study as are approved by the Head of Department.

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Resolutions of the Faculty of Engineering relating to Table 4: Degree Eligibility

BE (Computer Engineering):

In addition to gaining credit for the **154 credit points** of core units of study set out in Table 4, candidates are required to complete at least 16 **credit points** of elective units of study from the table of recommended elective units of study for BE (Computer Engineering). Further credit for a total of not less than **192 credit points** shall be gained by completing additional elective units of study approved by the Faculty.

BE (Computer Engineering)/BSc or BA or BCom:

In addition to gaining credit for the **154 credit points** of core units of study set out in Table 4, candidates must complete at least **8 credit points** of elective units of study from the table of recommended elective units of study for BE (Computer Engineering). Candidates for combined degrees should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty in which they are undertaking the combined degree program.

Acceptable Alternative Units of Study:

Most Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Recommended Elective Units of Study for the BE (Computer Engineering)

Senior Advanced

ELEC 4302	Image Processing and Computer Vision	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 4303 Digital Signal Processing.	July
ELEC4401	Electronic Design	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits.	March
ELEC 4402	Integrated Circuit Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	March
ELEC 4501	Data Communication Networks	4	P: Advisory prerequisite ELEC 3501 Communications	March
ELEC 4502	Digital Communication Systems	4	P: Advisory prerequisite ELEC 3501 Communications	March
ELEC 4801	Biomedical Engineering Systems	4	P: Advisory prerequisite ELEC 3801 Fundamentals of Biomedical Engineering.	July
ELEC 5302	Fuzzy Systems	4		July
ELEC 5501	Advanced Communication Networks	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4501 Data Communication Networks.	July
ELEC 5502	Satellite Communication Systems	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4502 Digital Communication Systems.	July
ELEC 5601	Advanced Real Time Computing	4	P: Advisory prerequisite ELEC 4602 Real Time Computing.	July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 5602	Advanced Computer Architecture	4	P: Advisory prerequisites ELEC 4601 Computer Design and (COMP 2001 Computer Systems or COMP 2901 Computer Systems Adv).	*Mutually exclusive* with COMP 2901 Computer Systems (Advanced), and COMP 295F Computer Systems-EE Adv.	July
ELEC 5603	Biologically Inspired Signal Processing	4			July
ELEC 5604	Adaptive Pattern Recognition	4			July
ELEC 5605	Advanced Digital Engineering	4	P: Advisory prerequisite ELEC 4601 Computer Design		July
ELEC 5606	Multimedia Systems and Applications	4	P: Advisory prerequisites (ELEC 3602 Engineering Software or COMP 3100 Software Engineering), and ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.		July
ELEC 5607	Hardware/Software Co-Design	4	P: Advisory prerequisites: ELEC 3601 Digital Systems Design, and ELEC 3602 Programming for Engineering, or COMP 310F Software Engineering		

Table 5 - Electrical Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Electrical Engineering, and candidates for the combined degree courses of Bachelor of Engineering in Electrical Engineering with Bachelor of Art or Bachelor of Science or Bachelor of Commerce, are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as prescribed by the Faculty. See note (1) relating to core units offered by faculties other than Engineering.					
Core Units of Study - Electrical Engineering					
Junior					
COMP 1001	Introductory Programming	6	P: Akn HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P:Prereq COMP1001 or 1901	May not be counted with Computer Science 1902	July
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1703	Integral Calculus and Discrete Mathematics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1702 or 1704 or 1712 or 1792 or 1793 or 1794	July
PHYS 1001	Physics (Regular)	6	AK: HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1203	Physics 1EE (2)	4			
ELEC1101	Science, Technology and Engineering	6	P: Advisory prerequisites HSC Maths 3 unit, HSC Physics 2 unit	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	March
ELEC1102	Introductory Electrical Circuits	6	P: Advisory prerequisites MATHS 1001 Differential Calculus and Linear Algebra, ELEC 1101 Science, Technology and Engineering.	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	July
Intermediate					
COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
MATH 2001	Vector Calculus and Complex Variables	4	P: Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2002	Matrix Applications	4	P: Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
PHYS 2203	Physics 2EE	4			
ELEC 2101	Circuit Analysis			Mutually exclusive with U2.471 Introductory Mechatronics, U2.502 Electrical Technology, U2.504 Electrical and Electronic Engineering	
ELEC 2401	Electronic Devices and Circuits	4	P: Advisory prerequisite ELEC 1102 Introductory Electronic Circuits	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology.	July
ELEC 2501	Signals and . Communications	4	P: Advisory prerequisites MATH 1001 Differential Calculus and Linear Algebra, and MATH 1003 Integral Calculus and Discrete Mathematics, and ELEC 1102 Introductory Electronic Circuits.		July
ELEC 2601	Microcomputer Systems	4	P: Advisory prerequisites ELEC 1102 Introductory Electronic Circuits.	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology	March
Senior					
ELEC 3102	Engineering Electromagnetics	4	P: Advisory prerequisites (PHYS 2203 Physics2EE or PHYS 2002 Physics (Technological) B) and ELEC 2101 Circuit Analysis		March
ELEC 3201	Fundamentals of Electrical Energy Systems	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis.		July
ELEC 3602	Programming for Engineering	4 '	P: Advisory prerequisite COMP 2004 Programming Practice	COMP 3100 Software Engineering	March
ELEC 3301	Signals and Systems	4	P: Advisory prerequisites MATH 2005 Fourier Series and Differential Equations, and ELEC 2501 Signals and Communications.	MATH 3103 Signal Processing and MATH 3809 Signal Processing (Advanced).	March
ELEC 3302	Fundamentals of Feedback Control	4	P: Advisory prerequisite ELEC 3301 Signals and Systems	MECH 3800 Systems Control and CHNG 3302 Process Control.	July
ELEC 3401	Electronic Devices and Circuits	4	P: Advisory prerequisites ELEC 2401 Electronic Devices and Circuits and ELEC 2101 Circuit Analysis.		March
ELEC 3501	Communications	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 3601	Digital Systems Design	4	P: Advisory prerequisite ELEC 2601 Microcomputer Systems.		July
ELEC 3701	Management for Engineers	4			March
Senior Advanced					
ELEC 4702	Practical Experience				
ELEC 4703	Thesis	12	P: Prerequisite A minimum of 36 credit points from Senior or Senior Advanced units of study.		

Notes to Table 5:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.
(2) PHYS 1003 is an acceptable alternative to PHYS 1203.

Resolutions of the Faculty of Engineering relating to Table 5: Degree Eligibility

BE (Electrical Engineering):

In addition to gaining credit for the **134 credit points** of core units set out in Table 5, candidates are required to complete at least **36 credit points** of elective units of study (at least 32 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Electrical Engineering). Further credit for a total of not less than **192 credit points** shall be gained by completing additional elective units of study approved by the Faculty.

BE (Electrical Engineering)/BSc or BA or BCom:

In addition to gaining credit for the **134 credit points** of core units set out in Table 5, candidates are required to complete at least **28 credit points** of elective units of study (at least 24 of which must be at the 4 or 5 level) from the table of recommended elective units for BE (Electrical Engineering). Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty in which they are undertaking the combined degree program.

BE (Electrical Engineering)/BCom and admitted to Junior Year *prior to 1998* /BCom:

Candidates who commenced Junior Year prior to 1998 are **not** required to gain credit for the unit ELEC 3701. In addition to satisfying the remaining core requirements set out in Table 5, they are required to gain credit for at least **16 credit points** of elective units (at least 8 of which must be at the 4 or 5 level) from the table of recommended elective units for BE (Electrical Engineering). The unit of study ELEC 3701 may count toward the additional 16 credit points. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty in which they are undertaking the combined degree program.

Acceptable Alternative Units of Study:

Most Madiematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Resolutions of the Department of Electrical Engineering relating to Table 5

Recommended Elective Units of Study for the BE (Electrical Engineering)

Senior

ELEC 3101	Circuit Theory and Design	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, MATH 2005 Fourier Series and Differential Equations		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC3103	Electrical Engineering Design	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2501 Signals and Communications, and ELEC 2601 Microcomputer Systems.		July
ELEC 3202	Power Electronics and Drives	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits. Prereq U2.510 Electrical Engineering 2	Mutually exclusive with U3.474 Electrical Machines and Drives	July
ELEC 3402	Communications Electronics	2	P: Mutually exclusive with U3.476 Industrial Electronics; Prereq U2.510 Electrical Engineering 2; Coreq U3.511 Circuit Theory, U3.512 Signals and Systems		July
ELEC 3403	Switching Devices and High Speed Electronics	4	P: Advisory prerequisite ELEC 3401 Electronic Devices and Circuits.		July
ELEC 3801	Fundamentals of Biomedical Engineering	4	P: Advisory prerequisite ELEC 2401 Electronic Devices and Circuits or ELEC 2001 Electrical and Electronic Engineering.		March
Senior Advanced					
ELEC 4201	Electrical Systems Modelling and Analysis	4	P: Advisory prerequisite ELEC 3201 Fundamentals of Electrical Energy Systems.		March
ELEC 4301	Computer Control System Design	4	P: Advisory prerequisite ELEC 3302 Fundamentals of Feedback Control.		March
ELEC 4302	Image Processing and Computer Vision	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 4303 Digital Signal Processing.		July
ELEC 4303	Digital Signal Processing	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		March
ELEC 4401	Electronic Design	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits.		March
ELEC 4402	Integrated Circuit Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4501	Data Communication Networks	4	P: Advisory prerequisite ELEC 3501		March
ELEC 4502	Digital Communication Systems	4	P: Advisory prerequisite ELEC 3501		March
ELEC 4503	Error Control Coding	4	P: Advisory prerequisite ELEC 3501		March

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 4601	Computer Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4602	Real Time Computing	4	P: Advisory prerequisitse ELEC 3601 Digital Systems Design, and ELEC 3602 Engineering Software or COMP 3100 Software Engineering.		March
ELEC 4701	Project Management	4	P: Advisory prerequisite ELEC 3701		March
ELEC 4801	Biomedical Engineering Systems	4	P: Advisory prerequisite ELEC 3801 Fundamentals of Biomedical Engineering.		July
ELEC 5201	Electrical Systems Control	4	P: Advisory prerequisite ELEC 3302 Fundamentals of Feedback Control, and ELEC 4201 Electrical Systems Modelling and Analysis.	Level 5 units may not be available every year.	July
ELEC 5202	Advanced Power Electronics and Drives	4	P: Advisory prerequisite ELEC 3202 Power Electronics and Drives.		July
ELEC 5301	Non-linear and Adaptive Control	4	P: Advisory prerequisites ELEC 3302 Fundamentals of Feedback Control, and ELEC 4301 Computer Control System Design.		July
ELEC 5302	Fuzzy Systems	4			July
ELEC 5501	Advanced Communication Networks	4	P: Advisory prerequisites ELEC 3501, and ELEC 4501		July
ELEC 5502	Satellite Communication Systems	4	P: Advisory prerequisites ELEC 3501, and ELEC 4502		July
ELEC 5503	Optical Communication Systems	4	P: Advisory prerequisites ELEC 3402, and ELEC 3501		July
ELEC 5601	Advanced Real Time Computing	4	P: Advisory prerequisite ELEC 4602		July
ELEC 5602	Advanced Computer Architecture	4	P: Advisory prerequisites ELEC 4601 and (COMP 2001 or COMP 2901).	*Mutually exclusive* with COMP 2901 Computer Systems (Advanced), and COMP 295F Computer Systems-EE Adv.	July
ELEC 5603	Biologically Inspired Signal Processing	4			July
ELEC 5604	Adaptive Pattern Recognition	4			July

Table 5A - Electrical Engineering (Information Systems)

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

(This program is available only to students enrolled prior to 1998.)

Candidates for the degree of Bachelor of Engineering in Electrical Engineering (Information Systems) are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study as prescribed by the Faculty.
Candidates for the combined degree course of Bachelor of Engineering in Electrical Engineering (Information Systems) with Bachelor of Commerce are required to gain credit for all of the core units of study set out below **except** for ELEC 3701 Management for Engineers. See note (1) relating to core units offered by faculties other than Engineering.

Core Units of Study - Electrical Engineering (Information Systems)

Junior

COMP 1001	Introductory Programming	6	P: Akn HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Prereq Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1703	Integral Calculus and Discrete Mathematics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1702 or 1704 or 1712 or 1792 or 1793 or 1794	July
PHYS 1001	Physics (Regular)	6	P: AKn HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1203	Physics 1EE (2)	4			
ELEC 1101	Science, Technology and Engineering	6	P: Advisory prerequisites HSC Maths 3 unit, HSC Physics 2 unit	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	March
ELEC 1102	Introductory Electrical Circuits	6	P: Advisory prerequisites MATHS 1001 Differential Calculus and Linear Algebra, ELEC 1101 Science, Technology and Engineering.	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	July

Intermediate

COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
MATH 2001	Vector Calculus and Complex Variables	4	P: Prereq Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications	4	P: Prereq Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Prereq Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
PHYS 2203	Physics 2EE	4			
ELEC 2101	Circuit Analysis			Mutually exclusive with U2.471 Introductory Mechatronics, U2.502 Electrical Technology, U2.504 Electrical and Electronic Engineering	
ELEC 2401	Electronic Devices and Circuits	4	P: Advisory prerequisite ELEC 1102 Introductory Electronic Circuits	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology.	July
ELEC 2501	Signals and Communications	4	P: Advisory prerequisites MATH 1001 Differential Calculus and Linear Algebra, and MATH 1003 Integral Calculus and Discrete Mathematics, and ELEC 1102 Introductory Electronic Circuits.		July
ELEC 2601	Microcomputer Systems	4	P: Advisory prerequisites ELEC 1102 Introductory Electronic Circuits.	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology	March
Senior					
ELEC 3102	Engineering Electromagnetics	4	P: Advisory prerequisites (PHYS 2203 Physics2EE or PHYS 2002 Physics (Technological) B) and ELEC 2101 Circuit Analysis		March
ELEC 3301	Signals and Systems	4	P: Advisory prerequisites MATH 2005 Fourier Series and Differential Equations, and ELEC 2501 Signals and Communications.	MATH 3103 Signal Processing and MATH 3809 Signal Processing (Advanced).	March
ELEC 3302	Fundamentals of Feedback Control	4	P: Advisory prerequisite ELEC 3301 Signals and Systems	MECH 3800 Systems Control and CHNG 3302 Process Control.	July
ELEC 3401	Electronic Devices and Circuits	4	P: Advisory prerequisites ELEC 2401 Electronic Devices and Circuits and ELEC 2101 Circuit Analysis.		March
ELEC 3402	Communications Electronics	2	P: Mutually exclusive with U3.476 Industrial Electronics; Prereq U2.510 Electrical Engineering 2; Coreq U3.511 Circuit Theory, U3.512 Signals and Systems		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 3403	Switching Devices and High Speed Electronics	4	P: Advisory prerequisite ELEC 3401 Electronic Devices and Circuits.		July
ELEC 3501	Communications	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		July
ELEC 3601	Digital Systems Design	4	P: Advisory prerequisite ELEC 2601 Microcomputer Systems.		July
ELEC 3602	Programming for Engineering	4	P: Advisory prerequisite COMP 2004 Programming Practice	COMP 3100 Software Engineering	March
ELEC 3701	Management for Engineers	4			March
Senior Advanced					
ELEC 4303	Digital Signal Processing	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		March
ELEC 4401	Electronic Design	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits.		March
ELEC 4501	Data Communication Networks	4	P: Advisory prerequisite ELEC 3501 Communications		March
ELEC 4502	Digital Communication Systems	4	P: Advisory prerequisite ELEC 3501 Communications		March
ELEC 4601	Computer Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4602	Real Time Computing	4	P: Advisory prerequisitse ELEC 3601 Digital Systems Design, and ELEC 3602 Engineering Software or COMP 3100 Software Engineering.		March
ELEC 4702	Practical Experience				
ELEC 4703	Thesis	12	P: Prerequisite A minimum of 36 credit points from Senior or Senior Advanced units of study.		

Notes to Table 5A:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.

(2) PHYS 1003 is an acceptable alternative to PHYS 1203

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)

Resolutions of the Faculty of Engineering relating to Table 5A: Degree Eligibility

BE (Electrical Engineering - Information Systems):

In addition to gaining credit for the core units of study set out in Table 5A, candidates are required to complete at least **12 credit points** of elective units of study from the table of recommended elective units of study for BE (Electrical Engineering - Information Systems). Further credit for a total of not less than **192 credit points** shall be gained by completing additional elective units of study approved by the Faculty.

BE (Electrical Engineering - Information Systems)/BCom:

Candidates are not required to gain credit for any additional elective units of study.

Acceptable Alternative Units of Study:

Most Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Recommended Elective Units of Study for the BE (Electrical Engineering)

Senior Advanced

ELEC 4302	Image Processing and Computer Vision	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 4303 Digital Signal Processing.		July
ELEC 4801	Biomedical Engineering Systems	4	P: Advisory prerequisite ELEC 3801 Fundamentals of Biomedical Engineering.		July
ELEC 4402	Integrated Circuit Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4503	Error Control Coding	4	P: Advisory prerequisite ELEC 3501 Communications.		March
ELEC 5501	Advanced Communication Networks	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4501 Data Communication Networks.		July
ELEC 5502	Satellite Communication Systems	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4502 Digital Communication Systems.		July
ELEC 5503	Optical Communication Systems	4	P: Advisory prerequisites ELEC 3402 Communications Electronics, and ELEC 3501 Communications.		July
ELEC 5601	Advanced Real Time Computing	4	P: Advisory prerequisite ELEC 4602 Real Time Computing.		July
ELEC 5602	Advanced Computer Architecture	4	P: Advisory prerequisites ELEC 4601 Computer Design and (COMP 2001 Computer Systems or COMP 2901 Computer Systems Adv).	*Mutually exclusive* with COMP 2901 Computer Systems (Advanced), and COMP 295F Computer Systems-EE Adv.	July
ELEC 5605	Advanced Digital Engineering	4	P: Advisory prerequisite ELEC 4601 Computer Design		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 5606	Multimedia Systems and Applications	4	P: Advisory prerequisites (ELEC 3602 Engineering Software or COMP 3100 Software Engineering), and ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.		July
ELEC 5607	Hardware/Software Co-Design	4	P: Advisory prerequisites: ELEC 3601 Digital Systems Design, and ELEC 3602 Programming for Engineering, or COMP 31 OF Software Engineering		

Table 6 - Mechanical Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional credit points of elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units of study offered by faculties other than Engineering.					
Core Units of Study - Mechanical Engineering					
Junior					
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1702	Integral Calculus and Statistics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MECH 1500	Mechanical Engineering 1	6		*Mutually exclusive with:* MECH 1501 Engineering Statics	
MECH 1510	Kinematics and Dynamics	6		MATH 1051 Mechanics IE	
MECH 1600	Manufacturing Technology	4		*Mutually exclusive with:* AERO 1600 Workshop Technology	
MECH 1800	Computational Engineering 1A	7		MECH 1801 Computational Engineering 1C	
CIVL 1002	Computational Engineering	3		COMP 101F Introductory Programming and COMP 102S Introductory Computer Science	July
ELEC 1001	Introductory Electrical Engineering	4	C: MATHS 1001 Differential Calculus and Linear Algebra.	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology	July
CHEM 1401	Chemistry IE (2) (3)	6			
Intermediate					
MATH 2001	Vector Calculus and Complex Variables	4	P: Prereq Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications (2)	4	P: Prereq Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Prereq Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
MATH 2051	Linear Programming and Boundary Value Problems (2)	2			

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2052	Numerical Methods	2			
MECH 2200	Thermofluids	6		MECH 2201 Thermodynamics 1	
MECH 2300	Materials 1	4		CIVL 2101 Properties of Materials	
MECH 2400	Mechanical Design 1	6			
MECH 2500	Engineering Dynamics 1	4	P: (MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics		
AERO 2300	Mechanics of Solids 1	4	P: MATH 101F, MATH 102S		July
ELEC 2001	Electrical and Electronic Engineering	6	P:ELEC 1001 Introductory Electrical Engineering:	ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2601 Microcomputer Systems.	March
Senior					
MECH 3200	Thermal Engineering 1	7	P: MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1	MECH 3201 Thermodynamics 2	
MECH 3210	Fluid Mechanics	4	P: MECH 2200 Thermofluids, AERO 2200 Introductory Aerodynamics		
MECH 3300	Materials 2	4	P: MECH 2300 Materials 1 & AERO 2300 Mechanics of Solids 1		
MECH 3310	Mechanics of Solids 2	4	P: AERO 2300 Mechanics of Solids 1 and MATH 2005.		
MECH 3400	Design 2A	4	P: MECH 2400 Mechanical Design 1		
MECH 3410	Design 2B	4	P: MECH 2400 Mechanical Design 1.		
MECH 3500	Engineering Dynamics 2	4	P: MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005)		
MECH 3620	Industrial Management	5			July
MECH 3800	Systems Control	4	P: MATH 2001 and MATH 2005		
MECH 3600	Manufacturing Engineering	6	P: MECH 1600 Manufacturing Technology		
MECH 3610	Project	2			
Senior Advanced					
MECH 4100	Thesis	12	P: 36 credit points of Senior units of study.		
MECH 4110	Professional Engineering	4	P: 36 credit points of Senior units of study.		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 4120	Professional Communication	4	P: Completion of industrial experience.		
MECH 4130	Practical Experience		P: 28 credit points of Intermediate units of study.		

Notes to Table 6:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.
(2) These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering and the combined degree BE/BSc; *but not* for candidates for the combined degrees BE/BCom and BE/BA.
(3) Candidates for the combined degree BE/BSc may take as an alternative to CHEM 1401, other units of study from the Faculties of Science or Health Sciences, up to 12 credit points and subject to timetabling constraints.

Resolutions of the Faculty of Engineering relating to Table 6

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering and candidates for the degree of Bachelor of Engineering in Mechanical Engineering combined with Bachelor of Science are requied to gain credit for **all** core units of study set out in Table 6. Additional credit necessary to satisfy Section 9 shall be gained by completing at least **30 credit points** of elective units of study. At least 24 of these credit points must be chosen from mainstream electives marked as *.

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering combined with Bachelor of Arts or Bachelor of Commerce are required to gain credit for **all** core units of study set out in Table 6 **except** those marked as (2) . Additional credit necessary to satisfy Section 9 shall be gained by completing at least **16 credit points** of elective units of study which **must** be chosen from mainstream electives marked as *.

Acceptable Alternative Units of Study

Pursuant to Resolution 3, the Faculty has prescribed the following acceptable alternatives to core units of study listed in Table 6:

Core Unit of Study	*Acceptable Alternative*
CHEM 1401	CHEM 1101
MECH 1510	PHYS 1001
MECH 1810	COMP 1001
CIVL 1002	COMP 1001

Note: Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students considering doing Advanced options should seek advice from their Department before enrolling.

Resolutions of the Department of Mechanical and Mechatronic Engineering relating to Table 6

Note: Units of study not included in this table may also be selected subject to the approval of the Head of Mechanical and Mechatronic Engineering.

Recommended Elective Units of Study for BE (Mechanical Engineering)

Mainstream Electives

MECH 4200	Thermal Engineering 2*	4	P: MECH 3200 Thermal Engineering 1.	
MECH 4210	Computational Fluid Dynamics*	4	P: MECH 3210 Fluid Mechanic	
MECH 4220	Environmental Engineering*	6	P: 24 credit points of Senior units of study.	CHNG 4504 Environmental Impact Assessment and MECH 4230 Environmental Acoustics and Noise Control if Acoustics forms part of MECH 4220.

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
AERO 4301	Applied Numerical Stress Analysis*	6	P: MECH 3310 Mechanics of Solids 2	AERO 4300 Aircraft Structures 3	
MECH 4310	Advanced Engineering Materials*	6	P: MECH 3300 Materials 2.	MECH 4311 Advanced Aerospace Materials.	
MECH 4400	Advanced Design*	6	P: MECH 3410 Mechanical Design 2B.		
MECH 4510	Machine Vibration and Monitoring*	3	P: MECH 3500 Engineering Dynamics 2		
MECH 4800	Computational Methods for Partial Differential Equations*	4	P: MATH 2001 and MATH 2005.		
MECH 4900	Orthopaedic Engineering*	4	P: MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.		
MECH 4910	Biomaterials and Biomechanics*	4	P: 36 credit points of Senior units of study.		
MECH 4700	Robotic Systems*	4	P: MECH 3500 Engineering Dynamics 2 and MECH 3800 Systems Control.		
MECH 4600	Industrial Engineering*	6	P: MATH 2001 and MATH 2005 and MECH 3620 Industrial Management	MECH 4620 Industrial Ergonomics, MECH 4630 Introduction to Operations Research, and MECH 4610 Industrial and Engineering Management	
Other Electives					
ASNE 1001	Asian Studies 1A	4			
ASNE 1002	Asian Studies IB	4			
ASNE 2001	Asian Studies 2A	4	P: ASNE1001 and ASNE1002		
ASNE 2002	Asian Studies 2B	4	P: ASNE1001 and ASNE1002		
CIVL 3701	Engineering Transport and Planning	2			
ELEC 3801	Fundamentals of Biomedical Engineering	4	P: Advisory prerequisite ELEC 2401 Electronic Devices and Circuits or ELEC 2001 Electrical and Electronic Engineering.		March
BIOL 1001	Concepts in Biology				
ENGG 4001	Innovation and International f^nmnpfitivpnf cc	6			

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
IREL 1001	Macro Industrial Relations	6			March
MECH4311	Advanced Aerospace Materials	4	P: MECH 3300 Materials 2.	MECH 4310 Advanced Engineering Materials	
MECH 4610	Industrial and Engineering Management	2	P: MECH 3620 Industrial Management	MECH 4600 Industrial Engineering	
MECH 4620	Industrial Ergonomics	2		MECH 4600 Industrial Engineering	
MECH 4630	Introduction to Operations Research	2	P: MATH 2001 and MATH 2005	MECH 4600 Industrial Engineering	
MECH 4230	Environmental Acoustics and Noise Control	2	P: 24 credit points of Senior units of study.	MECH 4220 Environmental Engineering if Acoustics forms part of MECH 4220	

Table 7 - Mechanical Engineering (Mechatronics)

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional credit points of elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units of study offered by faculties other than Engineering.					
Core Units of Study - Mechatronics Engineering					
Junior					
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1702	Integral Calculus and Statistics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1712 or 1792 or 1793 or 1794 or 1703 or 1704	July
MECH 1500	Mechanical Engineering 1	6		*Mutually exclusive with:* MECH 1501 Engineering Statics	
MECH 1510	Kinematics and Dynamics	6		MATH 1051 Mechanics IE	
MECH 1600	Manufacturing Technology	4		*Mutually exclusive with:* AERO 1600 Workshop Technology	
MECH 1800	Computational Engineering 1A	7		MECH 1801 Computational Engineering 1C	
MECH 1810	Computational Engineering IB	3		MECH 1801 Computational Engineering 1C	
ELEC 1001	Introductory Electrical Engineering	4	C: MATHS 1001 Differential Calculus and Linear Algebra.	ELEC 1101 Science, Technology and Engineering, and ELEC 1102 Introductory Electronic Circuits, and ELEC 2002 Electrical Technology	July
CHEM 1401	Chemistry IE (2) (3)	6			
Intermediate					
MATH 2001	Vector Calculus and Complex Variables	4	P: Prereq Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February
MATH 2002	Matrix Applications (2)	4	P: Prereq Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Prereq Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
MATH 2051	Linear Programming and Boundary Value Problems (2)	2			

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2052	Numerical Methods (3)	2			
MECH 2200	Thermofluids	6		MECH 2201 Thermodynamics 1	
MECH 2400	Mechanical Design 1	6			
MECH 2500	Engineering Dynamics 1	4	P: (MATH 1701 & MATH 1702) and MECH 1510 Kinematics and Dynamics		
AERO 2300	Mechanics of Solids 1	4	P: MATH 10IF, MATH 102S		July
ELEC 2001	Electrical and Electronic Engineering	6	P:ELEC 1001 Introductory Electrical Engineering.	ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2601 Microcomputer Systems.	March
MECH 2700	Mechatronics 1	6			
Senior					
MECH 3700	Mechatronics 2	5	P: MECH 2700 Mechatronics 1		
MECH 3400	Design 2A	4	P: MECH 2400 Mechanical Design 1		
MECH 3410	Design 2B	4	P: MECH 2400 Mechanical Design 1.		
MECH 3500	Engineering Dynamics 2	4	P: MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005)		
MECH 3800	Systems Control	4	P: MATH 2001 and MATH 2005		
MECH 3600	Manufacturing Engineering	6	P: MECH 1600 Manufacturing Technology		
MECH 3610	Project	2			
ELEC 3202	Power Electronics and Drives	4	P:ELEC2001		
MECH 3620	Industrial Management (2)	5			July
ELEC 3601	Digital Systems Design	4			
ELEC 3401	Electronics Devices Circuits	4			
Senior Advanced					
MECH 4100	Thesis	12	P: 36 credit points of Senior units of study.		
MECH 4110	Professional Engineering	4	P: 36 credit points of Senior units of study.		

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 4120	Professional Communication	4	P: Completion of industrial experience.		
MECH 4130	Practical Experience		P: 28 credit points of Intermediate units of study.		

Notes to Table 7:

(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.
(2) These units of study are *core* for candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) and the combined degree BE/BSc; *but not* for candidates for the combined degrees BE/BCom and BE/BA.
(3) Candidates for the combined degree BE/BSc may take as an alternative to CHEM 1401, other units of study from Science up to 12 credit points and subject to timetabling constraints.

Resolutions of the Faculty of Engineering relating to Table 7

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) and candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) combined with Bachelor of Science are required to gain credit for **all** core units of study set out in Table 7. Additional credit necessary to satisfy Section 9 shall be gained by completing at least 30 **credit points** of elective units of study. At least 24 of these credit points must be chosen from mainstream electives marked as *.
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) combined with Bachelor of Arts or Commerce are required to gain credit for **all** core units of study set out in Table 7 except those marked as (2) . Additional credit necessary to satisfy Section 9 shall be gained by completing at least 16 **credit points** of elective units of study which **must** be chosen from mainstream electives marked as *.

Acceptable Alternative Units of Study

Pursuant to Resolution 3, the Faculty has prescribed the following acceptable alternatives to core units of study listed in Table 7:

Core ***Unit of Study***	***Acceptable Alternative***
CHEM 1401	CHEM 1101
MECH 1510	PHYS 1001
MECH 1810	COMP 1001
CIVL 1002	COMP 1001

Note: Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met.
Students considering doing Advanced options should seek advice from their Department before enrolling.

Resolutions of the Department of Mechanical and Mechatronic Engineering relating to Table 7

Note: Units of study not included in this table may also be selected subject to the approval of the Head of Mechanical and Mechatronic Engineering.

Recommended Elective Units of Study for BE (Mechanical Engineering - Mechatronics)

Mainstream Electives

MECH 4400	Advanced Design*	6	P: MECH 3410 Mechanical Design 2B.
MECH 4510	Machine Vibration and Monitoring*	3	P: MECH 3500 Engineering Dynamics 2
MECH 4700	Robotic Systems*	4	P: MECH 3500 Engineering Dynamics 2 and MECH 3800 Systems Control.
MECH 4710	Microprocessors in Engineered Products*	6	P: ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits.

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MECH 4720	Sensors and Signals*	6	P: MECH 3500 Engineering Dynamics 2 & MECH 3800 Systems Control & ELEC 3601 Digital Systems Design & ELEC 3401 Electronics Devices & Circuits.		
MECH 4730	Computers in Real Time Control and Instrumentation*	6	P: ELEC 3601 Digital Systems Design & ELEC 3401 Electronics Devices & Circuits.		
Other Electives					
ASNE 1001	Asian Studies 1A	4			
ASNE 1002	Asian Studies IB	4			
ASNE 2001	Asian Studies 2A	4	P: ASNE1001 and ASNE1002		
ASNE 2002	Asian Studies 2B	4	P: ASNE1001 and ASNE1002		
BIOL 1001	Concepts in Biology				
ENGG4001	Innovation and International Competitiveness	6			
IREL 1001	Macro Industrial Relations	6			March
MECH 4220	Environmental Engineering	6	P: 24 credit points of Senior units of study.	CHNG 4504 Environmental Impact Assessment and MECH 4230 Environmental Acoustics and Noise Control if Acoustics forms part of MECH 4220.	
AERO 4301	Applied Numeric Stress Analysis	6			
MECH 4600	Industrial Engineering	6	P: MATH 2001 and MATH 2005 and MECH 3620 Industrial Management	MECH 4620 Industrial Ergonomics, MECH 4630 Introduction to Operations Research, and MECH 4610 Industrial and Engineering Management	
MECH 4800	Computational Methods for Partial Differential	4	P: MATH 2001 and MATH 2005.		
MECH 4910	Biomaterials and Biomechanics	4	P: 36 credit points of Senior units of study.		

Table 8 - Project Engineering and Management (Civil) ** Not currently offered

Table 9-Telecommunications Engineering

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
Candidates for the degree of Bachelor of Engineering in Telecommunications Engineering, and candidates for the combined degree courses of Bachelor of Engineering in Telecommunications Engineering with Bachelor of Art or Bachelor of Science or Bachelor of Commerce, are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study as prescribed by the Faculty. See Note (1) relating to core units offered by Faculties other than Engineering.					
Core Units of Study - Telecommunications Engineering					
Junior					
COMP 1001	Introductory Programming	6	P: Akn HSC 3-unit Mathematics	May not be counted with Computer Science 1901 Students intending to major in Computer Science are advised to enrol in Mathematics 1703 or 1704 or 1793 or 1794 in their first year	February and July
COMP 1002	Introductory Computer Science	6	P: Prereq Computer Science 1001 or 1901	May not be counted with Computer Science 1902	July
MATH 1701	Differential Calculus and Linear Algebra	6	AK: HSC 3-unit Mathematics	May not be counted with Mathematics 1711 or 1791	February
MATH 1703	Integral Calculus and Discrete Mathematics	6	AK: HSC 4-unit Mathematics or Mathematics 1701	May not be counted with Mathematics 1702 or 1704 or 1712 or 1792 or 1793 or 1794	July
PHYS 1001	Physics (Regular)	6	P: AKn HSC Physics or HSC 4-unit Science	May not be counted with Physics 1002 or 1901 See prerequisites for Intermediate Physics units of study. Recommended concurrent unit of study: Mathematics 1701 or 1791	February
PHYS 1203	Physics 1EE (2)	4			
ELEC 1101	Science, Technology and Engineering	6	P: Advisory prerequisites HSC Maths 3 unit, HSC Physics 2 unit	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	March
ELEC 1102	Introductory Electrical Circuits	6	P: Advisory prerequisites MATHS 1001 Differential Calculus and Linear Algebra, ELEC 1101 Science, Technology and Engineering.	ELEC 1001 Introductory Electrical Engineering, and ELEC 2002 Electrical Technology	July
Intermediate					
COMP 2002	Design and Data Structures	4	P: Qual Computer Science 1002 or 1902	May not be counted with Computer Science 2902 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	February
COMP 2004	Programming Practice	4	P: Qual Computer Science 1002 or 1902 Prereq Computer Science 2002 or 2902	May not be counted with Computer Science 2904 See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook	July
MATH 2001	Vector Calculus and Complex Variables	4	P: Prereq Mathematics 1702 or 1703 or 1792 or 1793	May not be counted with Mathematics 2901	February

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
MATH 2002	Matrix Applications	4	P: Prereq Mathematics 1701 or 1791 or Distinction in Mathematics 1711	May not be counted with 2902	February
MATH 2005	Fourier Series and Differential Equations	4	P: Prereq Mathematics 2001 or 2901	May not be counted with Mathematics 2905	July
PHYS 2203	Physics 2EE	4			
ELEC 2101	Circuit Analysis			Mutually exclusive with U2.471 Introductory Mechatronics, U2.502 Electrical Technology, U2.504 Electrical and Electronic Engineering	
ELEC 2401	Electronic Devices and Circuits	4	P: Advisory prerequisite ELEC 1102 Introductory Electronic Circuits	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology.	July
ELEC 2501	Signals and Communications	4	P: Advisory prerequisites MATH 1001 Differential Calculus and Linear Algebra, and MATH 1003 Integral Calculus and Discrete Mathematics, and ELEC 1102 Introductory Electronic Circuits.		July
ELEC 2601	Microcomputer Systems	4	P: Advisory prerequisites ELEC 1102 Introductory Electronic Circuits.	ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology	March
Senior					
ELEC 3102	Engineering Electromagnetics	4	P: Advisory prerequisites (PHYS 2203 Physics2EE or PHYS 2002 Physics (Technological) B) and ELEC 2101 Circuit Analysis		March
ELEC 3301	Signals and Systems	4	P: Advisory prerequisites MATH 2005 Fourier Series and Differential Equations, and ELEC 2501 Signals and Communications.	MATH 3103 Signal Processing and MATH 3809 Signal Processing (Advanced).	March
ELEC 3302	Fundamentals of Feedback Control	4	P: Advisory prerequisite ELEC 3301 Signals and Systems	MECH 3800 Systems Control and CHNG 3302 Process Control.	July
ELEC 3401	Electronic Devices and Circuits	4	P: Advisory prerequisites ELEC 2401 Electronic Devices and Circuits and ELEC 2101 Circuit Analysis.		March
ELEC 3402	Communications Electronics	2	P: Mutually exclusive with U3.476 Industrial Electronics; Prereq U2.510 Electrical Engineering 2; Coreq U3.511 Circuit Theory, U3.512 Signals and Systems		July
ELEC 3501	Communications	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		July
ELEC 3601	Digital Systems Design	4	P: Advisory prerequisite ELEC 2601 Microcomputer Systems.		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 3602	Programming for Engineering	4	P: Advisory prerequisite COMP 2004 Programming Practice	COMP 3100 Software Engineering	March
ELEC 3701	Management for Engineers	4			March
Senior Advanced					
ELEC 4702	Practical Experience				
ELEC 4303	Digital Signal Processing	4	P: Advisory prerequisites ELEC 2501 Signals and Communications, and ELEC 3301 Signals and Systems.		March
ELEC 4501	Data Communication Networks	4	P: Advisory prerequisite ELEC 3501 Communications		March
ELEC 4502	Digital Communication Systems	4	P: Advisory prerequisite ELEC 3501 Communications		March
ELEC 4703	Thesis	12	P: Prerequisite A minimum of 36 credit points from Senior or Senior Advanced units of study.		

Notes to Table 9:
(1) For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by that Faculty.
(2) PHYS 1003 is an acceptable alternative to PHYS 1203.

Resolutions of the Faculty of Engineering relating to Table 9: Degree Eligibility

BE (Telecommunications Engineering):
In addition to gaining credit for the **146 credit points** of core units of study set out in Table 9, candidates are required to complete at least 24 **credit points** of elective units of study (at least 20 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Telecommunications Engineering). Further credit for a total of not less than **192 credit points** shall be gained by completing additional elective units of study approved by the Faculty.

BE (Telecommunications Engineering)/BSc or BA or BCom:
In addition to gaining credit for the **146 credit points** of core units of study set out in Table 9, candidates are required to complete at least **16 credit points** of elective units of study (at least 12 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Telecommunications Engineering).

Resolutions of the Department of Electrical Engineering relating to Table 9

Recommended Elective Units of Study for the BE (Telecommunications Engineering)

Senior

ELEC 3101	Circuit Theory and Design	4	**P:** Advisory prerequisites ELEC 2101 Circuit Analysis, MATH 2005 Fourier Series and Differential Equations		July
ELEC 3103	Electrical Engineering Design	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2501 Signals and Communications, and ELEC 2601 Microcomputer Systems.		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC3103	Electrical Engineering Design	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits, and ELEC 2501 Signals and Communications, and ELEC 2601 Microcomputer Systems.		July
ELEC 3202	Power Electronics and Drives	4	P: Advisory prerequisites ELEC 2101 Circuit Analysis, and ELEC 2401 Electronic Devices and Circuits. Prereq U2.510 Electrical Engineering 2	Mutually exclusive with U3.474 Electrical Machines and Drives	July
ELEC3403	Switching Devices and High Speed Electronics	4	P: Advisory prerequisite ELEC 3401 Electronic Devices and Circuits.		July
ELEC 3801	Fundamentals of Biomedical Engineering	4	P: Advisory prerequisite ELEC 2401 Electronic Devices and Circuits or ELEC 2001 Electrical and Electronic Engineering.		March
Senior Advanced					
ELEC 4302	Image Processing and Computer Vision	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 4303 Digital Signal Processing.		July
ELEC 4401	Electronic Design	4	P: Advisory prerequisites ELEC 3301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits.		March
ELEC 4402	Integrated Circuit Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4503	Error Control Coding	4	P: Advisory prerequisite ELEC 3501 Communications.		March
ELEC 4601	Computer Design	4	P: Advisory prerequisites ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.		March
ELEC 4602	Real Time Computing	4	P: Advisory prerequisitse ELEC 3601 Digital Systems Design, and ELEC 3602 Engineering Software or COMP 3100 Software Engineering.		March
ELEC 5501	Advanced Communication Networks	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4501 Data Communication Networks.	Not all Level 5 units may be available each year.	July
ELEC 5502	Satellite Communication Systems	4	P: Advisory prerequisites ELEC 3501 Communications, and ELEC 4502 Digital Communication Systems.		July
ELEC 5503	Optical Communication Systems	4	P: Advisory prerequisites ELEC 3402 Communications Electronics, and ELEC 3501 Communications.		July

Alpha & Num. codes	Unit of Study Name	Credit Point Value	Assumed Knowledge (AK) Prerequisites (P) Corequisites (C)	Additional Information / May not be counted with	When Offered (Semester)
ELEC 5601	Advanced Real Time Computing	4	P: Advisory prerequisite ELEC 4602 Real Time Computing.		July
ELEC 5602	Advanced Computer Architecture	4	P: Advisory prerequisites ELEC 4601 Computer Design and (COMP 2001 Computer Systems or COMP 2901 Computer Systems Adv).	*Mutually exclusive* with COMP 2901 Computer Systems (Advanced), and COMP 295F Computer Systems-EE Adv.	July
ELEC 5603	Biologically Inspired Signal Processing	4			July
ELEC 5604	Adaptive Pattern Recognition	4			July
ELEC 5605	Advanced Digital Engineering	4	P: Advisory prerequisite ELEC 4601 Computer Design		July
ELEC 5606	Multimedia Systems and Applications	4	P: Advisory prerequisites (ELEC 3602 Engineering Software or COMP 3100 Software Engineering), and ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.		July
ELEC 5607	Hardware/Software Co-Design	4	P: Advisory prerequisites: ELEC 3601 Digital Systems Design, and ELEC 3602 Programming for Engineering, or COMP 310F Software Engineering		

5. Regulations

Undergraduate degree requirements Bachelor of Engineering

Resolutions of the Senate

1 Specialisations

(a) The degree of Bachelor of Engineering shall be awarded in the following specialisations:
  (i) Aeronautical Engineering
  (ii) Chemical Engineering
  (iii) Civil Engineering
  (iv) Computer Engineering
  (v) Electrical Engineering
  (vi) Mechanical Engineering
  (vii) Mechanical Engineering (Mechatronics)
  (viii) Project Engineering and Management (Civil)*
  (ix) Telecommunications Engineering
  * not operational in 1998

(b) (i) Each specialisation may, with the permission of the Faculty, be undertaken as part of a combined degree program with the Bachelor of Commerce (BCom), Bachelor of Arts (BA) or Bachelor of Science (BSc).
  (ii) Resolutions governing the combined degree programs are set out in the Joint Resolutions of the Faculty of Engineering and the Faculties of Science, Economics and Arts.

(c) The testamur for the degree of Bachelor or Engineering shall specify the specialisation for which it is awarded.

(d) (i) Graduates in Engineering in any specialisation may be admitted to the program for another specialisation on conditions to be determined by the Faculty.
  (ii) Upon satisfactory completion of the program, the candidate shall receive a certificate relating to the additional specialisation.

(e) A candidate for the BE degree in any specialisation may apply to the Faculty for permission to transfer candidature to any other specialisation.

2 Definitions

For the purposes of these resolutions:

(a) A "unit of study" shall comprise such lectures, tutorial instruction, essays, exercises and practical work as the Faculty may prescribe.

(b) To complete a unit of study means:
  (i) to attend the lectures and any tutorials; and
  (ii) to complete satisfactorily any essays, exercises and practical work and to pass any final examination; prescribed for that unit of study.

(c) "Core" unit of study means a unit of study which must be completed in order to qualify for the award of the degree, unless exemption is granted by the Faculty.

(d) "Elective" unit of study means a unit of study other than a core unit of study.

(e) "Prerequisite" means a unit of study which must be completed before enrolment in any unit of study for which that unit of study has been prescribed as a prerequisite.

(f) "Corequisite" means a unit of study in which, unless previously completed, a candidate must enrol concurrently with any unit of study for which that unit of study has been prescribed as a corequisite.

3 Units of Study

(a) The units of study for the degree shall each have a credit point value.

(b) The units of study which may be taken for the degree are:
  (i) the units of study set out in the tables appended to these resolutions; and
  (ii) such other units of study as are approved by the Faculty.

(c) The Faculty may prescribe units of study as acceptable alternatives to one or more of the units of study set out in the tables appended to these resolutions.

(d) The Head of the Department concerned may accept other work completed by a candidate as the equivalent of a corequisite or prerequisite for any unit of study provided by that Department.

(e) A candidate may only enrol in units of study in accordance with these resolutions and subject to the constraints of the timetable, unless approval is given by the Head of Department.

4 Credit

A candidate who has completed a unit of study shall be credited with the credit point value of that unit of study except that:

(a) a candidate may not receive credit for more than one of such units of study as the Faculty may deem to be mutually exclusive; and

(b) a candidate may not receive credit for units of study which are deemed to be mutually exclusive with units of study credited toward the Bachelor of Science degree when enrolled in the Faculty of Science under Section 14 of the Resolutions of the Senate relating to the degree of Bachelor of Science.

5 Final Examination

(a) A final examination shall be prescribed for each unit of study.

(b) The final examination may consist of such written and/or oral examination(s), exercises, essays or practical work or any combination of these as the Faculty may determine.

(c) A candidate who has been prevented by duly certified illness or misadventure from sitting for the whole or part of the final examination may be tested at such times and in such a way as the Faculty shall determine. This shall not be regarded as a re-examination.

6 Conditions of Enrolment

(a) Except with the permission of the Faculty, a candidate in the first year of attendance shall enrol in Junior units of study with a total of not less than 48 credit points and not more than 54 credit points.

(b) In each subsequent year of attendance after the first, a candidate may enrol in any of the units of study for which there is no prerequisite or for which the candidate has completed the prerequisites provided that:
  (i) in the second year of attendance the candidate may enrol in Junior and/or Intermediate units of study only;
  (ii) the candidate shall enrol in any core credit points of study for which he/she was qualified to enrol in the previous year of attendance and for which credit has not yet been gained, and for which the candidate has not been granted exemption under subsection 7(b);

(iii) except with Faculty approval, the candidate shall not enrol for units of study totalling more than 60 credit points, nor enrol for units of study totalling less than 36 credit points, unless the candidate already has credit for 156 or more credit points.

(c) The Faculty may in special circumstances grant dispensation from the requirements of subsections (a) and (b).

(d) A candidate enrolled in a unit of study provided outside the Faculty of Engineering shall, in respect of that unit of study, be governed by the requirements of the Department providing the unit of study.

(e) A candidate who has been enrolled for the degree of Bachelor of Engineering but who has not re-enrolled for a period of one year or more shall complete the requirements for the degree under such conditions as the Faculty may determine.

(f) A candidate who re-enrols in a unit of study which the candidate has previously failed to complete shall, unless exempted by the Head of Department concerned, attend all lectures and other classes and complete all written and other prescribed work.

7 Conditions for Advanced Standing and Credit

(a) Graduates of other Faculties of the University of Sydney, or graduates of other universities, who desire to proceed to the degree of Bachelor of Engineering may be admitted to candidature with credit for such of the units of study set out in the appended tables as the Faculty may determine, up to a maximum of 96 credit points, provided they have completed as part of their previous degree units of study considered by the Faculty to be equivalent.

(b) Students who have completed units of study in other Faculties of the University of Sydney may apply for permission to enrol as candidates for the degree of Bachelor of Engineering. If granted such permission, they may be given credit for any of the units of study set out in the appended tables which have been completed in the other Faculties, or for any units of study considered by the Faculty to be equivalent, provided they have abandoned credit for such units of study in the other Faculties.

(c) Students who have completed units of study in another university or institution may apply for permission to enrol as candidates for the degree of Bachelor of Engineering. If granted such permission, they may be given credit for, or exempted from, such of the units of study set out in the appended tables as the Faculty may determine.

(d) With regard to each of the previous subsections, where an applicant for candidature has completed units of study which are not comparable with any of the units of study set out in the tables appended to these resolutions, the Faculty may grant non-specific credit points. Such credit points will be designated by the Faculty as Junior, Intermediate, Senior or Senior Advanced.

8 Levels of Award

(a) The degree of Bachelor of Engineering shall be awarded in two grades, namely, the Pass degree and the Honours degree.

(b) (i) There shall be three classes of Honours, namely, Class I, Class U and Class IJJ.

(ii) Second Class Honours may be awarded in two divisions, namely Division 1 and Division 2.

(c) If a candidate qualifies for the award of the degree with First Class Honours and the Faculty is of the opinion that the candidate's work is of outstanding merit, that candidate shall receive a University Medal.

9 Requirements for the Pass Degree

(a) To qualify for the award of a Pass degree a candidate shall, unless granted exemption by the Faculty under subsection (b) of this resolution:

(i) satisfy the requirements prescribed in those tables appended to these resolutions pertaining to the specialisation which the candidate is pursuing, and

(ii) complete additional elective units of study as may be necessary to gain credit for a total of not less than 192 credit points.

(b) In special circumstances, the Faculty may exempt a candidate from completion of any core unit of study. No credit shall be granted for any such exempted unit of study.

(c) A candidate who, with the prior permission of the Faculty, completes units of study at another university or appropriate institution may be given credit for such of the units of study set out in the tables attached to these resolutions as the Faculty may determine.

10 Honours and Prizes

(a) To qualify for the award of an Honours BE degree a candidate shall:

(i) complete the Pass degree requirements;

(ii) complete such Honours units of study as may be determined by the Head of the Department in which the candidate is pursuing the degree; and

(iii) attain a level of performance acceptable to the Head of Department.

(b) The Faculty may prescribe any Senior or Senior Advanced unit of study as being an Honours unit of study.

(c) Where an Honours unit of study and a core unit of study are deemed by the Faculty to be mutually exclusive, completion of the Honours unit of study will be taken as satisfying the core unit of study.

(d) Except with the permission of the Faculty, a candidate shall not be eligible for the award of an Honours degree unless the candidate has completed all the requirements in minimum time, namely, four years for the BE degree and five years for the combined BE/BSc, BE/BCom or BE/BA degrees.

(e) A candidate for an Honours degree who has failed to be placed in any Honours classification may be awarded a Pass degree.

(f) A candidate who has previously failed any unit of study shall not be eligible for any prize or scholarship awarded in connection with that unit of study.

11 Transitional Arrangements

The provisions of these resolutions came into force on 1 January 1998. All candidates who commenced candidature prior to this date shall complete the degree requirements under such conditions as the Faculty may determine.

Combined Degrees of Bachelor of Engineering with Bachelor of Science, Commerce or Arts.

Senate Resolutions

Joint Resolutions of the Faculties of Engineering and Science (BE/BSc)

1. Candidature for this combined degree program is a minimum of 5 years of full-time study.

2. Candidates qualify for the two degrees of the combined program (a separate testamur being awarded for both the BE and the BSc) by completing at least 240 credit points which must include the following:

(a) At least 160 credit points from the units of study prescribed for the BE specialisation undertaken. These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.

(b) At least 80 credit points from units of study listed in Table 1 for the BSc degree other than those in the Science discipline area of Engineering Science, 32 of which must be from Intermediate units of study and 24 of which must be from Senior units of study in one Science discipline area.

(c) The same unit of study cannot be used to satisfy the requirements of (a) and (b) above.

3.(a) Candidates may not enrol in any unit of study which is substantially the same as one they have already passed (or in which they are currently enrolled).

(b) The choice of units of study made by a candidate shall be limited by the exigencies of the timetable except that, where two units of study are given wholly or partly at the same time, the Heads of the Departments concerned may give permission for the candidate to attend equivalent units of study (orparts of units of study) at another time.

4. Candidates will be under the general supervision of the Faculty of Engineering. General supervision covers all areas of policy and procedures affecting candidates, such as combined degree program rules and enrolment procedures. Candidates will be under the supervision of the Faculty of Science regarding enrolment and progression within the BSc component of the combined degree program, as defined in subsection 2(b).

5. Candidates may qualify for the award of BE degree with Honours.

6. Candidates who complete the combined degree program may qualify for admission to an honours year in the Faculty of Science.

7. Candidates who abandon the combined degree program may elect to complete the BE degree in accordance with the appropriate Senate Resolutions.

8. Candidates in the combined degree program may apply for admission to the BSc degree and enrol in such units of study as are required to complete the requirements for the degree. Such candidates shall be deemed to have abandoned the BE/BSc combined degree program.

9. The Deans of the Faculties of Engineering and Science shalljointly exercise authority in any matter concerning this combined degree program not otherwise dealt with in the Senate Resolutions or these joint resolutions.

Joint Resolutions of the Faculties of Engineering and Economics (BE/BCom)*

* It should be noted that the number of credit points required by the two Faculties to gain this combined degree option is currently under review.

1. Candidature for this combined degree program is a minimum of 5 years of full-time study.

2. Candidates qualify for the two degrees of the combined program (a separate testamur being awarded for both the BE and the B Com) by completing the following:

(a) The units of study prescribed for the BE specialisation undertaken (totalling 160-162 credit points, depending on the specialisation). These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.

(b) Units of study in the Faculty of Economics worth at least 108 credit points including:
   (i) 12 credit points in Accounting;
   (ii) 12 credit points in Economics or Political Economy;
   (iii) 12 credit points in Econometrics;
   (iv) no more that 48 credit points at first-year level; and
   (v) a major in each of two subject areas as given in Table A of the Bachelor of Commerce degree, or one major and one minor from subjects listed in Table A.

Note that amajor is a sequence of 44 credit points as described for each subject in Table A; a minor in a subject comprises asequence of not less than 28 credit points, including 12 credit points in the subject at first-year level and 16 credit points from later year units of study required to complete a major in that subject.

Candidates will be exempt from taking first-year level Econometrics for the purpose of taking amajor or minor sequence in this subject by taking a combination of Junior and Intermediate Mathematics and Statistics units of study as prescribed by the Faculty of Economics.

3. Candidates may not enrol in any unit of study which is substantially the same as one they have already passed (or in which they are currently enrolled).

4. Candidates will be under the general supervision of the Faculty of Engineering. General supervision covers all areas of policy and procedures affecting candidates, such as combined degree program rules and enrolment procedures. Candidates will be under the supervision of the Faculty of Economics regarding enrolment and progression within the BCom component of the combined degree program, as defined in subsection 2(b).

5. Candidates may qualify for the award of the BE degree with Honours.

6. Candidates who complete the combined degree program may qualify for admission to an honours year in the Faculty of Economics.

7. Candidates who abandon the combined degree program may elect to complete the BE degree or the BCom degree in accordance with the appropriate Senate Resolutions.

8. The Deans of the Faculties of Engineering and Economics shall jointly exercise authority in any matter concerning this combined degree program not otherwise dealt with in the Senate Resolutions or these joint resolutions.

Joint Resolutions of the Faculties of Engineering and Arts (BE/BA)

1. Candidature for this combined degree program is a minimum of 5 years of full-time study.

2. Candidates qualify for the award of the two degrees of the combined program (a separate testamur being awarded for both the BE and the BA) by completing the following:

   (a) The units of study prescribed for the BE specialisation undertaken (totalling 160-162 credit points, depending on the specialisation). These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.

   (b) BA units of study totalling at least 80 credit points, of which at least 56 must be Senior credit points from Part A of the Table of Units of Study for the BA degree, including a major as defined in the resolutions relating to the BA degree.

3. Candidates may not enrol in any unit of study which is substantially the same as one they have already passed (or in which they are currently enrolled).

4. Candidates will be under the general supervision of the Faculty of Engineering. General supervision covers all areas of policy and procedures affecting candidates, such as combined degree program rules and enrolment procedures. Candidates will be under the supervision of the Faculty of Arts regarding enrolment and progression within the BA component of the combined degree program, as defined in subsection 2(b).

5. Candidates may qualify for the award of the BE degree with Honours.

6. Candidates who complete the combined degree program may qualify for admission to an honours year in the Faculty of Arts.

7. Candidates who abandon the combined degree program may elect to complete the BE degree or BA degree in accordance with the appropriate Senate Resolutions.

8. The Deans of the Faculties of Engineering and Arts shall jointly exercise authority in any matter concerning this combined degree program not otherwise dealt with in the Senate Resolutions or these joint resolutions.

A summary of many of the rules and regulations governing the undergraduate degrees in Engineering is set out below. This is intended to assist students in understanding the rules but is not intended to replace them in any way.

Summary of degree requirements

To become eligible for the award of the degree of Bachelor of Engineering,' you must

—■ complete the core units of study of your chosen branch of engineering,

— gain credit for a minimum of 192 credit points,

— complete a period of practical experience in engineering and

— that the minimum time for completion of the BE degree shall be two years and the maximum shall be eight years.

Core and elective units of study

For each of the branches of engineering in which a degree is awarded there is a list of prescribed *core* and recommended *elective* units of study. Many of these are common to more than one branch.

A core unit of study is one that must be passed to fulfil the requirements for the degree. In some cases the Faculty has specified units of study that are acceptable alternatives to the core units of study, completion of which satisfies the core unit of study requirement. An elective unit of study is one that is acceptable as part of the requirements but is not a compulsory unit of study.

The core and elective units of study for each branch of engineering are listed in the tables in Chapter 9.

Descriptions of each unit of study, in numerical order, are provided in Chapter 7.

Credit point value of Units of study

Each unit of study has a credit point value, which is an approximate measure of the time required for lectures, tutorials and practical classes, e.g. four credit points may mean approximately 4 hours of classes each week for one semester or, alternatively, 2 hours of classes each week throughout the year.

When you pass a unit of study you are credited with its credit point value, except where

— it is mutually exclusive with a unit of study you have already passed, or

— you are attempting the unit of study a second time, having gained a terminating pass the first time.

Completion of Units of study

In order to complete a unit of study you must: attend the lectures, tutorials and laboratory and practical classes prescribed for the unit of study; complete the exercises, practical work and assignments prescribed; and pass the examination(s) set for the unit of study.

If you have been absent without leave from more than ten percent of the classes in any one semester in a particular unit of study, you may be asked to show cause why you should not be deemed to have failed to complete that unit of study. Should you fail to show cause, you shall be deemed not to have completed that unit of study.

Absence from lectures and other classes

If you are unable to attend lectures and/or practical classes because of illness, accident or for any other reason, you must submit an 'Application for Special Consideration' form. When applicable, a medical certificate or other supporting evidence should be attached. Notification forms for this purpose are available at the Engineering Faculty Office. The forms must be handed to either your lecturer direct or to the Student Centre (Carslaw) within 7 days of the incident. The Faculty's policy on its handling of Special Consideration applications is available from the Student Enquiry Office.

Minimum number of credit points and rates of progress

To satisfy the requirements for a pass degree you are required to gain not less than 192 credit points, which must include all the core units of study for at least one branch of engineering.

The total of 192 credit points is the minimum, but many students gain more than this. Some students choose to take extra elective units of study and other students change their chosen branch of engineering and therefore have to pick up outstanding core units of study for the new branch.

The minimum time in which you can qualify for the degree is four years. If you want to qualify in the minimum four years, you should plan to gain not less than 48 to 52 credit points each year. Some students take five years to complete the degree requirements. This is usually because of failure in some of the units of study attempted, with the consequent need to repeat those units of study. Some candidates, however, plan to progress at a slower rate, sometimes so that they can take a number of elective units of study.

At present, the BE degree is available on a full-time basis only and students cannot complete the degree requirements on apart-time basis or externally.

Classification into years

Students are classified as being in Junior (First), Intermediate (Second), Senior (Third) or Senior Advanced (Fourth) year according to the year from which the majority of their credit points are being taken.

Selection of units of study

The following advice is intended to help you select your units of study. You should become familiar with the units of study that are available for the degree and particularly with those that have been prescribed as core units of study for the branch or branches of engineering in which you are interested.

In Chapter 9, Tables 1 to 9 set out the core units of study prescribed for each of the branches of engineering. Following each of these Tables is a summary of the Faculty and Department/School resolutions relating to that branch of engineering, showing, e.g., acceptable alternative units of study to the core units of study listed in the tables. Information about which elective units of study are recommended for which branch of engineering and other relevant information is also set out here.
For detailed descriptions of each unit of study refer to Chapter 7, *Units of Study*. If, for special reasons, you want to take a unit of study which is not included in the lists of prescribed units of study you may apply to the Faculty for permission.

Changing your branch of study

Please note that all changes to your branch of study will be dependent on places being available in the new branch.

While first year students in the quota for Aeronautical, Civil and Mechanical Engineering must choose an enrolment menu designed for one of these particular branches of engineering, there is sufficient flexibility for students to be able to change their branch of engineering at the beginning of second year and still be able to complete the degree requirements within the minimum of four years in most cases. Students who wish to change branches at a later stage may do so but it would probably take them longer than the minimum of four years to complete the degree requirements.

Similarly, students who wish to do so may change from Chemical or Electrical Engineering into one of the other branches. The number of years that it would take them to complete the degree requirements would depend on the stage at which they wish to change and also on which branch of engineering they wish to enter.

Junior year enrolment

In your first year of attendance you are normally required to enrol in 48 credit points.

Students in all branches of engineering study mathematics, chemistry, physics and/or mechanics and computing in their first year. Units of study in these basic science subjects form the solid science basis upon which the teaching in the various branches of engineering is later built. First year students also take introductory units of study in the branch of engineering towards which they are proceeding.

At enrolment time students are given information about a variety of enrolment menus, which are combinations of units of study designed for each of the branches of engineering. Enrolment menus comprise units of study which are considered to provide the best possible introduction to the branch of engineering for which they are designed and they will lead to sensible second year enrolments.

For some branches of engineering there is only one Junior (First) year menu, which comprises all the Junior core units of study prescribed for that particular branch. In other branches, there is a choice of menus which comprise some or all of the Junior core units of study together with a choice of recommended elective units of study.

If you wish to take the opportunity of transferring to the Faculty of Science at the end of your Intermediate (or Senior) BE year, you should study the rules relating to the double degree under Resolution 13. (These rules are set out below.) You will need to fulfil a number of conditions to be eligible to transfer to the Faculty of Science, one of which is the completion of two 16-credit point Science units of study in your Intermediate BE year. You should therefore ensure that the menu/units of study you take in your first year will enable you to take the appropriate Science units of study in your second year.

It is strongly recommended that you enrol in a menu and not in a one-off combination of units of study if you wish to complete the degree requirements in the minimum of four years.

Each menu shows the branch of engineering for which it is suitable and also the consequential minimum number of credit points necessary for Intermediate year to complete all Junior and Intermediate core units of study for each branch if all units of study on the menu are completed at a satisfactory standard. There is also an indication where the consequential Intermediate enrolment would be very heavy, where it would be excessive and where there would be serious timetabling problems.

A 'one-off' enrolment in units of study outside the menus can have a number of pitfalls:

— the units of study might not timetable,

the consequential Intermediate Year BE enrolment might have prerequisite/corequisite problems and/or serious timetabling problems,

— it might result in you needing to spend five years completing the degree requirements.

Intermediate and later year enrolments

The minimum enrolment for re-enrolling students is normally 3 6 credit points and the maximum is normally 64 credit points (unless the Faculty has imposed any special conditions on your re-enrolment because of unsatisfactory progress in the previous year).

Enrolments outside the 36 to 64 credit points limit require special Faculty permission. You should note, however, that an enrolment of more than 48 to 52 credit points is demanding, and only an exceptionally strong student should contemplate an enrolment in the region of 56 to 64 credit points. Experience has shown that a student who fails a number of units of study and who then tries to 'catch up' by taking more than 48 to 52 credit points will perform far worse than if he or she had attempted a more realistic number of credit points.

Intermediate year students must include in their enrolment any outstanding Junior core units of study for their chosen branch of engineering. (Outstanding core units of study are units of study which a student either did not attempt in the previous year, or attempted but did not complete satisfactorily.) Similarly, Senior students must include in their enrolment any outstanding Junior and Intermediate core units of study, etc.

If you received a Terminating Pass for a unit of study in the previous year and if that unit of study is an '(a)' level prerequisite for a higher year core unit of study in your chosen branch, then you would normally be required to repeat that unit of study in your next year of enrolment (unless you were granted permission otherwise).

Your enrolment in outstanding core units of study must generally take priority over your enrolment in higher year units of study and you must not enrol in units of study with timetable clashes.

If you are enrolling, for example, in the Intermediate year and if you are not able to add sufficient Intermediate core units of study to your outstanding Junior units of study to total the normal minimum enrolment of 36 credit points, then you should add elective credit points (from units of study that do not cause timetable clashes) or you may apply to the Faculty for special permission to enrol in less than 36 credit points. Senior and Senior Advanced students should proceed in the same way.

You should note that, generally speaking, timetabling problems with outstanding core units of study and current year core units of study only occur when students have failed to complete units of study at a satisfactory standard and have to repeat units of study or when students change their branch of engineering.

If you are thinking about proceeding towards the 'double degree' of BSc BE, then you should include two 16 credit point Science units of study in your Intermediate year enrolment. If this would result in an excessive number of credit points, then you should discuss with advisers at enrolment time the feasibility of leaving one or two 4 to 8 unit Intermediate Engineering units of study out of your enrolment. There is provision for the Faculty to grant you special permission to 'carry' these 4 to 8 credit points in a part-time BE enrolment concurrently with your Resolution 13 B Sc degree enrolment. There is also provision for the Faculty of Science to allow you to take as part of the BSc enrolment one of the Engineering Science units of study (e.g. Mechanical and Aeronautical Engineering Science). (This permission is normally only given if one of your Intermediate Science units of study is not prescribed as a core unit of study for the branch of engineering in which you are proceeding.) On completion of the Engineering Science unit of study you could then apply to the Faculty of Engineering for exemption from the Engineering units of study which comprise the Engineering Science unit of study.

Advice for students

Advisers are available for all the branches of engineering during the official enrolment periods in February each year. This is generally the appropriate time for students to seek advice and discuss their plans of units of study.

If you require further guidance in the selection of your units of study, however, or advice on any other matter concerning your studies, do not hesitate to consult a member of staff.

An academic Year Adviser is appointed for each year in each branch of Engineering. You should consult the noticeboards in your Department and the Student Enquiry Office to find the name and location of your Year Adviser.

Result grades

The Board of Examiners of the Faculty of Engineering is the body which determines BE students' examination results. The Board meets in December each year when it considers the results recommended by the examiners of each unit of study for each student. Official examination result notices are then sent to students.

Some teaching departments may release informal results at the end of First Semester, but these are not official, final results.

Satisfactory performance in a unit of study is recognised by the award of the grade of Pass (P). Performance at levels higher than this is recognised by the award of a Credit (Cr), Distinction (D) or High Distinction (HD). If the requirements for a unit of study are not completed then a grade of Fail (XX) may be awarded.

Grade	*%*
Pass	50-64
Credit	65-74
Distinction	75-84
High Distinction	85-100
Fail below	50

If a student failed a unit of study but the failure was borderline, then the B o ard of Examiners may award one of the following results instead of a Fail:

Terminating Pass (T)—A Terminating Pass will not permit a student to enrol in further units of study in that subj ect or to use that unit of study as a prerequisite for units of study that require a clear pass in their prerequisite units of study. (This means that a T Pass does not fulfil '(a)' level prerequisite requirements.)

Terminating Pass, Optional Supplementary (M)—This is aT Pass (see above), with permission to attempt a supplementary examination: if you perform satisfactorily in the supplementary you may be granted a clear pass; if you fail, or do not sit the supplementary, you will be granted a Terminating Pass in the unit of study.

Fail, Supplementary Examination (X)—This means that you have failed the unit of study but have been granted permission to attempt a supplementary examination: if you perform satisfactorily in the supplementary you may be granted a clear pass or you may be granted a Terminating Pass; if you fail, or if you do not sit the supplementary, you will be awarded a Fail in the unit of study.

The Board also uses a concession system where, if a student failed a unit of study but the student's overall performance in all units of study reached a certain standard, the Board may award one of the following results instead of a Fail:

Pass, Concessional (PCon)—This means that the Board has conceded you a Pass. A PCon may be treated as a full, clear pass for progression purposes.

Terminating Pass (Concessional)—This means that the Board has conceded you a Terminating Pass (see T above).

Terminating Pass, Optional Supplementary (Concessional) (MC)—This means that the Board has conceded you a Terminating Pass, with permission to attempt a supplementary examination (see M above). This affords an opportunity for you to gain a full pass.

Fail, Concessional Supplementary (XC)—This means that you have failed the unit of study but have been granted permission to attempt a supplementary examination: if you perform satisfactorily in the supplementary you may be granted a Pass; you could also be awarded a Concessional or Terminating Pass (see above); or you could be awarded a Fail. If you do not sit the supplementary, you will be awarded a Fail in the unit of study.

If a student has not been able to complete the requirements for a unit of study because of serious ill-health or misadventure (which has been duly attested), the Board may grant the following result:

Supplementary Examination to count as an Annual (XTCA)—This means that you may sit for a supplementary examination, and your result in the supplementary will be treated as though you had obtained it at the annual examination. You may be awarded any of the passing grades (up to and including HD) and if you fail the examination you will be awarded a Fail.

Students who are awarded supplementary examinations for reasons of illness or misadventure and who have already achieved some form of passing grade will have their result achieved indicated, followed by 'SUPP TO CHANGE GRADE'. This gives students the opportunity to attempt a supplementary exam in order to improve their original grade.

Students awarded supplementary examinations should consult the department that teaches the unit of study for information about the form and content of the supplementary examination.

Students who have been awarded a result of Incomplete (I or DCX) or Result to Come (V) should consult the member of staff responsible for the unit of study.

Supplementary examinations should be regarded as privileges and not as rights.

The Board of Examiners meets again each February to determine the results of students who were granted permission to sit for supplementary examinations. Students who pass their supplementary examinations will not be awarded grades of pass higher than Pass (except where an XTC A or other result of STC A—Supplementary to count as Annual—was awarded).

Exemption from attendance at classes

If you enrol in a unit of study which you have previously attempted you may be granted exemption from attendance at laboratory or practical classes. To seek such exemption, apply on the appropriate form *befoi-e the unit of study starts.* Application forms are available at the Engineering Faculty Office. Applications for exemption must be made before March 31 for Semester 1 and before August 31 for Semester 2.

Deferment of enrolment

Deferment of enrolment is only possible from second year onwards. To ensure your place is kept open, you must apply in writing to the Faculty Manager, stating the reasons for your requested deferment. Deferment is normally granted for only one year, although this may be extended in exceptional circumstances which must be detailed in your letter of application.

Practical experience

At an appropriate stage of your training you are required to work as an employee of an approved engineering-related organisation and submit a satisfactory written report of your work. This period of experience, usually about 12 weeks, is normally undertaken after you complete some or all of the prescribed Senior units of study and before you enrol for your final year of study. It is possible to undertake all of the work experience at the end of Senior Year, or undertake a part at the end of Intermediate Year and complete the work experience at the end of Senior Year. There is a core unit of study prescribed for each of the branches of engineering which comprises this practical experience requirement. Please refer to the unit of study descriptions later in this Handbook for specific conditions applying in each Department in relation to when the work experience can be undertaken and what type of experience is suitable.

If you are not committed to employment as a cadet or scholarship holder the Careers and Appointments Service of the University is available to help you obtain suitable employment.

Candidates for the degree in chemical engineering obtain this experience in special vacation practice schools, located in industrial plants and supervised by academic staff, whenever this can be arranged.

Honours degree

If you have made good progress for three years you may apply for admission as a candidate for the honours degree before commencing on your fourth and final year of study.

When you are accepted as a candidate for honours you may be required to enrol, in the final year, in Honours units of study specified by the head of the department in which you are a candidate.

Alternatively, if you satisfy the requirements for the award of the pass degree in four years, you may then apply for admission as a candidate for honours. If accepted, you will be required to enrol for a fifth year of study and the award of the degree is deferred for one year.

In both cases the acceptance of an application rests with the head of the department concerned. Applications from students who have taken longer than three or four years, as the case may be, to reach the necessary standard may be considered, but in such cases it is necessary to obtain special approval of the Faculty.

The various Engineering departments use different formulae for determining students' eligibility for the award of Honours. All enquiries about this should be addressed to the relevant department.

The double degree BSc BE: another option

Many Engineering students take the opportunity of gaining the 'double degree' of BSc BE. Apart from the combined BE/BSc degree, there is a second option to obtain the two degrees.

If you satisfy certain requirements you may be permitted to transfer to the Faculty of Science for one year in order to complete the requirements for the BSc degree. This one year is additional to the four years required to complete the BE degree. Students who proceed towards the 'double degree' usually transfer to the Faculty of Science after they have completed two years of Engineering, but there is provision for students to do so after they have completed the Senior (or Third) year of the BE degree unit of study. There is also provision for students to complete the BSc degree under Resolution 13 of the Faculty of Science resolutions over two years part-time instead of one year full-time. Most students do so full-time, however. There is also provision for students to remain in the Faculty of Science for an extra year in order to complete an Honours BSc degree.

After completion of the Science year(s), students then transfer back to the Faculty of Engineering in order to complete their BE degrees.

The rules and regulations relating to the 'double degree' are set out in Resolution 13 of the Resolutions of the Senate relating to the degree of Bachelor of Science and in Resolutions of the Faculty of Science. These rules are set out below and you should study them carefully if you are interested in obtaining the 'double degree' of BSc BE.

If you are interested in proceeding towards the 'double degree' it is essential that you plan your units of study carefully in your lunior (First) year, so that you fulfil prerequisite requirements for the Intermediate Science units of study which you must take in your Intermediate (Second) year.

Application to transfer to the Faculty of Science under Resolution 13 should be made at the end of your Intermediate (or Senior) year studies (i.e. by the end of December in the year prior to the one in which you wish to undertake the Science year). Applications will close on the last working day in the University prior to the closing of the University for the Christmas break.

Similarly you will need to lodge an application to transfer back to the Faculty of Engineering from the Faculty of Science.

Applications for transfer to and from the Faculty of Science are available at the Student Centre and the Faculty of Science and Faculty of Engineering Offices.

Resolution 13 Rules

1. Pursuant to Resolution 13 of the Resolutions of the Senate governing the degree of Bachelor of Science, students who are of two or three years' standing in the Faculty of Engineering may be admitted to candidature for the degree.
2. To be eligible for admission, such students:
   (1) must have gained credit in the Faculty of Engineering for not less than 96 credit points if of two years' standing in that faculty, or not less than 108 credit points if of three years' standing in that faculty; and
   (2) except with the permission of the Dean of the Faculty of Science, must have completed at full Pass Level or better
   (i) all units of study attempted in the Faculty of Engineering at their first examination; including
   (ii) at leas t two Intermediate Normal or Intermediate Lo ng units of study offered by departments of the Faculty of Science. In some circumstances students may be permitted to count as *one* of the Intermediate units of study for this purpose, units of study undertaken in the Faculty of Engineering which combined are the equivalent of one of the following units of study in the Faculty of Science:
   Chemical Engineering Science 2,
   Civil Engineering Science 2,
   Mechanical and Aeronautical Engineering Science 2.
3. To qualify for the award of the pass degree, candidates after admission under Resolution 13 of the Resolutions of the Senate governing the degree of Bachelor of Science shall complete in one year of full-time study or in two consecutive years of part-time study, units of study totalling at least 24 credit points subject to the provisos:
   (1) that at least 12 of the required 24 credit points shall be for a Senior unit of study and, if only one Senior unit of study is completed, at least 8 of the remaining 12 credit points shall be for an intermediate unit of study; and
   (2) that, except with the permission of the Dean, the 24 credit points shall not include any credit points
   (i) for units of study listed under Senate Resolution 10 Groups (d) or (e) relating to the degree of Bachelor of Science, or
   (ii) for any units of study already attempted either completely or in part, within the Faculty of Engineering, or
   (iii)for all or part of the units of study:
   Chemical Engineering Science 2,
   Chemical Engineering Science 2 Auxiliary,
   Civil Engineering Science 2,
   Mechanical and Aeronautical Engineering Science 2.

Such permission will be given only if the candidate has not counted one of these units of study as an Intermediate unit of study for the purpose of gaining admission under Resolution 13; up to 8 credit points, taken in one year to complete *one* of the above units of study, may then be included. Any one of the 8 unit units of study above may then be counted as an Intermediate unit of study for the purposes of part (1) of this resolution provided the whole unit of study is completed in one year.

4. Candidates admitted under Resolution 13 shall comply with Resolution 13 of the Resolutions of the Senate governing the degree of Bachelor of Science.

5. To qualify for admission to Honours units of study, such candidates shall comply with Resolution 13 of the Resolutions of the Senate.

There is no provision for students admitted under Resolution 13 to continue in the Faculty of Science after one full-time or two part-time years of study except to complete an Honours unit of study.

Candidates who fail to complete the required 24 credit points may only be readmitted to the Faculty of Science if a successful application is made at the appropriate time through UAC. Successful applicants will be given credit for units of study completed in accordance with Resolution 11 of the Resolutions of the Senate governing the degree of Bachelor of Science.

Admission of BSc graduates

If you are enrolled in the Bachelor of Science degree unit of study at this University and wish to transfer to the Bachelor of Engineering degree unit of study, you mustmake application through the Universities Admissions Centre by a closing date which is late in September in the year preceding that in which you wish to enrol in the Faculty of Engineering.

Your application will be considered on the basis of academic merit, to the extent that facilities are available. Consideration will be given to your HSC examination results and to your examination results in the Faculty of Science (and to your results in any other tertiary units of study you may have completed). The offer of a place in the Faculty of Engineering is NOT automatic and the competition for entry is keen. If you are a graduand/graduate in the Faculty of Science and if you are offered a place in the Faculty of Engineering, you may be able to complete the BE degree requirements in two further years of full-time study. You would need to have completed appropriate units of study in the Faculty of Science so that you could be given credit for/exemption from all or most of the Junior and Intermediate core units of study prescribed for that branch of Engineering in which you wish to proceed.

You should seek advice from the Engineering Department in which you wish to study regarding their requirements in order that you might complete the BE degree requirements in two years.

Talented Students Scheme

The Faculty makes special provision for first year students who have achieved outstanding academic results before coming to the Faculty. Examples of such results would include a TER of 99+, or successful competition in a Maths or Physics Olympiad. The Engineering Scheme links in with the corresponding program in the Faculty of Science since all students undertake a high proportion of Science subjects in their Junior year. Students who are admitted to the scheme undertake flexible unit of study programs which are individually tailored to their needs; talented students can take additional subjects to broaden their knowledge, undertake units of study at a more advanced level and accelerate their progress towards the degree. Students can apply to enter the scheme at the time of enrolment in first year.

A similar scheme applies for the Faculty for 98+ TER candidates who have taken 4-unit Mathematics and Science (4 units from Physics, Chemistry, Engineering Science or Science). HSC students in this category will be eligible for the first semester credit and may choose to commence study in the July Semester or undertake an individual program. In either case the student will receive credit for the March Semester. Students can enter this arrangement on enrolment in their first year by discussing their options with the Dean of the Faculty.

Discontinuation and variation of enrolment

Your enrolment is your responsibility. It is in your best interests to ensure that the formal record of your unit of study enrolment is correct.

If you wish to cease attending a unit of study (or all your units of study), you are discontinuing your enrolment in those units of study. You must notify the University of your intention to discontinue by submitting the appropriate form to the Engineering Faculty Office. If you fail to do so, you may be recorded as being Absent Fail in the unit(s) of study at the end of the year and may be sent a warning letter or asked to 'Show Cause' why you have notmade satisfactory progress.

There are three categories of discontinuation results used to record discontinuations in the Faculty of Engineering: 'Withdrawn', 'Discontinued with Permission', and 'Discontinued'. *Tliese results are dependent upon the time ofyearyou choose to discontinue (see below).*

If your enrolment is **'Withdrawn' (W),** then your enrolment is cancelled as though you had never enrolled. This enrolment does not appear on an official transcript of your academic record.

If your enrolment is **'Discontinued with Permission',** it means that you commenced the unit(s) of study and were given permission to discontinue without any academic penalty or implication of failure whatsoever. However, HECS or fees are still liable for these subjects. The enrolment and the result of 'Discontinued with Permission' (DP) appear on an official transcript of your academic record.

If your enrolment is **'Discontinued'** (Disc), then it means that the discontinuation counts as a failure. HECS or fees are still liable for these subjects. On an official transcript of your academic record, your enrolment appears with the result of 'Discontinued'. As this result implies failure, you will be allocated a 0% unit value for this subject in the calculation of your weighted average mark. The Faculty takes student WAMs into consideration when determining whether or not students have made satisfactory progress.

Total discontinuation

If you wish to discontinue all your units of study, then you must notify the University of this intention by completing and submitting your 'Confirmation of Enrolment' form (together with your student card) to the Engineering Faculty Office. You should note your reasons for discontinuing on this form. If your 'Confirmation of Enrolment' form is not available, then you should obtain an 'On-line variation form' from the Student Centre or Faculty Office and use that instead.

If your enrolment is recorded as 'Discontinued', which means that the discontinuation counts as a failure, then you have failed to make satisfactory progress with your studies and the Faculty may determine that you should be sent a 'Warning Letter' or that you should be asked to 'Show Cause'.

Variation of enrolment

Any change to your enrolment, including total withdrawal from the degree, can only be done through the Engineering Faculty Office. This includes units of study taken outside this Faculty. Collect a 'Variation of Enrolment' form from the Faculty Office, have the changes approved by your Year Adviser/Supervisor and hand the completed form back to the Faculty Office. Note: Some Science undergraduate units of study offering 'Normal' and 'Advanced' options are exempt from the following rules and you may move freely between the options throughout the year. If you're not sure if your unit of study is one of these, please check with the Faculty Office. Again, you must lodge the changes through the Faculty Office.

Before March 31 (March Semester HECS deadline)

You may enrol in or withdraw from any unit of study—semester or year-long—without academic or financial penalty. Your discontinuation result will be 'Withdrawn'.

After March 31

You may only enrol in or withdraw from July Semester units of study without academic or financial penalty.

— You cannot enrol in March Semester or full-year units of study;

— If you drop a March Semester or full-year unit of study between March 31 and the seventh teaching week of March Semester, you will automatically receive a 'Discontinue with Permission' result;

— If you drop any unit of study after the seventh teaching week, you will receive aresult of 'Discontinue'. If, however, you believe you have good reason for discontinuing at this late stage, discuss this with your Year Adviser, who may recommend aresult of 'Discontinue with Permission';

—You remain liable for the HECS payment for these units of study.

After August 31 (July Semester HECS deadline)

— You cannot enrol in any unit of study this year;

— You cannot drop any unit of study this year without penalty;

— If you drop a July Semester unit of study between August 31 and the seventh week of teaching of July Semester, you will automatically receive a 'Discontinued with Permission' result;

— If you drop any unit of study after the seventh teaching week, you will receive aresult of 'Discontinued'. If, however, you believe you have good reason for discontinuing at this late stage, discuss this with your Year Adviser, who may recommend a result of 'Discontinue with Permission';

—You remain liable for the HECS payment for these units of study.

There is no way these rules can be bent or broken, so it is in your best interests to ensure thatyourenrolment is correct. If you haven't lodged every change through the Faculty Office and in accordance with the HECS deadlines, we will not be able to help you if you discover something wrong.

Other rules relating to variation of enrolment

You should note that variations of enrolment are subject to all the other rules relating to enrolment in the BE degree unit of study. First year students are normally required to be enrolled in 48 to 52 credit points, and re-enrolling students are normally required to be enrolled in 36 to 64 credit points (unless special conditions have been imposed on their re-enrolment). Students are normally required to fulfil prerequisite and corequisite requirements and they are not permitted to enrol in units of study with timetable clashes. Students must enrol in outstanding core units of study and must give priority to their enrolment in these units of study over higher year units of study.

Weighted Average Mark (WAM)

The Faculty uses students' weighted average marks (or WAMs) when considering a number of aspects of students' candidatures: Engineering departments use WAM calculations when determining students' eligibility for the award of Honours degrees. The Faculty uses WAM calculations when ranking applicants for scholarships for postgraduate study and for undergraduate prizes and scholarships. The Faculty also takes account of students' WAMs when determining whether or not students have made satisfactory progress with their studies. A WAM is calculated for every student for every year of enrolment by adding together the products of the marks achieved with the unit value of each unit of study attempted (including units of study which have been failed or 'Discontinued') and dividing by the total number of credit points attempted. Units of study which have been 'Withdrawn' or 'Discontinued with Permission' are not included in the WAM calculation.

Application procedure to re-enrol in the BE degree unit of study after total discontinuation

New first year students

If you are a new first year student who totally discontinues his/her enrolment and you now wish to re-enrol in the BE degree unit of study, then generally speaking you will need to apply for re-enrolment through the Universities Admissions Centre (unless you were recorded as 'Discontinued with Permission' and were given 'Repeat status'). ('Repeat status' means that you may enrol in the BE degree unit of study in the next calendar year by completing an internal University 'General application for enrolment' form and that you will not need to compete for a place through UAC for that one calendar year only. If you do not take up that option and then wish to re-enrol in the BE degree unit of study in a future year, you will need to apply for re-admission through UAC.)

UAC applications must be lodged by the closing date late in September/ early in October in the year prior to that in which you wish to re-enrol.

Re-enrolling students

If you are a re-enrolling student in the BE degree unit of study who totally discontinues his/her enrolment and wish to re-enrol in the BE degree unit of study, then generally speaking you should apply for re-enrolment by completing an internal University 'General application for enrolment' form by 1 October in the year prior to that in which you wish to re-enrol.

Failure to make satisfactory progress and exclusion

If the Faculty considers that you have failed to make satisfactory progress with your studies, the Faculty may exclude you from re-enrolment in the Faculty of Engineering. This process of excluding students is designed to ensure that the resources available in the Faculty are used to teach those students who make the best use of them. Failure to make satisfactory progress cannot be defined precisely in all cases in advance, but generally you will be considered not to have made satisfactory progress if:

— your weighted average mark (WAM) for the year is poor; and/or

— you do not gain at least half of the credit points for which you are enrolled; and/or

— you fail a major unit of study more than once; and/or

— you had special conditions imposed on your re-enrolment (usually because of lack of satisfactory progress in the previous year of enrolment) and you fail to meet these conditions.

If the Faculty considers that your annual progress has not been satisfactory, it may decide that you should be sent a 'Warning Letter', in which you are advised of this and also of certain conditions that you would need to meet in your next year of enrolment in the Faculty. These conditions would normally specify the number of credit points and particular credit points of study that you would need to pass in the next year of enrolment in the Faculty. Failure to meet such conditions would normally result in you being asked to show good cause why you should be allowed to re-enrol in the Faculty of Engineering.

If the Faculty considers that your progress has been most unsatisfactory it may decide that you should be asked to show good cause why you should be allowed to re-enrol in the Faculty of Engineering. This means that you are being asked for an explanation for your failure to make satisfactory progress in your studies. When the Faculty considers students' statements purporting to show good cause, it takes account of illness, accident and/or personal problems.

If the Faculty determines that you have shown good cause (i.e. it accepts your explanation), then it will allow you to re-enrol. In doing so, the Faculty will probably impose certain conditions on your re-enrolment (such as specifying the number of credit points and particular credit points of study that you must pass in your next year of enrolment). Should you fail to meet these conditions you may be called upon again to show good cause why you should be allowed to re-enrol in the Faculty of Engineering.

If the Faculty considers that you have failed to show good cause (or if no statement is received from you), then the Faculty may exclude you from enrolment. If you are excluded, you have the right of appeal to the Senate. The Senate may either uphold your appeal and allow you to re-enrol in the Faculty of Engineering or itmay disallow your appeal and confirm your exclusion.

A student who is excluded from re-enrolment in the Faculty may apply for re-admission to the Faculty after two academic years have elapsed. When considering an application for re-admission, the Faculty takes account of the following: the circumstances that led to the student's failure to make satisfactory progress; how these circumstances have changed; and the student's activities since being excluded. The Faculty would normally expect a student to have undertaken relevant tertiary studies successfully during this period. (You should note, however, that students who are excluded from one Faculty or degree at this University are finding it increasingly difficult to gain selection into another degree either at this University or at other tertiary institutions.)

Outcomes of degree programs in the Faculty of Engineering

This section provides a statement of expected outcomes from the undergraduate degree programs in the Faculty of Engineering.

Outcomes of the undergraduate degree programs can be specified in terms of the attributes of graduates from the Faculty, with two qualifications:

(a) There is aminimum common set of attributes that all Engineering graduates will possess. However, in recognition of the differences between students, the Faculty provides a wide range of learning opportunities so that students can achieve optimum outcomes consistent with their own interests.

(b) The more advanced objectives of teaching in the Faculty can probably only be specified in very general terms. This is appropriate for university-level teaching.

The attributes of our graduates can be divided into three classes:

(1) Knowledge and understanding: Unit of study curriculum descriptions in this Handbook summarise the fields covered, which embrace broad areas of engineering and adjoining disciplines. The units of study emphasise understanding of underlying principles and conceptual frameworks rather than rote learning of facts. It is this type of understanding that graduates can carry with them into their future careers.

(2) Abilities: These encompass generic capabilities, such as management and communication skills, as well as specific engineering abilities, such as proficiency in engineering problem-solving and analysis; testing and measurement; and planning and design. Graduates will possess the ability to effectively apply knowledge acquired during the unit of study and, equally importandy, be able to adapt to new environments in engineering with confidence. A range of practically-orientated capabilities are developed in the Faculty's programs. These include: the ability to extract key aspects from information; the ability to evaluate the reliability of data; skills in estimation and approximation; the ability to recognise when additional expertise or information is required; and the ability to take the broad view of an engineering task including the non-engineering aspects. To help develop these capabilities, laboratory work is a key element in the Faculty's undergraduate programs. Through laboratory design and project work, students not only acquire up-to-date technical skills (including computer-based skills), but develop attitudes important to the practice of engineering.

(3) Attitudes: Personal characteristics of the graduates include: an understanding of the function of engineers in society; an understanding of the roles of scholarship, research, and innovation; a recognition of the importance of continued study to remain up-to-date; an appreciation of professional ethics; and a cognisance of environmental issues.

The Engineering degree is accredited by the Institution of Engineers with Continued Full Recognition. The rigorous periodic accreditation process includes a full review of unit of study structure and content, inspection of Faculty facilities, perusal of examination papers and meetings with students and staff. The Faculty is developing uniform procedures for quality assessment of credit points of study, including a common scheme for unit of study evaluation by students and review of examination material.

6. Postgraduate

Postgraduate study

The Faculty of Engineering offers a widerange of postgraduate research and coursework programs within the Departments of Aeronautical, Chemical, Electrical and Mechanical and Mechatronic Engineering and the specialisation, Environmental Engineering.

Full details of the postgraduate degrees and diplomas are contained in a graduate brochure which is updated annually and is available from the Faculty Office.

Doctor of Engineering

The senior of the higher degrees in the field of engineering is the DEng degree. Originally called Doctor of Science in Engineering, DScEng, the name was changed to Doctor of Engineering in 1981. The degree is awarded for distinguished published work. The first doctorate in engineering was conferred in 1924.

DScEng
John Job Crew Bradfield, 1924
William George Baker, 1932
David Milton Myers, 1938
David Lipscombe Hollway, 1954
Bernard Yarnton Mills, 1959
Robert Thomas Fowler, 1960
James BrydonRudd, 1962
John Ernest Benson, 1975
Harry George Poulos, 1976
George Kossoff, 1981
Robert Henry Frater, 1982

DEng
John Robert Booker
Bhushan Lai Karihaloo
Kerry Rowe
Nicholas Snowden Trahair

Doctor of Philosophy

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

Applicants should normally hold a master's degree or a bachelor's degree with first or second class honours of the University of Sydney, or an equivalent qualification from another university or institution.

The degree may be taken on either a full-time or part-time basis.
In the case of full-time candidates, the minimum period of candidature is six semesters (3 years). The maximum period of candidature is normally ten semesters.

Part-time candidature may be approved for applicants who can demonstrate that they are engaged in an occupation or other activity which leaves them substantially free to pursue their candidature for the degree. Normally the minimum period of candidature will be determined on the recommendation of the Faculty but in any case will not be less than six semesters; the maximum period of candidature is normally 14 semesters.

The Faculty may admit some applicants on a probationary basis for a period not exceeding twelve months.

Master of Engineering

Graduates in engineering of the University of Sydney who have had at least three years' experience after graduation may be admitted as candidates for the ME degree. The award is made for a thesis or a design of special merit, and may be looked upon as an external degree reserved by the Faculty for its own graduates.

Master of Engineering (Research)

The Master of Engineering (Research) degree provides candidates with opportunities to develop specialist interests through a program of supervised research (theoretical or applied), shorter than the three years usually required for the PhD degree. Candidature is normally on a full-time basis but may also be undertaken part-time. The ME(Res) degree may be undertaken in the Departments of Aeronautical, Chemical, Electrical or Mechanical Engineering in the School of Civil and Mining Engineering

The minimum academic entry requirement is normally the 4-year Bachelor of Engineering degree from the University of Sydney with first or second class honours in the same branch of engineering as that in which the ME(Res) degree is to be undertaken, or an equivalent qualification from another university or tertiary institution. In exceptional circumstances a graduate in engineering with apass degree or a graduate with an honours degree in a different branch of engineering or from another Faculty may be admitted to candidature but such an applicant may be required to undergo a preliminary examination.

The Faculty may admit some applicants on a probationary basis for a period not exceeding twelvemonths.

The minimum period of candidature is one year full-time and two years part-time and the maximum period of candidature is two years full-time and three years part-time. If a candidate is required to undertake a preliminary examination then the candidature commences after the completion of the preliminary examination.

Special attention is drawn to the need for applicants to provide concise details of their proposed research program including aims and methodology and evidence of their ability to carry out intensive research and advanced study. Candidates who enrol for this degree with the object of later transferring to candidature for the PhD degree should select a research project that is suitable for this purpose.

Applicants admitted to candidature for theME(Res) degree are expected to work individually on advanced study and research under the direction of a supervisor, with whom regular consultation about their work and the general planning of their thesis is required. On completion of their candidature a thesis must be submitted embodying the results of their work.

Master of Engineering Studies

The MES degree provides candidates with programs of formal coursework alone or coursework and applied research aimed at meeting the professional development needs of engineers and scientists in the private and public sectors of industry and in private practice. The degree is offered on a full-fee paying basis.

The minimum academic entry requirement is the 4-year Bachelor of Engineering degree from the University of Sydney, or an equivalent qualification from another university or tertiary institution.
Therninimum period of candidature is one year full-time and two years part-time and the maximum period of candidature for all candidates is two years full-time and three years part-time.

Candidates for the MES have two alternative methods of candidature, by coursework alone or by coursework and project. They are required to complete either 30 units of coursework or at least 20 units of coursework and a design or research project valued at 10 units.

Candidates may choose to complete the units of coursework from the same subject area or fromrelated subject areas, in the same department or school, or they may choose to complete all subjects from departments other than the one in which they are primarily studying. Candidates may also be givenpermission to take subjects from another Faculty at this University or from another tertiary institution such as the University of New South Wales or the University of Technology, Sydney. If you wish to apply to count subjects from another tertiary institution, you would of course need approval from that institution to enrol there and the permission of the University of Sydney.

The regulations in regard to coursework taken external to the Faculty are:

- Up to 12 units and amaximum of 4 approved subjects can be taken in other Faculties or external to the institution
- Up to 12 units of approved business related subjects.
- A maximum of 5 units of approved undergraduate engineering subjects can be taken within the Faculty at this university.
- A minimum of 50% of all coursework must be undertaken within the Faculty of Engineering at the postgraduate level.
- Approval to take courses at another institution is given on the understanding that you may not count these courses towards a degree, diploma or any other qualification at the other institution where you are taking them.
- A candidate who fails to demonstrate satisfactory progress may be asked to show good cause why his or her candidature should not be terminated. A candidate who fails (or discontinues without permission) in more than 2 courses or 6 units (whichever is the higher) will be deemed not to have made satisfactory progress and may be asked to show good cause why he or she should be allowed to re-enrol.

Most postgraduate subjects are run in the afternoon or evening.

A 1-hour lecture each week for one semester (i.e. 14 weeks) together with the associated tutorial, laboratory and assignment work, is rated normally as one unit.

For their projects, candidates are encouraged to select problems based on their professional experience or their research interests. Many projects will be closely related to the research activity within the Faculty, and in some cases it may be possible for original work to be reported in the project report. A design study or a critical examination of a professional problem may also be acceptable as a project. The work on the project is expected to occupy about one-third of a candidate's total program, i.e. a maximum of 10 units credit.

Aeronautical Engineering
There is no coursework program currently available.

Chemical Engineering
There is no coursework program currently available.

Civil Engineering
The School of Civil and Mining Engineering offers the MES coursework program in the areas of Geotechnical Engineering, Structural Engineering and Structural and Foundation Engineering.

You should note, however, that the School of Civil and Mining Engineering may not be able to offer all its courses each year, so that even a full-time candidate may take 18 months or two years to complete the degree requirements in that School.

Electrical Engineering
The Department of Electrical Engineering is in the process of restructuring its postgraduate coursework options into a smaller number of more focused and relevant subjects which will be offered more regularly than has been the case in the past. Since the primary focus is on part-time enrolments, it may well require two years in order to complete requirements for the degree. The process of restructuring is to better relate a masters degree as the top level qualification with more focused diplomas and (approval being sought for 1998) certificates in specified areas as discussed below.

Mechanical and Mechatronic Engineering
The coursework program is available on both a full- and part-time basis in Mechanical Engineering There is no Masters program in Mechatronic Engineering available at present.

In order to complete the degree requirements in one year, however, a candidate would need to take subjects from those offered by other departments or by another tertiary institution.

Environmental Engineering
The Faculty of Engineering offers a coursework program in Environmental Engineering for the MES degree and DipEnvironEng. While the program is managed by the Department of Chemical Engineering, teaching is by Chemical, Civil and Mechanical Engineering, as well as by other departments in the University.

B oth MES and Diploma candidates will be required to complete certain core requirements:

- MES candidates will need to choose at least 15 units from the list of postgraduate environmental subjects taught by the Faculty of Engineering and Diploma candidates 10. The course P4.300 Environmental Impact Assessment will be a core requirement for all candidates within these 15/10 compulsory units. This will mean that 50% of the coursework will have to be taken from postgraduate Environmental Engineering subjects.
- All candidates will also be required to complete at least one subject from each of the approved Economics subjects and Planning and Law subjects.
- The remaining units to be completed may be chosen from any of the postgraduate subjects offered by the Faculty of Engineering.

Diplomas and Certificates

Diplomas:
Graduate Diplomas are offered on a full fee-paying basis. Courses leading to the award of a diploma are currently available in the following specialist areas:

Geotechnical Engineering	DipGeotEng
Structural Engineering	DipStructEng
Structural and Foundation Engineering	DipStructFoundEng
Power Engineering	DipPowEng
Computer Systems Engineering	DipCompSystEng
Telecommunications	DipTelecomm
Environmental Engineering	DipEnvironEng

The minimum academic entry requirement is the 4-year Bachelor of Engineering degree from the University of Sydney, or an equivalent qualification from another university or tertiary institution.

Theminimumperiod of candidature is one year full-time and two years part-time and the maximum period of candidature for all candidates is two years full-time and three years part-time.

Candidates are required to complete 20 units of coursework, chosen from the subjects available for the MES degree. The Diploma requirements differ from the MES requirements only in that no project is required.

The School of Civil and Mining Engineering offers Diplomas in Geotechnical Engineering, in Structural Engineering and in Structural and Foundation Engineering. As for the MES, even full-time candidates could take 18 months to two years to complete the diploma requirements.

The Department of Electrical Engineering offers three Diplomas in specific areas: Telecommunications, Computer Systems Engineering, and Power Engineering. Tables of courses for these diplomas are being continually developed in line with industry and graduate need. This can lead to requiring more than one year of part-time candidature in order to enrol in specific courses.

ThsTDiploma in Environmental Engineering is managed by the Department of Chemical Engineering. The teaching is provided by Chemical, Civil and Mechanical Engineering and by other teaching departments in the University. As for the MES in Environmental Engineering, the DipEnvironEng has certain requirements:

- Diploma candidates will need to choose at least 10 units from the list of postgraduate environmental subjects taught by the Faculty of Engineering.
- The course P4.300 Environmental Impact Assessment will be a core requirement, as will the completion of at least one subject from each of the approved Economics and Planning and Law subjects.

The Committee for Postgraduate Studies of the Faculty of Engineering has prescribed subjects which may be taken by candidates for the degree of Master of Engineering Studies and by candidates for postgraduate diplomas within the Faculty.

Certificates:

The Department of Electrical Engineering is also expecting approval of a number of Graduate Certificates from 1998. These 10 credit-point qualifications (half that required for a Diploma) offer a more focused qualification of immediate application to workplace needs. The status, requirements and availability of these certificates can be obtained from the department.

Note: For information about these subjects, please contact the postgraduate adviser in the Faculty Office, or the coursework adviser in your school or department.

7. Other Information

(a) Faculty Specific Information

The Faculty

Faculty adviser

You are most welcome to discuss with the undergraduate or postgraduate advisers any questions about your studies, difficulties in maintaining your studies for financial or personal reasons, or any other questions or problems that may arise. *As difficulties can usually be handled more easily in the early stages, you should seekhelp without delay.* Discussions are held in strict confidence—simply come to the Faculty Office, in Room 226, Engineering Faculty Building and make an appointment.

Enrolment

Special enrolment instructions

These are the special requirements for Engineering students.

To complete your enrolment in Engineering you proceed to the PNR Enrolment Centre in the Drawing Office, where you

— collect your enrolment form,

— complete a registration form,

— consult an adviser about your plan of courses and

— record your courses on the computer and receive your timetable.

Examinations

Freedom of Information Act

Examination scripts, or copies of same, are available for viewing or collection from Departmental Offices for three months after final examinations each year, after which they will be shredded.

Enquiries

All examination result enquiries must be made with your Department. The Engineering Faculty Office is not equipped to handle examination enquiries.

Supplementary examinations

A supplementary examination may be granted by the Faculty:

(a) to candidates whose performance in an examination has been significantly affected by duly certified illness or misadventure;

(b) to candidates who have failed an examination but whose overall level of performance in the year's work is deemed sufficient to warrant the concession of a further test.

Supplementary examinations under category (b) are normally granted *only* to those candidates who are in their first year of attendance.

The award of supplementary examinations is a privilege and not a right.

Illness or misadventure

The Faculty of Engineering recognises that the performance of students may be adversely affected by illness or other misadventure, and makes provision for special consideration of such disabilities when examination results are considered.

Any student who believes that his/her performance has been or may be adversely affected by an occurrence of illness or misadventure may request the Faculty to make special consideration of same. All such requests must include a special consideration application on the form provided by the Faculty, supplied within one week of the occurrence and accompanied by an appropriate medical certificate or other relevant documentary evidence apart from the student's own submission. Such certificates or documentary evidence *should state not only the nature of the illness or misadventure but also (where relevant) the opinion of the issuer as to the extent oftjie disability involved.*

If the student has completed the assessment for which special consideration is requested, then further documentary evidence of the extent of the disability from a specialist medical practitioner/counsellor etc. must also be supplied. For example, if a student completes an examination but still wishes to request special consideration for it, this additional specialist evidence is required.

Finally, the Faculty intends only to compensate for sub-standard performance in assessments which do not reflect a student's true competence in a subject, and such provisions must not act to the disadvantage of other students. The Faculty will only compensate students when there is clear evidence that results have been adversely affected by the disability for which special consideration is requested.

Financial assistance

Special assistance

In certain circumstances assistance is available to students who encounter some unforeseen financial difficulty during their studies. The assistance is usually in the form of bursaries or interest free loans.

Students wishing to apply for financial assistance should make enquiries from either of the following:

Financial Assistance Office, Student Services, tel. 9351 2416.
President of the Students' Representative Council, tel. 9660 5222.

J.N. Eilis Memorial Fund

The J.N. Ellis Memorial Fund was established in 1969 following an appeal made to all graduates in engineering to honour the memory of Neil Ellis, who as Sub-Dean and later as Administrative Assistant to the Dean over a considerable period of years was able, by sympathetic counselling, to help many students who were having difficulties in completing their studies.

The object of the fund is to provide financial assistance to students in the Faculty of Engineering who are in such a position that without assistance they would not be able to continue their studies. Students seeking such assistance should apply to Financial Assistance, Student Services, tel. 9351 2416. Awards are made on the recommendation of the Dean. Value: $500. Applications may be made at any time.

Those who receive assistance from the fund are asked to make a contribution to it when they are financially able to do so. In this way the fund will be able to continue and grow in the extent to which it can help deserving students in future years.

Learning assistance

The University's Learning Assistance Centre offers a wide range of workshops and other activities to assist students develop the learning and language skills needed for academic study. The workshops are

available free to all enrolled students of the University. Workshop topics include essay and assignment writing, oral communication skills, studying at university, conducting research.

The Learning Assistance Centre is located on Level 7 of the new Education Building next to Manning House (tel. 9351 3853).

(b) List of Staff by Departments

1. Staff: FACULTY

Dean

Professor JudyARaper.BEPhD *U.N.S.W.* CPEng.,FIChemEFIEAust

Pro Dean

Professor John Robert Booker, AO, BSc PhD DEng, FAA

Associate Dean (Postgraduate and Research)
Associate Professor Kenny C.S. Kwok, BE PhD *Monash,* FTEAust

Associate Dean (Undergraduate)

Associate Professor Geoffrey W. Barton, BE PhD

Advisers to Undergraduate Students

Aeronautical

Undergraduate Adviser - Professor Grant P Steven
Junior - Dr Osvaldo Querin
Intermediate - Dr Kee Choon Wong
Senior - Dr K Srinivas
Senior Advanced - Dr Peter Gibbens

Chemical—

Undergraduate Adviser-Associate Professor G.W. Barton
Junior—Dr K.C. Hughes
Intermediate—Dr V.G. Gomes
Senior—Associate Professor D.F. Bagster
Senior Advanced—Dr LA. Furzer

Civil-

Junior and Intermediate—Mr N.L. Ings
Senior—Dr M.J. Clarke
Senior Advanced—Associate Professor A. Abel

Electrical—

Junior —Dr M. Johnson
Intermediate - Dr M Hedley
Senior—Dr J. Rathmell
Senior Advanced—Associate Professor D. Wong

Mechanical—

Undergraduate Adviser—Dr Assaad Masri
Postgraduate Adviser—Prof. Nhan Phan-Thien
Junior—Dr L. Bilston
Intermediate—Mr P. McHugh
Senior—Dr D. Fletcher
Senior Advanced—Dr J.D. Atkinson

Secretary to the Faculty and Finance Officer

Mr Michael Whitley, BA Hons *East Anglia* MCom *U.N.S.W.,* ASA CIAFCIS

Student Administration Staff

Postgraduate Adviser — Ms Josephine Harty, BA *Macq.*
Undergraduate Adviser — Mrs Anna Maria Brancato

Executive Assistant to the Dean

Ms Evangeline Chow, BA DipEd

Executive Officer, Engineering Advancement Office

Mr Jeremy M. Steele, BA *Keele*

Marketing Manager

Mr Eric van Wrjk, BSc *ANU* GradDipEd GradDipAppEcon *UCan*

Chancellor's Industry Scholarships in Engineering

Executive Officer: Ms Lee Glasson, BA DipEd

Computer Engineer

Mr Kevin R. Rosolen, MSc *Macq.*

Database Administrator/Manager

Mrs Lila Yassini, BSc *Tehran* GradDipMetallurgy *W'gong* MCompSc *W'gong*

Professional Officer Grade II

Didier Debuf, BE *U.N.S.W.*

Industry Liason

Dr Maurice B arton, BSc Hons *Brighton C. O. T.* MSc *Oxon* PhD *Aston,* FAIM

Faculty Librarian

Mrs Joan Morrison, BA MSLS *Case Western Reserve*

2. Staff: DEPARTMENTS

Aeronautical Engineering

Head of Department

Grant P. Steven, BSc *Glas.* DPhil *Oxf.*

Lawrence Hargrave Professor

Grant P. Steven, BSc *Glas.* DPhil *Oxf.*
Appointed 1991

Senior Lecturers

Douglass J. Auld, BSc BE MEngSc PhD
Karkenahalli Srinivas, ME PhD *I.I.Sc.*
Liyong Tong, BSc MEngSc *Dalian* PhD *B. U.A.A.,* MJEAust

Lecturers

Peter Gibbens, BE(Aero) PhD *N'cle*
Kee-Choon Wong, BE PhD
Osvaldo Querin, BE ME(Res), PhD

Professional Officer

Jehangir Madhani, MSc, *Strath,* BSc *S'landUK*

Chemical Engineering

Head of Department

Brian S Haynes, BE PhD *U.N.S.W.,* FIChemE, FIEAust, CPEng

Professors

Brian S Haynes, BE PhD *U.N.S.W.,* FIChemE, FIEAust, CPEng
Appointed 1997
Rolf G.H. Prince, BE BSc *NZ.* PhD, FIChemE HonFIEAust FTSE FEng
Appointed 1969

ICI Australia/University of Sydney Professor of Process Systems Engineering

Jose Romagnoli, BE *N.delSur.Arg.* PhD *Minn.*
Appointed 1991

Shell Professor of Environmental Engineering

James G Petrie BSc, PhD *Capetown*

Professorial Fellow

Ric Charlton, BE MESc, FTS

Associate Professors

DavidF. Bagster, BScApp BScBE *QldftiD Camb.,* FIEAustHChemE CEng
John P. Barford, BE PhD *U.N.S.W,* FIChemE FIEAust CEng (Director of Research)
Geoffrey W. Barton, BE PhD

Senior Lecturers

Ian A. Furzer, DSc(Eng) PhD *Lond.,* MIChemE CEng MAIChemE
Timothy A.G. Langrish, BE *NZ.* DPhil *Oxf,* MIChemE
Vincent G. Gomes, BTech MEng PhD *Montr.*

Technical Manager

Robert Staker, PhD *Adel.*

Professional Officer Grade IV

Denis M. Nobbs, BE *U.N.S.W.*

Honorary Appointments

Honorary Research Associates

G. DeLeon, PhD, MAIMM GSA
Kenneth C. Hughes, BSc PhD *U.N.S.W.* ASTC *S.T.C.*
Peter B. Linkson, BE PhD, FIEChemE FAusIMM FGAA Ceng
Barry W. Walsh, BE PhD, MIChemE CEng SPE

Honorary Professional Associate

Wayne A. Davies, BSc PhD, MEAust

Civil Engineering

Head of Department

John P. Carter, BE PhD, MICE FIEAust

Challis Professor of Civil Engineering

Nicholas Snowden Trahair, BSc BE MEngSc PhD DEng, FIEAust
Appointed 1979

Professors

Harry George Poulos; AM, BE PhD DScEng, FIEAust FASCE FAA
Appointed 1982
John P. Carter, BE PhD, MICE FIEAust
Appointed 1990

Professor of Engineering Mechanics

John Robert Booker, BSc PhD DEng, FIEAust FAA
Appointed 1985

BHP Steel Professor of Steel Structures

Gregory J. Hancock, BE BSc PhD, FIEAust
Appointed 1990

Associate Professors

Andrew Abel, DipIIng *T.U. Bud.* MSc *McM.* PhD *U.N.S.W,* CEng FFM
Peter Ansourian, BSc BE PhD, FIEAust
AH Ja'afari, BSc ME *Tehr.* MSc PhD *Sur.*
Kenny C.S. Kwok, BE PhD *Monash,* FIEAust
Stuart G. Reid, ME *Cant.* PhD *McG.*
John C. SmaH, BSc(Eng) *Lond.* PhD, MEAust MASCE
Robert J. Wheen, BSc BE MEngSc, FIEAust MASCE

Senior Lecturers

David W Airey, BA MPhil PhD *Camb.*
Logan W Apperley, BE PhD *Auck.*
Murray J. Clarke, BSc BE PhD
Kim J.R. Rasmussen, MEngSc *T. U. Denmark* PhD

Lecturers

Noel L. Tugs, MEngSc *U.N.S.W* BE, MASCE MIEAust
Lloyd J. Pilgrim, BSurv PhD *N'cle(N.S.W.)*

Tutor in Surveying

John Curdie, ME DipT&CP, FIS

Professional Officers Grade II

Nigel P. Balaam, BE PhD

Professional Assistant

Craig Polley, B ScE MSCE *Wisconsin*

Computer Systems Officer

Danny D.Q. Kim, BSc *Ho Chi Minh United*

Honorary Appointments

Emeritus Professor

A.E. Jenkins, BMetE MEngSc PhD *Melb.,* FIM FIEAust MAIMM MAIM

Honorary Research Associates

Russell Q. Bridge, BE (Hons) *U.N.S.W,* PhD, FIEAust
Peter T.Brown, BE PhD
Roger J. Enright, BE PhD *U.N.S.W.* MSc *W.Virginia*
Howard B. Harrison, BE PhD, MTEAust
Ian S.F. Jones, BE *U.N.S.W.* PhD *Wat,* MIEAust
Harold Roper, BSc PhD *Witw.* MEngSc, MAIMM
Richard D. Watkins, BE *Qld* PhD *Aberd,* MIEAust

Honorary Teaching Associate

Ian G. Bowie, MSc *Mane,* MCSCE MIEAust

Electrical Engineering

Head of Department

David Hill, BE BSc *Qld* PhD *N'cle(N.S. W),* FIEAust FTEEE

P.N. Russell Professor

Trevor WiUiam Cole, BE *W.Aust.* PhD *Camb.,* FIEAust
Appointed 1980

Professors

David HiU, BE BSc *QldFhD N'cle(NS.W.),* FIEAust FTEEE
Marwan A. Tabri, Maitrise de physique *Paris* PhD
Hong Yan, BS *Nanking LET.* MSE *Mich.* PhD *Yale*

Associate Professors

Robert A. Minasian, BE PhD *Melb.* MSc(Dist) DipMicrowave Eng(Dist) *Lond.,* MIEE SMIREE FIEAust
Stephen W Simpson, BSc PhD, FIEAust
Anthony D. Stokes, BSc BE PhD, FIEAust
Branka S. Vucetic, MSc PhD *Belgrade*
David G. Wong, BSc BE MEngSc PhD, FIEAust

Readers

Shu Yuen Ron Hui, BSc *Birm.* PhD DIC *Lond.,* MTEEE MIEE

Senior Lecturers

David F. Gosden, ME U.N.S.W. MBA A.G.S.M., MIEAust
David Levy, BSc, MSc (Engl), Natal, MIEE PhD Natal
James G. RathmeU, BSc BE PhD, SMIREE
Graham E. Town, *BEN.S.W.I.T.* PhD, MIEEE MIREE
Hansen Yee, BSc BE PhD, MIEEE

Lecturers

Mark Hedley, BE B Sc PhD
Xiheng Hu, DipMechEng *Beijing* DipElecEng *Chongoing Indust. Uni.* MElecCompEng *China* PhD
Mark Johnson, BSc BE PhD
Swamidoss Sathiakumar, BSc *American Coll. IndiaBEMB* PhD *LI. Sc.*
Greg Cowle, BSc, BE *U.N.S.W,* PhD *Southampton*
Dragana Popovic, BE, ME *Belgrade,* PhD *N'cle*
Yash Shrivastava, BTech ITT Kanpur *India,* PhD *Iowa*

Professional Officers Grade III

Ross Hutton, BE *Q.I.T.*
Peter J. Seebacher, BAppSc *N.S.W.I.T.* MEngSc
Robert G. Sutton, ME *U.N.S.W.*

Professional Officers Grade II

Ebrabim Gogani, ME *Tehr. Polytechnic* PhD *Brunei*
Michael Rados, BSc BE MEngSc
AH Raghemi-Azar, BSc *Tehr. Polytechnic* MSc PhD *S'ton*

Research Fellows

Kamal Alameh, BE *Beirut* MEngSc *Melb.* PhD
Zhong-Ping Tiang, BSc *Wuhan* PhD *Ecole des Mines France*
Yuxing Zhao, BSc *Suzhou,* MSc *Shanghai Inst Optics and Fine Mech*
Richard Coggins. BE, BSc, PhD
Tinhong Yuan, MSc, PhD *Beijing Inst Tech*

Honorary Appointments

Emeritus Professors

W.N. Christiansen, DSc *Melb.,* FInstP FAIP FIEE FIEAust FAA FIREE(Aust)

Hugo K. Messerle, MEngSc DSc *Melb.* PhD, FTS FIEE FIEAust FIREE FIEEE FAIP

Research Associate

Peter M. NickoUs, MB BS BSc BE PhD

Research Affiliate

J J. Lowke, BSc PhD DipEd *Adel.*

Mechanical and Mechatronic Engineering

Head of Department

lohn H. Kent, BE MEngSc PhD

PN. Russell Professor

Roger Ian Tanner, BSc *Brist.* MS *Calif.* PhD *Mane,* FAA FTS FIEAust MASME MAIChE
Appointed 1975

Professors

Robert William Bilger, BSc BE *N.Z.* DPhil *Oxf.,* FTS FIEAust
Appointed 1976
Hugh Francis Durrant-Whyte, BSc(Eng) *Lond.* MSE PhD *Penn.*
Appointed 1995
Yiu-Wing Mai, BSc(Eng) PhD *U.K.,* MASME FIEAust
Appointed 1987
Nhan Phan-Thien, BE PhD
Appointed 1991
Michael V Swain, BSc, PhD *U.N.S.W.*
Appointed 1997

Associate Professors.

John H. Kent, BE MEngSc PhD
Assaad R. Masri, BE PhD

Senior Lecturers

Steven W Armfield, BSc *Flinders* PhD
John D. Atkinson, PhD *Cal.Tech.* BSc BE
M.W.M.G. Dissanayake, BSc(Eng) *Peradeniya* MSc PhD *Birm.*
Andrei Lozzi, BSc *U.N.S. W.* MEngSc PhD
Paul J. McHugh, BSc BE
Eduardo M. Nebot, BS *Bahia Blanca* MS PhD *Colorado*
David C. Rye, BE *Adel.* PhD
Lin Ye, B S *Harbin* MS PhD *BIAA*
Liangchi Zhang, BSc MEng *Zhejiang* PhD *Peking* MASME MASPE MJSPEMJSME

Lecturers

Lynne E. Bilston, MSc PhD *Penn.* BE

Visiting Professor

Raymond A Jarvis BE (Elect), PhD *WA.*

Adjunct Associate Professor

Robin J. Higgs, MBBS *Lond* FRCS *Edin* FRACS FA Orth A

(c) Scholarships and Prizes

Many students enrolling in the Faculty of Engineering obtain financial assistance by way of a cadetship or scholarship, either at the time of enrolment, or at a later stage in their studies.

Information about the Australian government *Austudy Scheme* is available from the State Director, Department of Employment, Education and Training, 477 Pitt Street, Sydney 2000.

Scholarships are also awarded by a number of industrial organisations. Many of these do not require the student to enter into a financial bond.

Some government departments and public authorities provide cadetships or traineeships which require the student to enter into an agreement to work for the employer for a specified number of years after graduation.

Before accepting a bonded cadetship or traineeship students should give careful consideration to the conditions of the award and in particular the obligations which they will incur should they decide to relinquish the award for any reason.

A list of currently available prizes and scholarships is available from the University's Scholarships Office in the Main Quadrangle, tel. 93513250.

Chancellor's Industrial Scholarships in Engineering (CISE)

Chancellor's Scholarships in Engineering are open to final year high school students who expect to achieve a TER of at least 96.00 in the HSC or interstate equivalent. They are highly competitive and many applications are received each year for the limited number of places available.

The Scholarships are worth $10 250 in 1995. This is paid in fortnightly instalments for the four years' duration of the normal undergraduate course, subject to continued satisfactory academic performance.

Chancellor's Scholars attend site visits to the sponsoring companies as well as functions at the University designed to promote good relations and personal interaction between the students and the organisations supporting the CSE program.

During the long vacations between first, second and third year, each Scholar is allotted to a sponsoring organisation for industrial education placement (IEP). Unlike other engineering undergraduates who have only one industrial placement during their time at the University, Chancellor's Scholars have the opportunity to gain experience working in various aspects of industry. Every Scholar works for three different companies and every sponsor sees three different students over the four years of the undergraduate course.

Most scholars expect to, and do join one of the sponsors on graduation, but there is no formal obligation either way.

The CSE Program is controlled by a Steering Committee and administered by the Faculty of Engineering.

Chairman, Steering Committee
Mr P. Moyle (Shell Australia)

Director
Professor R.G.H. Prince

Executive Officer
Ms Lee Glasson

Sponsoring organisations

ABB Asea Brown Bovery

AGL Sydney Ltd

Alcan Australia Limited

Ansett Airlines

Babcock Australia Limited

Baulderstone Hornibrook

BHP Engineering Pty Ltd

BHP Rod and Bar Products

BHP Slab and Plate Products

Boral Limited

Bull HN Information Systems

Caltex Refining
CIG
Civil Aviation Authority
CMPS&F Pty Ltd
Comalco Rolled Products
Council of the City of Sydney
CRA Adv. Tech. Development
CSR Humes
CSR Refined Sugars
Dow Chemical
DSTO Surveillance Research Laboratories
EPT Limited
Esso Australia
Federal Airports Corporation
Hawker De Havilland
ICI
James Hardie Building Projects
Master Foods of Australia
Metal Manufactures Limited
Optus Pty Ltd
Pacific Power
Pioneer Concrete
Qantas Airways
Rheem Australia Water Heater Div.
Roads and Traffic Authority
Schlumberger Seaco Inc.
Shell Company of Australia Ltd
Shell Refining (Australia) Pty Ltd
State Rail Authority
Sydney Electricity
Telecom
Telestrar
The Readimix Group
Thiess Contractors
Transfield Group
Wang Australia
Water Board

(d) Student Facilities and Societies

Noticeboards

Faculty noticeboards, one for Junior courses and one for Intermediate courses, located outside the Student Enquiry Office, 2nd level, Faculty Building. Each of the Engineering departments has a noticeboard for Senior and Senior Advanced students.

Noticeboards are also in the various Science departments, and information concerning the courses given by those departments will be posted on these boards.

Details of class lists, timetable variations, examination times and other information relating to courses of study will be posted on the relevant noticeboards. Students are expected to inspect the noticeboards at frequent intervals.

Notices referring to cadetships, scholarships, vacation employment and career opportunities and other matters of this nature are also displayed on the noticeboards in and around the Student Enquiry Office, 2nd level, Engineering Faculty Building.

The Faculty library

The University of Sydney Library consists of a central library—called Fisher Library—and a number of branch libraries of which Engineering is one. The Engineering Library is on the ground floor of the PNR Building in the Engineering Precinct. Other branch and department libraries within the University contain relevant material, e.g. Architecture, Physics, Mathematics, Chemistry, Wolstenholme and Badham Libraries. Engineering students may use all the libraries of the University.

Multiple copies of reference books for Junior and Intermediate courses are held in the undergraduate section of Fisher Library. Students in the senior years in Engineering will find most of their reference material in the Engineering Faculty Library. Books may be borrowed for two weeks with two loan renewals permitted. Journals may not be borrowed but photocopying facilities are available.

The Engineering Library opens from 8.45 am to 6.00 pm Monday-Friday during term. Vacation hours are 9.00 am to 5.00 pm Monday to Friday.

Dewey Decimal Classification numbers are given for some courses in chapter 4: *Courses of Study.* These are notmeant to be exhaustive lists and reference should also be made to the subject catalogue in the library.

Engineering associations

SUCEA

The Sydney University Chemical Engineering Association (SUCEA) is a body representing the graduates of the Department of Chemical Engineering. Established in the 1950s, it is one of the oldest alumni associations at the University of Sydney. With 1326 members living in over 20 countries around the world, it is also one of the largest.

SUCEA holds a number of social events and a technical symposium each year with the aim of maintaining strong contact between the Department and its graduates (some of whom are well into their sixties). So, via SUCEA, you will still be part of the 'Chem Eng' family even after you graduate.

SUEUA

The objects of SUEUA, the Sydney University Engineering Undergraduates'Association, are:

(a) to perform such actions and to organise such functions as the committee may deem necessary and desirable in the interests of the Faculty of Engineering, University of Sydney, and the students thereof;
(b) to act as an intermediary body between the teaching staff on the one hand and the members of the Association on the other;
(c) to organise Engineering teams for inter-faculty sport.

The office of the SUEUA is on the ground floor of the PNR Building close to the Faculty library.

In this office the association conducts a bookshop where many items of stationery, and some textbooks and codes of practice, are available at competitive prices.

The SUEUA normally holds an election for the president and other office bearers in March each year and all financial members of the association are eligible to vote. The president becomes a member of the Faculty by virtue of this office. The by-laws of the University provide for the undergraduates in Engineering to elect two others of their number to be members of Faculty and an election for this purpose is conducted in October each year. All Engineering undergraduates, including those enrolled in the Faculty of Science as candidates for the double degree, are eligible to vote.

Institution of Engineers, Australia

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

The institution functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession—e.g. civil, electrical, mechanical, chemical and transportation to name a few.

Any student of an approved School of Engineering can join the Institution as a student member (StudlE Aust).

As a student member you will receive the fortnightly magazine *Engineers Australia,* containing articles of general engineering interest and advising you of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, and so on.

Student members may freely use the comprehensive library and reference facilities maintained by the Institution—a handy place to obtain a hard-to-get book or periodical.

Within most divisions is a Graduates and Students Section, known as GAS, and all graduates of, or students at, approved engineering schools are eligible for membership.

The Graduates and Students Sections organise film nights, site tours and other activities of general interest. The Malcolm Stanley Speakers' Competition for public speaking is held each year, usually in September, and prizes are awarded for the best speeches.

For membership information and application forms enquire at the Faculty Office or at the Sydney Division Office, 118 Alfred Street, Milsons Point 2061 (P.O. Box 138).

The Institution of Chemical Engineers

An alternative organisation for Chemical Engineering students is the Institution of Chemical Engineers. The Institution welcomes and values studentmembers, offering special rates for technical meetings, together with Institution literature and guides to gaining employment. For further information contact.the General Office in Chemical Engineering.

The Association of Professional Engineers, Scientists and Managers, Australia

APESMA is a professional organisation that represents the industrial interests of its members. Its major focus is on providing advice and assistance on employment-related matters, including individual representation and improving salaries and conditions for professional engineers, scientists and managers. The Association also provides members with legal, financial and insurance services and runs an extensive management education program.

APESMA has some 19 000 members in all areas of public and private sectors in Australia. In addition, 6500 university students in engineering and science-related disciplines are studentmembers.

The Association invites students to become affiliate members for no charge while they are studying. This membership gives students access to information and advice on industrial experience, salary rates for graduates and contracts of employment. Studentmembers receive *The Student Update,* apublication designed specifically for students, three times a year. This gives students some practical insight into aspects of the workplace to which they may not have given much thought, in particular the employment issues that affect them as professional engineers.

For more information and student membership application forms, contact Felicity Ryan, Membership Liaison Officer, tel. 9264 9500.

(e) A Short History of the Faculty

A hundred and seventeen years of engineering education

In 1983 the Faculty of Engineering celebrated one hundred years of engineering education at the University of Sydney.

At the beginning of March 1883 the first classes in engineering were held in the Main Building. Engineering then formed part of the newly created Faculty of Science (1882). The classes were attended at the opening by three matriculated students who were candidates for the engineering certificate and by seven non-matriculated students.
The lecturer in engineering was Mr W.H. Warren, who had been appointed in December 1882 following a decision by the University Senate to carry outsignificantrevisions to the teaching of the University. These revisions, which provided for the establishment of Schools of Medicine, Science and Engineering, were unable to be implemented in 1881 for lack of staff, accommodation, and facilities.

In 1883, when the new engineering curriculum was introduced, the Senate reported that 'great inconvenience [had] been felt during the year, both by the lecturers and the students, through the deficiency in accommodation for lecturing purpose ... the room occupied by the Lecturer in Engineering [was] much too small to contain the apparatus required for the illustration of his lectures...' A temporary structure was erected at the rear of the Main Building, and in 1885 classes moved to a fairly commodious low white building with a verandah facing Parramatta Road, on a site now partly occupied by the Holme Building.

In 1909 the new building for the P.N. Russell School of Engineering was sufficiently completed early in the year for the work of the school to be conducted within its walls. This building — an outcome of the extraordinary benefaction of Peter Nicol Russell — was formally opened by the Governor on 20 September 1909 at the same time as he opened the new Fisher Library building (now MacLaurin Hall). During the course of the next few decades extensions were made to the PNR Building until, with the expansion in student numbers in the 1950s and early 1960s, new facilities were constructed in the Darlington extension area across City Road. Since the mid seventies all departments have been accommodated in this area, although a wind tunnel in the Woolley Building is still in use by Aeronautical Engineering.

(f) Foundations and Centres

The Warren Centre for Advanced Engineering

The Warren Centre for Advanced Engineering is an independent, industry-linked institute committed to fostering excellence and innovation in advanced engineering throughout Australia. Set up in 1983 to mark the centenary of engineering education at The University of Sydney, The Warren Centre is a self-funding, non-profit organisation.

The Warren Centre has four objectives:

- Stimulating innovation in the advanced engineering technologies important to Australia's industrial development.
- Encouraging effective deployment and use of new engineering technologies.
- Promoting the integration of technology, management, design and enterprise among Australian businesses.
- Providing independent advice and comment on the above issues and their impact on national policies and industrial development and enterprise.

In its brief history, The Warren Centre has gained wide recognition for its unique approach and its achievements in diverse fields of engineering technology and industry development.

The Centre's core services includemajorprojects, seminars and lectures and a range of programs being developed in recent years for high-tech enterprises.

Operation

The Warren Centre is governed by aBoard of Directors which consists of a majority of members from industry as well as the Dean of Engineering and representatives from the Engineering Faculty and The University.

The Centre's fundamental aim is to engage in activities which are likely to justify strong participation and financial support by industry and the engineering profession.

The Centre underwrites the initial setup costs and risks for each activity from its investment income, which also covers core operating and administrative costs.

The investment base comprises donations, bequests and reserves. The reserves are adjusted regularly from investment income to preserve the original capital value of donations and bequests in current dollars.

Standing currently at just over $3 million, the investment base plays an important role in determining the scope and growth of The Warren Centre's activities.

Activities

Conferences and Seminars

Seminars are held during each Major Project. The Centre also sets up conferences and seminars to explore contemporary issues such as engineering risk, intellectual property, financing innovation, engineering mathematics and adding value.

SMENetworking

The Warren Centre promotes activities targeting small to medium size enterprises (SMEs), including the Auslndustry Business Networks Program and Round Tables where SMEs in suburban and regional centres exchange ideas, discuss issues and explore opportunities of mutual interest.

Opening Other Frontiers

The Warren Centre played a key role in the establishment of the Australian Graduate School of Engineering Innovation (AGSEI) and the Asia Pacific Smart Card Forum.

Publications

The Centre's publications on the findings of its activities have received world-wide respect for their value and objectivity.

Major Projects

The Warren Centre brings together the leading edge people in a selected field of engineering technology to work as a Major Project team to:

- Develop new insights and knowledge in the technology; and
- Accelerate the technology's application in Australian industry.

These Major Projects invariably result in important breakthroughs in the technology itself and impact on Australian engineering practice and business enterprise. Major Projects have included:

Underground Space in the Urban Environment (1996) - which established the status quo for development and use of underground space and provided strategies, supported by engineering technology, for integrating the use of underground space into the fabric of the urban environment.

Utilisation of Supercomputers in Science and Engineering (1992) - which demonstrated how high performance computing can provide a new approach to solving practical problems for industry and government through extensive use of case studies, giving hands-on experience to the project team.

Energy Management in the Process Industries (1990) - which demonstrated that commercially practical applications of modern energy management techniques and technology offer annual savings exceeding $1 billion nationally, and indicated how this might be achieved.

Economic Recycling and Conservation of Structures (1989) - which combined philosophy with practical technology to achieve cost-effective conservation and re-use buildings.

Fire Safety and Engineering (1989) - which established the basis for a new systematic engineering approach to achieve fire safety, with the prospect of large savings in building construction costs without any reduction in safety.

Preparing Australians for a Future with Technology (1988) - which examined cultural and educational tasks involved and provided guidelines for initiatives in technological awareness.

Winning by Design (1987) - which explored the key role that design plays in creating successful value-added products for export markets; it also played an important role in the establishment of the Australian Academy of Design.

AdvancedProcess Control (1987) - which identified potential benefits from the use of advanced process control in Australian industry and offered courses in technology.

Chairman, Board of Directors
Peter J North, BE, MBA *Harvard,* FAIM, FAICD

Executive Director
Professor Trevor W Cole, BE *W Aust.,* PhD *Camb.,* FTSE, FIEAust CPEng, FRSA, AIDQDip}

General Manager
Angus M Robinson, BSc *Melb.,* FAIM, FAusIMM

Administration Manager
Cheonhee Sohn, *BAHUFS* South Korea, MEd *U.N.S.W.*

Australian Centre for Innovation and International Competitiveness (ACIIC)

ACIIC was established as a non-profit company in April 1992 and has the status of adepartment of the Faculty of Engineering. Itis dedicated to building bridges between Australia's intellectual capability and the worlds of business and government. Its mission is to:

- work closely with Australian industry to build international competitiveness;
- support economic and social development using the leverage of technological innovation;
- integrate innovation to capture the benefits of the national investment in science and technology;
- assist the engineering community to understand the forces which are reshaping the requirements of engineering employment and engineering education.

ACIIC delivers a number of services to the Faculty. These include:

- teaching undergraduate and postgraduate courses in engineering management, innovation and environmental engineering and public policy;
- supervision of undergraduate final year theses and PhD students;
- assistance with strategic planning, marketing, the development of new teaching initiatives, and linkages with government and industry.
- It is also engaged in grant and contract-supported research on issues of science, technology, engineering and innovation planning and management. Recent projects include:
- development of appropriate models for innovation and competitiveness in the knowledge economy;

- models of social and organisational innovation appropriate to the learning organisation;
- application of foresight techniques to strategic planning and priority-setting;
- strategic planning for public sector organisations such as universities, schools, local governments and public libraries in the context of the information economy and technologies;
- evaluation of research funding programs, university industry linkages, and the distribution of basic research capability across Australian universities;
- application of new learning theories and technologies in schools and adult education and in involving industry.

ACIIC provides a non-engineering capability to the Faculty which will assist it to pursue relevant objectives of the strategic plan. Its contribution will be assessed against the quality of the student intake, the visibility and image of the Faculty, the quality and impact of non-engineering education and the strength of and revenue raised for research.

Australian Graduate School of Engineering Innovation (AGSEI)

AGSEI is a national Advanced Engineering Centre promoting an engineering culture which brings together technology, management and marketing, with an overall focus on wealth creation and the introduction of a more effective process of engineering innovation to Australian industry.

AGSEI has been formed jointly by the Engineering Faculties of the University of Sydney and the University of Technology, Sydney, and is located separately from both of them. Its objectives are:

- to ensure that today's engineers, as well as those of tomorrow, are better equipped to take leadership roles in assuring the success of industrial enterprises;
- to educate engineers and others to think and contribute across disciplines in a corporate environment;
- to demonstrate the central role of innovation in achieving competitive advantage;
- to provide industry with convenient access to national and international best practice in engineering management and the application of technology;
- to enhance the capability to commercialise new technology and the results of research and development;
- to foster the creation of new industry through technology transfer and the introduction of appropriate management systems;
- to raise understanding in the professions and society of the role of industry, technology and engineering in the creation of national wealth;
- to educate engineers to understand and contribute to enterprise management, and to educate executive managements to understand and utilise their engineering capability more effectively.

Students

Initially programs are being structured for engineers and other professionals who have been in industry for two to three years after completing their bachelor's degree. Later programs will be developed for undergraduate courses.

The programs

AGSEI offers an array of courses centring on:

Engineering Management

Engineering Innovation

Industrial Systems Engineering

The programs cover topics in:

- quality
- innovation
- technology
- systems engineering
- information technology and management
- computer-aided engineering and logistic support
- human resources and change management
- professional and business ethics
- design and documentation
- manufacturing
- government
- economics
- marketing
- finance
- law

The approach taken is distinctly different from that of an MBA. The MBA programs teach generic management, regardless of what is being managed. AGSEI builds specifically on the capability of *engineers,* and is wholly about organisation and application of engineering effort to innovation and business performance — *total engineering,* not total management.

Modules

The basic program element is the module, typically offered over one week and involving intensive material presentation plus workshop and project sessions. Modules may be aggregated, by those who wish to do so, to lead to formal awards at several levels such as graduate certificate or master's degree. Modules will have the following characteristics:

- All modules will be available in stand-alone form, designed expressly to meet the needs of engineers and engineering enterprises.
- All programs require the course content to be trialed in industry, with advice from AGSEI staff, and (where possible) the results to be reported and discussed in workshop sessions.
- Heavy use is made of industry-based project work.
- Wherever possible, modules involve group interaction, normally multi-disciplinary. AGSEI acts not only as a teaching and advisory resource but as a framework in which participants (engineers and other professionals who deal with engineers) learn from each other and from inter-organisation contacts.

More detailed information may be obtained from the AGSEI (tel. 209 4111).

Finite Element Research Centre

The Finite Element Research Centre aims to promote research and development into finite element methods, to enhance education in finite element analysis (FEA) and to provide a research source for industrial and commercial use of FEA. Areas of interest to the Centre include structural mechanics, heat transfer, fracture mechanics, buckling, composite materials, structural dynamics and earthquake engineering.

Chemical Engineering Foundation

The Chemical Engineering Foundation within the University of Sydney was established in 1981 with the following objectives:

- to foster good communications between industry and commerce and the Department of Chemical Engineering,
- to advise on courses of instruction in Chemical Engineering,
- to encourage students of high calibre to work in the Department,
- to assist graduates in Chemical Engineering to make appropriate contributions to industry,
- to facilitate and develop research in Chemical Engineering with particular reference to industry oriented projects.

The Chemical Engineering Foundation provides an opportunity for executives in Australian industry to assess and discuss what is taught in the undergraduate course in chemical engineering.

Activities include financial support to the undergraduate programme and to research by both postgraduates and staff. Continuing education courses for practising engineers are regularly arranged, publication of updates on the Department's research activities is undertaken twice yearly, and emphasis is placed on expanding industry-university collaboration.

Australian Centre of Advanced Risk and Reliability Engineering

The Australian Centre of Advanced Risk and Reliability Engineering Ltd (ACARRE) is a joint venture of the University and the Australian Nuclear Science and Technology Organisation (ANSTO). It is a company limited by guarantee, and has the objective of promoting appropriate application of risk and reliability engineering and management principles in Australia and the near region. It operates in three fields: education, through undergraduate, postgraduate and external courses; research; and consulting for industry and government throughout Australia in a range of industries including the chemical industry, oil refining, transport, storage and distribution. In undertaking these activities, ACARRE draws on specialist skills from the University, ANSTO and elsewhere. The Executive Director is the ANSTO Professor of Risk Engineering.

The Civil Engineering Foundation

The objectives of the Foundation are to assist the University of Sydney on matters associated with education and research in Civil Engineering and mining Engineering. By securing the resources the Foundation enables the Department to be the leading provider of civil engineering education and research in Australia.

In particular the Foundation aims to identify the needs and to provide the resources to:

- Assist the Department to achieve and maintain pre-eminence in selected disciplines in civil and mining engineering.
- Establish the Department as the leader in the provision of postgraduate and continuing education.
- Enhance co-operation between industry and the Department in education, research and technical services.
- Facilitate communication at all levels between the civil and mining engineering community and the Department.

The Foundation actively fosters collaboration between the school, the engineering profession and the industry it serves.

This is achieved by:

- Promoting engineering consultation, research, training, lectures, short courses and technical reporting.
- Providing direction to undergraduate and postgraduate education programmes.
- Sponsoring research projects in the School and encouraging research links with industry.
- Forming working parties of top engineers from government, consulting practices, the civil and mining industry and the University to study topical issues arising in the engineering profession.
- Reporting the important results of all these activities to Members and the Public through reports and engineering publications.

The Foundation is supported by annual subscriptions from its Benefactors, Governors, Members and Personal Members, functions and by special donors. The annual subscriptions, as determined by the Foundation Council are: $5000 for Governor level and $1000 for Member. Details of other grades of membership are obtainable from the Foundation. Tel (02) 9351 2127.

Management of the Foundation is vested in a Council of not less than five representatives of Governor organisations and up to five representatives of Members appointed by the Senate. Ex-Officio members of the Council include the Chancellor, deputy Chancellor, Vice Chancellor, the Professors in the Department of Civil and Mining Engineering, the Head of Department, the President of the Civil Engineering Graduates' Association, the Directors of the School's Centres, and representatives of the Students.

Electrical Engineering Foundation

The mission of the Electrical Engineering Foundation is to build a successful partnership between Sydney University Electrical Engineering, industry and the profession which facilitates, in Australia, the achievement of world-class performance through education, research and development.

The Foundation is managed by a Board made up of representatives from industry, University staff, students and graduates.

The Foundation pursues its mission through activities in the following areas:

- Forward Planning for the Department
- Presenting University Research
- Identifying Industry's Research needs
- Industry Funding of new Research and Teaching
- Bringing Industry and Students together
- Encouraging Student and Teaching Excellence
- Professional Development for Industry
- Marketing to potential Students
- Alumni Relations

President: Mr Allan Gillespie, Chief Executive Officer of AUSTA Electric. Director: Professor Trevor Cole. Executive Officer: Mr Stuart Glanfield. Tel: 9351 7172, e-mail: eef@ee.usyd.edu.au.

Centre for Geotechnical Research

The Centre was set up within the University of Sydney in August 1987 with the primary aim of promoting industry-university cooperation in furthering knowledge in the theory and application of geotechnics and geomechanics.

It comprises staff and laboratories from the following departments, schools and groups: Civil Engineering, Geology and Geophysics, Geography, Soil Science, Ocean Sciences, Ocean Sciences Institute and the Coastal Studies Unit.

The objectives of the Centre are:

- to serve as a focus for research in geotechnics and geomechanics within the University of Sydney,
- to undertake specialised research, investigation, consulting, and testing work for industry and government organisations,
- to foster inter-disciplinary research and teaching and geotechnics and geomechanics,
- to develop techniques and equipment for geotechnical testing,
- to disseminate technical information on geotechnics and geomechanics to industry.

Centre for Advanced Structural Engineering

The Centre for Advanced Structural Engineering was established within the University of Sydney to promote the advancement of structural engineering within and beyond the University. The Centre is housed within, and involves University staff and facilities of, the Department of Civil Engineering.

The Centre provides a focus for researchers, industry, government and practising structural engineers for research and the teaching of contemporary structural technology.

The Centre undertakes specialised research, investigation, consulting and testing work for government, consulting engineering, and industry, and disseminates technical information on structural engineering to the profession and industry.

Centre for Advanced Materials Technology

The Centre was established within the University of Sydney in 1989 and is located in the Department of Mechanical and Mechatronic Engineering with the main objective of promoting industry-University collaborative research on the design, engineering, development and manufacturing technology of advanced materials. The Centre also undertakes specialised research and development projects, consulting and testing activities for industry and government organisations in advanced materials. It comprises staff and research facilities in the Departments of Mechanical Engineering, Civil and Mining Engineering, Aeronautical Engineering, Applied Physics, Operative Dentistry and the Electron Microscope Unit.

Cooperative Research Centre in Aerospace Structures

In 1992 the Cooperative Research Centre in Aerospace Structures started on its program of research in composite aircraft structures. This is aimed at providing a research base for manufacturing in Australia. Cooperating in the Centre are the University of Sydney, Monash University, the University of New South Wales, the Royal Melbourne Institute of Technology, Aeronautical Research Laboratories, Hawker de Havilland and Aerospace Technologies of Australia. When at full operation it is expected that nearly 30 researchers will be active on the Centre's projects.

Optical Fibre Technology Centre (OFTC)

The OFTC at the University was established in 1989 as an initiative of the telecommunications industry with the primary aim to undertake research and development in the design, fabrication and application of Application Specific Optical Fibres. The key researchers are Dr Ian B assett (Physics), Dr Simon Poole (Technical Director), Dr Mark Sceats (Chairman, Chemistry), and Associate Professor Tony Stokes (Electrical Engineering). The excellence of the interdisciplinary OFTC research team, which now numbers 15 full-time staff and a similar number of higher degree students, is recognised world-wide. The Centre also provides training courses in optical fibre technology to industry.

8. General Information

Admissions Office

Student Centre
Ground Floor
F07 - Carslaw
The University of Sydney
NSW 2006 Australia
Phone +612 93514117
+612 93514118
+6129351 3615 — Special Admissions (including Mature Age)
Fax +612 93514869
E-mail admissions@records.usyd.edu.au

This office services prospective local undergraduate students. Applicants without Australian citizenship or permanent residency should contact the International Office. Postgraduate students should contact the appropriate faculty.

Assessment

For matters regarding assessment, refer to the relevant Department.

Co-op Bookshop

Transient Building
F12-Transient
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 3705
+61 2 9351 2807
Fax +61 2 9660 5256
E-mail sydu@mail.coop-bookshop.com.au
Website http://mail.coop-bookshop.com.au/coop.html

Sells textbooks and general books. Special order services available.

Enrolment and pre-enrolment

Students entering first year

Details of the enrolment procedures will be sent with the UAC Offer of Enrolment. Enrolment takes place at a specific time and date, depending on your surname and the Faculty in which you are enrolling, but is usually within the last two weeks of January. You *must* attend the University in person or else nominate, in writing, somebody to act on your behalf. On the enrolment day, you pay the compulsory fees for joining the student Union, the Students' Representative Council and sporting bodies. You also choose your first-year units of study, so it's important to consult the Handbook before enrolling.

All Other Students

The Student Information Bulletin is sent to all enrolled students in early to mid-October, and contains instructions on the procedure for pre-enrolment.

Examinations

Examinations and Exclusions Office

Student Centre
Level 1
F07 - Carslaw
The University of Sydney
NSW 2006 Australia
Phone +612 93514005
+612 93514006
Fax +612 93517330
E-mail Exams.Office@exams.usyd.edu.au

The Examinations and Exclusions Office looks after exam papers, timetables and exclusions.

Graduations

Ground Floor, Student Centre
F07 - Carslaw
The University of Sydney
NSW 2006 Australia
Phone +612 93514009
Fax +61293515072
E-mail Naomi@records.usyd.edu.au

(Grievances) Appeals

Many decisions about academic and non-academic matters are made each year and you may consider that a particular decision affecting your candidature for a degree or other activities at the University may not have taken into account all the relevant matters. In some cases the by-laws or resolutions of the Senate (see Calendar Volume 1) specifically provide for a right of appeal against particular decisions; for example, there is provision for appeal against academic decisions, disciplinary decisions and exclusion after failure.

Normally amatter should be resolved by discussing it with the academic staff member concerned, or with a senior member of staff within the department. However, a situation could arise where you might wish to have a decision reviewed or to draw attention to additional relevant information. In this case you should put your case in writing to the head of department and if you're still not satisfied with the result you should contact your Dean. Only after following these steps can you appeal to the Senate. In the case of examination results the appeal may be made to the department. Parking appeals should be addressed to the Manager, Campus Services. You may wish to seek assistance or advice from the SRC regarding an appeal; if so, contact the

Education/Research Officer
Level 1
Wentworth Building
Phone +612 9660 5222

HECS, fees, other charges

Phone +61 2 9351 5659, 9351 2086, 9351 5499 and 9351 5062
Fax +61 2 9351 5081
+612 93515350

Library (Fisher)

F03 - Fisher Library
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 2993 — Enquiries - Information Desk
+61 2 9351 3711—Library Hours
+61 2 9351 7273 —Borrowers' Cards
+61 2 9351 6692 — Holds Enquiries
+612 9351 7277 — Inter-library Loans
+61 2 9351 2265 —Loans, overdues enquiries
Fax +61 2 9351 2890—Administration
+61 2 9351 7278—Renewals
E-mail loanenq@library.usyd.edu.au — Loan and Library enquiries
reqill@library.usyd.edu — Inter-library Loans
Website http://www.library.usyd.edu.au/—Fisher Library HomePage
http://www.library.usyd.edu.au/Services/Libraries/Fisher/index.html

Student Centre

Ground Floor
F07 - Carslaw Building
The University of Sydney
NSW 2006 Australia
Phone +612 9351 3023 — General Enquiries
+612 93514109—Academic Records
+612 9351 3023 — Discontinuation of Enrolment
+61 2 9351 4109—Handbooks
+612 93515060 —Prizes
Fax +612 93515081
+612 93515350
E-mail admissions@records.usyd.edu.au

Part-time, full-time

A student is normally considered as full-time if they have a HECS weighting of at least .375 per semester. Anything under this amount is considered a part-time study load. Note that some faculties have minimum study load requirements for satisfactory progress.

Privacy and Freedom of Information

The NSW Freedom of Information (FOI) Act 1989 provides the public with a legally enforceable right of access to University documents, subject to particular exemptions. In addition, the Act enables individuals to ensure that information held about them is accurate, up-to-date and complete. The University has a number of policies permitting access by individuals to information about themselves without recourse to the Freedom of Information Act.

TheUniversity necessarily accumulates a great deal of information on individuals; within the Uni, access to this is restricted to staff who need the information to carry out their duties. As regards external requests for personal information, it is policy that the University will disclose information to a third party if the subject of the information has consented in writing to the disclosure, or if the University has a legal obligation to respond to a request, including a subpoena, and the request is in the appropriate written form. Enquiries should be directed to the:

Freedom of Information Coordinator and Privacy Officer
c/-Archives A14
Phone +612 93514263
Fax +612 93517304
E-mail trobinso@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/foi.

Student Services

Room 711, Level 7
A35 - Education Building
The University of Sydney
NSW 2006 Australia
Website http://www.usyd.edu.au/su/stuserv/ Student Services

Accommodation Service

Phone +612 93513312
Fax +612 93517055
E-mail larthur@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/accom/ Student Accommodation

Casual Employment

Phone +612 9552 2589
Fax +61 2 9552 2589
E-mail mross@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/cas_emp/ Casual Employment

Counselling Service

Phone +612 93512228
Fax +612 93517055
E-mail myoung@mail.usyd.edu.au

Disability and Welfare Services

Phone +61 2 9351 4554
Fax +612 93517055
E-mail cstuckin@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/disability/ Disability Services

Financial Assistance

Phone +612 93512416
Fax +612 93517055

Refer to the University of Sydney Calendar 1996, Volume 2, for a listing of all undergraduate and postgraduate sources, conditions and benefits or financial support funded by the University.
E-mail psweet@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/fin_assist/ Financial Assistance

Learning Assistance Centre

Phone +612 93513853
Fax +612 93514865
E-mail lewalker@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/lac/

Other student assistance

Careers Centre

Room 147, Ground Level
KOI - Mackie Building (Arundel St, Forest Lodge)
The University of Sydney
NSW 2006 Australia
Phone +612 93513481
Fax +61293515134
E-mail srawling@careers.usyd.edu.au — General Enquiries
asharp@careers.usyd.edu.au — Library
Website http://www.usyd.edu.au/homepage/exterel/careers/index.htm
Provides careers advice and information, Graduate Employment Services and graduate Labour market information to students and staff.

Centre for Continuing Education (bridging courses)

KOI-Mackie
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 2907
Fax +61 2 9351 5022
E-mail info@cce.usyd.edu.au
Website http://www.usyd.edu.au/homepage/exterel/cont_edu cont_edu.htm

Health service

Level 3, G01 -Wentworth
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 3484—Wentworth
+61 2 9351 4095 —Holme
+61 2 9351 0636— Mallett
Fax +61 2 9351 4110 —Wentworth
+612 93514338 —Holme
+61 2 9351 0580 —Mallett
E-mail P.Brown@unihealth.usyd.edu.au
Provides full general practitioner services and emergency medical care to the University community

Koori Centre

RoomU201
A22 - Old Teachers' College
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 2046 — General Enquiries
+61 2 9351 7001 — Liaison Officer
+612 9351 7073 — Student Counsellor
Fax +61 2 9351 6923
E-mail adrninoff@koori.usyd.edu.au
Website http://www.koori.usyd.edu.au/centre/
The Koori Centre runs the AEA training program, supports Aboriginal and Torres Strait Islander students on campus and during enrolment. There is also an educational unit which supports Aboriginal studies in the University.

Language Centre

Room 312, A19 - Griffith Taylor
Al 8 - Christopher Brennan
The University of Sydney
NSW 2006 Australia
Phone +612 93512683
Fax +61 2 9351 4724
E-mail Langcent.Enquiries@language.usyd.edu.au
Website http://www.arts.su.edu.au/language.centre/intro.html
Provides self-access course materials in over 100 languages; beginners and intermediate courses in Spanish language and Culture; beginners and advanced courses in Celtic languages and cultures.

Mathematics Learning Centre

Room 441
F07 - Carslaw
The University of Sydney
NSW 2006 Australia
Phone +612 93514061
Fax +612 93515797
E-mail MLC@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/mlc/MLC.html

Scholarships

Research and Scholarships Office
Scholarships Administration Room N410.1, A14
A14 - Main Quadrangle
The University of Sydney
NSW 2006 Australia
Phone +612 93513250
Fax +612 93513256
E-mail scholars@reschols.usyd.edu.au
Website http://www.usyd.edu.au/homepage/exterel/su/reschols/ index.html

International students

International Office
Level 2
K07-Margaret Telfer
The University of Sydney
NSW 2006 Australia
Phone +612 93514161
+61 2 9351 4079
Fax +61 2 9351 4013
E-mail info@io.usyd.edu.au

International Student Services Unit

Level 2
K07 - Margaret Telfer Building
The University of Sydney
NSW 2006 Australia
Phone +612 93514749
Fax +61 2 9351 4013
E-mail info@issu.usyd.edu.au
Website http://www.usyd.edu.au/su/issu/ International Student Services Unit
Website http://www.usyd.edu.au/homepage/exterel/internat/ int_student_centre.html
Provides an advisory and counselling service to international students at The University of Sydney.

Student organisations

Students' Representative Council

Level 1, Wentworth G01
The University of Sydney
NSW 2006 Australia
Phone +612 9351 2871 — President, Honi Soit
+61 2 9660 4756 —Bookshop
+612 9660 5222 — Legal Aid
Fax +61 2 9660 4260

University of Sydney Union

Box 500 Holme Building
A09-Holme
The University of Sydney
NSW 2006 Australia
Phone +61 2 9563 6000 — Switchboard/Enquiries
+612 9563 6282 — Academic Dress
+61 2 9563 6103 —ACCESS Centre, Manning
+612 9563 6269 — Campus Store, Holme
+61 2 9563 6016 — Campus Store, Wentworth
+61 2 9563 6160 — Clubs and Societies Office
+612 9563 6010 — School Tutoring Co-ordinator
+61 2 9563 6032 —Union Broadcasting Studio
+61 2 9563 6115 —Welfare and Information Services Manager
Fax +612 9563 6239
E-mail enquiries@union.usyd.edu.au
Website http://www.usu.usyd.edu.au/

Provides welfare, social and recreational services to the University community.

Sydney University Sports Union

G09 - Sports and Aquatic Centre
The University of Sydney
NSW 2006 Australia
Phone +61 2 9351 4960
Fax +61 2 9351 4962

Provides services, facilities and clubs for sport, recreation and fitness.

Women's Sports Association

Room 214
A30 - Sports Centre
The University of Sydney
NSW 2006 Australia
Phone +612 9660 6355
+612 93512057
Fax +61 2 9660 0921
E-mail jlawler@mail.usyd.edu.au
Website http://www.usyd.edu.au/su/suwsa/welcome.html

Provides for students, predominantly women, to participate in sport and recreation through theprovision of facilities, courses and personnel.

9. Glossary of Terms

Applying for a course

Admissions

The Admissions Office is responsible for overseeing the distribution of offers of enrolment and can advise prospective students regarding admission requirements.

Application

Prospective (intending) students must lodge an application form with the Universities Admissions Centre (UAC) by the last working day of September of the year before enrolment. Note that some faculties, such as Dentistry and Sydney College of the Arts, have additional application procedures.

Mature age

A category of Special Admission applicants who are 21 years or older on 1 March of the year in which they want to study and who do not have the high school qualifications normally required for entry into a course.

Special Admission

Certain categories of applicants, such as mature-age applicants, students who have experienced educational disadvantage or Aboriginal or Torres Strait Islander applicants, may apply for admission to the University under one of several Special Admission schemes. Contact the Special Admissions office for further information.

TER

The Tertiary Entrance Rank (TER) is the numerical expression of a student's performance in the NSW Higher School Certificate (HSC), which takes into account both assessment and examination results.

TER cut-off

The TER of the last student admitted to a course. Some courses have a minimum TER.

Universities Admissions Centre (UAC)

The organisation that processes applications for most NSW undergraduate university and TAFE courses.

Enrolment and general terms

Academic year

The period during which teaching takes place, from February to November. The academic year is divided into two semesters.

Advanced standing

(See also: Credit) Recognition of previous experience or studies, meaning that the candidate has satisfied the entry requirements for a unit. Advanced standing does not reduce the number of credit points required to complete the degree course.

Associate Diploma

The undergraduate award granted following successful completion of Associate Diploma course requirements. An Associate Diploma course usually requires less study than a Diploma course.

Assumed knowledge

The level of knowledge expected for entry to a Unit of Study. Unlike prerequisites, levels of assumed knowledge are not compulsory for entry to a Unit. Students who do not have the assumed knowledge may, however, be at a considerable disadvantage and may consider completing a bridging course prior to enrolment. Contact the Learning Assistance Centre, Mathematics Learning Centre, Language Centre or Centre for Continuing Education for further information.

Bachelor's degree

The highest undergraduate award offered at the University of Sydney (other undergraduate awards are Associate Diploma and Diploma). A B achelor's degree course normally requires three or four years of full-time study (or the part-time equivalent).

Campus

The grounds on which the University is situated. There are eleven campuses of the University of Sydney: Burren Street (Graduate School of Business), Camperdown and Darlington ("Main campus"), Camden (Agriculture and Veterinary Science), Conservatorium (Conservatorium of Music), Cumberland (Health Sciences and Nursing), Mallett Street (Nursing), Orange Agricultural College, Rozelle (Sydney College of the Arts), St James (Law) and Surry Hills (Dentistry).

Chancellor

(See also: Vice-Chancellor) The non-resident head of the University.

Combined degree course

A program consisting of two degree courses taken together, which usually requires less time than if the courses were taken separately.

Core

(See also: Elective/Option) A Unit of Study that is compulsory for the course or subject area.

Corequisite

A Unit of Study that must be taken with a given Unit. If a corequisite is not successfully completed, it becomes a prerequisite for further study in that subject area.

Course

A complete degree or diploma program.

Credit

(See also: Advanced standing) Recognition of previous studies or studies completed at another institution. II credit is granted then the number of credit points required for completion of the degree course is reduced.

Credit point

A measure of value indicating the contribution each Unit of Study provides towards meeting course completion requirements stated as total credit point value.

Dean

The head of a faculty.

Deferment of enrolment

Persons who have not previously attended a recognised tertiary institution are normally able to defer commencement of their candidature for one year. Applications are handled by the Admissions Office of the University. Application for deferment must be made during the UAC enrolment week at the "Deferment" desk in MacLaurin Hall and be accompanied by the "offer of enrolment" card.

Degree

The award conferred following successful completion of a degree course (for example Bachelor's degree or Master's degree).

Department/School

The academic unit responsible for teaching in a given subject area.

Diploma

The award granted following successful completion of Diploma course requirements. A Diploma course usually requires less study than a degree course. Graduate Diploma courses are for graduates only.

Doctorate

(See also: PhD) The Doctorate awards and the PhD are the highest awards available at the University of Sydney. A Doctorate course normally involves research and coursework; the candidate submits a thesis that is an original contribution to the field of study. Entry to a Doctorate course oftenrequires completion of a Master's degree course. Note that the Doctorate course is not available in all Departments of the University of Sydney.

Elective/Option

(See also: Core) A Unit of Study that may be taken towards, but is not compulsory for, a course or subject area.

Enrolment

The process whereby an applicant officially accepts the offer of aplace in a particular course. If UAC application is successful, an "offer of enrolment" card is mailed to the applicant, along with instructions for enrolment. In most cases, the applicant must attend the University on a particular enrolment day or, if unable to attend, must appoint somebody to enrol on their behalf. Units of Study must be nominated on enrolment day. Academic records and HECS liability calculations are based on the enrolment details, so students must ensure that the Faculty holds correct enrolment information (see also: Variation of enrolment).

Entry requirement

The level of knowledge and/or experience required for entry to a particular Unit of Study.

Faculty

The administrative unit responsible for overseeing satisfactory progress during a degree or diploma course.

Full-time

A study load usually defined in terms of HECS weighting of at least .375 per semester.

Intermediate

Faculty of Science: Second-year level.

Junior

First-year level.

Laboratory practical

See: Practical.

Lecture

(See also: Tutorial) A class given to a large group of students, during which the lecturer speaks or presents audiovisual material and students take notes.

Major

The subject area(s) in which a student specialises at Senior level. Students usually specialise in one (single major) or two (double major) subject areas. The major is usually recorded on the testamur.

Master's degree

A postgraduate award. Master's degree courses may be offered by coursework, research only or a combination of coursework and research. Entry to the course often requires completion of an Honours year at undergraduate level.

Minor

Subject areas in which a student studies, but does not specialise at Senior level.

Orientation period

"O' Week" takes place during the week prior to lectures in February semester. During O' Week, students can join various clubs, societies and organisations, register for courses with Departments and take part in activities provided by the University of Sydney Union.

Part-time

A study load usually defined in terms of HECS weighting of less than .375 per semester.

PhD

(See also: Doctorate) The Doctor of Philosophy (PhD) and other Doctorate awards are the highest awards available at the University of Sydney. A PhD course is normally purely research-based; the candidate submits a thesis that is an original contribution to the field of study. Entry to a PhD course often requires completion of a Master's degree course. Note that the PhD course is available in most Departments of the University of Sydney.

Postgraduate

The term used to describe a course leading to an award such as Graduate Diploma, Master's degree or PhD, which usually requires prior completion of a relevant undergraduate degree (or diploma) course. A "postgraduate" is a student enrolled in such a course.

Practical

Similar to a tutorial, during which experiments or other relevant applied activities are carried out.

Prerequisite

A Unit of Study that must be taken prior to entry to a given Unit.

Recommended reading

Reading material that is suggested but not compulsory for a Unit of Study.

Registrar

The head of the administrative divisions of the University.

Registration

In addition to enrolling (with the Faculty) in Units of Study, students must register with the Department responsible for teaching each Unit. This is normally done during the Orientation period (O' Week). Note that unlike enrolment, registration is not a formal record of Units attempted by the student.

Resolutions of Senate

Regulations determined by the Senate of the University of Sydney that pertain to degree and diploma course requirements and other academic matters.

School
Similar to a large Department, otherwise a grouping of Departments.

Semester
A period of fourteen weeks during which teaching takes place. There are two semesters per year for most faculties.

Senior
Second-year level or higher.

Faculty of Science: third-year level.

Subject area
One or more Units of Study that comprise a particular field of study (eg Japanese or Chemistry).

Textbook
Reading material that the student is expected to own.

Tutorial
(See also: Lecture) A small class consisting of a tutor and up to about 25 students, during which concepts raised in lectures are discussed in detail and may be supplemented with readings, demonstrations and presentations.

Undergraduate
The term used to describe a course leading to a diploma or Bachelor's degree. An "undergraduate" is a student enrolled in such a course.

Unit of Study
A stand-alone component of a degree or diploma course that is recordable on the academic transcript.

Variation of enrolment
The process whereby students officially notify the Faculty of changes regarding the Units of Study they are attending. This must be done by a certain deadline in each semester, to avoid penalties such as "discontinued" results on the academic transcript (see: Results) or unnecessary HECS charges.

Vice-Chancellor
(See also: Chancellor) The administrative head of the whole University, including academic and administrative divisions.

Costs

Bursary
A sum given to a student who has limited resources or is experiencing financial hardship, ranging from $100 to $1,000.

Fees (full-fee undergraduate/postgraduate)
Tuition,examination or other fees payable to the University by an enrolled or enrolling student in connection with a course of study or attendance at the University and includes fees payable in respect of the granting of a degree, diploma, associate diploma or other award. It does not include annual subscription to organisations such as the Union or SRC or fees payable in respect of residential accommodation.

HECS
All Australian undergraduate students are currently required to contribute to the cost of tertiary education through the Higher Education Contribution Scheme (HECS) which is administered under the Higher Education Funding Act 1988. Under HECS students pay for part of the cost of their higher education and the Commonwealth pays the rest. The amount payable is determined by the units of study a student choses to undertake in the case of coursework awards, or the attendance (full-time or part-time) in the case of research students.

Prize
Matriculation, undergraduate and postgraduate funding automatically awarded on academic results in courses, yearly examinations or on the recommendation of the Head of Department. There are also prizes for essay writing and composition by anonymous application. Prize values range from $100 to $6,250.

Scholarship
Matriculation and undergraduate funding by application awarded on TER results for students enrolling in the first year of a degree course. Postgraduate funding for full-time candidates enrolled in a research degree course with scholarship conditions and benefits varying according to specific awards. The intention is to encourage and support schoarship at the University in general or in targeted areas.

Assessment, Examination, Satisfactory Progress and Graduation

Academic transcript/record
The official record of results for each student (see: Results).

Appeals
The process whereby a student may raise objections regarding results, Faculty decisions or other academic matters.

Assessment
(See also: Examination) The appraisal of a student's ability throughout the semester, by various means such as essays, practical reports or presentations, which counts towards thefinal mark or grade.

Candidate
Someone studying for a degree or diploma. The term may also be used to describe someone sitting for an examination.

Examination
(See also: Assessment) The appraisal of a student's ability, usually at the end of semester. Most examinations take place on campus under strictly supervised conditions but some Units make use of take-home or open-book examinations.

Exclusion
Aruling by the Faculty, which declares the student ineligible for further enrolment for reasons such as lack of satisfactory progress. Students who wish to re-enrol must show good cause why they should be allowed to re-enrol (see: Show cause and Satisfactory progress).

Grievances
see appeals

Grade
A category into which a student's final mark falls (see: Results).

Graduand
A person who has fulfilled the requirements of a degree but is yet to graduate.

Graduate
(See also: Postgraduate) A person who has graduated. Also a term used to describe a course leading to an award such as Master's degree or PhD or a student enrolled in such as course.

Graduation
The ceremony during which degrees are conferred and diplomas awarded.

Honours degree

A Bachelor's degree for which extra work (course work and/or thesis) has been completed, usually requiring an extra year of study.

Mark

(See also: Grade) The numerical result of assessments and/or examinations for a Unit of Study, which may be converted to a grade.

Pass degree

A Bachelor's degree.

Re-enrolment

The process by which continuing students enrol in Units of Study.

Results

The official statement of the student's performance in each Unit of Study attempted, as recorded on the academic transcript, usually expressed as a grade:

High Distinction	a mark of 85% and above
Distinction	a mark of 75-84%
Credit	a mark of 65-74%
Pass	a mark of 50-64%
Terminating Pass	whereby the student is deemed to have completed Unit requirements, but is not permitted to re-enrol in order to attempt to achieve a higher grade.
Fail	a mark of less than 50%
Withdrawn	This is the same as if the candidate had not enrolled in the course concerned. Although the University has a record of the withdrawal, the course and result will not appear on the official academic transcript. There is no HECS liability either. In order to have a course recorded as "withdrawn", notice must be given by the candidate to the Faculty office on or before the deadline. Refer to the section on degree regulations.
Discontinued with Permission	This does not count as an attempt at the particular course, but does appear on the candidate's academic record. A candidate may have enrolment recorded as "discontinued with permission" where: 1. notice is given to the faculty office on or before the deadline or; 2. after the deadline, evidence is produced of serious illness or misadventure. Refer to the section on degree regulations for deadlines. Discontinuation with permission does not mean that the student's progress is considered to be satisfactory.
Discontinued	This counts as an unsuccessful attempt at the course concerned and appears on the candidate's academic record. Where notice is given after the deadline for "discontinued with permission" but before the last day of lectures for the course, theresultis "Disc". Refer to the section on degree regulations for deadlines.
Absent Fail	If the candidate misses the deadline for "discontinued" and does not sit the final exam, the result is "absent fail".

Satisfactory progress

A minimum standard of performance required for continuation of enrolment. Senate resolutions rule that if a student fails or discontinues a year of candidature or a Unit of Study more than once then he or she is ineligible for re-enrolment (see: Exclusion and Show cause). Note that some faculties may have alternative or additional requirements for satisfactory progress.

Show cause

The Faculty may require a student to show good cause why he or she may be allowed to continue in the degree or diploma course, where requirements for satisfactory progress have not been met (see: Exclusion and Satisfactory progress).

Special consideration

The process whereby enrolled students who have experienced significant educational disadvantage may have their assessment deadlines or grades revised.

Study Vacation (Stuvac)

The week prior to the examination period in each semester, during which no classes are held.

Supplementary examination

An extra or alternative examination taken by a student who has experienced significant educational disadvantage during semester or the examination period. Note that some faculties do not offer supplementary examinations (see also: Special consideration).

Suspension of candidature

A complete break in the studies of an enrolled student, usually for a period of one year. Applications are handled by the Faculty office. (Those wishing to postpone commencement of a course need to apply for deferment, see: Deferment of enrolment).

Testamur

The document given to the graduand at graduation.

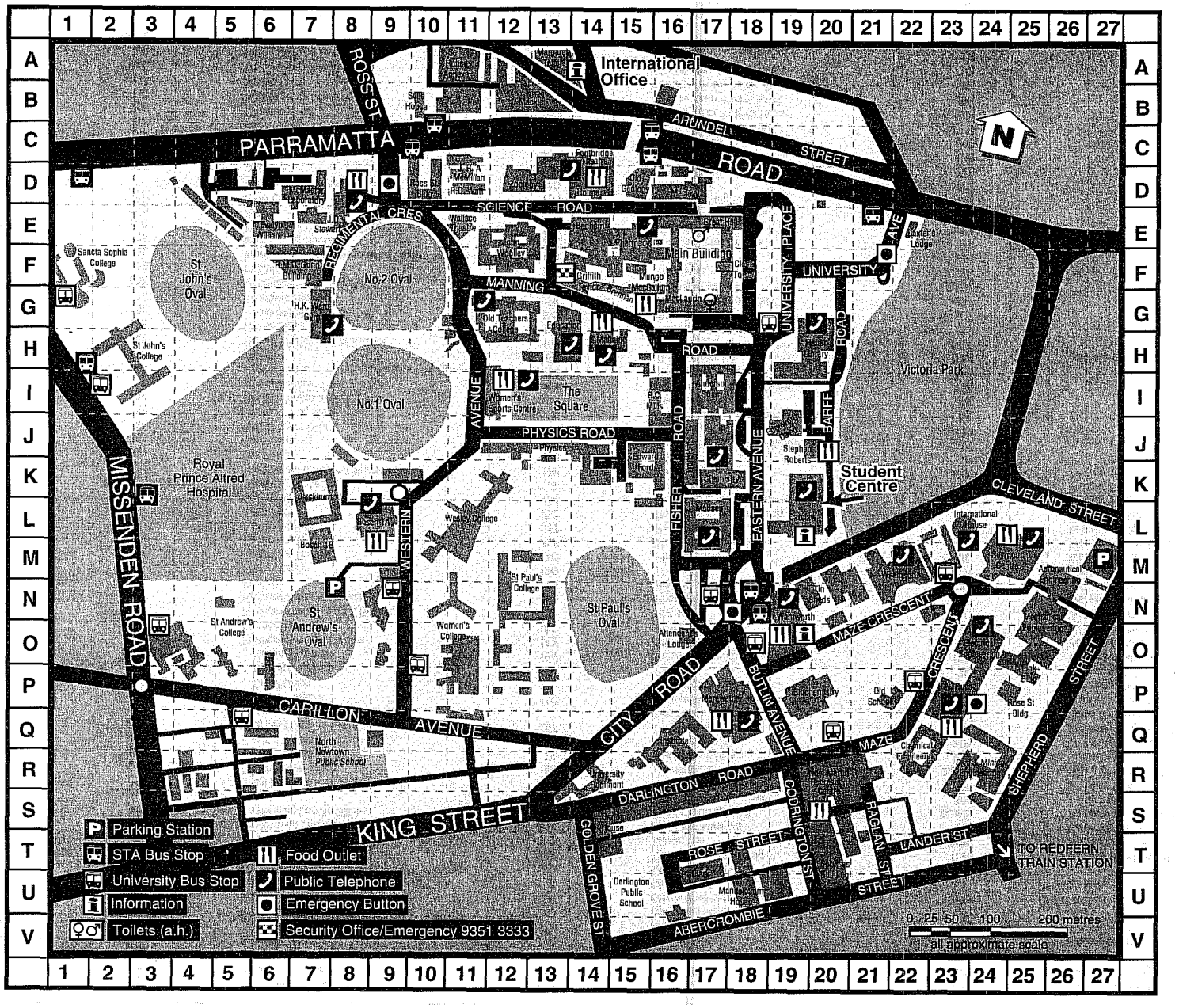
Thesis

A piece of written work (sometimes called a dissertation) by a student, normally a candidate for an Honours degree or a higher award (such as Master's degree or PhD).

Weighted Average Mark (WAM)

A numerical expression of a student's performance throughout their degree program, usually assigning more "weight" to Senior or Honours years. Note that the WAM calculation may differ for purposes such as eligibility to various scholarships and will vary from faculty to faculty.

University of Sydney - Map of Main Campus



Departments, schools and buildings - Key to Map

- Academic & Executive Services 16E
- Accounting 17P
- Accommodation Service 13Q
- Administrative Policy & Strategic Planning Division 16E
- Administrative Support Services Division 16E
- Aeronautical Engineering 26M
- Agricultural Chemistry & Soil Science 10D
- Agricultural Economics 11D
- Agriculture Faculty Office 11C
- Alma Street Glasshouse 23N
- Anaesthesia 7K
- Anderson Stuart Bldg 171
- Anatomy & Histology 171
- Animal Health Cam
- Animal Science 7F
- Anthropology 16F
- Archaeology, Classics SAncient History 16F
- Architectural & Design Science 22M
- Architecture, Dept & Faculty Office 22M
- Archives 19H
- Art Workshop 20M
- Arts Faculty Office 16F
- Asset Management 13A
- Asian Studies 14F
- Attendant's Lodge 160
- Badham Bldg & Library 14E
- Banks (see Financial institutions)
- Baxter's Lodge 22E
- Behavioural & Social Sciences in Nursing MapB
- Behavioural Science Cumb
- Behavioural Sciences in Medicine 7K
- Biochemistry 20P
- Biological Sciences 16D
- Biomedical Science Cumb
- Blackburn Bldg 7K
- *Bookshops:*
  - Medical 7K
  - SRC Secondhand 19N
  - University Co-operative 16J
- Bosch 1A {lecture theatres) 8L
- Bosch 1B Bldg 7H
- Brennan, C, Bldg 15F
- Budget Office 16E
- Business Liaison Office 11E
- Business Services 19U
- Campus Services 20T
- Careers Centre 13B
- Carslaw Bldg 19L
- Cashiers 13A
- Central Services 22E
- Central Records Office 16E
- Centre for Teaching {learning 19L
- Chancellor's Committee Shop 17F
- Chaplains' Centre 10G
- Chemical Engineering 22Q
- Chemistry 17K
- *Child Care:*
  - Boundary Lane 16U
  - Carillon Avenue 9Q
  - Laurel Tree House (Glebe) 16B
  - Union (Darlington) 21S
- CM & Mining Engineering 24R
- Clark Bldg 17T
- Clock Tower 17F
- Communication Disorders Cumb
- Community &Alumni Relations 160
- Community & Mental Health Nursing Cumb
- Community Health Cumb
- Community Medicine 15K
- Computer Science, Basser Dept 17L
- Continuing Education, Centre for 13B
- Coppleson Postgraduate Medical Institute 9K
- Counselling Service 13Q
- Crop Sciences 13F
- Darlington House 14S
- Development Office 160
- Disability & Welfare Services 13Q
- Econometrics 17P
- Economic History 17P
- Economics, Dept & Faculty Office 17P
- Edgeworth David Bldg 19J
- Education Bldg & Faculty Office 13Q
- Educational Development 4 Evaluation 15K
- Educational Psych, Measurement & Technology 13G
- Edward Ford Bldg 15K
- Electrical Engineering 240
- Employment Service, Casual 14C
- Engineering Faculty Office 250
- English 12E
- Equal Employment Opportunity Unit 16S
- Evelyn Williams Bldg 6E
- Experimental Medicine 7K
- External Relations Division 16E
- Facilities Planning, Office of 20T
- *Financial institutions:*
  - Commonwealth 14C
  - Credit Union 14D
  - National Australia 15E
  - National Australia 19N
- Financial Services Division 16E
- Finance, Dept of 16Q
- Financial Management & Reporting 13A
- Financial Services Division 16E
- Fine Arts 151
- Fisher Library 19G
- Footbridge Theatre 14C
- French Studies 15F
- Garage, University 21T
- Geography 16Q
- Geology & Geophysics 19J
- Germanic Studies 15F
- Government & Public Administration 17P
- Great Hall 18E
- Greek, Modern 14F
- Griffith Taylor Bldg 14F
- Gunn, R.M.C, Bldg 7F
- Health Information Management Cumb
- Health Sciences Faculty Office Cumb
- Health Service (Holme Bldg, Wentworth Bldg) 14C.19N
- History 15G
- History &Philosophy of Science 19L
- Holme Bldg 14C
- Industrial Relations, Dept of 160
- Infectious Diseases 7K
- Information Technology Services 19U
- Institute Bldg 160
- International Office & International Student Seraces 13A
- International House 23L
- International Preparation Program 20T
- Italian 151
- Koori Centre 12G
- Learning Assistance Centre 13G
- Linguistics 16J
- Link Bldg 250
- Lost Property 14F
- Mackie Bldg 13B
- MacLaurin Hall 16G
- Macleay Bldg SMuseum 16D
- MadsenBldg 17L
- Mail Room (Internal) 20T
- Main Bldg 17F
- Mandelbaum House 18U
- Manning House 14H
- Margaret Telfer Bldg 13A
- Marketing, Dept of 16Q
- Marketing & Publications 16E
- Mathematics & Statistics 19L
- McMaster Laboratory CSIRO 7D
- McMillan, J.R.A, Bldg 11C
- Mechanical & Aeronautical Engineering Bdg 25N
- Mechanical Engineering 25N
- Media Office 16E
- Medical Radiation Technology Cumb
- Medicine 7K
- Medicine, Dept of 7K
- Medicine Faculty Office 15K
- Merewether Bldg 17P
- Microbiology 20P
- Mills, RiC, Bldg 151
- Mungo MacCallum Bldg 15G
- Music = 24M
- Nicholson Museum 16G
- Nursing Therapeutics Cumb
- Obstetrics & Gynaecology 9K
- Occupational Health 15K
- Occupational Therapy Cumb
- Old Geology Bldg 15D
- Old School Bldg 21P
- Old Teachers'College Bldg 12G
- Operations Accounting 13A
- Orange Agricultural College OrAg
- Orthoptics Cumb
- Pathology 7K
- Personnel Services 13A
- Pharmacology 7M
- Pharmacy 15E
- Philosophy 17G
- Photowise Imaging 20T
- Physics 13J
- Physiology 171
- Physiotherapy Cumb
- Planning Support Office 16E
- Post Office 15E
- Printing Services, University 20T
- Properties & Investments 13A
- Psychology 14F
- Purchasing 13A
- Publications Unit 16E
- Public Health & Community Medicine 15K
- Quadrangle 17F
- Queen Elizabeth II Resesrch Institute 9K
- Regiment, University 14R
- Religion, School of Studies in 12E
- Researrii & Scholarships 16E
- Revenue Services 13A
- Risk Management 13A
- Rose Street Bldg 24P
- Ross Street Bldg 10D
- Russell) Peter Nicol, Bldg 23P
- St Andrew's College 50
- St John's College 3H
- St Paul's College 12N
- San eta Sophia College 1F
- Schools Liaison 12B
- Science Faculty Office 19L
- Security & Bldg Services 14F
- Selle House 10B
- Semitic Studies 17F
- Senate Room 17E
- ServiceiBldg 20T
- Seymour Theatre Centre 24M
- Shepherd St Parking Station 27M
- Sir Hermann Black Gallery 19N
- Social & Policy Studies in Education 13G
- Social Work & Social Policy 151
- Sociology 151
- Solicitor, University 16E
- *Sports:*
  - Noel Martin Recreation Centre 20R
  - Sports Union 7G
  - Swimming Pool 20R
  - Tennis courts 20D
  - Ward, H.K., Gymnasium 7G
  - Women's Sports Association 121
- Statistics Unit 16E
- Stephen Roberts Theatre 20J
- Stewart, J.D, Bldg 8E
- Stores 20T
- Student Centre 19K
- Student Services 13G
- SRC 19N
- SUPRA 4R
- Surgery 7K
- SydU-lech 19U
- Systems Development 13A
- Teaching & Curriculum Studies 13G
- Tin Sheds Gallery 20M
- Trades & Grounds Serrvices 20T
- Traffic Office 14F
- Transient Bldg 16J
- Union, University of Sydney 19N
- Unistaff 19U
- University Collection 19H
- University of Sydney Club 15G
- Urban & Regional Planning 22M
- Veterinary Anatomy 8E
- Veterinary Clinic 6E
- Veterinary Clinical Sciences 6E
- Veterinary Pathology 7E
- Veterinary Science Faculty Office 8D
- Vice-Chancellor's Office 16E
- Wallace Theatre 11E
- War Memorial Gallery 17E
- Watt, R.D, Bldg 11D
- Wentworlh Bldg 19N
- Wesley College 11L
- Western Avenue Underground Parking Station SN
- Wilkinson Bldg 22M
- Women's College 110
- Woolley Bldg, John 12E
- Yeoman Bedell's Office 17E
- Zoology 12D