

# Faculty of Engineering Handbook 2001



The University's web site details courses at Sydney, some careers they can lead to, and what university life is like. The interactive site, with video and sound clips, has links to the University's faculties and departments. You can explore the University of Sydney on the web at <u>www.usyd.edu.au</u>.

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University semester and vacation dates 2001		Last dates for withdrawal or discontinuation 2001	
Semester 1 lectures begin	Monday 26 February	Semester 1 units of study	
Easter recess		Last day to add a unit	Friday 9 March
Last day of lectures	Thursday 12 April	Last day for withdrawal	Friday 30 March
Lectures resume	Monday 23 April	Last day to discontinue without failure (DNF)	Thursday 12 April
Study vacation: 1 week beginning	Monday 11 June	Last day to discontinue (Discontinued - Fail)	Friday 8 June
Examinations commence	Monday 18 June	Semester 2 units of study	
Semester 1 ends	Saturday 30 June	Last day to add a unit	Friday 3 August
Semester 2 lectures begin	Monday 23 July	Last day for withdrawal	Friday 31 August
Mid-semester recess		Last day to discontinue without failure (DNF)	Friday 7 September
Last day of lectures	Friday 21 September	Last day to discontinue (Discontinued - Fail)	Friday 2 November
Lectures resume	Tuesday 2 October	Full Year units of study	-
Study vacation: 1 week beginning	Monday 5 November	Last day for withdrawal	Friday 30 March
Examinations commence	Monday 12 November	Last day to discontinue without failure (DNF)	Friday 27 July
Semester 2 ends	Saturday 1 December	Last day to discontinue (Discontinued - Fail)	Friday 2 November

Academic year information (Academic: Board policy and dates 1998-2002) is available at: www.usyd.edu.au/su/lanning/policy/acad/3\_0aca. html

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# Message from the Dean

Welcome to the Faculty of Engineering of the University of Sydney, which is also known as the PN. Russell Faculty 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 in the best possible facilities, 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. Over recent years our Advanced Engineering program has seen our high achieving students exposed to innovation, entrepreneurship and integrated design. We are now embarking on even more ambitious schemes to allow all our graduates to become skilled in these important areas.

In whichever of the 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 Faculty, 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. At the same time we teach you the responsibility you have as an engineer.

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. These skills will be taught to you by our outstanding academic staff in collaboration with our collegues from industry. You will work on real problems with real engineers!

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.

If you are one of the growing number of students who have opted to take a combined degree, you will already be aware of the value and flexibility that these additional studies in quite different areas can add not only to your career prospects but also to your enjoyment of your university time and appreciation of life in general. You will be gaining a breadth of experiences and knowledge that can only benefit your career as an engineer.

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.

Judy Raper, Dean

# Letter from the SUEUA President

As the president of the Sydney University Engineering Undergraduate Association (SUEUA), I am writing this letter to inform you of the outstanding attributes that the Faculty of Engineering has to offer, in both the academic and nonacademic aspects of university life.

I chose to study engineering at the University of Sydney, due to its reputation for academic excellence and the Faculty's ability to cater for all needs of the whole student body. The Dean's passionate support for SUEUA gives us as a student association the ability, and the enjoyment, to fulfil the social needs of the faculty.

This will be my fourth year of study at Sydney. I can gladly say that as a result of the last three years in engineering, being so involved with SUEUA has brought to light some of my hidden skills in communication, leadership and fun. July involvement with SUEUA has also given the the chance to make new and exciting friendships with students from all over the faculty. Its these friendships which will last a lifetime! *Prospective students* 

What exactly does SUEUA do? Well I'm glad you asked. SUEUA's role as the student faculty society is to organise and run all social events on the engineering calendar, liaise with academic and administrative staff and provide seminars and workshops with industry to help prepare students for their eventual departure into the ever-advancing world of engineering.

Compared with your high school, the University of Sydney is quite vast and may seem a little intimidating at first. However, if you get involved early, instead of seeing thousands of unknown faces each day on your way to class, you will see friends whom you would have met at SUEUA functions such as 'First Year Camp', 'Beer'n'Bangers' or a lazy Friday afternoon SUEUA barbecue.

Engineering can be quite a challenging degree, so why not come to the University of Sydney and enjoy all the benefits the Faculty of Engineering has to offer. *Fellow students* 

So you've been at this University for one, two or maybe even five years working hard to get your degree. If I could offer you some advice: don't forget to have fun! Think of yourself and experience everything that university life has to offer. If you get involved now, you too will be able to meet exciting new friends, future business contacts and develop your own interpersonal skills.

Last year in seeking a summer placement for my vocational employment, I was involved in many job interviews with some of the largest engineering firms in Sydney. It was during these



interviews that the importance of my involvement with SUEUA, and also the Engineering Revue, became very apparent. In the modern world of engineering employers are no longer only looking for the students with HD averages, skills in management, leadership and teamwork are of increasing importance. As a student with no, or very little, industry experience, how did my potential employers compare the with my competition? They looked into the extent of my extra-curriculum experience and involvement, and what skills I had gained as a result.

Without a doubt, the last three years have been the most rewarding and exciting of my life. It was not until I arrived at the University of Sydney and the Faculty of Engineering, that I really saw the potential of what university life had to offer. I've learnt so much, developed in so many different ways and had an amazing, unforgettable time in between. Hopefully you too can see this transformation within yourself and are using the experiences, gained to lead you into the future.

Have a great year. I know I will.

Alan Connack, SUEUA President 2001

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 programs 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 program 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 and Project Engineering and Management

Phone: (02) 9351 2136 Fax: (02) 9351 3343 Email: <u>office@civil.usyd.edu.au</u> Head: Associate Professor Robert J. Wheen Executive Assistant to Head of School: Ms Tmne Blair The title Civil Engineer is given to one who invents, contrives, designs and constructs for the benefit of the community. Civil

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.

Graduates in construction engineering and management will find themselves particularly well placed for project management and leadership roles in the following organisations; construction companies, project management organisations (major management, consulting and planning firms), government organisations, large corporations including mining and industrial companies, and part of multidiscipline teams of professionals in charge of large infrastructure projects - eg, water supply or transportation systems.

In the first and second 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 third year, basic courses are given in structures, soil mechanics, surveying, hydraulics, structural design, construction, materials and practice of civil engineering.

In the fourth year, the basic courses of the third year are continued with an additional course which requires the preparation of a thesis. At honours level a more extensive thesis is required. A major segment of final year studies comprises options in structures, fluid mechanics, engineering management, soil mechanics 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. 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 to ensure that high standards are maintained in the teaching of all subjects.

# Electrical, Telecommunications, Software and Computer Engineering

Phone: (02) 9351 3229 Fax: (02) 9351 3847 Email: <u>peterf@ee.usyd.edu.au</u> Web: <u>www.ee.usyd.edu.au</u> Head: Associate Professor Stephen Simpson Manager, Academic Support Services: Peter Finneran The School of Electrical and Information Engineering

The School of Electrical and Information Engineering offers students the opportunity to study engineering in an exciting, innovative and relevant environment. The fields of Electrical, Sotware, Telecommunications, ecommerce and Computer Engineering are ones in which there has been a history of constant improvements, developments and innovations in existing technologies, coupled with the evolution of new technologies. The School 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.

The degree courses offered by the School of Electrical and Information Engineering - Electrical Engineering, Software, Telecommunications, eCommerce 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, Medical Science, Science or Commerce. The School will be offering a new degree in Electronic Commerce in 2001.Students are also able to participate in exchange programs with universities in Sweden, Hong Kong 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 in 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 Software Engineering degree has a common first year with Electrical, Telecommunication and Computer Engineering programs. The second year is mostly in common with a core emphasising science and technology, computer science and microcomputer programming. A feature of the program is that students can start specialising in the second year by selecting software engineering electives in business software, electronics and circuits, for CAD software, commerce and biology. Specialisations in software engineering databases, signal processing, information systems, telecommunication software systems, CAD, operating systems and compilers, real time systems and high performance computing.

The ecommerce degree is for those who want a broad knowledge of the emerging digital economy, its underlying technology, and the business skills relevant to it. The program will produce IT professionals with the knowledge of those technologies that will allow them to become leaders and innovators in the emerging information technology and electronic business industries.

Electrical, Telecommunications, Software, ecommerce 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, Mechatronic and Biomedical Engineering

Phone: (02) 9351 2341 Fax: (02) 9351 7060 Email: <u>hod@mech.eng.usyd.edu.au</u> Web: <u>www.mech.eng.usyd.edu.au</u> Head of School: vacant Administrative Officer: Colleen Moore

The School of Aerospace, Mechanical and Mechantronic Engineering offers degrees in mechanical, mechatronic and biomedical engineering.

*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 three different degrees -Mechanical, Mechatronics or Biomedical.

*Mechatronics* combines mechanical engineering, electronics and computing. It is the enabling technology of computerautomated 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.

*Biomedical* engineers apply engineering principles to understand, modify or control biological systems, and develop technology to monitor physiological functions and to assist in diagnosis and treatment of patients. Biomedical engineering is an interdisciplinary branch of engineering, encompassing areas of electrical, mechanical and chemical engineering. Subjects in biomedical and orthopaedic engineering as well as research opportunities in Electrical, Mechanical and Mechatronic Engineering are available. This degree meets the tertiary study entry requirements for the Graduate Medical Program.

The first two years of undergraduate study in mechanical, mechatronic or biomedical engineering provide students with an introduction to engineering science, design and manufacturing methods, management, computing and electronics, so that by the end of the second 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, mechatronic and biomedical 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. Faculty of Engineering Handbook 2001

# Undergraduate units of study

#### 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 (eg, Computer Science 3, Economics 2). 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 'nonlisted' 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.

Each unit of study has a unique code and number, comprising 4 letters followed by 4 numbers (eg, 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 School of Aerospace, Mechanical and Mechatronic Engineering and is normally offered to Second Year (Intermediate) students.

### Aeronautical Engineering

# AERO1 4 0 0 Introto Aircraft Construction & Design 6 credit points

Offered: July. Classes: 1 lec/week per semester. 1 x 3hr practical/ workshop session/week per semester. Assessment: In-course involvement, practical assignments and quizzes.

First Year Elective unit of study for the degree in Aeronautical Engineering.

#### Syllabus Summary

Introduction to aircraft design and construction methods; fibreglass molding of complex components; bonding and glueing; structural reinforcement; manufacture of metal components; wooden components; aircraft grade materials; welding; riveting; bolting and other fasteners.

Investigation of a typical aircraft configuration; component layout; alternate configurations; weight penalties or gains.

Requirements for ancillary equipment; aircraft instruments; accuracy of instruments; engine and propeller selection; fuel system; navigation and communication systems.

Aviation regulation; process of aircraft certification; aircraft categories; performance measurement and requirements; weight and balance; centre of gravity requirements.

#### Objectives/Outcomes

The objective of this unit of study is to introduce and foster practical engineering skills in students newly enrolled in the degree of Bachelor of Engineering (Aeronautical).

Students will actively participate in the construction and design of a light aircraft. The aircraft is to be constructed under current Civil Aviation Regulations so that students will gain an insight into all aspects of the process. By being a part of the construction team students will also experience the organisational requirements necessary to successfully complete a complex engineering project.

The final outcome will be that students gain an understanding of:

- Light aircraft design methods
- Innovative methods of construction
- · Techniques for selecting, sizing and stressing components
- · Regulatory requirements for certification
- Off-Design requirements
- Construction tolerances
- Team-work requirements in undertaking complex engineering projects.

### A E R O 1 6 0 0 Workshop Technology 4 credit points

Offered: February. Prohibition: MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture. Classes: (one 3hr

lab)/wk. Assessment: Assignments, practical work.

#### **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

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

#### A E R O 1 6 0 1 Aerospace Manufacture 6 credit points

MECH 1600 Manufacturing Technology. Classes: (1 lec, one 3hr lab)/wk. Assessment: Assignments, practical work.

**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. To understand the concepts of project and time management and the influences of ethics, communication and responsibility in the context of Engineering practice.

Syllabus Summary:

a) Workshop Technology:

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.

b) Professional Engineering:

Ethics and Responsibility. Introduction to project management, time management and planning. Communications; oral; written; effective presentation of ideas.

#### Textbooks

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

#### AERO 1701 Introduction to Aerospace Engineering 3 credit points

Offered: February. Classes: (1 lec, one 2hr tut/lab)/wk. Assessment: Assignments, guizzes and evaluation of work undertaken during the semester.

Objectives/ Outcomes:

To develop an understanding of the role of aerospace 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 engineering based problems

Syllabus Summary:

Glossary of terms for aerospace vehicles and their components. Brief introduction to aerodynamics, astronautics, aircraft and spacecraft performance, mechanics of flight, aerospace structures, materials and propulsion systems. The operating characteristics of modern vehicles, their uses and limitations. Modern developments in aerospace. Future trends, mass transport vehicles, aerospace planes, orbital vehicles. The limitations of the aerospace environment.

Reference books

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

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

Stinton The Anatomy of the Aeroplane (Collins, 1985)

#### AERO 1801 Computer Engineering Applications 3 credit points

#### Offered: July. Classes: (1 lec, one 2hr lab)/wk. Assessment: Course tasks and Assignments.

NB: Web page: problemsolvers.aero.usyd.edu.au. Objectives/ Outcomes:

To provide basic computational skills for engineering problem solving using personal computers. Students will develop familiarity with the use of standard PC's in an Engineering context. Students will become aware of the details and structure of programming in a wide variety of environments including PC networks.

Syllabus:

Programming in an engineering environment:

Program structures, data types, operators, input/output, functions and procedures. The use of interpreters/compilers; debug-Offered: February. Prohibition: AERO1 6 0 0 Workshop Technologyging; object-oriented coding; code optimisation; code documentation; flow charts; program design and philosophy. The use of toolboxes and engineering software libraries. Specialised functions for personal computers: network operation; communication via Intranet and Internet; network standards, software and hardware. Introduction to spreadsheets: data structures; graphing; recursion.

Engineering applications:

Problems in engineering mechanics; graph plotting, curve fitting and solution interpolation. Solution of simultaneous linear equations; applications in structural analysis. Solution of ordinary differential equations; applications in fluid statics, structural mechanics. Iterative solutions for non-linear problems; trajectory simulation; particle dynamics.

Search and retrieval of engineering data; use of on line information systems and the Australian Standards.

Textbooks

Text Books:

The Student Edition of MATLAB (Prentice Hall, 1995)

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

Etter Engineering Problem Solving with MATLAB (Prentice Hall, 1993)

#### AERO 2201 Fluid Mechanics 1 4 credit points

Offered: July. Prerequisite: MATH 1001, MATH 1002, MATH 1003. Prohibition: AERO 2701 Space Engineering 1. Classes: (three lec, one 1 hr lab/tut)/wk. Assessment: assignments, practical work, 2hr examination.

NB: Web page: www.aero.usyd.edu.au/aero/aerodyn.html. **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 nondimensional 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. Boundarv layer flows; laminar and turbulent layers; skin friction coefficient; flow separation; pressure and friction drag.

Introduction to turbomachinery.

Textbooks

Fox and McDonald, Introduction to Fluid Mechanics (5th Ed, Wiley)

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

Offered: February. Prerequisite: 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005). Classes: (1 lec, one 3hrlab)/wk. Assessment: 2hr exam and course assignments.

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)

### AERO 2500 Intro Flight Mechanics and Performance 4 credit points

# Offered: February. Prerequisite: MATH 1001,1002,1003. Classes: (3 lec, one 1hrtut/lab)/wk. Assessment: 2hrexam, assignments.

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.

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 (Roskam A&EC, 1979)

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

#### AERO 2701 Space Engineering 1 8 credit points

Offered: February. Prohibition: AERO 2201 Fluid Mechanics 1 AERO 2500 Introductory Flight Mechanics and Performance. Classes: (4 lec, one 2hr tut/lab)/wk. Assessment: Exam (50%), assignments(50%).

Objectives/ Outcomes:

To develop an understanding of the environment of space, including the effects due to relevant physical phenomenon. To gain an understanding of the initial component steps to be undertaken in the design of an aerospace vehicle.

Syllabus Summary:

Introduction to instrumentation for the physical sciences, optics for communications and sensing. Electromagnetic properties of matter; Maxwell equation.

Launch system basics; introduction to fluid mechanics; basic flight mechanics and orbital mechanics. Vehicle stability and control.

Introduction to spacecraft subsystems; attitude control, structures, thermal loading, mechanisms, power generation and storage, propulsion; liquid and solid rockets. Telemetry tracking and command (TT&C), useful payloads. Space application concepts; communications, earth observation, astronomy, microgravity, exploration. *Textbooks* 

Reference books: to be advised

### AERO 2800 Aeronautical Engineering Computing 4 credit points

**Offered:** February. **Prerequisite:** AERO 1801 Computer Engineering Applications. **Classes:** (1 lec, one 3hr lab)/wk. **Assessment:** 2hr exam (50%), assignments(50%).

#### **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.

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 credit points

Offered: February. **Prerequisite:** AERO 2201 Fluid Mechanics 1. **Classes:** (3 lec, one 1hrtut/lab)/wk. **Assessment:** 2hr exam(75%), assignments/lab reports(25%).

#### **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.

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

Offered: July. Prerequisite: AERO 2201 Fluid Mechanics 1. Prohibition: MECH 3211 Fluid Mechanics 2. Classes: (2 lec, one 1hr tut,)/wk one 3 hr lab. Assessment: 2hr exam, assignments/lab reports.

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 flow theory, boundary layers and gas dynamics.

Syllabus Summary:

Navier-Stokes equations - derivation, significance and fundamental importance. Pipe flow - Bernoulli, shear losses, minor losses, networks. Pumps - pump types, characteristics, applications. 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. Introduction to gas dynamics, steady onedimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube. Introduction to steady two-dimensional supersonic flow. *Reference books* 

Potter & Wiggert, Mechanics of Fluids, Prentice Hall

McCormickAerodynamics, Aeronautics and Flight Mechanics (Wiley, 1979)

Berlin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

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 3301 Aerospace Structures 1 4 credit points

Offered: February. Prerequisite: AERO 2300 Mechanics of Solids 1. Classes: 3 lecture, one hr tutorial/lab per week. Assessment: 2hr exam, assignments/lab reports.

Objectives/Outcomes

To develop an understanding of the fundamentals of structural strength estimation. Students will gain skills in problem solving in the area of aerospace 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.

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)

#### AERO 3351 Aerospace Structures 2 4 credit points

Offered: July. Prerequisite: AERO 2300 Mechanics of Solids 1. Classes: 3 lec, one 1 hr tut/lab per week. Assessment:: 2hr exam, assignments/lab reports.

#### **Objectives/Outcomes**

To develop an understanding of the fundamentals of structural strength estimation. Students will gain skills in problem solving in the area of aerospace 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.

#### Reference books

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

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

#### AERO 3400 Aircraft Design 1

3 credit points

Offered: February. Prerequisite: MECH 2400 Mechanical Design 1. Prohibition: AERO 3401 Aerospace Design 1. Classes: (1 lec, one 3hr tut)/wk. Assessment: Exam, tutorial assignments, major and minor design projects.

**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.

Reference books

Svennson Introduction to Engineering Design (UNSW Press, 1981)

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

AERO 3401 Aerospace Design

### 4 credit points

Offered: February. Prerequisite: MECH 2400 Mechanical Design 1. Prohibition: AERO 3400 Aircraft Design 1. Classes: 1 lec, one 3hr tut per week. Assessment: exam, tut assignments, major and minor design projects.

Objectives/Outcomes

To develop an understanding of the procedures for design. Students will gain skills in designing aerospace vehicle components.

Syllabus Summary

Introduction to design; the process of aerospace design; safety and its implications; component design; structural analysis. *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

#### 3 credit points

Offered: July. Prerequisite: MECH 2400 Mechanical Design 1. Classes: (1 lec, one 3hrtut)/wk. Assessment: Exam, tut assignments, major and minor design projects.

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.

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

Offered: July. Prerequisite: AERO 2500 Introductory Flight

Mechanics and Performance. Classes: (3 lec, one 1hr tut/lab)/wk. Assessment: exam, assignments.

#### 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 thenrelation 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.

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

Offered: February. Prerequisite: AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. Classes: Part-week course held mid-semester vacation.

**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 3600 Aviation Technology

4 credit points

Offered: February. Classes: (one 2hr lec, one 2hr tut/lab)/wk. Assessment: exam(50%), assignments(50%).

**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. Signal post processing; 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.

Reference books

CASA Civil Aviation Orders, parts 100 to 103.

Cutler Understanding Aircraft Structures (PSP professional, 1988)

#### AERO 3602 Aviation Operation and Management 4 credit points

Offered: July. Classes: (one 3hr lec/tut)/wk. 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.

Third year elective unit of study 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. Risk and reliability management. Textbooks

Reference books: To be advised by the Lecturer.

#### AERO 3700 Space Engineering 2 8 credit points

Offered: July. Prerequisite: AERO 2701 Space Engineering 1. Classes: 4 lec, one 2hr tut/lab per week; site visits. Assessment: exam (50%), assignments(50%).

**Objectives**/Outcomes

Students will gain skills in solving problems typically encountered in Space Engineering. An appreciation of the complexity of space vehicle design and component integration will be gained. Methods of program management to ensure absolute quality control will be shown to have paramount importance. Ŝyllabus Summary

Advanced spacecraft subsystems; propellant budgets, attitude control, thermal view factor calculations, nuclear generation of power, surface tension propellant tanks, sensor and actuator sizing.

Introduction to Quality Assurance; Product Assurance.

Launch vehicle design; systems and trajectory analysis. Launch site design and operation; including environmental considerations. Earth station design, staff functions, TT&C ground segment implementation. Human spaceflight; design & operational implications. Spacecraft operation and control. Space vehicle testing; theory and practice; acoustic, vibration, thermal, thermal vacuum tests.

Introduction to supersonic and hypersonic flows. Fundamentals of Gas Dynamics. Advanced orbit mechanics. Interplanetary, Molniya type orbits.

**Textbooks** 

To be advised

### AERO 4200 Aerodynamics 3

3 credit points

Offered: February. Prerequisite: AERO 3250 Aerodynamics 2. Classes: (2 lec, one 1 hr tut/lab)/wk. Assessment: 2hr exam(50%), assignments/lab reports(50%).

#### *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. 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

Offered: July. Prerequisite: MECH 3201 Thermodynamics 2. Classes: (3 lec, one 1 hr tut/lab)/wk. Assessment: 2hr exam(50%), assignments/lab reports(50%).

#### **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; suborbital propulsion systems; scram-jets; hybrid engines. 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

#### Offered: July. Prerequisite: AERO 3250 Aerodynamics 2. Classes: (2 lec, one 1 hr tut/lab)/wk. Assessment: Assignments/lab reports.

**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. 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 Aircraft 4 credit points

Offered: February. Prerequisite: AERO 3250 Aerodynamics 2. Classes: (3 lec, one 1hr tut/lab)/wk. Assessment: course assignments and a written examination.

#### **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. Reference books

Bramwell Helicopter Dynamics (Arnold)

Gessow and Myers Aerodynamics of the Helicopter (Mcmillan)

#### AERO 4291 Advanced Computational Aerodynamics 3 credit points

#### Offered: July. Prerequisite: AERO 3250 Aerodynamics 2. Classes: (2 lec, one 1 hr tut/lab)/wk. Assessment: course assignments. **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 computational results against known flow solutions. Reference books

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

#### AERO 4292 Aeroelasticity

#### 3 credit points

Offered: July. Prerequisite: AERO 3250 Aerodynamics 2. Classes: (2 lec, one 1 hr tut/lab)/wk. Assessment: Course assignments/lab assessments.

**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.

#### 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 4301 Applied Numerical Stress Analysis 6 credit points

Offered: February. Prerequisite: MECH 3310 Mechanics of Solids 2. Prohibition: AÉRO 4303 Aerospace Structures 3. Classes: 2 lec/ wk plus prac classes. Assessment: one 2hr exam. Class work is assessed.

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.

### Reference book

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

#### AERO 4303 Aerospace Structures 3

6 credit points Offered: February. Prerequisite: AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. Prohibition: AERO 4301 Applied Numerical Stress Analysis. Classes: (3 lec, one 1.5 hr tut/ lab)/wk. Assessment: 2hr exam, assignments/lab reports.

#### 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 aerospace 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

#### 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)

#### AERO 4351 Aerospace Structures 4 3 credit points

Offered: July. Prerequisite: AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2. Classes: 2 lec, one 1 hr tut/lab)/ wk. Assessment: 2hr exam, assignments/lab reports.

#### *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 aerospace structural analysis.

#### Syllabus Summary

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

#### 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)

### AERO 4390 Smart Materials and Structures 3 credit points

**Offered:** July. **Prerequisite:** AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2. **Classes:** 2 lec, 1 hrtut/lab per week. **Assessment:** 2 hr exam, assignments/lab reports.

#### Objectives/Outcomes

To develop an understanding of the modern smart materials and structures technologies. Students will gain an appreciation of the advanced technology components: sensors, actuators, and central process unit, in the implementation of Smart Structures System.

#### Syllabus Summary

Smart materials (Piezoelectricity, SMA, ER/MR Fluids, Magnetostriction, Electrostriction, MEMS), Modeling single/dual piezoelectric actuation of beams and plates (Surface boned or embedded actuators; Block force/Uniform strain/Bernoulli-Euler models; Bending/torsion models with skewed actuators); Vibration Control; Contro Schemes (single channel feedback/feedforward control, digital filters, adaptive controllers); MEMS; Fiber Optics; Composite structures; Structural health monitoring/damage detection (Damage detection methods, vibration signature analysis for fault detection, damage classification, case study).

#### AERO 4400 Aircraft Design 3

#### 6 credit points

Offered: February. Prerequisite: AERO 3450 Aircraft Design 2 AERO 3401 Aerospace Design. Classes: (1 lec, one 3hr design class)/wk. Assessment: Design projects.

*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.

Reference books

Torenbeek Synthesis of Subsonic Airplane Design (Delft UP) Roskam Airplane Design (Roskam A&EC)

### AERO 4490 Advanced Aircraft Design 4 credit points

Offered: July. Prerequisite: AERO 3450 Aircraft Design 2, AERO 3401 Aerospace Design. Classes: (one 3hr design class)/wk. Assessment: Design projects.

#### **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 design methods. 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.

Reference books

Torenbeek Synthesis of Subsonic Airplane Design (Delft UP) Roskam Airplane Design (Roskam A&EC)

#### AERO 4500 Flight Mechanics 2

#### 6 credit points

Offered: February. Prerequisite: AERO 3500 Flight Mechanics 1. Classes: (4 lec, 1 tut)/wk.

#### **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.

#### Reference Books

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)

Roskam Airplane Flight Dynamics and Automatic Flight Controls (RoskamA&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

Offered: July. Prerequisite: AERO 3500 Flight Mechanics 1.

Classes: (2 lec, 1 tut)/wk.

**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.

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 Modem (McGraw-Hill, 1995)

#### AERO 4600 Practical Experience

0 credit points

Offered: July. Prerequisite: 40 credit points of 3rd year UOS. Classes: 12 weeks of prac work experience.

**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 tie 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 4620 Aeronautical Exchange Program 24 credit points

Offered: February, July. Prerequisite: Completion of all first, second and third year core units of study in Aeronautical Engineering Approval by Head of School of Aerospace, Mechanical and Mechatronic Engineering. Assessment: Individual units of study at an overseas university participating in an aeronautical exchange program are assessed and a weighted average mark will be calculated from this to obtain an assessment.

#### **Objectives/Outcomes**

The object of this exchange program is to give students the opportunity to study in a different cultural environment for one semester. Students will gain an understanding of the differences in technique applied in the aeronautical industry in other parts of the world. Many aerospace developments are being initiated by groups in North America or Europe and this exchange program will allow Australian students to be involved in these new areas.

#### Exchange Program Summary

Students spend one semester at an overseas university that is part of the approved exchange program in aerospace engineering. The course work completed at the exchange university is to be equivalent to one semester at University of Sydney. Units of study must be at the advanced undergraduate level commensurate with core units of study in the fourth year aeronautical engineering program. The specific units of study must be approved by heads of department at both institutions. A recommended subject is Thesis or Design Project and students are encouraged to undertake work experience within the overseas industry where this is possible.

For details of overseas universities participating in this exchange program, contact the head of department of aeronautical engineering.

### AERO 4700 Space Engineering 3

#### 4 credit points Offered: February. Prerequisite: AERO 3700 Space Engineering 2.

Classes: 3 lec, one 1 hr tut/lab per week. Assessment: Exam (50%), assignments(50%).

#### **Objectives/Outcomes**

Students will gain an appreciation of the advanced technology components required in the implementation of Aerospace Engineering. They will gain an understanding of the possibibties and future directions of these emerging technologies.

Syllabus Summary

Advanced spacecraft subsystems and design; redundancy philosophies; flight computers; magnetic torquing; star tracking. Advanced launch systems; Reuseable, Single Stage To Orbit, nuclear propulsion, mass drivers. Advanced orbit mechanics; gravity assist trajectories and other interplanetary strategies, Lagrange points, Halo orbits, gravitational models etc.

Launch vehicle selection and payload integration; coupled analysis.

Re-entry vehicle design, including application of super/hypersonic flow. An introduction to rarefied gas dynamics.

Advanced space propulsion systems; solar sailing, electric propulsion, pulsed nuclear, antimatter. Space navigation systems; GPS; GLONASS. Space based communications system architecture (GEO, LEO, MEO systems)

Project Management; Schedule, cost control, proposals, bid structure, personnel management, systems engineering, ISO 900X and other relevant standards.

Basic Space Law and legislative issues; The Outer Space Treaty, The Space Activities Act.

Textbooks

To be advised

#### AERO 4900 Thesis or Design Project

10 credit points

Offered: February, July. Prerequisite: 40 Credit Points of 3rd Year UOS AERO 4950 Thesis Preparation. Classes: Literature survey, design, expt and/or analysis work over whole year. **Assessment:** A bound thesis document Js to be submitted for assessment.

**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 work in 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 4907 Interdiciplinary Thesis A 2 credit points

Offered: February, July. Prerequisite: 40 credits of 3rd year UOS. Assessment: A Thesis Plan and Literature Review is to be submitted for assessment.

Objectives/ Outcomes:

To develop an understanding of the practise of aeronautical engineering. Students will gain skills in task preparation, specification definition, communication and work schedule planning. These are the prehminary steps required to commence a significant research project.

If the submission is considered to be satisfactory then it will be used as the basis for the research project to be undertaken in AERO 4957 Interdiciplinary Thesis B.

### AERO 4920 **Seminar** 2 credit points

Offered: July. Prerequisite: 40 credit points of 3rd Year UOS. Classes: A mini-conference held at the end of a week midway through the semester. Assessment: Oral presentation evaluated by peers and staff.

**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.

#### AERO 4950 Thesis Preparation

#### 2 credit points

Offered: February, July. **Prerequisite:** 40 credit points of 3rd year UOS. **Classes:** None. **Assessment:** A Thesis Plan and Literature Review is to be submitted for assessment.

Objectives/ Outcomes:

To develop an understanding of the practise of aeronautical engineering. Students will gain skills in task preparation, specification definition, communication and work schedule planning. These are the preliminary steps required to commence a significant research project.

Each student is to conduct a literature survey on a research topic of their choice. Once complete they are then required to submit a detailed task schedule for the proposed research project. The schedule should include a task completion time line, resource specifications and detailed designs for the project.

If the submission is considered to be satisfactory then it will be used as the basis for the research project to be undertaken in AERO 4900 Thesis.

#### AERO 4957 Interdiciplinary Thesis B 10 credit points

**Offered:** February, July. **Prerequisite:** 40 Credit Points of 3rd Year UOS AERO 4907 Interdiciplinary Thesis A. **Assessment:** A bound thesis document is to be submitted for assessment. 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 work in 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.

### **Chemical Engineering**

### CHNG 1001 Chemical Engineering Applications 4 credit points

**Offered:** February. **Classes:** One (2 hr) lecture/tutorial per week plus 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%).

First year 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 the key 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.

### CHNG 1101 Chemical Engineering 1A 4 credit points

Offered: February. Classes: Two (1 hr) lectures; plus one (2 hr) tutorial per week for one semester. Assessment: One 3hr exam at end of semester plus continuous assessment of assignments. First year core unit of study for the degree in Chemical Engineering.

**Objectives/Outcomes** 

This is a first unit 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 unit 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.

### CHNG 1102 Chemical Engineering 1B

### 4 credit points

Offered: July. Prerequisite: CHNG 1101 Chemical Engineering 1A. Classes: 2 hours of lectures, 3 hours of tutorials per week.

#### Assessment: Assignments; final examination.

First year core unit of study for the degree in Chemical Engineering.

#### Objectives/Outcomes

This is a first unit 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 unit 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. 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.

#### CHNG 1201 Chemical Process Case Studies 4 credit points

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

First year 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.

#### CHNG 1301 Computing for Chemical Engineers 1A 4 credit points

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

First year 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 1302 Computing for Chemical Engineersl B 4 credit points

Offered: July. Prerequisite: Advisory prerequisite: CHNG 1301

Computing for Chemical Engineering 1 A. Classes: Two lectures and one tutorial per week for one semester. Assessment: assessed on pass/fail basis -100% tutorial performance.

Objectives/outcomes: to develop a basic understanding of the Matlab computing environment and its use in solving chemical engineering problems.

Syllabus summary:

- Review of linear algebra
- Introduction to Matlab
- Matlab functions
- Interpolation and curve fitting

Applications (of the above) to chemical engineering problems Textbooks

Engineering Problem Solving with Matlab, 2nd edition, D.M. Etter, Prentice Hall.

### CHNG 2101 Chemical Engineering 2A

4 credit points

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

Second year core unit of study for the degree in Chemical Engineering.

#### **Objectives/Outcomes**

This unit 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 advanced 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.

#### CHNG 2102 Chemical Engineering 2B

#### 4 credit points

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

Second year core unit of study for the degree in Chemical Engineering.

#### **Objectives/Outcomes**

This unit 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 unit introduces the concept of chemical engineering rate processes and their importance in selecting and designing process equipment; students will meet 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.

#### CHNG 2301 Chemical Engineering Computations 4 credit points

Offered: February, July. **Prerequisite:** Advisory prerequisites: MATH 1001, MATH 1002, MATH 1003, MATH 1005, CHNG 1301. **Classes:** 4hrs lec & tut/wk. **Assessment:** Tutorials, assignments and one final examination.

Second year 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.
- Svllabus 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.

#### CHNG 2302 Process Data Management 4 credit points

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

Year 2 elective unit of study for the degree in Chemical Engineering.

*Objectives/Outcomes* 

It is expected that students will understand the basic principles of statistical data analysis and usage.

Syllabus Summary

Data gathering and uses; data quality; data filtering; frequency distributions; averages and measures of dispersion; statistical inference; hypothesis testing; analysis of variance; least-squares fitting; linear regression; data reconciliation; control charts; statistical software packages.

# CHNG 2501 Environmental Chem Eng Fundamentals 4 credit points

**Offered:** July. **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 two projects.

Second year core unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

- To develop an awareness of the various concepts which underpin sustainable development;
- To explore the role of chemical and process engineers in promoting sustainable development;
- To explore tools and approaches for quantifying industry's environmental performance.
- Syllabus Summary
- Sustainability its biophysical, economic and social dimensions;
- A thermodynamic analysis of the industrial economy;
- Industry's "triple bottom line" accountability;
- Environmental resource management air, water, and land pollution;
- Australian industry and sustainability;
- · Industry case studies successes and failures.

#### CHNG 2502 Clean Products and Processes 4 credit points

**Offered:** July. **Prerequisite:** advisory prerequisite: CHNG 2501. **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 two projects.

Year 2 elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

- To develop a systems analysis view of industry's environmental performance;
- To distinguish between 'cleaner technology' and 'clean-up' technology;
- To develop tools and approaches for the design of cleaner processes.

Syllabus Summary

- Limitations of clean-up technologies;
- · From products to processes to services;
- Cleaner technology, Life Cycle Assessment and industrial ecology;
- Waste minimisation hierarchy;
- Process synthesis with environmental objectives;
- Design for sustainability micro and macro dimensions;
- Case studies: (a) resource industries; (b) chemical and process industries; (c) small and medium scale industries.

### CHNG 2601 Materials and Corrosion 4 credit points

**Offered:** July. Classes: 2hr of lec & tut/wk. **Assessment:** One 2hr exam.

Core unit 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 corrosion kinetics. Passivation. Corrosion types protection and case studies. Materials selection and design. High temperature corrosion and oxidation. *Textbooks* 

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

- Unrig and Revie Corrosion and Common Control 3rd edn (Wiley, 1985)
- Pourbaix Atlas of Electrochemical Equilibria in Aqueous Solutions (NACE, 1974)

#### CHNG 2701 Fundamentals of Bioprocess Engineering 1

4 credit points

**Offered:** February. **Prerequisite:** Advisory prerequisite: CHEM 1101, CHEM 1201. **Classes:** one lecture per week and two tutorial/ project/lab sessions per week for one semester. **Assessment:** Tutorials 35% projects 35% and final examination 30%.

Second year elective unit of study for the degree in Chemical Engineering.

**Objectives** 

To understand the major metabolic pathways of the cell.

- To understand the role of biochemistry in Biochemical Engineering.
- To understand how chemical engineering fundamentals are relevant to the study of biochemistry.
- Syllabus

Major macromolecules of the cell: carbohydrates, proteins, lipids, nucleic acids.

- Énzymes: structure and function, enzyme kinetics, enzyme recovery and purification.
- Major metabolic pathways: carbohydrate metabolism, citric acid cycle, lipid metabolism, oxidtive phosporylation, nitrogen metabolism.
- Textbooks

Biochemistry, L. Stryer 4th edition, WH Freeman and Co. NY

#### CHNG 2702 Fundamentals of Bioprocess Engineering 2

4 credit points

Offered: July. Prerequisite: advisory prerequisite: CHEM 1101,

CHEM 1201. Classes: one lecture and two tutorial/project/labs per week for one semester. Assessment: Laboratory 35% projects 35% and final examination 30%.

Second year elective unit of study for the degree in Chemical Engineering.

Objectives

To study practical aspects of the application of biochemistry to industrial processes.

Syllabus

Molecular biology basic concepts; Introduction to Immunology; Biochemistry and medicine.

Laboratory projects

Enzyme reactions, Protein separation, Electrophoresis, Chromatography.

Textbooks

Biochemistry L. Stryer 4th Ed- W.H. Freeman and Co, NY.

#### CHNG 3001 Chemical Engineering Laboratory 4 credit points

**Offered:** February. **Prerequisite:** Advisory 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.

Third year 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.

#### Faculty of Engineering Handbook 2001

#### Syllabus Summary

This laboratory course complements the various "Unit Operations" courses in 3rd 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 inter-

pretation of the experimental data and to the writing of a clear, logical and concise technical report.

### CHNG 3041 Exchange Program 3A 24 credit points

**Offered:** February, July. **Prerequisite:** Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. **Assessment:** Individual approved subjects at the host institution are assessed according to their standard procedures and a composite mark is derived from the weighted average of those assessments.

Year 3 elective unit of study for the degree in Chemical Engineering.

#### Objectives/Outcomes

The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.

Upon completion of the full year-long exchange (ie both CHNG 3041 and 3042), students will have completed work at least equivalent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 units of study.

### CHNG 3042 Exchange Program 3B 24 credit points

**Offered:** February, July. **Prerequisite:** Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. **Assessment:** Individual approved subjects at the host institution are assessed according to their standard procedures and a composite mark is derived from the weighted average of those assessments.

Year 3 elective unit of study for the degree in Chemical Engineering.

#### *Objectives/Outcomes*

The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.

Upon completion of the full year-long exchange (ie both CHNG 3041 and 3042), students will have completed work at least equivalent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 units of study.

#### CHNG 3101 Unit Ops (Heat Transfer) 4 credit points

Offered: July. **Prerequisite:** Advisory 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.

Third year 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 Ops (Mass Transfer) 4 credit points

Offered: February. Prerequisite: advisory prerequisites: CHNG

2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. **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.

Third year core unit of study for the degree in Chemical Engineering.

#### Objectives

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 stage process. 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 Ops (Particle Mechanics) 4 credit points

Offered: July. Prerequisite: advisory prerequisites: 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 final examination.

Third year 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.

### CHNG 3104 Unit Ops (Fluid Mechanics)

4 credit points

**Offered:** February. **Prerequisite:** advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. **Classes:** Four hours of lectures and tutorials per week for one semester. **Assessment:** Tutorial assignments and final examination. Third year 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.

#### CHNG 3105 Thermodynamics 1 4 credit points

Offered: February. Prerequisite: advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. Classes: Two (1 hr) lectures plus one (1 hr) tutorial per week for one semester. Assessment: Assignments; final examination. Third year core unit of study for the degree in Chemical Engineerina.

**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 for real 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 volumeexplicit equations of state (e.g. the virial equation in volumeexplicit form); application of pressure-explicit equations of state in computer methods for property prediction.

### CHNG 3106 Thermodynamics 2

4 credit points

Offered: July. Prerequisite: Advisory prerequisite: CHNG 3105 Thermodynamics 1. Classes: Two (1hr) lectures plus one (1 hr)

tutorial per week for one semester. Assessment: Assignments; final examination.

Third year 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 fugacities 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 K-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.

#### CHNG 3107 Reaction Engineering 1 4 credit points

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

Third year 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.

#### CHNG 3301 Process Modelling

4 credit points Offered: February. Prerequisite: Advisory 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.

Third year 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

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

Thrd year 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.

### CHNG 3401 Project Economics 4 credit points

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

Third year 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 4001 Practical Experience

#### 0 credit points

**Offered:** July. **Prerequisite:** advisory prerequisite: 28 credit points of 3rd year units. **Classes:** There are no formal classes. Students are required to obtain 10 weeks of practical work experience before entering their 4th 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 4th academic year.

Fourth year 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, dirough the Chemical Engineering Foundation, and the Careers and Appointments Service will assist wherever possible.

#### CHNG 4002 Thesis

#### 8 credit points

Offered: February. Prerequisite: Advisory prerequisite: Students should have completed (or be enrolled in) all other 4th Year core units. 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.

Fourth year 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 a program of 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

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

Fourth year elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

The objective of this unit is to provide students with exposure to the latest developments in research and technology. *Syllabus* 

This unit 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

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

Fourth year elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

The objective of this unit is to provide students with exposure to the latest developments in research and technology.

Syllabus

This unit 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 4006 Professional Option

#### 2 credit points

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

Fourth year 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 4041 Exchange Program 4A 24 credit points

Offered: February, July. Prerequisite: Completion of all Year 1,2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. Assessment: Students spend one academic year at the host institution where they take a normal load. Their specific course choices are approved by the Heads of Department of the two institutions. Individual approved subjects at the host institution are assessed according to their standard procedures and a composite mark is derived from the weighted average of these assessments.

Year 4 elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.

Upon completion of the full year-long exchange (ie both CHNG 4041 and 4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree,

including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

### CHNG 4042 Exchange Program 4B

24 credit points Offered: February, July. Prerequisite: Completion of all Year 1,2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. Assessment: Students spend one academic year at the host institution where they take a normal load. Their specific course choices are approved by the Heads of Department of the two institutions. Individual approved subjects at the host institution are assessed according to their standard procedures and a composite mark is derived from the weighted average of these assessments.

Year 4 elective unit of study for the degree in Chemical Engineering.

#### **Objectives/Outcomes**

The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.

Upon completion of the full year-long exchange (ie both CHNG 4041 and 4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree, including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

### CHNG 4101 Separation Processes

#### 4 credit points

Offered: July. Prerequisite: Advisory prerequisites: CHNG 3101, CHNG 3102, CHNG 3103, CHNG 3104. Classes: Four hours of lectures and tutorials per week for one semester. Assessment: Tutorial assignments and final written examination.

Fourth year 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 components from aqueous waste liquids. Flowsheeting packages and phase equilibria in environmental systems. Practical distillation for tray and packed columns following the Kister methods.

#### CHNG 4102 Transport Phenomena 4 credit points

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

Fourth year 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.

#### CHNG 4103 Advances in Polymer Engineering 4 credit points

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

#### CHNG 4104 Reaction Engineering 2 4 credit points

Offered: July. Prerequisite: Advisory 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%)

Fourth year 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 problem 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.

#### CHNG 4105 Advanced Thermodynamics 4 credit points

Offered: February. Prerequisite: Advisory prerequisites: CHNG 3105 and CHNG 3106. Classes: Three hours of lectures and tutorials per week for one semester. Assessment: May vary from year to year.

Fourth year elective unit of study for the degree in Chemical Engineering.

Objectives/Outcomes

This subject will provide students with information and knowledge on advanced aspects of thermodynamics. It will consider the application of this material to process simulation and design.

#### Faculty of Engineering Handbook 2001

Syllabus Summary: A selection of advanced thermodynamic topics that may include: -multiphase equilibrium; -multicomponent equilibria; -computation of the conditions for equilibria; cubic equations of state: -mixing rules: -thermodynamics of polymer models; -group contribution of Rorey's lattice model and the mean field lattice gas model.

The syllabus details may change as specialist lecturers become available.

#### CHNG 4201 Chemical Engineering Design 1 4 credit points

Offered: February. Classes: 4 hours of lectures and tutorials per week for one semester. Assessment: Tutorial assignments and a final examination.

Fourth year 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.

#### CHNG 4202 Chemical Engineering Design 2 8 credit points

Offered: July. Classes: Approximately 8 hours of informal classes, design and library work per week for one semester. Assessment: Design report and contribution to design group.

Fourth year 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.

#### CHNG 4203 Major Industrial Project 24 credit points

Offered: February. 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.

Fourth year 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

The major component of this unit of study is the conduct of a project in industry under joint University/industry supervision. 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.

In addition, students will be required to incorporate in their work industry case studies in core curriculum areas of their degree program, as determined by the Head of Department. Students are expected to show a proficiency in each of these case studies comparable with that which would be achieved in the units of study they are replacing. The Major Industrial Project may not then be counted with the units of study corresponding to the selected case study areas. Case studies which may be required are:

- (1) Case Studies in Process Design and Simulation
- (in lieu of CHNG 4201 Chemical Engineering Design 1)
- (2) Case Studies in Project Management
- (in lieu of CHNG 4401 Project Engineering)
- (3) Case Studies in Hazard and Environmental Impact Analy-
- sis (in lieu of CHNG 4402 Process Plant Risk Management)

#### CHNG 4301 Advanced Fluid Dynamics Modelling 4 credit points

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

Fourth year 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

#### CHNG 4304 Process Control 2 4 credit points

Offered: February. Prerequisite: CHNG 3302 Process Control 1. Classes: Four hours of lectures, tutorial and laboratory work per week for one semester. Assessment: Tutorial assignments, laboratory reports and a whole semester project.

Fourth year elective unit of study for the degree in Chemical Engineering.

**Objectives/Outcomes** 

It is expected that students 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. Lab-oratory experiments and PC laboratory in Process Control.

#### CHNG 4305 Process Systems Engineering 4 credit points

Offered: July. Prohibition: 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

Fourth year 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

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

#### CHNG 4402 Process Plant Risk Management 4 credit points

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

Fourth year 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

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

Fourth year 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

Offered: July. Prerequisite: CHNG 2701 & CHNG 2702 Fundamentals of Bioprocess Engineering 1 & 2; MICFt 2007 Microbiology for Engineers A; MICR 2008 Microbiology for Engineers B. Classes: 2 x 2 hr / week Lectures, 4 x 12 hr / semester Laboratories, 6 x 1 hr Tutorials. Assessment: Assignments (15%), laboratory work (15%), design study (15%) and final examination (55%).

Fourth year elective unit of study for the degree in Chemical Engineering.

#### Objectives/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.
- 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.

# CHNG 4504 Environmental Decision Making 4 credit points

Offered: July. Classes: One 2 hour lecture and one (1 hr) tutorial per week for one semester. Assessment: Tutorial assignments and projects.

Fourth year unit of study for the degree in Chemical Engineering.

#### *Objectives/Outcomes*

- To acquaint students with the issues to be considered in environmental decision making, the wide range of stakeholders involved, and uncertainties in the information available to support the decision.
- To bring all this together in a structured manner, ensuring the clear identification of decision objectives, and the criteria by which the value of possible decision outcomes will be assessed.

· To explore decision making in Impact Assessment.

#### Syllabus Summary

This course will consider, from a "Systems" perspective, the practice of environmental decision making, the tools and approaches used in problem structuring and decision analysis, and the evaluation of decision outcomes. A specific focus will be where there are multiple objectives to be satisfied, including the exploration of trade-offs between environmental, economic, and social objectives. The course will explore the use of "Life Cycle Thinking" to guide the scope of decision analysis, providing the spatial and temporal boundaries which define the decision space. Students will be exposed to the theory and practice of Environmental Impact Assessment, as well as product and process Life Cycle Assessment. Decision making in the context of project life cycle considerations will also be explored, focusing on identification and management of risk and uncertainty.

#### CHNG 4506 Advanced Environmental Engineering 4 credit points

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

Assessment: Assignments; final examination.

NB: Not offered in 2001.

Fourth year 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.

#### Faculty of Engineering Handbook 2001

#### 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.

### CHNG 4601 Advanced Particle Mechanics 4 credit points

Offered: July. Prerequisite: All four components of Unit Operations. Classes: 3hrs lec & tut/wk for one semester. Assessment: Assignments and final examination.

Fourth Year elective unit 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; incipient fluidisation; theory of bubble rise; bubble formation; fluid-bed reactors.

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

#### CHNG 4604 Chemical Modelling of Aqueous Systems

#### 4 credit points

**Offered:** February. **Prerequisite:** CHNG 3101, CHNG 3102, CHNG 3103, CHNG 3104 and CHNG 3106. Classes: Three hours of lectures/tutorials per week for one semester. Assessment: Class assignments, tutorials and a final examination.

Year 4 elective unit of study for the degree in Chemical Engineering.

#### **Objectives/Outcomes**

To develop an understanding of the current state-of-the-art in chemical modelling of aqueous systems and its application to environmental problems, water pollution and wastewater treatment, chemical manufacturing, mineral processing and extractive metallurgy.

Students will develop skills in the following:

- Making critical decisions in characterising aqueous systems;
- Developing appropriate models for solving realistic problems involving aqueous processes;
- Critically assessing and evaluating available computer packages for modelling;
- Developing treatment strategies for process streams, wastewaters and the aquatic environment.

#### Syllabus Summary

Basic concepts of chemical modelling of aqueous systems. Identification, selection and assessment of key input data for a chemical model. Chemical speciation in an aqueous environment. Aqueous systems at elevated temperature and high concentrations of dissolved species. Interaction of atmospheric carbon dioxide on waste residue disposal and aqueous processing. Chemical modelling techniques, and review and evaluation of computer software for aqueous processes.

Case studies and applications include: the removal/recovery of heavy metals (eg Cd, Cu, Cr, Zn) from wastewaters; lime as a reagent; effect of atmospheric C02 on metal precipitation and disposal; gypsum solubility; gas solubility, absorption and "sour" water treatment; mineral processing (leaching, solvent extraction, flotation); complexing ligands (S042-, C1-, NH3, C02, S02); aluminium in the environment; aqueous corrosion.

#### CHNG 4605 Mineral Processing 4 credit points

**Offered:** February. **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.

Fourth year 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.

#### CHNG 5101 Chemical Equilibrium Modelling of Aq Sys

#### 8 credit points

**Offered:** February, July. Assessment: Exam, assignment, class exercises.

This course introduces you to the current state-of-the-art in chemical modelling of aqueous systems and its application to environmental problems, water pollution and wastewater treatment, chemical process engineering, corrosion engineering, mineral processing and extractive metallurgy. Students will develop skills in making critical decisions in characterising aqueous systems, developing appropriate models for solving realistic problems involving aqueous processes, critically assessing and evaluating available computer packages for modelling, and developing treatment strategies for process streams, wastewa-ters and the aquatic environment. Typical questions to be addressed include: does the toxicity of a heavy metal depend on its dissolved form? What species are present in a complex wastewater? What effect will the pH have on the solution composition of an aqueous stream and what solids might precipitate? Will atmospheric carbon dioxide influence this? What will be the effect of chloride ion on the stability of a heavy metal solid residue? How will chemical modelling aid in characterising and treating an aqueous waste? What software is available and at what cost?

It will be shown how predictive chemical models allow complex aqueous processes to be treated in a systematised way and, consequently, to be understood and managed.

#### CHNG 5401 Process Plant Risk Management 8 credit points

#### Offered: February.

Topics include: Inevitability of risk, types of hazard 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 risk, risk contours. Role of the human factor. Inherent safety, and risk reduction by engineering and management approaches. Community intgeraction. Case studies.

### CHNG 5501 Environmental Biotechnology 8 credit points **Offered:** February.

NB: Contact Dept of Chemical Engineering for Environmental Engineering postgraduate handbook.

Microbial metabloism; reactor design for liquid, gaseous and solid treatment including anaerobic processes, biological nutrient removal, biofiltration and bioremediation.

#### CHNG 5503 Environmental Decision Making 8 credit points

Offered: July. Assessment: Major project, 2 minor projects, assignments.

Acquaints students with the issues to be considered in environmental decision making, the wide range of stakeholders involved, and uncertainties in the information available to support the decision. This will all be brought together in a structured manner, ensuring the clear identification of decision objectives, and the criteria by which the value of possible decision outcomes will be assessed. Decision making will be explored in Impact Assessment.

#### CHNG 5901 Project Part A

6 credit points

Offered: February, July. NB: See Department of Chemical Engineering for information.

CHNG 5902 Project Part B 6 credit points

Offered: February, July. NB: See Department of Chemical Engineering for information.

CHNG 5904 Seminar 1 2 credit points

Offered: February, July. NB: See Department of Chemical Engineering for information.

CHNG 5905 Seminar 2 2 credit points

Offered: February, July. NB: See Department of Chemical Engineering for information.

### Civil Engineering

#### CIVL 1001 Civil Engineering 1 4 credit points

Offered: February. Assumed 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: Lectures: 13hrs; lec/tut-13hrs; lab /drawing office: 26hrs. Assessment: Specified assignments and one 3hr exam at end of unit.

First year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil). Elective unit of study 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.

#### Reference books

Krick An 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).

#### CIVL 1004 **Computational Engineering** 4 credit points

Offered: July. Prohibition: COMP1001 Introductory Programming or COMP 1002 Introductory Computer Science. Classes: 1 lecture and one 2 hour computer lab session/ week. Assessment: One 2 hr examination at end of semester plus assessment of computer exercises during semester.

First year core subject in Civil Engineering and Project Engineering and Management (Civil).

COMP 1001 Introductory Programming and COMP 1002 Introductory Computer Science is an acceptable alternative. Objectives

To provide an introduction to a programming language and to the logic of programming. To introduce computer graphics and to highlight the application of graphics to the solution of engineering problems.

Outcomes

Students should obtain an understanding of the logic of computer programming and be able to write computer programs to solve engineering problems. They should also be able to present visual images and graphics and to apply computer graphics to the solution of engineering problems.

Syllabus summary

Introduction to the matrix and graphics functions of MATLAB: Matrix manipulation, input/output, flow control, function and script files, object hierarchies including high and low level graphics functions, object properties, plotting functions and colour maps. Introduction to 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

Lecture Notes Prepared by Department.

Reference Books

D. Hanselman and B. Littiefield Mastering Matlab Prentice-Hall 1996

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

F.S. Hill MacMillan Computer Graphics 1990

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

#### CIVL 1051 **Dynamics**

5 credit points

Offered: July. Assumed knowledge: Mathematics 3 unit course and Science 4 unit course (or the Physics core of 3-4 unit Science) at the HSC. Prohibition: MECH 1510. Classes: 2 hours lectures and 2 hours tutorials per week. Assessment: One 3 hr exam at the end of the semester plus assessment of assignments and quizzes during the semester.

First year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

Syllabus summary: Newton's Laws, Kinematics including rectilinear motion, angular motion and curvilinear motion, motion of rigid bodies. Absolute and relative motion. Kinetics including particle motion and rigid body motion. Work and energy. Linear and angular impulse and momentum. Kinetics of steady mass flow. Periodic motion.

Objectives: To introduce basic concepts of motion and the calculation of paths of motion and the forces associated with the motion.

Outcomes: It is expected that students will be able to apply the dynamics of particles and rigid bodies, mainly in two dimensions to solve engineering problems.

Textbooks

Meriam and Kraige, Mechanics - Volume 2, Dynamics, SI Version, 4th Edition, Wiley (1997).

#### CIVL 1052 Statics

#### 5 credit points

Offered: February. Assumed knowledge: Mathematics 3 unit course at the HSC. Prohibition: MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics. Classes: Lectures: 26hrs; tut.: 26hrs. Assessment: Assignment submissions during semester and one 3hr exam at end of semester.

First year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

Syllabus summary: Basic concepts: scalars and vectors; units. Statics of the rigid body; forces and moments in two dimensions and three dimensions; system isolation; free body diagrams, and equilibrium criteria in two dimensions and three dimensions. Cable systems; beams with distributed loads, statically determinate pin-jointed structures, hydrostatics.

Objectives: To introduce basic concepts of static equilibrium and the calculation of forces and moments in statitdcally determinate structures.

Outcomes: It is expected that students will be able to analyse simple pinjointed structures, draw free body diagrams. *Textbooks* 

Meriam and Kraige Engineering Mechanics, Volume 1, Statics, SI version, 4th Edition, Wiley (1997).

#### CIVL 2004 Engineering Communications 1 2 credit points

Offered: February. Classes: 12hrs lec, 14hrs discussion/oral presentation. Assessment: Based on two written reports and one oral presentation session. Extra credit for some or all oral presentations may be given for verifiable 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. Second year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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.

Reference Books

Library classification 808.

#### CIVL 2201 Structural Mechanics 6 credit points

Offered: February. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. Classes: lec: 39hrs. tut: 26hrs.

Assessment: Class assignments and one 3hr closed-book exam covering the whole syllabus at the end of semester.

Second year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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* 

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).

CIVL 2204 Introduction to Structural Concepts 4 credit points

**Offered:** July. **Assumed knowledge:** CIVL 1051 Dynamics and CIVL 1052 Statics. **Prohibition:** CIVL 2203 Structural Design, CIVL 2101 Properties of Materials. Classes: Lectures: 26 hrs; Design classes 26 hrs. **Assessment:** Design class assignments and one 3hr closed book exam covering the whole syllabus at the end of semester.

Second year core unit of studey for the degree in Civil Engineering and Project Engineering and Management (Civil).

Objectives: To provide a basic understanding of design concepts and the design of steel, composite and concrete structures. To provide an understanding of limit state design and structural loading.

Outcomes: Proficiency in the selection of structural systems and structural materials including 2D and 3D systems, bracing systems, and floor systems. Proficieny in the computation of structural loadings including dead, live, wind, snow and earthquake loads.

**T**extbooks

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 I and II.

Buckle, The Elements of Structures, (2nd ed.) (Pitman International)

Schoedek, 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).

Gorenc, Tinyon and Syan, Steel Designers' Handbook (6th ed.)

(UNSW press) Park and Paulay, Reinforced Concrete Structures (Wiley)

Trahair and Bradford, Behaviour and Design of Steel Structures to AS4100 3rd Ed. (E & EN Spon 1998)

Warner, Rangan and Hall, Reinforced Concrete (Pitman) Chen, Handbook of Structural Engineering, CRC Press (1997).

CIVL 2205 Introduction to Structural Design 4 credit points

Offered: July. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. Prohibition: CIVL 2203 Structural Design, CIVL 2101 Properties of Materials. Classes: Lectures: 26 hours; design classes: 26hrs. Assessment: Design class assignments and one 3hr closed book exam covering the whole syllabus on steel, concrete and timber design at the end of semester.

Intermediate core course for the degree in Civil Engineering. Objectives: To develop an understanding of the properties of concrete, steel and timber materials and their relevance in structural design. To provide a basic understanding of the design in concrete, steel and timber elements to current code criteria.

Outcomes: Proficiency in the design of simple structural elements, including the ability to select the best materials for design applications.

Textbooks

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

SAA AS4100 - Steel Structures Code

- SAA AS3600 Concrete Structures Code, and
- SAAAS1720.1 -Timber Structures Code, and
- SAA AS 1170 Loading Code, Parts I and H

Reference Books

- Campbell-Allen and Roper, Concrete Structures: Materials, Maintenance and Repair (Longman Scientific and Technical) Soroka Portland, Cement Paster and Concrete (MacMillan
- Australia, 1979) Akroyd, Concrete - Its Properties and Manufacture (Pergamon)
- and/or Troxell, Composition and Properties of Concrete 2nd ed.
- (McGraw Hill)
- U.S. Bureau of Reclamation Concrete Manual
- Czemin, Cement Chemistry and Physics for Civil Engineers (Lockwood)
- William D. Callister Jr., Materials Science and Engineering An Introduction (4th ed.) (Wiley) Timber Design Handbook, SAAHB108-1998
- Park and Paulay, Reinforced Concrete Structures (Wiley)
- Library Classification: U624.182, U624.184, U624.183 (Fisher

Library)

#### Engineering Geology 2 CIVL 2409 4 credit points

Offered: July. Assumed knowledge: Either GEOL 1002 or GEOL 1501 Engineering Geology. Classes: 26hrs lec, 26hrs lab. Field Excursions in the Sydney area, as appropriate. Assessment: Practical lab work, assignment, plus one combined practical and theory 3hr exam at the end of the semester.

Second year core unit of study for the degree in Civil Engineering, unless the two Geology 2 units of study 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

T. West Geology Applied to Engineering.

Reference books

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

CIVL 2610 Fluids 1

#### 6 credit points

Offered: February. Assumed knowledge: MATH 1001, MATH

1002, MATH 1003, MATH 1005, Classes: 26hrs lec, 42hrs lab/tut. Assessment: One 3hr exam covering the whole syllabus at the end of semester. Satisfactory laboratory and tutorial performance is also a requirement. Tutorial tests and laboratory assignents, as indicated at the commencement of the course.

Second year core unit of study for the degree in Civil Engineering. Third year core unit of study for the degree in Project Engineering and Management (Civil).

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

#### Textbooks

Douglas, Gasiorek and Swaffield 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).

#### CIVL 2801 **Engineering Construction 1** 4 credit points

Offered: July. Classes: 26hrs lec & 26hrs tut. Assessment: Regular coursework as well as class tests (no final examination will be conducted)

Second year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil). Elective unit of study 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

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.

#### CIVL 3005 **Engineering Communications 2** 2 credit points

Offered: July. Assumed knowledge: CIVL 2004 Engineering Communications 1. Classes: 26hrs discussion/oral presentation. Assessment: Based on written reports and oral presentations. Extra credit for oral presentation may be given for 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.

Third year core unit of study for the degree in Civil Engineering (except for students undertaking a BE/BComm).

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 databases. Dealing with the media. Written reports and oral presentation on topics of general, technical and/or social significance. Effective group communication and teamwork.

#### CIVL 3102 Materials Aspects in Design

#### 4 credit points

Offered: July. Assumed knowledge: CIVL 2101 Properties of Materials. Classes: lec 40hrs, lab: 12hrs. Assessment: One 3hr exam covering the whole syllabus.

Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

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

Materials Science and Engineering an Introduction

William D. Callister Jr. 4th Edition 'Wiley' publishers

- 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
- Czemin Cement Chemistry and Physics for Civil Engineers (Lockwood).

Relevant SAA Specifications.

#### CIVL 3204 Structural Analysis 6 credit points

Offered: February. Assumed knowledge: CIVL 2201 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations. Classes: 42hrs lec & 42hrs tut. Assessment: One 3 hr exam at end of semester plus assessment of assignments.

Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

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 unit of study 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. Program PRFSA. Plastic analysis of beams and frames. Upper and lower bound theorems. *Textbooks* 

KJR Rasmussen, Structural Analysis 1, (Univ of Sydney)

KJR Rasmussen, GJ Hancock, MJ Clarke Structural Analysis 2, (Univ of Sydney)

Reference Books

Popov, Introduction to the Mechanics of Solids (Prentice Hall) Partes, Braced Frameworks (Pergamon)

Timoshenko and Young, Theory of Structures (McGraw Hill)

#### CIVL 3206 Steel Structures 1

6 credit points

Offered: July. Assumed knowledge: CIVL 2201 Structural Mechanics. Classes: 39hrs lec, 39hrs tut/lab/drawing office. Assessment: One 3 hr exam at the end of the semester plus assessment of design and problem based assignments. Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

Objectives: To provide a basic understanding of the behaviour and design of steel members, connections 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, connections and structures - design concepts, 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, inplane bending of beam-columns, lateral buckling of beam-columns, bolted and welded connections. *Textbooks* 

(AISC) Economical Structural Steelwork.

GJ. Hancock, M.J. Clarke & T. Wilkinkson, CIVL 3206 Steel Structures 1 printed lecture notes.

BHR Hot Rolled and Structural Products Handbook.

Standards Australia Specifications - current editions

AS 1170 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 to AS4100 (3rd Edn, E & FN Spon, 1998).

# CIVL 3207 Risk and Reliability Analysis 2 credit points

Offered: February. Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005, CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts, CIVIL 2205 Introduction to Structural Design. Classes: 16hrs lec; 12hrs tut. Assessment: One 3hr exam plus a mid-semester test.

Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

Objectives: To provide a basic understanding of the principles of statistical decision theory, probabilistic risk assessment and structural reliability analysis; to develop an understanding of 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, Bayes' 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, fie design point, reliability based design, simulation methods, system effects.

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 HorwoodTWiley, 1987).

#### CIVL 3223 Concrete Structures: Behaviour 3 credit points

Offered: February. Assumed knowledge: CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design. Prohibition: CIVL 3205 Concrete Structures 1. Classes: Lectures 28hrs: tut/lab/ drawing office 14 hrs. Assessment: One 3 hour exam plus midsemester test and reports.

Third year unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

Syllabus Summary: The behaviour of reinforced concrete members and structures, including: introduction, material properties, 'elastic 'analysis (stresses/deformations/time-dependance), ultimate strength of beams (flexure), ultimate strength of columns (short and slender). Material aspects of cement and concrete.

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 of reinforced concrete behaviour (including an understanding of capabilities and limitations). Expected Outcomes: Proficiency in basic methods of reinforced concrete analysis and interpretation of results. *Textbooks* 

Warner et al, Concrete Structures (Longman 1998) Standards Australia Specifications - current editions:

AS3600 Concrete Structures Code

ASHB2.2 Structural Engineering Standards

Reference Book

Park and Paulay, Reinforced Concrete Structures.

### CIVL 3224 Concrete Structures: Design 3 credit points

Offered: July. Assumed knowledge: CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design. **Prohibition:** CIVL 3205 Concrete Structures 1. **Classes:** Lectures 24 hrs: tut/lab/ drawing office 18 hrs. **Assessment:** One 3 hour exam plus design project and mid-semester test.

Third year unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

Syllabus Summary: The reinforced concrete truss analogy (shear/torsion/and detailing implications). Introduction to behaviour or reinforced concrete slabs. 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. Material aspects of cement and concrete.

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

Expected Outcomes: Proficiency in basic methods of reinforced concrete analysis and design.

Textbooks

Warner et al. Concrete Structures (Longman 1998)

Standards Australia Specifications - current editions:

AS1170 Loading Code - Parts 1, 2 & 4

AS3600 Concrete Structures Code

ASHB2.2 Structural Engineering Standards

Reference Books

Concrete Design Handbook, Cement and Concrete Association of Australia

Reinforcement Detailing Handbook, Concrete Institute of Australia.

#### CIVL 3401 Soil Mechanics A

4 credit points

Offered: February. Assumed knowledge: CIVL 2201 Structural Mechanics. 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.

Third year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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. *Reference books* 

CR. Scott An Introduction to Soil Mechanics and Foundations. R.F. Craig Soil Mechanics.

#### CIVL 3402 Soil Mechanics B

#### 4 credit points

Offered: July. Assumed knowledge: CIVL 3401 Soil Mechanics A. Classes: 16 hrs lec/tut., Project Work. Assessment: One 2hr exam covering the whole syllabus at the end of semester. 3 Projects each of 3 weeks duration during semester.

Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

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

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. Improved team, report writing and presentation skills. Production of design charts and aids.

Syllabus summary: Shear strength of soils. Earth pressure theories. Elementary bearing capacity theory. Slope stability analysis. Analysis of Retaining Walls, Pile capacity

#### 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.

### CIVL 3501 Surveying 1

4 credit points

Offered: February. Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005. Classes: lec: 26hrs, fieldwork/ pract.: 24hrs. Assessment: fieldwork, reports, tutorials, and one 3hr exam at the end of the course.

Third year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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. Blinker, P. Wolf Elementary Surveying (Harper Collins Publishers).

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

#### CIVL 3602 Fluids 2

4 credit points

Offered: July. Assumed knowledge: CIVL 2610 Fluids 1. Classes: Lectures: 26hrs; tut.: 26hrs. Assessment: one 3hr exam covering the whole syllabus at the end of semester. Tutorial tests, as indicated at the commencement of the course.

Third year core unit of study for the degree in Civil Engineering. Third year elective unit of study for the degree in Project Engineering and Management (Civil).

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, open channel flow, pipe networks, hydro and aero-foils, pumps and turbines, compressible flow and unsteady flows.

#### Textbooks

Douglas, Gasiorek and Swaffield Fluid Mechanics (Pitman). Hydraulics Data Sheets (Department of Civil Engineering, University of Sydney)

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).

#### CIVL 3701 Transportation Engineering and Planning

2 credit points

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

Third year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil). Third and fourth year elective unit of study 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.

Reference books

Hay, Introduction to Transportation Engineering (Wiley).

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

ICAO Airport Planning Manual.

Rural Road Design (Austroads 1989). Pavement Design (Austroads 1992).

#### CIVL 3802 Engineering Construction 2 4 credit points

Offered: February. Assumed knowledge: Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge. Classes: 26hrs lec & 26hrs tut. Assessment: A number of assignments, including both oral and written presentations, will make up 90 marks, a site visit report will be assessed formally and will make the balance 10 marks (total 100 marks).

Third year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil), 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 works 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* 

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.

#### CIVL 3803 Project Appraisal

4 credit points

Coordinator A.Prof. A. Jaafari QA auditor A.Prof. R J Wheen Offered: February. Prohibition: CIVL 4803 Engineering Management. Assessment: Tests and coursework (no final examination at the end of semester).

Senior core course for the Bachelor of Project Engineering & Management (Civil), elective for all other branches of engineering (except Civil Engineering) and faculties.

Course objectives: To develop basic competency in project appraisal, planning and strategic management, including an appreciation of the total project life cycle analysis and associated decision processes.

Expected outcomes: Students should be able to carry out basic project appraisal, financial planning and life cycle costing tasks. Projects and ventures in both public and private sectors will be studied. It is expected that students will develop skills in decision making regarding analysis of alternatives, financial budgeting and project capital decisions.

Syllabus summary: Framework for conceptualisation and development of capital projects; various stages in project life cycle; importance of front-end planning and optimisation; techniques for project appraisal; economic analysis of public sector projects; depreciation, capitalisation and valuation studies, replacement of long term assets, the impact of fiscal policies on projects; value engineering/management; sensitivity and project risk analysis/management.

Textbooks

Grant, heson and Leavenworth, Principles of Engineering Economy (J.Wiley & Sons).

Reference books

Turner, Handbook of Project-based Management (McGraw-Hill).

#### CIVL 3804 Contracts, Formulation and Management

5 credit points

Coordinator A.Prof. A. Jaafari, Mr. Stephen Hibbert QA auditor: A.Prof. Ft J Wheen

**Offered:** July. **Assessment:** Class tests and coursework, as generally advised at the commencement of the course. No final examination will be conducted.

Senior core course for the Bachelor of Project Engineering and Management (Civil), fourth year elective for Civil Engineering degree, elective for all other branches of engineering and faculties.

Course objectives: To give students a fundamental knowledge of the legal system under which project procurement is conducted generally. Emphasis will be on the principles of contract formulation, administration and fmalisation, including prevention and/or settlement of disputes.

Expected outcomes: This course will lead to the development of theoretical knowledge in the field of project procurement via contracts formulation and administration, covering not only the areas of contracting but also the principles behind good management of legal framework and associated issues.

Syllabus summary: Brief overview of the legal system in Australia and comparison with the legal systems in the region, fundamental principles behind good management and comparison with legal requirements; fundamentals of project procurement management, introduction to the contract law; introduction to the relevant statutes/by-law requirements and regulations made under these affecting project ownership, planning, design and implementation; review of standard forms of project procurement, implementation and administration; potential liabilities associated with project participation; review of typical project delivery systems, including standard and model contract conditions and specifications; optimisation of project team responsibilities, quality management provisions; optimum systems for project delivery/management under uncertain conditions; management of OH&S, environmental due diligence and other statutory liabilities; management of contract extensions and claims; management of documentation and records; project assignment. *Textbooks* 

Allan, Law of Contract in Australia (CCH Australia).

Bockrath, JT, Contracts and the Legal Environment for Engineers and Architects (McGraw Hill)

Reference books

Numerous references are specified at the commencement of the course.

CIVL 3805 Project Scope, Time and Cost Management

6 credit points

Coordinator A.Prof. A. Jaafari, Mr. Ted Tooher QA auditor: A.Prof. R J Wheen

**Offered:** February. **Assessment:** Tests and assignment completed and submitted by students in stages. Details will be advised at the commencement of the course.

Senior core course for the Bachelor of Project Engineering & Management (Civil), fourth year elective for Civil Engineering degree, elective for all other branches of engineering and faculties.

Course objectives:

- To develop underpinning knowledge of scope, time and cost management as applied to projects
- To provide practical examples and opportunities to apply scope, time and cost management to projects
- To initiate process of reflective learning and evidence development for competencies in the areas of scope, time and cost management

Expected outcomes:

- Demonstrate knowledge of subject area
- Ability to apply tools in a project environment
- Competence in learning and evidence generating to sustain competency.
- Syllabus summary:

Scope management including project authorisation, scope definition, control and finalisation. Cost management including project costing, resource planning, budgeting and controlling financial completion. Time management including activity sequencing, duration estimating, scheduling, progress control, monitoring and forecasting.

Textbooks

Gray and Larson, Project Management - The Managerial Process (McGraw Hill, 2000)

Turner, Handbook of Project-based Management (McGraw-Hill). Reference books

PMI, A Guide to the Project Management Body of Knowledge (www.pmi.org).

### CIVL 4008 Practical Experience

0 credit points

Offered: February. Prerequisite: 28 credit points of Senior courses. Classes: 12wks practical work experience (375hrs minimum). Assessment: A written report, employers certificate.

Fourth year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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 diis 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 and the Civil Engineering Foundation is available to assist students to obtain suitable employment. *Reference book* 

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

#### CIVL 4013 Honours Thesis/Design/Project 10 credit points

Offered: Full Year (starts Feb). Prerequisite: 40 credit points of senior subjects (WAM >65%). Prohibition: CIVL 4014 or CIVL 4015. Classes: Literature survey, design, expt and/or analysis work over whole year. Assessment: A bound document is to be submitted for assessment.

Fourth year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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

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

The level of originality for an honours thesis is greater than that required for the ordinary thesis unit of study. This unit of study should be completed successfully for the award of Honours in the civil stream of Bachelor of Engineering.

#### CIVL 4014 Thesis/Design/Project

5 credit points

Offered: February, Full Year (starts Feb). Prerequisite: 40 credit points of Senior Subjects. Prohibition: CIVL 4013 Honours Thesis/ Design/Project or CIVL 4015. Classes: Literature survey, design, expt and/or analysis work over whole year. Assessment: A bound document is to be submitted for assessment.

Fourth year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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

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

### CIVL 4016 Professional Practice- Civil Engineering 5 credit points

Offered: July. Classes: 26hrs lec, 26hrs tut. Assessment: Project test and assignment work. No final examination.

Fourth year core unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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, (d) quality assurance; (e) engineering contracts and documentation.

Reference books

As advised during course, and:

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

Weame Civil Engineering Contracts (Thomas Telford).

Professional Practice Course Notes (Dept. Civil Engineering, University of Sydney)

#### CIVL 4218 **Concrete Structures 2** 5 credit points

Offered: July. Assumed knowledge: CIVL3223 or CIVL3225 Concrete Structures - Behaviour, CIVL 3224 or CIVL 3226 Concrete Structures - Design. Classes: 26hrs lec. 26hrs tut. Assessment: One 3 hr exam plus assessment of selected assignments Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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, serviceability and strength for prestressed concrete beams in flexure and shear, anchorage zones, prestress losses, load balancing.strength of beams, columns and beam columns, moment redistribution, ultimate strength of concrete slabs, vield 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, design of composite slabs incorporating profiled steel sheeting, design of composite columns.

Textbooks

Warner et al. Concrete Structures (Longman).

Standards Australia Specification - current editions

AS2327 Part 1 Composite Structures Code AS1170 Parts 1 and 2 Loading Code, and

AS3600 Concrete Structures Čode, 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.

#### **CIVL 4219 Structural Dynamics**

#### 5 credit points

Offered: February. Assumed knowledge: CIVL 3204 Structural Analysis. Classes: 26hrs lec. 26hrs tut. Assessment: One 3hr exam and assignments.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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.

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. 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 and Vickery 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).

#### CIVL 4220 **Steel Structures 2**

#### 5 credit points

Offered: July. Assumed knowledge: CIVL 3206 or CIVL 3227 Steel Structures 1, Classes: 28hrs lec. 28hrs tut, Assessment: One 3 hr exam at end of the semester plus assessment of assignment work. Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

Syllabus summary: Local buckling behaviour and design; stability analysis and design of steel structures including flexuraltorsional buckling analysis. Advanced connections - behaviour, analysis and design. Shell structures - behaviour, membrane analysis and bending.

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. Textbooks

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

Standards Australia AS4100 - Steel Structures (1998).

Hogan and Thomas Design of Structural Connections, 4m Edition, (AISC 1994).

Syam and Chapman Design of Structural Steel Hollow Section Connections (AISC, 1996).

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 4221 Bridge Engineering**

5 credit points

Offered: February. Assumed knowledge: CIVL 3225 or CIVL 3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL 3224 Concrete Structures - Design and CIVL 3227 or CIVL 3206 Steel Structures 1. Classes: 26hrs lec & 26hrs tut. Assessment: Based on submitted work, seminar presentations and one 3hr exam.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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.

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. Reference books

NAASRA Bridge Design Specification.

Australian and New Zealand Railway Conferences Railway Bridge Design Manual.

#### CIVL 4222 **Finite Element Methods**

#### 5 credit points

Offered: February. Assumed knowledge: CIVL 3204 Structural Analysis. Classes: Sem: 26hrs lec & 26hrs tut. Assessment: Classwork, assignments and one 3hr exam.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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, use and testing of finite element packages.

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.

#### Reference books

Zienkiewicz The Finite Element Method 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).

# CIVL 4406 Environmental Geotechnics 5 credit points

Offered: July. Assumed knowledge: CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B. Classes: Lectures and tutorials - 52 hours. Assessment: Tutorial and assignment submissions, as indicated at the commencement of the course. No final examination. Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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, in cluding types of tailings dams, design of dams, water balances, rehabilitation, use of slope stability and seepage software.

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.

Reference Books

S. G. Vick Planning, Design and Analysis of Tailings Dams (Wiley).

R.K. Rowe, R.M. Quigley & J.R. Booker Clayey Barrier Systems for Waste Disposal Facilities.

Library classification: 624.151

### CIVL 4407 Geotechnical Engineering 5 credit points

**Offered:** February. **Assumed knowledge:** CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B. Classes: Lectures and tutorials - 52 hours. **Assessment:** One 2 hour examination covering the whole syllabus at the end of semester. Credit will be given for tutorial and assignment submissions, as indicated at the commencement of the course. No final examination. Fourth year elective unit of study for the degree in Civil Engi-

neering and Project Engineering and Management (Civil). Site investigation and field measurements. Behaviour, selec-

tion and design of shallow foundations. Strip and raft foundations. Pile foundation analysis and design. Foundations on rock. Cam clay theory and application using computer programs.

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 design process 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. *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).

#### CIVL 4607 Environmental Fluids 1 5 credit points

**Offered:** February. Classes: 26 hrs lec, 26 hrs tut. **Assessment:** Tests and assignment submissions as indicated at the beginning of the course.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

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.

Objectives: To develop an understanding of: basic meteorological principles; the principles of hydrology; the importance of 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 catchments; determine runoff hydrographs 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.

Textbooks

Australian Rainfall and Runoff (I.E. Aust., 1987).

Computer Applications in Hydraulic Engineering Haestad Press Reference books

Raudkivi Hydrology (Pergamon)

Raudkivi and Callander Analysis of Groundwater Flow (Edward Arnold).

#### CIVL 4608 Environmental Fluids 2 5 credit points

Offered: July. Assumed knowledge: Material covered in

Environmental Fluids 1. Classes: 26hrs lec, 26hrs tut. **Assessment:** By tests and assignment submissions, as indicated at the beginning of the course.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

Coastal processes. Sediment transport. Breakwater design. Fluid structure interaction. Flood effects.

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 ma-

jor 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 advanced flood routing techniques utilising computer programs.

Textbooks

Computer Applications in Hydraulic Engineering (Haestad Press).

### CIVL 4609 Water Resources Engineering 5 credit points

Offered: July. Classes: Sem: 26hrs lec, 26hrs tut. Assessment: Tests and assignment submissions, as indicated at the beginning of the course.

Fourth year elective unit of study for the degree in Civil Engineering and Project Engineering and Management (Civil).

Water quality; water purification methods; water reticulation; water resource management; irrigation and hydro-power.

Objectives: To develop an understanding of: the assessment methods for water quality; physical biological and chemical

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treatment methods; 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.

#### CIVL 4803 Engineering Management 4 credit points

Offered: February. Prohibition: CIVL3803 Project Appraisal. Classes: 26hrs lec, 26hrs tut. Assessment: Class tests and

coursework. No final examinations will be conducted.

Fourth year core unit of study for the degree in Civil Engineering.

Course objectives: To develop basic competency in project appraisal, planning and strategic management, including an appreciation of the total project life cycle analysis and associated decision processes.

Expected outcomes: Students should be able to carry out basic project appraisal, financial planning and life cycle costing tasks. Projects and ventures in both public and private sectors will be studied. It is expected that students will develop skills in decision making regarding analysis of alternatives, financial budgeting and project capital decisions.

Syllabus summary: Framework for conceptualisation and development of capital projects; various stages in project life cycle; importance of front-end planning and optimisation; techniques for project appraisal; economic analysis of public sector projects; depreciation, capitalisation and valuation studies, replacement of long term assets, the impact of fiscal policies on projects; value engineering/management; sensitivity and project risk analysis/management. *Textbooks* 

Grant, Ireson and Leavenworth, Principles of Engineering

Economy (J.Wiley & Sons).

Reference books

Turner, Handbook of Project-based Management (McGraw-Hill).

#### CIVL 4807 Project Formulation

5 credit points

Offered: July. Assumed knowledge: Completion of CIVL 3803 Project Appraisal or equivalent knowledge. 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.

Fourth year elective unit of study for the degree in Civil Engineering, elective for other branches and faculties. Core unit of study for the degree in Project Engineering and Management (Civil).

The unit 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 concepts for projects and products. Groups will develop competitive proposals embodying business plans and demonstrating the technical and financial feasibility of the project, appropriate legal and managerial arrangements and corporate structure for the proposed enterprise. The unit will be conducted through workshops and with the participation of leading professionals from business planning, engineering, legal and financing industries.

Objectives: To develop an understanding of conceptualisation, formulation and documentation of projects and products; to gain skills in the preparation of a business plan/proposal 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, develop risk management plan, develop marketing and sales plan, prepare the design of professional documentation, and present the same to a board of review.

#### CIVL 4808 Project Management & Information Technol

4 credit points

Coordinator A. Prof. A. Jaafari, Dr. Milad Saad QA auditor: A.Prof. R J Wheen

**Offered:** February. **Assumed knowledge:** Sufficient knowledge of information technology systems & communications capabilities. **Assessment:** Coursework and class tests. No final examinations will be conducted. Details will be advised at the commencement of the course.

Fourth year core unit of study for Project Engineering & Management (Civil), elective for all other branches of engineering and other faculties.

- Course objectives
- To develop an understanding of information management for projects.
- To understand computer applications and current e-use of technology.
- To provide the ability to program and implement proj ect management systems.

Expected Outcomes

- Understand the importance of information management for projects.
- Gain in-depth knowledge and skills in project management information technology.
- Ability to apply the current technology and tools for e-project management.
- Syllabus summary:

Fundamentals of information technology management; understanding of computer applications; cost benefit analysis; data capture and standardization; projects re engineering; benchmarks and testing; risk analysis; management roles and technology-

Textbooks

Gray and Larson, Project Management - The Managerial Process (McGraw Hill, 2000)

Published papers; internet addresses; reference books; case studies.

(Details will be advised at the commencement of the course.)

#### CIVL 4809 Project Planning and Tendering 4 credit points

Coordinator A.Prof. A. Jaafari QA auditor: A.Prof. R J Wheen Tutors: Mr. K K Manivong and Mr. M Chaaya

Offered: July. Assumed knowledge: Completion of CIVL 2801 Engineering Construction 1 and CIVL 3802 Engineering

Construction 2 or the equivalent knowledge. **Assessment:** A class test and an assignment, using an integrated system. Details will be advised at the commencement of the course.

Fourth year core unit of study for the Bachelor of Project Engineering & Management (Civil), elective for all other branches of engineering and other faculties.

Course objectives:

- To teach multidisciplinary project planning and scheduling skills;
- To develop skills in computer-supported fully detailed planning and estimating;
- To apply the principles of operational estimating to a given project, including setting appropriate tendering strategies, risk analysis and setting of contingency budgets; and
- To develop appropriate contractual reports and documentation, and to undertake a presentation of the proposed plans and strategies.

Expected Outcomes

Students will be able to plan and estimate engineering projects, jobs and operations based on resources and dedicated method
statements. They will also develop an understanding of the processes and procedures used for computer-supported integrated planning and estimating.

Syllabus summary:

Fundamentals of operational planning and estimating, resource allocation and optimisation, preparation of method statements, estimation of the quantities of resources for execution of tasks and operations, preparation of operational schedules, estimation of indirect costs, estimation of work package costs, building up estimates of direct cost, consolidation of direct cost, risk analysis, alternative analysis and optimisation of plans, setting contingencies, preparation and presentation of reports. *Textbooks* 

Lecture Notes on Operations Analysis and Management.

This unit will use an integrated system for teaching. Appropriate guidelines and textbooks will be given at the commencement of

the unit.

Reference books

Halpin and Woodhead. Construction Management, Second Edition, John Wiley & Sons.

Barrie and Paulson. Professional Construction Management.

#### CIVL 4810 Project Quality Risk and Procurement Mgt

6 credit points

Coordinator A.Prof. A. Jaafari QA auditor: A.Prof. R J Wheen Offered: July. Assessment: based on both coursework and class tests, details of which will be advised at the commencement of the unit. No final examination will be held.

Fourth year core unit of study for the Bachelor of Project Engineering & Management (Civil), elective for all other branches of engineering and other faculties.

Course objectives: To provide underpinning knowledge and application skills in the project environment for:

• quality management

- risk management
- procurement management

Expected outcomes: Participants will be able to design and implement plans for quality, risk and procurement management on a range of simple generic projects and provide input to these plans for more complex projects. They will also be able to apply reflective learning to production of evidence towards satisfaction of competencies for recommission as project managers.

Syllabus summary: Introduction to Modern Quality Management Principles, seven quality tools, quality assurance, preparation of quality plans. Introduction to risk analysis, planning and risk management through the project life cycle. Introduction to principles of procurement management. Purchasing, contracts, partnerships and alliancing. Setting up procurement plans, administration and closure of contracts for project delivery. *Textbooks* 

Gray and Larson, Project Management - The Managerial Process (McGraw Hill, 2000).

Turner, Handbook of Project-based Management (McGraw-Hill) Reference books; PMIA Guide to the Project Management Body of Knowledge (www.pmi.org).

#### CIVL 4903 **Civil Engineering Design** 6 credit points

Offered: February. Assumed knowledge: CIVL 3225 or CIVL 3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL 3224 Concrete Structures - Design and CIVL 3227 or CIVL 3206 Steel Structures 1. Classes: 13hrs lec & 39hrs of drawing office work. Assessment: No formal exam; assessment will be based on submissions. Fourth year core unit of study for the degree in Civil Engineering and fourth year elective for the degree in Project Engineering and Management (Civil).

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 par-

ticular design selected. Feasibility studies and examination of existing works. Study of design projects by stages, including details of some aspects.

The unit 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 unit. *Reference books* 

The unit 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

AS1554 - Manual Welding, Part I

AS1170 - Loading Code, Parts I and II

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)

CIVL 5250 Frame Analysis I 6 credit points

Offered: July.

CIVL 5253 Steel Structures: Members/Connections 6 credit points

Offered: February.

CIVL 5254 Steel Structures: Loading/Design 6 credit points Offered: July.

CIVL 5257 Concrete Structures: Prestressed 6 credit points Offered: February.

CIVL 5351 Environmental Geotechnics 6 credit points Offered: February.

CIVL 5353 Environmental Oceanography & Meteorology

4 credit points **Offered:** February.

CIVL 5450 Analysis and Design of Pile Foundations 6 credit points Offered: July.

CIVL 5454 Rock Engineering 6 credit points Offered: February.

CIVL 5456 Earth and Rockfill Dams 6 credit points Offered: July.

CIVL 5654 Ocean Mixing 4 credit points Offered: July.

CIVL 5655 Water Resources - Management and Use 4 credit points

Offered: July.

CIVL 5850 Project Planning and Optimisation 6 credit points Offered: July.

Faculty of Engi	neering Handbook 2001	
CIVL 5851 6 credit points Offered: July.	Civil Engineering Project	Electrical I
CIVL 5852 12 credit points Offered: Februa	Project ary, July.	ELEC 1001 In 4 credit points Offered: July. Prem Differential Calculus
CIVL 5853 2 credit points Offered: Februa	Seminar arv. Julv.	Assessment: Lab of semester. Core unit of study
CIVL 5854 6 credit points <b>Offered:</b> Februa	Project Integration Management	Engineering and M chatronic Enginee Syllabus Electricity: defini
CIVL 5855	Project Scope, Time and Cost Management	Voltage and currer Power dissipation
6 credit points Offered: Februa	ary.	orem. Loop curre
CIVL 5856 6 credit points <b>Offered:</b> July.	Project Quality, Risk & Procurement Mg	source conversior voltage source. Co voltages and curre sipation and stora
CIVL 5857 6 credit points <b>Offered:</b> July.	Project Quality Leadership and TQM	behaviour of capa order circuits. Tra gular voltages. Al od, frequency and
CIVL 5858	Project Process Design	sistance, inductan cuits. RL and RC s
6 credit points Offered: Februa	ary.	locus diagrams. E mittance. Power i
CIVL 5859 6 credit points Offered: July.	Contracts Law and Administration	AC network. Anal Series-parallel cir transmission line.
CIVL 5860	Project Appraisal & Financial Management	cuit elements. Intr tors. V-I characte
6 credit points Offered: Februa	ary.	ELEC 1101 E
CIVL 5861 6 credit points Offered: July.	Integrated and Concurrent Project Mgt	6 credit points Offered: February. Classes: Six conta
CIVL 5862 6 credit points <b>Offered:</b> Februa	Life Cycle Asset Management ary.	Laboratory performance plus two 2-hr examine Core unit of study
CIVL 5863	Project Management and	Engineering.
6 credit points Offered: July.		Number systems Algebra, Universa
CIVL 5864	Project Risk and Uncertainty Management	devices; Digital A plement addition
6 credit points Offered: July.		isters, Shift regist quential circuits, I (BCD and binary)
CIVL 5865	Alliance & Performance Based Contracting	nals and data-bus plexers. demultipl
6 credit points		comparators; App

Offered: February.

CIVL 5866 Advanced Project Formulation 12 credit points Offered: July.

# **Electrical Engineering**

# ELEC 1001 Introductory Electrical Engineering

Offered: July. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus. Prohibition: ELEC 1102 Foundations of Electronic Circuits. Classes: Two lec/wk and nine 3hr lab/tut. Assessment: Lab reports and assignments and a 2hr exam at end of semester.

Core unit of study for the degrees in Civil Engineering, Project Engineering and Management (Civil) and Mechanical and Mechatronic Engineering.

itions and conventions. SI units. Charge and on laws. Electrical energy sources. Ohm's law. nt measurements. Conductivity and resistance. . Kirchhoff 's laws. Current and voltage dividrs. Measurement of resistance. Thevenin's theents and node voltages. Reciprocity theorem. inciple of superposition. Voltage-to-current n. Delta-star conversion. Loading effect of a ombined voltage supply circuits. Time varying ents. Average and effective values. Energy disge. Capacitance, inductance. Steady-state DC acitors and inductors. Natural response of first insients. C and L response to square and trianlternating current quantities. Magnitude, peri-phase. Complex algebra. AC behaviour of rence and capacitance. Introduction to AC cirseries circuits. Impedence concept. Phasor and Equivalent series and parallel impedences. Adin AC circuits. Power triangle. Power factor. t behaviour. Series resonance. Introduction to lysis. RLC parallel circuit. Parallel resonance. rcuits. Introduction to filters. Single phase Domestic distribution. Wiring and grounding. supply. Power factor correction. Nonlinear cirroduction to semiconductors. Diodes. Transiseristics.. Nonlinear circuit analysis. Load line nt.

# ELEC 1101 Foundations of Computer Systems credit points

Offered: February. Assumed knowledge: HSC Maths 3 unit. Classes: Six contact hours per week combining lectures, laboratory work, computing, tutorials and presentations. Assessment: Laboratory performance, presentations, reports and assignments plus two 2-hr exams at the end of the semester. Core unit of study for the degrees in Electrical, Electrical (Infor-

mation Systems), Computer, Software and Telecommunications Engineering.

and codes, Parity; Logic gates and Boolean al logic gates (Nand gates); Combinational logn and construct project; Flip-flops and related rithmetic: operations and circuits. Two's comand subtraction, Overflow; Counters and regter applications; Design of synchronous, se-Designs of synchronous, cascadable counters ; Integrated circuit logic families; Tri-state siges; MSI logic circuits, Applications of multilexers, decoders, priority encoders, magnitude lications of programmable logic devices, Major project utilising programmable logic devices; Interfacing with the analog world; Memory devices; Introduction to microprocessors, stored-program computer architecture, instruction codes and addressing modes, instruction execution cycle; Digital design of an arithmetic-logic-unit for a computer. Human communication; technical skills in written, numeric and graphical communication, word processors.

# ELEC 1102 Foundations of Electronic Circuits 6 credit points

Offered: July. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus. Assumed knowledge: HSC Physics 2 unit. 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.

Core unit of study for the degrees in Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

Syllabus

Linear DC circuit elements and laws, and series and parallel circuits; concepts of equivalent circuits; operational amplifiers and 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. Electrical measurement tools. Safety issues. Computer based simulation of circuits. Computer communication tools such as spread sheets, charting and drawing packages. Management of people, documents and projects.

# ELEC 2001 Electrical and Electronic Engineering 6 credit points

Offered: February. Prerequisite: ELEC 1001 Introductory Electrical Engineering. Prohibition: ELEC 2003 Electrical and Electronic Engineering A, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems. Classes: (Three lec and 3hrs lab/tut) per wk. Assessment: Lab reports and assignments and a 3hr exam at end of semester. Core unit of study for Mechatronic Engineering. Syllabus

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 a rotating 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, BJT 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 2003 Electrical and Electronic Engineering A 4 credit points

Offered: February. Prerequisite: ELEC 1001 Introductory Electrical Engineering. Prohibition: ELEC 2001 Electrical and Electronic Engineering, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems. Classes: (3 lec and a 3hr lab/tut) per week. Assessment: Lab reports and assignments and a 3hr exam at end of semester. Core unit of study for Mechanical Engineering. Syllabus

Three phase electric power systems. Star and delta connections. Balanced and unbalanced loads. Magnetic fields. Solenoids and toroids. 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. Principles of electric machines. Methods of starting and speed control. Semiconductor devices: Diode, BJT and FET characteristics. Small-signal models. Basic circuits. Amplifiers and biasing; rectifiers. Linear power supplies. 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.

### ELEC 2101 Circuit Analysis

### 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **Prohibition:** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A. Classes: (Two lec and 2 hrs tut) per week. **Assessment:** Assignments and a 2hr exam at end of semester. Core unit of study for Electrical, Electrical (Information Sys-

tems), Computer and Telecommunications Engineering. Recommended elective unit of study for Software Engineering. Syllabus

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.

# ELEC 2301 Signals and Systems 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling, and MATH 1004 Discrete Mathematics. Prohibition: MATH 3019 Signal Processing and MATH 3909 Signal Processing (Adv). Classes: (Two lec and an average of 2 hrs lab/tut) per week. Assessment: Lab, assignments and a 2hr exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

#### Syllabus

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 2401 Introductory Electronics 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **Prohibition:** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A. **Classes:** (Two iec and an average of 2 hrs lab/tut) per week. **Assessment:** Lab work and a 2hr exam at end of semester. Core unit of study for Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

#### Syllabus

Basics of semiconductors, diodes, transistors; small-signal and large-signal models, rectification, biasing, gain; FET and BJT circuits, introduction to operational amplifiers.

### ELEC 2601 **Microcomputer Systems**

4 credit points Offered: February. Prerequisite: Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. **Prohibition**: ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical

Electronic Engineering A. Classes: (Two lec and an average of 2 hrs lab/tut) per week. Assessment: Lab, assignments and a 2hr exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

Syllabus

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

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 2301 Signals and Systems. Classes: (2 lec and one 2hr tut)/wk. Assessment: Assignments, labs and an exam at the end of semester.

Recommended elective unit of study for Electrical and Telecommunications Engineering.

Syllabus

The main aim of the unit 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 syndiesis; active RC filters; switched capacitor filters.

### ELEC 3102 Engineering Electromagnetics 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: PHYS 2203 Physics2EE and ELEC 2101 Circuit Analysis. Classes: (Two lect and a 2hr tut) per week. Assessment: Questions in lect/tut and a 2hr exam at end of semester.

Core unit of study for the degrees in Electrical, Electrical (Information Systems) and Telecommunications Engineering. Syllabus

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, propagation in waveguides, waveguide components, radiation patterns of antennas and arrays; numerical methods.

#### ELEC 3103 Electrical Engineering Design 4 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 2101 Circuit Analysis, ELEC 2301 Signals and Systems, ELEC

2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems. Classes: (One lec and a 2 hr lab) per week. Assessment: Lab, assignments and a 1 hr exam at end of semester.

Recommended elective unit of study for Electrical and Software Engineering.

Syllabus

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 Electrical Energy

Systems Fundamentals 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: ELEC 2101 Circuit Analysis. Classes: (Two lec and a 2 hr lab/tut) per week. Assessment: Assignments, a quiz and a 2hr exam at end of semester

Core unit of study for the degree in Electrical Engineering. Syllabus

Systems consisting of electromechanical converters (electrical machines), 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

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Lab reports, assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical Engineering. Syllabus

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 3302 Fundamentals of Feedback Control 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 2301 Signals and Systems. Prohibition: MECH 3800 Systems Control and CHNG 3302 Process Control. Classes: (Two lec and a 2hr lab/ tut) per week. Assessment: Lab reports and a 2hr exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering. Recommended elective unit of study for Software Engineering. Syllabus

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 root locus; rules for sketching root locus; 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 3303 Digital Signal Processing 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: ELEC 2301 Signals and Systems. Prohibition: Prohibition: ELEC 4303 Digital Signal Processing. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Lab reports, assignments and a 2hr exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering. Syllabus

Review of discrete time signals and systems: time domain and frequency domain representations, advanced difference equations, stability analysis, magnitude and phase response, linear phase/constant delay systems, z-transform, filter specifications. Review of Discrete Fourier Transform, convolution, Fast Fourier transform (FFT), decimation in time algorithm. FIR filter design: windowing method, DFT/Windowing method, frequency sampling method, optimal FIR filters. HR filter design: impulse invariant transformation, bilinear transformation, frequency warping, Butterworth filters, Chebyshev filters, Elliptic filters, all pass filters, phase modification & linearisation. Computer aided design techniques. Advanced topics: auto and cross-correlation, multirate filtering, DSP in microprocessors, finite precision & errors, DSP hardware & software structures, real-time processing.

# ELEC 3401 Electronic Devices and Circuits 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC 2401 Introductory Electronics and ELEC 2101 Circuit Analysis. Classes: (2 lec and a 2hr lab) per week. Assessment: Lab and a 2hr exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering. Recommended elective unit of study for Software Engineering. *Syllabus* 

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 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. Classes: (2 lec and an average of 2 hr lab/tut) per week. Assessment: Practical work and a 2hr exam at end of semester.

Core unit of study for Electrical (Information Systems) and Telecommunications Engineering. Recommended elective unit of study for Electrical Engineering.

#### Syllabus

Photonic devices and models (semiconductor optical properties, lasers and photodiodes), optical transmitters and modulation, optical amplifiers, optical receivers, basic opto-electronic link, tuned amplifiers, oscillators, modulation/demodulation circuits, mixers, feedback amplifiers, high frequency amplifiers.

#### ELEC 3403 Switching Devices-High Speed Electronics

4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. Classes: (2 lec and an average of 2 hr lab/tut) per week. Assessment: Practical work and a 2hr exam at end of semester.

Core unit of study for Electrical (Information Systems) and Computer Engineering. Recommended elective unit of study for Electrical and Telecommunications Engineering. *Syllabus* 

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 and tri-state), metastability and latch-up in CMOS, logic family characteristics (voltage levels, noise margins, power and switching speed), interfacing logic families, 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, crosstalk and shielding).

# ELEC 3502 Random Signals and Communications 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: ELEC 2301 Signals and Systems. Classes: (2 lec and 2 hr lab/tut) per week. Assessment: Assignment and lab marks and an exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering. Recommended elective unit of study for Software Engineering.

### Syllabus

An overview: sources, channels and limits to communication, signals and spectra, distortionless transmission, linear and nonlinear distortion, transmission loss. Random Signals: probability and random variables, probability functions, statistical averages, probability models, random processes, random signals. Signal transmission with noise: noise models, signal-to-noise ratio, pulse detection and matched filters. Analog communication: bandpass systems and signals, double-sided amplitude modulation (AM), modulators and transmitters, suppressedsideband amplitude modulation, frequency conversion and demodulation, frequency/phase modulation (FM/PM), transmission bandwidth and distortion, generation and detection of FM/ PM, interference, receivers for FM/PM, frequency division multiplexing, a case study of analog communication systems, noise in analog communication systems.

# ELEC 3503 Introduction to Digital Communications 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 2301 Signals and Systems. Classes: (2 lec and 2 hr lab/tut) per week. Assessment: Assignment and lab marks and an exam at end of semester.

Core unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering. Recommended elective unit of study for Software Engineering. *Syllabus* 

Introduction: to Communications systems, components, signals and channels, sampling, quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), quantisation noise, time division multiplexing, delta modulation. Digital communications: baseband signals, digital PAM, eye diagram, equalization, correlative coding, error probabilities in baseband digital transmission, bandpass transmission, digital amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK) and quadrature shift keying (QPSK), error probabilities in bandpass digital transmission, a case study of digital communication systems. Introduction to information theory: fundamental limits in communications, channel capacity and channel coding, signal compression.

# ELEC 3601 Digital Systems Design

4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems. Classes: Two lec per week and nine 3-hr lab sessions.

Assessment: A 2 hr exam at end of semester.

Core unit of study for the degrees in Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

Syllabus

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, arithmetic pipe-lines, digital systems design project, specification languages, simulation.

## ELEC 3604 Internet Engineering

### 4 credit points

Offered: July. Prerequisite: Advisory prerequisites: ELEC 1101 Foundations of Computer systems, COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. Prohibition: ELEC 5609 Internet Engineering, COMP 3007 Networked systems. Classes: 2 lec and a 2hr lab/tut per week. Assessment: Assignment and lab marks and an exam at end of semester.

Core unit of study for Computer and Software Engineering. Recommended elective unit of study for Electrical, Electrical (Information Systems) and Telecommunications Engineering. *Syllabus* 

Introduction to OSI stack. Standards organisation. Review of circuit and packet switching. Internet Protocol (IP), Transport Control Protocol, User Datagram Protocol; Elementary sockets; advanced sockets; IPv4 and IPv6; Mobile Internet Protocol; Routing sockets; Datalink access; Client server design and pro-

gramming models; Multicasting; Session access protocol; session description protocol; real-time protocol; Applications and standards; some study cases.

# ELEC 3701 Management for Engineers 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: Nil. Classes: (2 lec and 1 hr tut) per week. Assessment: Web Based

Teaching, assignments and a 2hr exam at end of semester. Recommended elective of study for the degrees in Electrical and Electrical (Information Systems) Engineering.

Syllabus

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

**Offered:** February. **Prerequisite:** Advisory Prerequisite: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A.

**Classes:** Two lec and an average of 2 hours lab/tut) per week.

Assessment: Lab reports and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical Engineering. *Syllabus* 

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 & Analysis 4 credit points

**Offered:** February. **Prerequisite:** Advisory Prerequisite: ELEC 3201 Fundamentals of Electrical Energy Systems. **Classes:** (Two lec and a 2hr lab/tut) per week. **Assessment:** Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical Engineering. *Syllabus* 

A range of topics will be presented related to electrical systems analysis, with a particular 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 4301 Computer Control System Design 4 credit points

Offered: February. Prerequisite: Advisory Prerequisite: ELEC 3302 Fundamentals of Feedback Control. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Assignments, midterm quiz and a 3hr exam at end of semester.

Recommended elective unit of study for Electrical and Computer Engineering.

Syllabus

Discrete models for sampled data systems, sampling and zero order hold equivalent, properties of difference equations including stability, Z transform, input output models (eg, pulse transfer function), stability tests (Jury's test, Nyquist criterion, Lyapunov method), sensitivity and robustness, observers, controllers, optimal control including Kalman filter and linear quadratic regulator, approximations of continuous time controllers, finite word length implementations.

ELEC 4302 Image Processing and Computer Vision 4 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 2301 Signals and Systems, and ELEC 4303 Digital Signal Processing. Classes: (Two lec and a 1 -Hr tut) per week. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical, Electrical (Information Systems) and Software Engineering. *Syllabus* 

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 (MR!) 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 4401 Electronic Design 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC 2301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Assignments and/or quizzes, lab work and a 2hr exam at end of semester.

Core unit of study for Electrical (Information Systems) Engineering. Recommended elective unit of study for Electrical, Computer and Telecommunications Engineering. *Syllabus* 

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

**Offered:** February. Prerequisite: Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. **Classes:** (Two lec and a 2hr lab/tut) per week. **Assessment:** A design project and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical, Electrical (Information Systems) and Computer Engineering.

Syllabus

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

**Offered:** February. **Prerequisite:** Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. **Classes:** Two lec and a 2hr lab/tut) per week. **Assessment:** Assignments, lab work and a 2hr exam at end of semester.

Core unit of study for Electrical (Information Systems) and Telecommunications Engineering. Recommended elective unit of study for Electrical and Software Engineering. 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 underworking of LANs with wide area high speed networks. Comprehensive broadband networks for user access. Standards.

#### ELEC 4502 Digital Communication Systems 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec & one 2hr lab/tut)/wk. Assessment: Assignments, lab work and one 2hr exam at end of Sem 1.

Core unit of study for Electrical (Information Systems) and Telecommunications Engineering. Recommended elective unit of study for Electrical and Computer Engineering.

Syllabus

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.

#### ELEC 4503 **Error Control Coding** 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC

3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec & 1 hr tut)/ wk. Assessment: Assignments and a 2hr exam at end of semester. Recommended elective unit of study for Electrical, Electrical (Information Systems) and Telecommunications Engineering. Purpose

To introduce students to error control coding fundamentals and applications in communication and data storage systems. **Expected** Outcomes

Students will gain a broad appreciation of principles of error control coding techniques, applications in various communication and data storage systems, performance analysis in noisy

environment and implementation of codec devices. Assumed Understanding/Previous Coursework

Familiarity with the concepts of error probability, studied in ELEC 3502, and introductory information theory, covered in ELEC 3503, is assumed.

Syllabus

Error control coding principles, linear algebra, linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, bursterror 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 4601 Computer Design 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Assignments, lab reports and a 2hr exam at end of semester.

Core unit of study for the degree in Electrical (Information Systems) and Computer Engineering. Recommended elective unit of study for Electrical, Software and Telecommunications Engineering

Syllabus

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. Synchronous, asynchronous and semi-synchronous buses. Bus interconnections. 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. Some case studies.

## ELEC 4602 Real Time Computing

4 credit points Offered: February. Prerequisite: Advisory Prerequisites: ELEC

3601 Digital Systems Design and COMP 3100 Software Engineering. Classes: (2 lec & one 2hr lab/tut)/wk. Assessment:

Lab marks, reports and a 2hr exam at the end of semester.

Core unit of study for Electrical (Information Systems), Computer and Software Engineering. Recommended elective unit of study for Electrical and Telecommunications Engineering. Syllabus

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, implementation 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 4604 Engineering Software Requirements 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: COMP 3100 Algorithms, COMP 3205 Product Development Project, ELEC 3601 Digital Systems Design and ELEC 3701 Management for Engineers. Classes: (2 lec and 2 hr lab/tut) per week. Assessment: Lab work, project and a 2h exam at end of semester.

Core unit of study for Software Engineering.

Syllabus

The objective of this course is for students to become aware of issues, tools and techniques involved in the engineering of software to meet specific performance, safety and security requirements; to understand the factors that affect software reliability and be familiar with design techniques that can enhance reliability. Topics covered include: systems design process; system specifications; functional decomposition; safety requirements aspects; security requirements; reliability concepts, models and design techniques.

# ELEC 4701 Project Management

#### 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 3701 Management for Engineers. Classes: (Two lec and one 2hr tutorial/ workshop) per week. Assessment: Assignments and in-course involvement, and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical and Telecommunication Engineering.

### Syllabus

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

Offered: February. Assessment: Assessment in this unit 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 became familiar with and their relationship to the firm and finally, 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. 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. Core unit of study for the degrees in Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

### ELEC4703 Thesis

#### 12 credit points

Offered: July. Prerequisite: A minimum of 36 credit points from third and fourth year units of study. Classes: There 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.

Core unit of study for the degrees in Electrical, Electrical (Information Systems), Computer, Software and Telecommunications Engineering.

Syllabus

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 equivalent to one or two hours per week in Semester 1, and two days per week in Semester 2.

#### ELEC 4704 Software Project Management 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: COMP 3100 Algorithms, COMP 3205 Product Development Project and ELEC 3701 Management for Engineers. Classes: (2 lec and 2 hr lab/tut) per week. Assessment: Lab work, project and a 2h exam at end of semester.

Core unit of study for Software Engineering.

Syllabus

The objective of this course is for students to understand the issues involved in software project management and the factors that affect software quality; to be familiar with a range of standards, techniques and tools developed to support software project management and the production of high quality software; and to be able to develop software project plans, supporting software quality plans and risk management plans. Topics covered include project management issues such as client management; management of technical teams; project planning and scheduling; risk management; configuration management; quality assurance and accreditation; legal issues. Topics on software quality include: factors affecting software quality; planning for quality; software quality assurance plans; software measurement; Australian and international standards.

### ELEC 5501 Communication Networks (Advanced) 4 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks. Classes: (2 lec and a 1 hr tut) per week. Assessment: Assignments, reports and a 2hr exam at end of semester. Recommended elective unit of study for Electrical, Electrical (Information Systems) andTelecommunications Engineering. *Syllabus* 

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

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems. Classes: (Two lec and a 1 hr tut) per week. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical, Electrical (Information Systems) and Telecommunications Engineering. *Purpose* 

The course is designed to provide students with knowledge of satellite communication techniques and applications in fixed and mobile services.

Expected Outcomes

Students will gain detailed knowledge of digital signalling techniques in modern satellite communication systems, with particular emphasis on satellite mobile communications.

Assumed Understanding/Previous Coursework Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation, studied in ELEC

3502, ELEC 3503 and ELEC 4502, is assumed.

#### Syllabus

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 satel-Ute systems, national satellite systems, mobile satellite network design, digital modem design, speech codec design, error control codec design, low earth orbit communication satellite systems.

# ELEC 5503 Optical Communication Systems 4 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 3402 Communications Electronics, ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (Two lec and a 1 hr tut) per week. Assessment: Assignments and a 2hr exam at end of semester. Recommended elective unit of study for Electrical, Electrical (Information Systems) and Telecommunications Engineering. *Syllabus* 

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, multichannel multiplexing techniques, optical fibre communication systems.

# ELEC 5504 Cellular Radio Engineering 4 credit points

Offered: February. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec and a 2hr lab/tut) per week. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Electrical, Electrical (Information Systems) and Telecommunications Engineering. *Syllabus* 

Antenna basics: analysis of simple antennas, uniform linear antenna arrays, planar array, base-station antennas, mobile antennas. Mobile radio channel: multipath fading, diversity, log-normal fading, mean propagation loss, propagation models. Cellular technologies: cell types, coverage, frequency allocation, link budget, power budget, traffic capacity. TDMA cellular systems - GSM standard: coding and modulation, special characteristics and features, logical and physical channels, frame structure, general packet radio services (GPRS), GSM evolution towards UMTS. CDMA cellular systems - IS-95 standard: physical and logical channels, asynchronous data, short message service, packet data services for CDMA cellular/PCS systems, cdma2000 layering structure.

### ELEC5506 Optical Networks

#### 4 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec and a 1 hr tut) per week. Assessment: Assignments and a 2hr exam at end of semester. NB: Not offered in 2001.

Recommended elective unit of study for Electrical, Electrical (Information Systems), Computer and Telecommunications Engineering.

Syllabus

Introduction, photonic network architectures: point to point, star, ring, mesh; system principles: modulation formats, link budgets, optical signal to noise ratio, dispersion, error rates, optical gain and regeneration; wavelength division multiplexed networks; WDM components: optical filters, gratings, multiplexers, demultiplexers, wavelength routers, optical crossconnects, wavelength converters, WDM transmitters and receivers; Wavelength switched/routed networks, ultra high speed TDM, dispersion managed links, soliton systems; broadcast and distribution networks, multiple access, subcarrier multiplexed lightwave video networks, optical local area and metropolitan area networks; protocols for photonic networks: IP, Gbit Ethernet, SDH/SON-ET, FDDI, ATM, Fibre Channel.

#### ELEC 5608 Electronic Commerce 4 credit points

Offered: July. Prerequisite: Advisory prerequisites: COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. Classes: (2 lec and 2 hr lab/tut) per week. Assessment: Lab mark and an exam at end of semester.

NB: Not offered in 2001.

Recommended elective unit of study for Electrical, Electrical (Information Systems), Computer and Software Engineering. *Syllabus* 

Introduction to electronic commerce, evolving markets and trading systems. Computer and telecommunications infrastructure for electronic commerce, capacity planning. Marketing principles and strategies for electronic commerce. Security issues. Legal and regulatory issues. Specific systems for retail, money management, trading and business to business transactions. Some case studies.

#### ELEC 5611 Advanced Computer Engineering 4 credit points

Offered: July. Prerequisite: Advisory Prerequisite: ELEC 4601 Computer Design. Offered. Classes: (Two lec and a 2hr lab/tut) per week. Assessment: Laboratory and a 2hr exam at the end of semester.

Recommended elective unit of study for Electrical, Electrical (Information Systems), Computer and Software Engineering. *Syllabus* 

This unit of study covers one of the following topics: advanced computer architecture, advanced digital engineering and/or hardware software co-design. The school will advise prior to enrolment timewhat material will be covered in a particular year.

Advanced Computer Architecture: 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.

Advanced Digital Engineering: 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.

Hardware Software Codesign: 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; Hardware/software partitionning; Reconfigurable computing.

# ELEC 7503 Optical Communication Systems 6 credit points

Offered: July. Prerequisite: Advisory Prerequisites: ELEC 3402 Communications Electronics, ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec and a 1 hr tut) per week. Assessment: Assignments and a 2hr exam at end of semester. Introduction to optical fibre communications, optical fibre trar

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, multichannel multiplexing techniques, optical fibre communication systems.

# ELEC 7504 Cellular Radio Engineering 6 credit points

**Offered:** February. **Prerequisite:** Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 35Q3 Introduction to Digital Communications. **Classes:** (2 lec and a 2hr lab/tut) per week. **Assessment:** Assignments and a 2hr exam at end of semester.

Antenna basics: analysis of simple antennas, uniform linear antenna arrays, planar array, base-station antennas, mobile antennas. Mobile radio channel: multipath fading, diversity, log-normal fading, mean propagation loss, propagation models. Cellular technologies: cell types, coverage, frequency allocation, link budget, power budget, traffic capacity. TDMA cellular systems - GSM standard: coding and modulation, special characteristics and features, logical and physical channels, frame structure, general packet radio services (GPRS), GSM evolution towards UMTS. CDMA cellular systems - IS-95 standard: physical and logical channels, asynchronous data, short message service, packet data services for CDMA cellular/PCS systems, cdma2000 layering structure.

# ELEC 7506 Optical Networks 6 credit points

**Offered:** July. **Prerequisite:** Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Classes: (2 lec and a 1 hr tut) per week.

Assessment: Assignments and a 2hr exam at end of semester. Introduction, photonic network architectures: point to point, star, ring, mesh; system principles: modulation formats, link budgets, optical signal to noise ratio, dispersion, error rates, optical gain and regeneration; wavelength division multiplexed networks; WDM components: optical filters, gratings, multiplexers, demultiplexers, wavelength routers, optical crossconnects, wavelength converters, WDM transmitters and receivers; Wavelength switched/routed networks, ultra high speed TDM, dispersion managed links, soliton systems; broadcast and distribution networks, multiple access, subcarrier multiplexed lightwave video networks, optical local area and metropolitan area networks; ET, FDDI, ATM, Fibre Channel.

### ELEC 7608 Electronic Commerce

6 credit points **Offered:** July. **Prerequisite:** Advisory prerequisites: COMP 2002 Design and Data Structures and COMP 2004 Programming

Practice. Classes: (Two lec and a 2hr lab/tut) per week.

Assessment: Lab mark and an exam at end of semester.

Introduction to electronic commerce, evolving markets and trading systems. Computer and telecommunications infrastructure for electronic commerce, capacity planning. Marketing principles and strategies for electronic commerce. Security issues. Legal and regulatory issues. Specific systems for retail, money management, trading and business to business transactions. Some case studies.

# ELEC 7611 Advanced Computer Engineering 6 credit points

#### Offered: July. Prerequisite: Advisory Prerequisite: ELEC 4601 Computer Design. Classes: (Two lec and a 2hr lab/tut) per week.

Assessment: Laboratory and a 2hr exam at the end of semester.

This unit of study covers one of the following topics: advanced computer architecture, advanced digital engineering and/or hardware software codesign. The school will advise prior to enrolment time what material will be covered in a particular year.

Advanced Computer Architecture: 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.

Advanced Digital Engineering: 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.

Hardware Software Codesign: 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; Hardware/software partitionning; Reconfigurable computing.

# ELEC 8521 Radio Frequency Engineering 6 credit points

#### Offered: February, July.

The course covers several important subjects in radio frequency engineering, leading to the analysis and design of components and systems commonly encountered in radio systems. The course builds on an undergraduate degree in electrical engineering and covers the following areas: transmission lines and circuit descriptions; passive radio frequency components, including couplers, filters and power dividers; typical radio frequency circuits; radio frequency system characteristics, including noise, linearity, sensitivity, selectivity and distortion; basic radio frequency measurements; amplifier and oscillator design; frequency translating circuits; non-linear arid large signal characteristics; introduction to device modelling and circuit simulation. The course is targeted at engineers involved in the design, specification, implementation and support of radio frequency systems such as in mobile communications.

# ELEC 8522 Antennas and Propagation 6 credit points

### Offered: February, July.

The course provides the basic knowledge on antennas used in mobile communications and those topics of radio propagation essential to the task of cellular planning. Most attention is paid to antenna array meory and its application for base station antenna systems. Radio propagation starts from the basics of the theory, elementary description of fading, diffraction, depolarization and shadowing. The course then addresses issues of radio coverage prediction and optimization using models and modern measurement techniques.

ELEC 8525 GSM Advanced System Techniques 6 credit points Offered: February. The course covers the system characteristics and practical implementation aspects of the international mobile telecommunications system using the GSM standard. A systems perspective is taken and the course takes the participant through studies of traffic issues as well as the integration of the GSM network into the terrestrial parts of the network. The GSM protocol is discussed in detail as well as its interpretation in terms of the international OSI reference model. Signalling within the network, call setup, the air interface and the radio frequency layer are covered. Measurement and handover techniques, recommendations of the ETSI organization, and an introduction to the new DCS 1800 standard complete the course.

### ELEC 8621 Signal & Video Processing for Multimedia

# 6 credit points **Offered:** February, July.

Multimedia Signal Processing. Contents will be MPEG based, covering standards (MPEG-1, 2, 4 and 7), architecture, image/video retrieval in a digital video library, content-based processing techniques, video coding, media fusion, human computer interaction/communications, intelligent multimedia, and applications.

# ELEC 8701 The Exploitation of New Ideas 6 credit points

#### Offered: February, July.

The course covers the broad field of idea generation and how these ideas can be converted into wealth. The central core of the course is the study of technology contracts and how these are relevant in intellectual property (TP) issues. Intellectual property and patents are covered in some detail. The potential commercial value of intellectual property is addressed as is the process of licensing and sale of IP. The course includes quite practical advice and understanding from the viewpoint of the inventor/ developer of IP. It utilises a range of educational materials including videodisc, publications, licensing games, case studies, CD-ROM databases, and Internet-based material. The course includes visiting IP and legal professionals.

# ELEC 8702 New Venture Creation 6 credit points

#### Offered: February, July.

This course is linked intimately to the progressive development of a detailed business plan for a commercial outcome. It uses a series of case studies, textbook, publications, visiting entrepreneurs and video material. During the course the attendees are required to apply the developing new knowledge to the creation of their own business plan. The course encourages development of a team, and a focus on a particular product or service with ket potential. Attendees are encouraged to provide their own business concept. Otherwise, appropriate concepts will be developed within the course. It is intended that the final session of the course takes the form of a presentation of business plans to be reviewed and commented on by a panel of experienced venture capitalists and business managers. (Note that the February semester course will be given on two evenings per week over six weeks with the examination following one week later.)

# ELEC 8703 Integrated Product Design and Dev 6 credit points

### Offered: February, July.

This course presents product design and development as a process which integrates (a) the ket aspects of understanding customer and ket needs (as well as competitive products), (b) the technology possibilities which emerge from research and development and, (c) the design, manufacture, distribution and support of the successful product. It addresses integration across functional areas in an organisation and the sort of demand that effective product development places on the enterprise as a whole. The course is based on proven industrial product development processes and will provide an effective framework in which product design and development can be managed. For designers, researchers, manufacturers, and keters, the course provides the cross-functional understanding and skills needed to be part of an effective product design and development team.

## ELEC 8704 Business Plan

#### 2 credit points

### Offered: February, July.

This one credit point unit is expected to take at least 26 hours of work researching, writing and presenting a significant report addressing the practical application of a major aspect of the Graduate Certificate in Technology Commercialisation courses. A satisfactory report is based on the submitted written document (70%), a poster presentation summary of the report (15%) and a verbal presentation of the report (15%). Suitable topics would include a commercialisation strategy for a specific technology or invention, a product design and development plan, or a business plan for the initial establishment funding of a new technology-based company.

#### ELEC 8801 Advanced Topics: Wireless Communication

# 6 credit points **Offered:** July.

These units contain specific material on recent advances in the designated areas and content will change as necessary to accommodate advances in technology.

# ELEC 8802 Advanced Topics in Integrated Systems 6 credit points

#### Offered: July.

These units contain specific material on recent advances in the designated areas and content will change as necessary to accommodate advances in technology.

# ELEC 8803 Advanced Topics in Signal Processing 6 credit points

### Offered: February, July.

These units contain specific material on recent advances in the designated areas and content will change as necessary to accommodate advances in technology.

# ELEC 8805 Advanced Topics in Photonics

# 6 credit points Offered: July.

These units contain specific material on recent advances in the designated areas and content will change as necessary to accommodate advances in technology.

## ELEC 8900 **Project, Full-Time** 12 credit points

### Offered: February, July.

The carrying out and writing up of an approved significant project equivalent to about four months full-time work in a topic preferably related to their course-work enrolment. It can be part of the candidate's normal employment. As a guide, a project topic is likely to be satisfactory if a successful outcome of the work is such that it would lend itself to publication in a learned journal such as the Journal of the Institution of Engineers, Australia. The project may be carried out full-time over one semester or part-time over two semesters (part A followed by part B).

# ELEC 8901 Project Part-Time Part A 6 credit points

### Offered: February, July.

The carrying out and writing up of an approved significant project equivalent to about four months full-time work in a topic preferably related to their course-work enrolment. It can be part of the candidate's normal employment. As a guide, a project topic is likely to be satisfactory if a successful outcome of tie work is such that it would lend itself to publication in a learned journal such as the Journal of the Institution of Engineers, Australia. The project may be carried out full-time over one semester or part-time over two semesters (part A followed by part B).

# ELEC 8902 Project Part-Time Part B 6 credit points

### Offered: February, July.

The carrying out and writing up of an approved significant project equivalent to about four months full-time work in a topic preferably related to their course-work enrolment. It can be part of the candidate's normal employment. As a guide, a project topic is likely to be satisfactory if a successful outcome of the work is such that it would lend itself to publication in a learned journal such as the Journal of the Institution of Engineers, Australia. The project may be carried out full-time over one semester or part-time over two semesters (part A followed by part B).

ELEC 8904 Seminar 2 credit points

#### Offered: February, July.

Research and writing of a significant report or essay on an agreed topic within the area of the qualification being sought.

# Mechanical Engineering

#### MECH1501 Engineering Statics 4 credit points

**Offered: July. Prohibition:** MECH 1500 Mechanical Engineering. Classes: 1 x 2hr plus 1 x 1 hr lec-tut session/wk. **Assessment:** In class assessment, projects, exam.

First year core unit of study. Syllabus

Introduction to Engineering mechanics, vectors, forces, components; moments - 2d and 3d; free body diagrams; 2d equilibrium; 3d equilibrium; trusses, frames and machines; centroids and centres of mass; friction; bearings and wedges

Course Objectives

Students should:

- Develop an understanding of and competence in solving statics problems in engineering.
- Improve their group work and problem solving skills.

Expected Outcomes Students should be able to:

- Draw a correct free body diagram for any engineering entity
- Calculate the value of unknown forces and moments acting on any three dimensional object from the equilibrium equations
- Calculate the force in an internal member of a simple structure
- Calculate the forces acting as a result of two objects in contact
- · Find the centre of mass or centroid of an object
- Work as an effective member of an engineering team
- Be able to outline a logical approach for solving a complex engineering problem

Textbooks Bedford and Fowler Engineering Mechanics: Statics (vol 1) SI

Edition, Addison Wesley.

#### MECH 1511 Introductory Dynamics 4 credit points

**Offered:** July. **Prohibition:** MECH 1530 Engineering Mechanics, MECH 1510 Kinematics and Dynamics. Classes: lectures, problem solving workshop, and tutorial. **Assessment:** In class assessment, projects, exam.

First year elective unit of study for Aerospace Engineering students.

Syllabus

Introduction to kinematics and dynamics; position, velocity and acceleration of a point; straight line (rectilinear) motion; curvilinear motion; other coordinate systems; orbital mechanics; relative motion; force and acceleration; Newton's 2nd law; equations of motion in Cartesian coordinates; equations of motion in other coordinates; momentum; linear & angular momentum; collisions; energy methods; work; power; kinetic energy; potential energy; mass flows & variable mass systems

Course Objectives

Students should:

- · Develop an understanding of and competence in solving kinematic and dynamic problems in engineering.
- Improve their group work and problem solving skills. Expected Outcomes
  - Students should be able to:
- Calculate the trajectory for a particle in 3 dimensional space
- Determine the forces acting an object undergoing acceleration
- Use momentum principles to detennine the forces and motion of objects undergoing collisions
- Calculate the forces on an object with variable mass, or mass flows
- Use energy methods to determine the kinematics of a particle under conservative forces
- Work as an effective member of an engineering team
- Be able to outline a logical approach for solving a complex engineering problem

#### Textbooks

Bedford and Fowler Engineering Mechanics: Dynamics (vol 2) SI Edition, Addison Wesley

### MECH 1530 Engineering Mechanics 8 credit points

Offered: July. Prohibition: CIVL1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1. Classes: lectures, problem solving workshop and tutorial. Assessment: In class assessment, projects, exam. First year core unit of study for Mechanical, Mechatronics, Biomedical, Aeronautical and Space Engineering students.

Syllabus

Introduction to Engineering mechanics, vectors, forces, components; moments - 2d and 3d; free body diagrams; 2d equilibrium; 3d equilibrium; trusses, frames and machines; centroids and centres of mass; friction; bearings and wedges; introduction to kinematics and dynamics; position, velocity and acceleration of a point; straight line (rectilinear) motion; curvilinear motion; other coordinate systems; orbital mechanics; relative motion; force and acceleration; Newton's 2nd law; equations of motion in Cartesian coordinates; equations of motion in other coordinates momentum; linear & angular momentum; collisions; energy methods; work; power; kinetic energy; potential energy; mass flows & variable mass systems

Course Objectives

- Students should:
- Develop an understanding of and competence in solving statics, kinematic and dynamic problems in engineering.
- Improve their group work and problem solving skills. Expected Outcomes
- Students should be able to:
- Draw a correct free body diagram for any engineering entity
- Calculate the value of unknown forces and moments acting on any three dimensional object from the equilibrium equations
- Calculate the force in an internal member of a simple structure
- Calculate the forces acting as a result of two objects in contact
- Find the centre of mass or centroid of an object
- Calculate the trajectory for a particle in 3 dimensional space
- Determine the forces acting an object undergoing accelera-• tion
- Use momentum principles to determine the forces and motion of objects undergoing collisions
- Calculate the forces on an object with variable mass, or mass flows
- Use energy methods to determine the kinematics of a particle under conservative forces
- Work as an effective member of an engineering team

Be able to outline a logical approach for solving a complex engineering problem

Textbooks

Bedford and Fowler Engineering Mechanics: Statics (vol 1) and Dynamics (vol 2) SI Edition, Addison Wesley

### MECH 1540 Introductory Mechanical Engineering 5 credit points

#### Offered: February. Prohibition: AERO 1601 Aerospace

Manufacturing, MECH 1500 Mechanical Engineering 1, MECH 1800 Computational Engineering 1A. Classes: Professional Engineering: 3 x 1 hr lecture-tute per week Mechatronics Design: 2 hr lecture-tute per week. Assessment: In-class assessments, assignments, exam. First year core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus Summary

Professional Engineering (3 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.

Mechatronic Design: (2 Cr): Introduction to the design of mechatronic systems. Elements of mechatronic systems; actuators, sensors. Industrial examples.

Objectives

- Students will develop skills in
- engineering management techniques
- working in groups
- verbal and written communication
- use of mechatronics elements
- Expected outcomes

To develop an understanding of

- the role of professional engineers and their responsibilities
- the design of mechatronic systems

#### MECH 1545 Introductory Professional Engineering 3 credit points

Offered: February, Prohibition: AERO 1601 Aerospace

Manufacturing MÉCH 1500 Mechanical Engineering 1. Classes: 3 x 1 hr lecture-tute per week. Assessment: In-class assessments, assignments, exam

First year core unit of study for the degree in Mechanical and Mechatronic Engineering.

Syllabus Summary

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.

Objectives

- Students will develop skills in
- engineering management techniques
- working in groups
- verbal and written communication
- Expected outcomes
- To develop an understanding of the role of professional engineers and their responsibilities
- MECH 1600 Manufacturing Technology
- 4 credit points

Offered: July. Prohibition: AERO1 6 0 0 Workshop Technology. Classes: One 3 hour lab per week. Assessment: Practical work.

First year core unit of study for the degrees in Mechanical and Mechatronic Engineering

(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: lame, 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 1802 C Programming

#### 3 credit points

Offered: July. Classes: 1 hr lec and 2 hr lab/week. Assessment: One 2 hr exam and computer exercises.

*NB: Web page: <u>www.acfr.usyd.edu.au/teaching/Jst-year/</u> mech1802/.* 

First year core unit of study for the degree in Mechatronic Engineering

Syllabus Summary

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 a foundation for the study of systems and embedded programming in the degree in Mechatronic Engineering.

Expected outcomes

Students will develop skills in the design, coding, debugging, testing and documentation of C programs.

Textbooks

Deitel and Deitel C: How to program (Prentice Hall, 1994) *Reference Books* 

Kernihan and Ritchie The C programming Language 2nd ed (Prentice Hall, 1988)

McConnell Code Complete (Microsoft Press, 1994)

# MECH1820 Introduction to Computing 6 credit points

**Offered:** February. **Prohibition:** MECH 1800 Computational Engineering 1A MECH 1801 Computational Engineering 1C INFO 1000 Information Technology Tools. **Classes:** Lecture and computer labs. **Assessment:** In class basic skills test, assignments, exam. First year core unit of study for Mechanical, Mechatronics, and Aeronautical Engineering.

Syllabus Summary

Computing basics (1 Cr): Introduction to using computers in an engineering environment. Basics of computing and using common applications in windows and office.

Programming in Matlab(3 Cr): Basic programming skills and techniques. Matlab as an interactive programming tool. Matlab as a programming language. Basic features: array operations; graphing; relations and logical operations. Linear algebra. Applications in mechanics and numerical analysis.

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.

Objectives

To provide a solid grounding in engineering programming. Use of computers in engineering applications.

- Expected outcomes
- Students will develop skills in:
- basics of computer programming
- programming with Matlab
- problem-solving with Matlab
- · 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 Madab (Prentice Hall, 1995) Excerpts from Etter, Engineering problem solving with Matiab (Prentice Hall, 1993)

#### MECH 2201 Thermodynamics 1 4 credit points

Offered: February. Prohibition: MECH 2200Thermofluids. Classes: (2 lec and one 3hr lab/tut)/wk. Assessment: One 2 hr

exam, assignments and laboratory work.

Second year 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 2202 Fluids 1

2 credit points

Offered: July. Prerequisite: MATH 1001, MATH 1002, MATH 1003. Prohibition: MECH 2200 Thermofluids, AERO 2201 Fluid

Mechanics 1. Classes: 1 lecture/wk and labs and tuts.

**Assessment:** One 1 1/2 hr exam, assignments and laboratory work. Second year unit of study for the degrees in Mechanical and Mechatronic Engineering.

Syllabus Summary

Fluid properties, pressure, shear, hydrostatics, forces, moments, buoyancy, stability, continuity equations, streamlines, Euler, Bernoulli equations, linear momentum, propulsion, angular momentum, turbomachinery, dimensional analysis, boundary layers, pipe flow and friction.

Objectives

The understanding of fluids fundamentals.

Expected outcomes

To be able to analyse engineering problems involving fluid flow.

Textbooks

Textbooks

Potter and Wiggert, Mechanics of Fluids, Prentice-Hall. Library Classification: 536.7, 621.4,532., 620.106

MECH 2300 Materials 1

4 credit points

Offered: July. Prohibition: CIVL2101 Properties of Materials. Classes: 2 lectures and 1 hr tut/wk plus three 3 hr lab sessions. Assessment: One 2 hr exam plus assignment work.

Second year 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* 

Callister 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 Introducition 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

Offered: July. Classes: (2 lec/wk, plus 2 x 2hr drawing office

sessions)/wk. Assessment: assignments and quizzes.

Second year 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)

Reference books

- SHIGLEY & MISCHKE Mechanical Engineering Design (McGraw-Hill)
- R.L. Norton Machine Design, An Intergrated Approach (Prentice Hall)

Library Classification: 621.815

MECH 2500 Engineering Dynamics 1

### 4 credit points

Offered: July. Prerequisite: MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics. Classes: Two lec/wk, three 3 hr lab sessions and ten 2 hr tutorials. Assessment: Exam and assignments.

Second year 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 and parallel 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

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

Offered: July. Classes: 3 hr lectures and a 3 hr lab/wk.

Assessment: 2 hr exam plus project work.

Second year core unit of study for the degree in Mechatronic Engineering.

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

Library Classification: 670.427, 629.89, 629.895, 621.2, 629.804

#### MECH 2900 Anatomy and Physiology for Engineers 4 credit points

Offered: February. Prerequisite: Biology BIOL 1001 or some previous biology experience. Classes: 3 hrs/wk, including lectures and laboratory sessions. Assessment: Exam plus assignments and laboratory reports.

Syllabus summary

Gross anatomy of the major body systems; physiology of cell homeostasis; physiology of nervous, circulatory, respiratory, musculoskeletal, digestive and renal systems relevant to biomedical engineering.

**Objectives:** 

- Students should gain familiarity with anatomical and physiological terms and understanding their meaning
- Students should gain an understanding of the gross anatomy of the major systems in the human body and their importance in the design of biomedical devices
- Students should gain an understanding of the major physiological principles which govern the operation of the human body

Expected outcomes:

Students will be able to

a) identify the gross anatomical features of the human body b) describe the normal function of the major body systems (nervous, circulatory, respiratory, musculoskeletal, digestive and renal

c) determine how these functions relate to cellular function d) determine how a biomedical engineering device affects the normal anatomy and function of the body.

#### MECH 3200 Thermal Engineering 1 7 credit points

Offered: February. Prerequisite: MECH 2201 Thermodynamics 1 or MECH 2200Thermofluids. Prohibition: MECH 3201

Thermodynamics 2. Classes: (3 lec and 2 x 1 hr tut)/week and laboratory work. Assessment: two 2hr exams, assignments and laboratory reports.

Third year core unit of study for the degree in Mechanical Engineering

Thermodynamics (57%): 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 (43%): 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

Offered: February. Prerequisite: MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. Prohibition: MECH 3200 Thermal Engineering 1. Classes: (2 lec and 1 x 1 hr tut)/week and laboratory work. Assessment: One 2hr exam, assignments and laboratory reports.

Third year year core unit of study for the degree in Aeronautical Engineering

Svllabus summarv

Triermodynamics: 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

Cengel and Boles Thermodynamics, an Engineering Approach (McGraw-Hill) 2nd Edn.

Library Classification: 536.7, 621.4

#### MECH 3202 Heat Transfer 3 credit points

Offered: February. Prerequisite: MECH 2201 Thermodynamics 1. Classes: 1 lec, 1 tut/week and laboratory work. Assessment: One 2 hr exam, assignments and laboratory reports.

Third year core unit of study for the degree in Mechanical Engineering.

Syllabus Summary

Heat Transfer. 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.

Expected Outcomes

Ability to tackle and solve a range of heat transfer problems including finned heat exchangers, cooling by fluids, quenching, insulation and solar radiation.

# MECH 3211 Fluid Mechanics 2

4 credit points

Offered: July. Prerequisite: AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. Prohibition: AERO 3250 Aerodynamics 2. Classes: (2 lec, one 1 hr tut,)/wk one 3 hr lab. Assessment: 2hr exam, assignments/lab reports.

3rd Year core course 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. 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. Introduction to gas dynamics, steady onedimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube. Introduction to steady two-dimensional supersonic flow.

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 flow theory, boundary layers and gas dynamics. Reference books

Potter & Wiggert, Mechanics of Fluids, Prentice Hall McCormick Aerodynamics, Aeronautics and Flight Mechanics

(Wiley, 1979)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

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)

## MECH 3300 Materials 2

### 4 credit points

Offered: July. Prerequisite: MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1. Classes: 2 lec/wk plus 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. Third year 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, structureproperty 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

MECH3310 Mechanics of Solids 2

4 credit points

**Offered:** February. **Prerequisite:** AERO 2300 Mechanics of Solids 1 and MATH 2005. **Classes:** 2 lec/wk plus 2 tut/wk. **Assessment:** One two hour examination plus assignments and a lab in the semester.

Third 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. Van Wostrand Company Ltd, 1973)

Timoshenko and Goodier Theory of Elasticity (McGraw-Hill, 1951)

### MECH 3400 Mechanical Design 2A

4 credit points

Offered: February. Prerequisite: MECH 2400 Mechanical Design 1. Classes: 2 lectures & one 1 hr drawing office session/wk. Assessment: Assignments and quizzes.

Third 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

Textbooks

R.L. Norton Machine Design, An Integrated Approach (Prentice Hall), or

J.Shigley et al Mechanical Engineering Design (McGraw-Hill) *Reference Books* 

Orlov Fundamentals of Machine Design Vol I to V (M.I.R. Moscow)

Library classification: 621.815,001.6443

## MECH 3410 Mechanical Design 2B 4 credit points

Offered: July. Prerequisite: MECH 2400 Mechanical Design 1. Classes: 2 lectures & one 1 hr drawing office session/wk. Assessment: Assignments and quizzes.

Third year core unit of study for the degrees in Mechanical and Mechatronic Engineering

Svllabus Summarv

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

R.L. Norton Machine Design, An Intergrated Approach (Prentice Hall), or

J.Shigley et al Mechanical Engineering Design (McGraw-Hill) *Reference Books* 

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

Offered: February. Prerequisite: MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005). Classes: 2 lec and 1 tut/ wk plus laboratory sessions. Assessment: One 2 hr exam, assignments and laboratory work.

Third year 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.

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 3600 Manufacturing Engineering 6 credit points

Offered: February. Prerequisite: MECH 1600 Manufacturing Technology. Classes: lec: 3hrs/wk; plus an average of 2hrs/wkfor tut, lab and industrial visits. Assessment: One 2 hr exam plus labs, poster and industrial visits.

Third year core unit of study for the degrees in Mechanical and Mechatronic Engineering.

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 3601 Manufacturing Systems 2 credit points

#### Offered: February. Prerequisite: MECH 1600 Manufacturing Technology. Classes: 2 hrs/wk lec; plus industrial visits.

Assessment: One 1 hr exam plus labs and industrial visits.

Third year core unit of study for the degrees in Mechanical and Mechatronic Engineering.

Syllabus summary: 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 systems.

Expected outcomes: Students will understand the principles, merits and disadvantages of some commonly used manufacturing techniques.

Syllabus summary: 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. Practical: MECH 1600 Manufacturing Technology. 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 3610 Team Project

2 credit points

Offered: July. Prerequisite: 30 credit points of second year units of study. Classes: One hr/week for 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. Third year 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

Offered: July.

Third year core unit for the degree in Aeronautical Engineering. 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.

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 3700 Mechatronics 2

5 credit points

Offered: February. Prerequisite: MECH 2700 Mechatronics 1. Classes: 2 hr lectures plus a 3 hr lab/wk. Assessment: 2 hr exam plus project work.

Third year 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

An extensive list of reference books will be distributed Library Classification: 004.22, 004.35,005.133

#### MECH3800 Systems Control

#### 4 credit points

Offered: July. Prerequisite: MATH 2001 and MATH 2005. Classes: 2 lec and 1 tut/week plus laboratory sessions. Assessment: One 1 1/2 hr exam, assignments and laboratory work.

Third year 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 Madab and Simulink 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.

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 3910 Biomedical Technology 3 credit points

Offered: February. Assessment: Assignment and final exam. Objectives

Students will gain an understanding of the uses of biomedical engineering products in therapeutic, rehabilitation and clinical settings. Students will gain an understanding of the process of biomedical regulation in Australia and other major international markets as well as the entire process of creating a new biomedical engineering product, from design through to marketing and monitoring of the product.

Syllabus summary

Covers the marketing and regulation of biomedical products, biomedical ethics, development and testing protocols for biomedical devices, rehabilitation engineering, the uses of biomedical products in hospitals. The course will include the development of a full business plan for a new biomedical engineering product, including planning of full clinical trials, regulatory submissions and marketing plan.

#### MECH 3920 Biomedical Design Project 2 credit points

Offered: July. Prohibition: MECH 3610 Team Project.

Assessment: On the basis of progressive contribution to the project and on the quality of final presentation.

Objectives

To plan a biomedical project, to consider technical, managerial, economic, environmental and societal factors in taking a biomedical project from concept to conclusion.

Syllabus summary

Team building, considerations of conceptual design, economic analysis, project management oudine and potential benefit to the health care system.

MECH 4101 Thesis A

0 credit points

Offered: February, July. Prerequisite: 36 credit points of Third Year units of study. Assessment: Satisfactory or Unsatisfactory on the basis of the Proposal, Progress Report and actual progress as verified by the supervisor.

Fourth year core unit of study for the degree in Mechanical and Mechatronic Engineering.

Objectives

To involve students in a research or major design project and give diem the opportunity to conduct systematic investigations. Expected outcomes

Ability to plan, submit a Proposal, to autonomously carry out a project and to write a Progress Report at the end of semester. The student can only progress to Thesis B on attainment of a Satisfactory result in Thesis A.

Syllabus summary

In the Fourth year of the unit of study, each candidate works towards and writes an undergraduate diesis from work carried out in Thesis A and B.

Towards the end of each academic year a list of suggested topics and supervisors for thesis work is published for the information of current Third year students. In the case of students enrolling in Thesis A in 2nd semester, topics will be made available in 1 st semester. Each prospective Fourth year student is then required to consult with prospective supervisors to apply for a topic.

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 be of an 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.

Thesis A is the first part of Thesis A and Thesis B and requires the student to make significant progress toward the objectives oudined in the Proposal. This includes any workshop drawings and experimental setup. Generally about 50% of the total Thesis A & B time should be spent in Thesis A. Progress is assessed by the supervisor through regular contact with the student and through the forma] Progress Report.

MECH 4102 Thesis B 12 credit points

Offered: February, July. Prerequisite: MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances). Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution.

Fourth year core unit of study for the degree in Mechanical and Mechatronic Engineering.

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 meir study in a thesis.

Syllabus summary

In the Fourth 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 before a date to be announced. Thesis B is the second part of Thesis A and Thesis B and requires the student to continue from the progress attained in Thesis A.

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 eidier directed by the supervisor or be of an 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 on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-bound for the departmental library, on or before the due date. The penalty rate for late submissions will be advertised. Students are responsible for supplying their own thesis production materials.

The Charles Rolling Prize may be awarded for the best graduation thesis.

### MECH 4103 Interdisciplinary Thesis A 0 credit points

Offered: February, July. Prerequisite: 36 credit points of Third Year units of study. Assessment: Satisfactory or Unsatisfactory on the basis of the Proposal, Progress Report and actual progress as verified by the supervisor.

NB: The student can only progress to Thesis B on attainment of a Satisfactory result in Thesis A.

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, submit a Proposal, to autonomously carry out a project and to write a Progress Report at the end of semester.

The student can only progress to Thesis B on attainment of a Satisfactory result in Thesis A.

Syllabus summary: In this unit of study, each candidate works towards and writes an undergraduate thesis from work carried out in Thesis A and B.

Towards the end of each academic year a list of suggested topics and supervisors for thesis work is published for the information of current Third year students. In the case of students enrolling in Thesis A in 2nd semester, topics will be made available in 1 st semester. Each prospective Fourth year student is then required to consult with prospective supervisors to apply for a topic.

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 be of an original nature, but in any event the student is direcdy responsible to his or her supervisor for the execution of his or her practical work and the general layout of the thesis itself.

Thesis A is the first part of Thesis A and Thesis B and requires the student to make significant progress toward the objectives outlined in the Proposal. This includes any workshop drawings and experimental set up. Generally about 50% of the total Thesis A & B time should be spent in Thesis A. Progress is assessed by the supervisor through regular contact with the student and through the formal Progress Report.

# MECH 4104 Interdisciplinary Thesis B

12 credit points Offered: February, July. Prerequisite: MECH 4103 Interdisciplinary Thesis A (The Head of Department may allow Thesis A as

corequisite in exceptional circumstances.). Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution

NB: Core unit of study for the combined degrees BE (Mechanical or Mechatronic Engineering) / Bachelor of Medical Science. The Charles Rolling 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.

Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution.

Expected outcomes: Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

Syllabus summary: In this unit of study, each candidate works towards and writes an undergraduate thesis, at least one copy of which should be submitted in completed form before a date to be announced. Thesis B is the second part of Thesis A and Thesis B and requires the student to continue from the progress attained in Thesis A.

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 be of an 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 on A4 with text, diagrams, graphs, photographs, etc., properly displayed. One copy should be submitted, hard-bound for the departmental library, on or before the due date. The penalty rate for late submissions will be advertised. Students are responsible for supplying their own thesis production materials.

The Charles Kolling Prize may be awarded for the best graduation thesis.

### MECH 4110 Professional Engineering 4 credit points

Offered: February. Prerequisite: 36 credit points of Senior units of study. Classes: Lectures/consultations/student presentations - 4hr/ week for one semester. Assessment: Student assignments/ presentations and 2hr exam.

Fourth year 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.

Expected outcomes

A good understanding of the management of projects and engineering plants.

## MECH 4120 Professional Communication

4 credit points

Offered: July. Prerequisite: 32 credit points of third year units of study. 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. Assessment: Satisfactory performance in the seminar as assessed by the participants, and seminar workshops as assessed by the

course coordinator. Fourth year core unit of study for the degree in Mechanical and Mechatronic Engineering.

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.

Objectives

To improve student competence and confidence in developing and presenting a formal technical presentation.

Expected outcomes

The ability to structure and deliver a competent and informative technical presentation.

### MECH 4130 Practical Experience 0 credit points

Offered: February, July. Prerequisite: 28 credit points of second year units of study. Classes: 12 weeks of practical work experience. Assessment: A written report is required. Pass/Fail grade only is awarded. Marks will not be given. (This unit of study will not contribute to the weighted averages used to determine Honours.). Fourth year 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 third year 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.

The industrial experience report must be submitted early in Semester 1. The report is assessed on content in accordance with details that are distributed to students earlier. The report should contain a section on management.

Objectives

To give students the opportunity to work in an engineering organisation and gain some professional experience. To enhance student abilities and experience in technical report writing.

Expected outcomes

(i) A better appreciation of the role of engineers in the workplace.

(ii) The ability to present structured observations and reflections in the mode of a formal written report.

# MECH 4210 Computational Fluid Dynamics 4 credit points

**Offered:** July. **Prerequisite:** MECH 3210 Fluid Mechanic. **Classes:** 2 lectures and one tutorial per week. **Assessment:** Tut work, projects and one 2hr exam.

Fourth year 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. *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

**Offered:** February. **Prerequisite:** 24 credit points of third year units of study. **Prohibition:** MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control. **Classes:** 5 hrs/wk plus two Saturday field-trips. **Assessment:** One 1.5 hr exam, plus assignments.

Fourth year elective unit of study.

Syllabus summary

The unit of study will consist of the following components:

Environmental acoustics and noise control (2 credit points) -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.

Energy and the Environment (4 credit points) - Economic analysis of energy systems. Urban air pollution, ozone hole and greenhouse problems, waste disposal, water pollution. Montreal Protocol, Rio and Kyoto Accords. Sustainable energy, renewable energy, energy efficiency, C02 capture and sequestration and other emerging control technologies.

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.

### Reference books

Bies and Hansen Engineering Noise Control (Allen and Unwin, 1988).

Hassall and Zaveri Acoustic Noise Measurement (Bruel and Kjaer, 1988).

Preliminary reading can be made on the web at

www.ieagreen.org.uk.

Other books as advised during classes.

Library Classification: 534.8,620.23, 620.8, 628.1

#### MECH 4230 Environmental Acoustics & Noise Control

2 credit points

Offered: February. Prerequisite: 24 credit points of third year units of study. Prohibition: MECH 4220 Environmental Engineering. Classes: 2 lec and 1 tut/w. Assessment: One 1.5 hr exam. Fourth year 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.

Reference books

Bies and Hansen Engineering Noise Control (Allen & Unwin, 1988)

Hassall and Zaveri Acoustic Noise Measurement (Bruel & Kjaer, 1988)

Library classification: 534.8, 620.23

MECH 4240 Energy and the Environment

4 credit points

**Offered:** February. **Prerequisite:** 24 credit points of Senior units of study. **Prohibition:** MECH 4220 Environmental Engineering.

Classes: 3hrs per week. Assessment: Assignments and classwork. Fourth year elective unit of study

Syllabus summary

Economic analysis of energy systems. Urban air pollution, ozone hole and greenhouse problems, waste disposal, water pollution. Montreal Protocol, Rio and Kyoto Accords. Sustainable energy, renewable energy, energy efficiency, C02 capture and sequestration and other emerging control technologies.

Expected outcomes

No text or reference books are set. Preliminary reading can be made on the web at <u>www.ieagreen.org.uk</u>.

# MECH 4250 Air Conditioning and Refrigeration 3 credit points

Offered: February. Prerequisite: MECH 3200 Thermal Engineering 1. Classes: 1.5hr lecture and 1 hrtut/wk. Assessment:

Assignments, project and one 2hr exam.

Fourth year elective unit of study.

Syllabus summary

Applied psychrometrics, air conditioning systems, design principles, cooling load calculations, heating load calculations, introduction and use of computer-based load estimation packages software, air distribution, fans, ducts, air conditioning controls.

Refrigeration cycles, evaporators, condensors, cooling towers, compressors, pumps, throttling valves, piping, refrigerants, control, refrigeration equipment, stimulation of refrigeration systems, food refrigeration and industrial applications.

Use of CFD packages as tools to simulate flows in building and to optimise air conditioning design, energy estimation methods and software, energy management in buildings.

Objectives

To develop a practical understanding of air conditioning and refrigeration applications.

Expected outcomes

Students will be able to determine thermal loads on structures, and design an air conditioning or refrigeration!! system with attention to air distribution and energy consumption.

### MECH 4260 Combustion and Fire Safety 3 credit points

**Offered:** February. **Prerequisite:** MECH 3200 Thermal Engineering **1. Classes:** 1.5hr lecture and 1 hr tut/wk. **Assessment:** Assignments, project and one 2 hr exam.

Fourth year elective unit of study;

Syllabus summary

Basics of combustion and chemical kinetics, flames and simple reacting systems, basics of fire dynamics: initiation, development and spread of smoke and fire, pollutants formation, use of CFD in fire remodelling.

Principles of flame inhibition, fire suppressants, fire protection systems: detection, suppression and control. Design considerations for manual and automatic systems. Fire safety regulations: prescriptive and performance based designs.

Objectives

To give students a basic understanding of combustion and fire protection, and safety issues.

Expected outcomes

Students will be able to perform a simple analysis of simple reacting systems. They will also be capable of assessing fire risks and fire protection systems in buildings.

# MECH 4310 Advanced Engineering Materials 6 credit points

**Offered:** July. **Prerequisite:** MECH 3300 Materials 2. Prohibition: MECH 4315 Advanced Aerospace Materials. **Classes:** 3 lec/wk plus 3 tut & lab/wk. **Assessment:** One 2 hr exam, one project report, assignments and lab reports as specified at the commencement of the semester.

Fourth year 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: Students should gain the capabilities: (a) to conduct failure diagnosis of simplified failure cases of engi-

neering 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 Nrjhoff, 1982)

Chawala, Composite Materials (Springer-Verlag, 1987)

Crawford, Plastic Engineering (second edition, Maxwell-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, Modem Ceramic Engineering (M. Dekker, 1982) 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 4315 Advanced Aerospace Materials 6 credit points

Offered: July. Prerequisite: MECH 3300 Materials 2. Prohibition: MECH 4310 Advanced Engineering Materials. Classes: 3 lec/wk plus 3 tut & lab/wk. Assessment: One 2 hr exam plus assignments and lab reports as specified at the commencement of the semester. Fourth year 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 wifJi 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 microstructure 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)
- Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)

Chawala, Composite Materials (Springer-Verlag, 1987)

- Crawford, Plastic Engineering (second edition, Maxwell-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, Modem Ceramic Engineering (M Dekker, 1982)

#### MECH 4410 Advanced Design and Analysis 1 3 credit points

**Offered:** February. **Prerequisite:** MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B. **Classes:** 2 hrs/wk. **Assessment:** Assessment is based on one major assignment and two minor projects, as well as attendance, participation and evidenced effort during classes in the drawing office as well as the Mech PC laboratory.

Fourth year elective unit of study.

Objectives

To develop a fuller understanding of and familiarity with the practical design processes expected in industry, including application of analysis techniques (in particular the Finite Element Method) and knowledge obtained from other courses studied.

Expected outcomes

Students should be able to undertake with a measure of confidence basic design and related analysis tasks likely to be encountered in early industrial employment, and should have an understanding of the many aspects associated with such an activity. Strong competence and understanding of the application of the Finite Element Method in stress and vibration analysis will be expected.

Syllabus summary

The course draws together the various subjects studied and introduces the student to the practical aspects of design in the commercial environment, with particular emphasis on classical machinery such as fans, ore grinding mills and vibrating scHreens. The course includes considerable application of the finite element method in stress and vibration analysis, with specific use of the STRAND FE code in the faculty workstation laboratory.

Textbooks

Textbooks

Shigley and Mischke 'Mechanical Engineering Design' 5th

Edition

*Reference books* Lecture notes.

Lecture notes.

- Norton, 'Machine Design an integrated approach'
- Adams and Askenazi, 'Building Better Products with Finite Element Analysis'

Gurney, 'Fatigue of Welded Structures'

Bladder, 'Considerations in Design'

Wills, 'Mineral processing technology' 6th ed.

Bleier, 'Fan Handbook: Selection, Application and Design' Regular reference will be made to other publications, journals,

trade information as well as Australian and International Standards and Codes of Practice, societies and organisations.

#### MECH 4420 Advanced Design and Analysis 2 3 credit points

Offered: July. Prerequisite: MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B. Classes: 2 hrs/wk. Assessment: Assessment is based on one major assignment and

two minor projects, as well as attendance, participation and evidenced effort during classes in the drawing office as well as the Mech PC laboratory.

Fourth year elective unit of study.

Objectives

To develop a fuller understanding of and familiarity with the nominated elements of the complete design process, including application of analysis techniques (in particular the Finite Element Method) and knowledge obtained from other courses studied.

Expected outcomes

Students should be able to undertake with a measure of confidence course related tasks likely to be encountered in early industrial employment, and should have an understanding of the aspects associated with them. Competence and understanding of the application of the Finite Element Method in stress and vibration analysis will be expected.

Syllabus summary

This course is independent of MECH 4410 but inherently complements it with respect to the design and analysis related topics covered. These include structural dynamics and design for fatigue, operational troubleshooting/failure modes/design rectification techniques, design audits, qual!!ity management, machinery monitoring (strain, vibration), safety features and guarding for machines. The course includes application of the finite element method in class tasks as well as the major assignment which is related to design improvement of a given machine element, with specific use of the STRAND FE code in the faculty workstation laboratory.

Textbooks Textbooks

Shigley and Mischke, 'Mechanical Engineering Design' 5th

Edition

Reference books

Lecture Notes.

Norton, 'Machine Design - an integrated approach'

Adams and Askenazi, 'Building Better Products with Finite Element Analysis'

Gumey, 'Fatigue of Welded Structures'

Regular reference will be made to other publications, journals, trade information as well as Australian and International Standards and Codes of Practice, societies and organisations.

MECH 4510 Machine Vibration and Monitoring

3 credit points Offered: July. Prerequisite: MECH 3500 Engineering Dynamics 2. Classes: 3 hrs/wk including tutorials and practical sessions. Assessment: One 2 hr exam plus assignments.

Fourth year 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
- ule 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 4605 Industrial Engineering

8 credit points

Offered: February. Prerequisite: MATH 2001 and MATH 2005 and MECH 3620 Industrial Management. Prohibition: MECH 4610 Industrial and Engineering Management MECH 4620 Industrial Ergonomics MECH 4635 Introduction to Operations Research. Classes: 3 lec/wk plus associated tut and lab work and industrial visits. Assessment: Assignments plus exams.

Fourth year elective unit of study.

Industrial ergonomics - refer to syllabus summary for MECH 4620 Industrial Ergonomics.

Operations research - refer to syllabus summary for MECH 4635 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 the management 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

- Tana, Operations Research An introduction (Prentice Hall, 1997)
- Lewis, Introduction to Reliability Engineering (Wiley, 1987 or 1994)

# MECH 4610 Industrial Engineering and Management 2 credit points

Offered: February. Prerequisite: MECH 3620 Industrial Management. Prohibition: MECH 4605 Industrial Engineering. Classes: 2hrs lec and tut/wk plus industrial visits. Assessment: Assignments and one 2hr exam.

Fourth year 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

Textbooks

Samson D., 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

# MECH 4620 Industrial Ergonomics 2 credit points

#### Offered: February. Prohibition: MECH 4605 Industrial Engineering. Classes: 2 hrs lec/tut/wk plus associated lab work. Assessment: Assignment.

Fourth year elective unit of study.

(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.

Reference books

As advised during classes

Library Classification: 150, 331.1, 611, 612, 620, 658

# MECH 4635 Introduction to Operations Research 4 credit points

Offered: February. Prerequisite: MATH 1005 MATH 2001 MATH 2002 MATH 2005. Prohibition: MECH 4600 Industrial Engineering. Classes: 4 hrs/wk. Assessment: One 2hr paper plus assignments. Syllabus summary:

History and methods of operations research. Linear programming; simplex method; transportation models. Network models; project scheduling; critical path methods. Deterministic and probabilistic inventory control models. Simulation modeling. Optimization.

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.
- the importance of reliability analysis in part and system design.
- the use of maintenance and repair to extend the useful life of systems.

Expected outcomes:

- Students should develop skills in:
- problem formulation.
- the solution of a range of operations research problems,
  - the solution of a range of reliability problems.

Textbooks

- Taha, Operations Research An introduction (Prentice Hall, 1997)
- Lewis, Introduction to Reliability Engineering (Wiley, 1987 or 1994)

# MECH 4640 Product Life Cycle Design 2 credit points

**Offered:** July. **Prerequisite:** MECH 3600 Manufacturing Engineering. **Classes:** 2 hrs/wk. **Assessment:** Assignment. Fourth year elective unit of study.

### Syllabus summary

It is becoming more and more critical that product design incorporates the implications of disposal at the end of the operational life cycle of the product. For manufacturers this is emerging as a legislative issue as environmental implications enforce their responsibility over the entire life cycle of the product. This requires consideration of processing technology, materials and parts recycling, and design for disassembly. The course content addresses these issues via examples of consumer products manufacture and their design.

An assignment based on small consumer product redesign to improve recyclability will form an important component of the course. More specifically the contents focus on:

- Product life cycle engineering based on environmental and legislative issues.
- Net recovery value analysis based materials, parts, processes and energy model.
- Task analysis for disassembly planning based on clustering.
- Product profile and redesign to improve recyclability. Objectives
- To provide students with necessary knowledge and techniques to plan at the design stage the life cycle problems of the product. Expected outcomes

Students will learn the major issues involved in product life cycle engineering, relevant methods to improve the recyclability and the principal considerations on legislative, environmental, materials, processes etc.

#### MECH 4650 Workplace Industrial Relations 2 credit points

Offered: July. Prerequisite: 36 credit points of senior units of study. Classes: 20 hrs of lectures and tutorials. Assessment: Assessment will be based on the level of participation in the course. Fourth year elective unit of study.

Syllabus summary

Introduction to industrial relations, principal players in the system, Industrial relations law. Awards and agreements, working with unions, responsibility of managers, handling individual grievances, identifying and resolving conflict.

Objectives

To give students an understanding of industrial relation issues in Australia.

Expected outcomes

Students will develop skills to handle industrial relations in the workplace and deal with conflicts and disputes.

### MECH 4700 Robotic Systems

#### 4 credit points

Offered: July. Prerequisite: MECH 3500 Engineering Dynamics 2. Classes: (2 lec and one 2hr lab/tut)/wk. Assessment: One 1 1/2 hr exam plus assignment, project and lab work.

Fourth year 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 industrial robots.

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.

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

Offered: February. Prerequisite: ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits. Classes: (3 lec and one 2hr lab/tut)/wk. Assessment: Project and assignment work, plus one 2 hr exam. Satisfactory performance in project and assignment work is required.

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 modem cross-development tools. To provide experience of working in a project 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

Textbooks

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

Offered: February. Prerequisite: MECH 3500 Engineering Dynamics 2 and MECH 3800 Systems Control and ELEC 3401 Electronics Devices & Circuits and ELEC 3601 Digital Systems Design. Classes: 3hrs lec, 1 hr tut and 2hrs lab/wk. Assessment: Laboratory work and one 3 hour exam. Fourth year 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 technologies and where they may be used.

#### MECH 4730 Computers in Real-Time Control and Inst 6 credit points

**Offered:** February. **Prerequisite:** ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits. **Classes:** (3 lec and one 2hr lab/tut)/wk. **Assessment:** Project and assignment work, plus 2 hr exam. Satisfactory performance in project and assignment work is required.

Fourth year 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* 

Textbooks

Auslander DM, Tham CH, Real Time Software for Control, (Prentice Hall, 1990)

Library reference number: 629.8955133 1, Engineering Reserve

# MECH 4900 Orthopaedic Engineering 4 credit points

Offered: February. Prerequisite: MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2. Classes: 4hrs of tut/lab classes/ wk. Assessment: One 2hr exam.

Fourth year 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 tie biomechanics of the musculoskeletal 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 tie 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 Biomechanics and Biomaterials 4 credit points

Offered: July. Prerequisite: 36 credit points of third year units of study. Classes: 4 hrs of lecture/tut/lab per week. Assessment: Continual assessment and exam.

Fourth year 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 a basic understanding of the major areas of interest in both tie 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 aras 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.

- 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)

# MECH 5202 Computational Fluid Dynamics 4 credit points

Offered: July. Assessment: Tut work, projects and one 2hr exam. Objectives: To provide the skills necessary to use a state-of-theart computational fluid dynamics package.

Expected outcomes: Students are required to obtain solutions for a number of standard flows and one complex flow in computer laboratory sessions which are carried out on a commercial CFD package.

Syllabus: The governing equations are classified according to mathematical character. Finite difference and finite volume methods, accuracy and stability for the advection equation, diffusion equation and advection/diffusion equation are covered. Direct and iterative solution techniques for the resulting algebraic equations are considered. Solution of the full Navier-Stokes equations, including the pressure/continuity coupling is described. The k-epsilon turbulence model is derived and applied to standard flows.

# MECH 5624 Energy and the Environment 4 credit points

**Offered:** February. Prohibition: MECH 4220 Environmental Engineering MECH 4240 Energy and the Environment. Classes: (3 hr lec/tut)/wk. **Assessment:** Group assignment submissions, as indicated at the commencement of the course, oral examination. Objective: To develop an understanding of the economic and environmental constraints on the selection and design of energy systems.

Expected outcomes: Students will have learnt how to make economic assessment of energy system alternatives and to mitigate and evaluate their environmental impact.

Syllabus summary: Economic analysis of energy systems. Urban air pollution, ozone hole and greenhouse problems, waste disposal, water pollution. Montreal protocol, Rio and Kyoto Accords, C02 capture and sequestration and other emerging control technologies.

# MECH 5701 Computers in Real Time Control and Inst 6 credit points

**Offered:** February. **Prohibition:** MECH 4730 Computers in Real-Time Control and Inst MECH 4710 Microprocessors in Engineered Products. **Classes:** (2 lec and 2 hr lab/tut)/wk. **Assessment:** 

Assignment submissions, laboratory demonstration and final exam. 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; manmachine communication.

Course Objectives:

Microcomputer and microprocessor system, operating in real time have become very common components in today's engineering applications. The objective of this course 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 outcome:

The student will have a basic knowledge of the hardware components available in a microcomputer system and a detailed knowledge of facilities and capabiUties 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* 

Auslander DM, Tham CH, Real Time Software for Control, (Prentice Hall, 1990)

Computer in Real time Control and Instrumentations, Available from the UPS.

### MECH 5711 Microprocessors in Engineered Products

### 6 credit points

**Offered:** February. Prohibition: MECH 4710 Microprocessors in Engineered Products. Classes: (2 lec and 2 hr lab/tut)/wk. **Assessment:** Project and assignment work, plus one 2 hr exam. Satisfactory performance in project and assignment work is required.

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 modem cross-development tools. To provide experience of working in a project 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 modem 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

### -. 80C196KC Data Book. (Intel Corp.)

Peatman. Design with microcontrollers. (McGraw Hill) Reference books: An extensive reference list will be distributed.

#### MECH 5722 Robotics Systems 4 credit points

**Offered:** July. **Assessment:** Assignment, project and lab work and one 1 £2 hr exam.

Syllabus summary:

Overview of robotics: definitions, aim configurations, kinematics and dynamics of robot manipulators. Control of robots. Programming languages. Sensors. Robot applications. System design, and integration of robotics with other automated machinery.

Expected outcomes:

Students should gain an appreciation for the important factors that need to be considered in the selection and use of robotics for industrial applications.

Reference books

Fu, Gonzalez and Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill

McKerrow, Introduction to Robotics, Addison-Wesley

Asada and Slotine, Robotic Analysis and Control, John Wiley, 1985

Craig, Introduction to Robotics: Mechanical and Control, Addison-Wesley, 1986

# MECH 5900 Thesis, Semester 1, Full Time

12 credit points

Offered: February. Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution. *NB: Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-boundfor the university library. Students are responsible for supplying their own thesis production materials.* Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. 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 be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

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 5901 Thesis, Semester 2, Full Time 12 credit points

**Offered:** July. Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution.

NB: Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-boundfor the university library. Students are responsible for supplying their own thesis production materials. Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. 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 be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

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.

# MECH5902 Thesis, Semester 1, Part Time 6 credit points

Offered: February. Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution. *NB: Offered for part-time students who want to do a thesis project commencing in February or July, respectively. Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-bound for the university library. Students are responsible for supplying their own thesis production materials.* Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. 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 be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

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.

# MECH5903 Thesis, Semester 2, Part Time 6 credit points

**Offered:** July. **Assessment:** On the basis of the submitted thesis and the report by the supervisor of the student's contribution.

NB: Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-bound for the university library. Students are responsible for supplying their own thesis production materials. Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. 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 be of an original nature, but in any event the student is directly responsible to bis or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

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.

### MECH5904 Seminar, Semester 1 2 credit points

**Offered:** February. **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. **Assessment:** Satisfactory performance in a seminar as assessed by the participants.

Syllabus summary:

Each student, usually in consultation with his or her supervisor, prepares a abstract of the seminar for distribution one week in advance of the seminar. Although it is not obligatory, the subject for the seminar is normally closely related to the student's thesis project (MECH 5900); thus it tends to deal in depth with some relatively narrow technical field. At the seminar (where the participants comprise departmental staff, postgraduate students and visitors), oral presentation of the thesis is followed by critical discussion under formal chairmanship.

**Objectives:** 

To improve student competence and confidence in developing and presenting a formal technical presentation.

Expected outcomes: The ability to structure and deliver a competent and informative technical presentation.

### MECH 5905 Seminar, Semester 2

2 credit points Offered: July. 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. Assessment: Satisfactory performance in a seminar as assessed by the participants.

Syllabus summary:

Each student, usually in consultation with his or her supervisor, prepares a abstract of the seminar for distribution one week in advance of the seminar. Although it is not obligatory, the subject for the seminar is normally closely related to the student's thesis project (MECH 5900); thus it tends to deal in depth with some relatively narrow technical field. At the seminar (where the participants comprise departmental staff, postgraduate students and visitors), oral presentation of the thesis is followed by critical discussion under formal chairmanship.

Objectives:

To improve student competence and confidence in developing and presenting a formal technical presentation.

Expected outcomes:

The ability to structure and deliver a competent and informative technical presentation.

#### MECH 5912 Environmental Acoustics & Noise Control

#### 3 credit points

**Offered:** February. **Prohibition:** MECH 4230 Environmental Acoustics and Noise Control. **Assessment:** One 1.5hr exam. 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.

Objective:

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.

#### Reference books

Bies and Hansen Engineering Noise Control (Allen & Unwin, 1988)

Hassall and Zaveri Acoustic Noise Measurement (Bruel & Kjaer, 1988)

# Interdisciplinary units of study

# ENGG1001 Interdisciplinary Project 12 credit points

Offered: February. Prerequisite: UAI score of at least 98. Students considering this option are advised to see their Head of Department. Prohibition: Mutually exclusive with a number of other first year units of study. As these will vary depending on the branch of

Engineering, students considering this option are advised to see their Head of Department prior to enrolment. **Assessment:** A written report on the project undertaken and other oral and written presentations as specified.

First year unit of study for all degree branches in Engineering.

The project is a major component of this unit of study. Almough the project will be supervised by a senior Faculty member, the emphasis here is on the team members setting and achieving their own goals, and presenting their work in both oral and written form. Groups will be expected to make an engineering project by the end of Semester 1.

# ENGG 1002 Introduction to Engineering Leadership 2 credit points

Offered: July. Classes: Weekly lectures/tutorials will be

supplemented by a practical session at the end of the Semester. **Assessment:** Assessment will be on the basis of an examination and assignments. Satisfactory tutorial performance and group participation is also required.

Objectives/Outcomes:

To develop an understanding of supervisory leadership, this unit gives students the opportunity to build their leadership skills throughout their undergraduate course and beyond

Syllabus:

Leadership theory and practice; traditional leadership styles; personal qualities; morale; situational approach to leadership; bases of influence; delegation; and communication. At the conclusion of the unit, students undertake a series of consolidating exercises in practical leadership.

# ENGG 2002 Advanced Engineering Project 2 credit points

Offered: July. Prerequisite: Only students who have been named on the Dean's list at the end of Year 1 will be eligible. Classes: 2 hours tutorials per week for one semester. This Unit of study will be offered in either February or July Semesters. Assessment: A written report and oral presentations. Satisfactory tutorial performance is also required.

Syllabus: Students will work in groups on a defined Industrial Project, or continue with one of the projects previously carried out in study ENGG 1001. Each group will be expected to provide details and insight into how their findings could be used or exploited commercially.

Objectives/Outcomes: This unit of study is designed to provide students with an insight into engineering practice in industry. By its end, it is expected that students will be able to carry out the following tasks:

- analyse an industrial problem
- carry out the background research required to fully define and solve the problem
- work effectively as a team member at all stages of the project
  write a coherent report, oudining the problem and its solu-
- tion, as well as making an oral presentation • prepare a business plan with respect to an industrial or re-

## ENGG 2003 Introduction to Engineering Management

4 credit points

search project.

Offered: July. Prohibition: ELEC 3701, MECH 3620. Classes: Two (1 hr) lectures and one (1 hr) tutorial per week one semester. Assessment: Tutorial and project assignments plus a final (2 hr) examination.

Year 2 core unit of study for the "Management"stream within the degrees in Aeronautical, Chemical, Electrical, Mechanical and Mechatronics Engineering.

Syllabus: Engineers and management; communication; micro-and macro-economics; strategic management; business planning; legal responsibilities; industrial hazard management; human resource management; industrial relations; project management; quality assurance; operations management; accounting and financial management.

Objectives/Outcomes: To introduce students to a range of management concepts and techniques, and to develop an understanding of the role and challenges of management.

#### ENGG 2004 Introductory Engineering Studies 4 credit points

Offered: January (short).

#### ENGG 2005 Introductory Engineering Project 8 credit points

Offered: January (short).

# ENGG 2006 Advances in Engineering Leadership 2 credit points

Offered: July. Prerequisite: ENGG 1002. Classes: Weekly lectures/ tutorials will be supplemented by a practical session at the end of the Semester. Assessment: Assessment will be on the basis of an examination and assignments. Satisfactory tutorial performance and group participation is also required.

Objectives/Outcomes:

To develop an understanding of managerial leadership, this course builds on the foundations laid in ENGG 1002. The focus shifts from supervisory leadership to higher level management leadership.

Syllabus:

Decision making; problem solving; task and relationship behaviour; task organisation; priority setting; group decision making; duty of care; motivation; and conflict resolution. At the conclusion of the unit students undertake a series of practical leadership exercises.

# ENGG 3001 Technology Education 2 credit points

**Offered**: July. **Prerequisite:** Only students who have been named on the Dean's list at the end of Year 2 will be eligible. **Classes:** 2 hours tutorials per week for one semester. This unit of study will be offered in either February or July Semesters. **Assessment:** A written report and oral demonstrations. Satisfactory tutorial performance is also required.

Syllabus: Students will work alone or with a partner to develop an educational unit for Year 9 High School Students which will involve them in some aspect of engineering science or technology and which will, at the same time, raise an awareness of, and an interest in, engineering. The units will need to be designed with due regard to the teaching and learning process. Activities undertaken as part of the units should reflect, wherever possible, aspects of professional engineering practice.

Objectives/Outcomes: This elective will help understand engineering principles and applications by investigating, explaining and practising them with Year 9 school students. At the end of this elective it is expected that students will be able to:Investigate, identify, design, develop, implement, and evaluate experiential activities for non-engineers which reflect engineering practice; Develop skills in the management and use of personal and material resources and processes; Effectively communicate engineering principles and practices to others. Present work in written, graphical, and oral forms.

### ENGG 4001 Innovation/International Competitiveness

### 4 credit points

Offered: February. Classes: (1 lec/1 seminar)/wk. Assessment: Essay, group project case study, assignments and written exam. 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 rales 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; tie 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

# ENGG 4002 New Business Creation 4 credit points

**Offered:** July. **Assessment:** In-course involvement (attendance and discussion); product development assignment; business case study assignment; examination.

In the new economic environment, graduates must be better prepared to take control of their own employment futures which increasingly must include the option of entrepreneurship and the creation and growth of one's own company. For those graduates with a technical or engineering background, the new technology-based firm offers extremely large potential to create jobs and wealth. This unit of study provides a student with a clear understanding of the venture creation process with particular emphasis on technology-based ventures. A range of skills are developed relating to R&D management, intellectual property, technology contracts, product development, marketing, financial management and business planning. As a result, it is expected that this unit of study could be the first step for a number of its attendees to progress to active involvement in new technology based firms either in Australia or internationally.

### ENGG 4003 Economic, Social & Ethical Aspects of En

### 4 credit points

**Offered:** July. **Assessment:** Attendance at group discussions (10%); presentation of case study, and the leading of the discussion (40%); final exam (50%).

The unit of study will proceed primarily by lecture, case study presentation and group discussion. All students undertaking the unit of study are required to present, and lead the discussion on, at least one case study. Appropriate visiting professionals will form part of the delivery.

In selecting the projects for the unit of study, the organisers will include projects across a wide range of the fields of engineering studied and researched within the Faculty of Engineering at the University of Sydney.

In preparing the case studies, presenters will aim to cover the following:

- Outline the historical context of the project.
- Outline the justification for the project from the point of those who promoted the project.
- Identify the resources required for the project and the sources of those resources.
- Identify the main engineering objectives and challenges of the project.
- Identify the social and ethical issues involved in the project from the points of view of (a) the society of the time and (b) Australian society today.
- Provide an assessment of the 'success' of the project in terms of (a) the people who promoted the project and (b) the personal opinions of the presenter of the case study.

# ENGG 4004 Advanced Engineering Design Project 12 credit points

Offered: February, July. Prerequisite: Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group. Prohibition: AERO 4900, AERO 4950, CHNG 4201, CHNG 4202, CIVL4013, CIVL4014, ELEC 4703.MECH 4102,. Classes: Literature Survey, project formulation and detailed design of a major integrated facility to be carried out in interdisciplinary groups in February or July Semesters. Assessment: Assessment will be on the basis of a written report and oral presentations. Satisfactory tutorial performance and group participation is also required. Objectives/Outcomes:

To develop an understanding of the practice of engineering, utilising a diverse range of skills to solve complex problems. Students will gain skills in design, analysis and management by undertaking a significant research project in a multi-disciplinary team comprising students from across the faculty. Each student will be required to work in a team to produce an integrated design in greater detail than is possible in ordinary classes and to write a significant design report presenting the results of the process. The ability to work in a team of engineers from different disciplines will be assessed as part of this design project which will be centred around a major industrial facility.

Syllabus:

Introduction to the design process. Design philosophy. Use of computer packages in design. Design optimisation. Detailed equipment design and costing. Hazard assessment. Environmental Impact Assessment. Project Financial Analysis.

# CHAPTER 3 Tables of undergraduate courses

# **Table 1: Aeronautical Engineering**

		0	8	
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
Core Fi	e units of study rst Year			
AERO 1600	Workshop Technology	4	N) MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	February
AERO 1801	Computer Engineering Applications	3	NB: Web page: <u>problemsolvers.aero.usyd.edu.au</u> .	July
AERO 1701	Introduction to Aerospace Engineering	3		February
PHYS 1003	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
MATH 1001	Differential Calculus	3	A) HSC 3-unit Mathematics. N) May not be counted with MATH 1901 or 1011.	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 10051	Statistics	3	A) HSC 2-unit Mathematics. N) May not be counted with MATH 1905 or 1015.	July, January (short)
MECH 1530	Engineering Mechanics	8	N) CIVL1052 Statics MECH1501 Engineering Statics MECH1511 Introductory Dynamics MECH1510 Kinematics and Dynamics MECH1500 Mechanical Engineering 1.	July
MECH 1820	Introduction to Computing	6	N) MECH1800 Computational Engineering 1A MECH1801 Computational Engineering 1 C I N F O 1 0 0 0 Information Technology Tools.	February
Se	cond Year			
AERO 2201	Fluid Mechanics 1	4	<ul> <li>P) MATH 1001, MATH 1002, MATH 1003.</li> <li>N) AERO2701 Space Engineering 1.</li> <li>NB: Web page: <u>www.aero.usyd.edu.au/aero/aerodyn.html</u>.</li> </ul>	July
AERO 2300	Mechanics of Solids 1	4	P) 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
AERO 2500	Intro Flight Mechanics and Performance	4	P) MATH 1001, 1002,1003.	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	ıl 4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MECH 2201	Thermodynamics 1	4	N) MECH 2200 Thermofluids.	February

Table	1: Aeronautical Engine	eering -	- continued	
Unit of	study	Credit pointsi	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
MECH 2300	Materials 1	4	N) CXVL 2101 Properties of Materials.	July
MECH 2400	Mechanical Design 1	6		July
MECH 2500	Engineering Dynamics 1	4	P) MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	July
Th	ird Year			
AERO 3200	Aerodynamics 1	4	P) AERO 2201 Fluid Mechanics 1.	February
AERO 3250	Aerodynamics 2	4	<ul><li>P) AERO 2201 Fluid Mechanics 1.</li><li>N) MECH 3211 Fluid Mechanics 2.</li></ul>	July
AERO 3301	Aerospace Structures 1	4	P) AERO 2300 Mechanics of Solids 1.	February
AERO 3351	Aerospace Structures 2	4	P) AERO 2300 Mechanics of Solids 1.	July
AERO 34002	Aircraft Design 1	3	<ul><li>P) MECH 2400 Mechanical Design 1.</li><li>N) AERO 3401 Aerospace Design 1.</li></ul>	February
AERO 34502	Aircraft Design 2	3	P) MECH 2400 Mechanical Design 1.	July
AERO 3500	Flight Mechanics 1	4	P) AERO 2500 Introductory Flight Mechanics and Performance.	July
MECH 3201	Thermodynamics 2	4	<ul><li>P) MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1.</li><li>N) MECH 3200 Thermal Engineering 1.</li></ul>	February
MECH 3300	Materials 2	4	P) MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	July
MECH 3500	Engineering Dynamics 2	4	P) MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	February
Fo	urth Year			
AERO 4200	Aerodynamics 3	3	P) AERO 3250 Aerodynamics 2.	February
AERO 4201	Propulsion	4	P) MECH 3201 Thermodynamics 2.	July
AERO 4303	Aerospace Structures 3	6	<ul><li>P) AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2.</li><li>N) AERO 4301 Applied Numerical Stress Analysis.</li></ul>	February
AERO 4400	Aircraft Design 3	6	P) AERO 3450 Aircraft Design 2 AERO 3401 Aerospace Design.	February
AERO 4500	Flight Mechanics 2	6	P) AERO 3500 Flight Mechanics 1.	February
AERO 4600	Practical Experience	0	P) 40 credit points of 3rd year UOS.	July
AERO 4950	Thesis Preparation	2	P) 40 credit points of 3rd year UOS.	February, July
AERO 4900	Thesis or Design Project	10	P) 40 Credit Points of 3rd Year UOS AERO 4950 Thesis Preparation.	February, July
AERO 49203	Seminar	2	P) 40 credit points of 3rd Year UOS.	July

Notes to Table 1

MATH 1004 Discrete Mathematics is an acceptable alternative to MATH 1005
 Students enrolled in BE/BCom enrol in AERO 3401 Aerospace Design as an alternative to AERO 3400 & AERO 3450.
 Students enrolled in BE/BCom are exempt from this unit.

### Table 1: Aeronautical Engineering - continued

	Credit	A) Assumed Knowledge Q) Qualifying	P) Prerequisite
Unit of study	points	C) Corequisite N) Prohibition	

Offered

# Resolutions of the Faculty of Engineering relating to Table 1

# Degree eligibility

# **BE(Aeronautical)**

In addition to gaining credit for the 148 credit points of core units of study set out in Table 1, candidates are required to complete at least 44 credit points of elective units of study from the table of recommended elective units of study for BE(Aeronautical). A mininum of 192 credit points is required to be eligible for the award of the degree of BE (Aeronautical).

### **BE(Aeronautical)/BSc or BA**

In addition to gaining credit for the 148 credit points of core units of study set out in Table 1, candidates are required to complete at least 80 credit points of units of study given by either the Faculty of Science for BE/BSc or Arts for BE/BA. An additional 12 credit points of elective units of study from the table of recommended elective units of study for BE(Aeronautical) are also required. A mininum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty in which they are undertaking the combined degree.

#### **BE(Aeronautical)/BCom**

In addition to gaining credit for the 144 credit points of core units of study set out in Table 1, candidates are required to complete recommended units of study given by the Faculty of Commerce . A mininum of 240 credit points is required to be eligible for the combined degree BE/BCom. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty Commerce.

#### **BE (Aeronautical Engineering)(Management)**

In addition to gaining credit for the 144 credit points of core units of study set out in Table 1, candidates are required to complete at least 24 credit points of units of study from the table of recommended elective units of study for BE (Aeronautical Engineering). Further credit of 24 credit points shall be gained by completing the units of study listed in the table of additional units of study for BE (Aeronautical Engineering )-( Management).

## Acceptable alternative units of study

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent Advanced level unit, 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. Students undertaking Study Abroad in their final year of the degree must enrol in the AERO 4620 Aeronautical International Exchange Program unit of study as an alternative to a semester's standard units.

# Recommended elective units of study

Fu	rst Year			
AERO 1400	Intro to Aircraft Construction & Design	6		July
ELEC 1001	Introductory Electrical Engineering	4	<ul><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li><li>N) ELEC1102 Foundations of Electronic Circuits.</li></ul>	July
Se	cond Year			
AERO 2800	Aeronautical Engineering Computing	4	P) AERO 1801 Computer Engineering Applications.	February
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2052	Numerical Methods	2	C) MATH 2001 or 2901. N) MATH 2952.	July
Th	ird Year			
AERO 3501	Flying Operations	2	P) AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1.	February
AERO 3600	Aviation Technology	4		February
AERO 3602	Aviation Operation and Management	4		July
ENGG 2003	Introduction to Engineering Management	4	N) ELEC3701, MECH3620.	July

Table	Gable 1: Aeronautical Engineering - continued				
Unit of	study	Credit points	;	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
Fo	urth Year				
AERO 4250	Aerodynamics 4	3	P)	AERO 3250 Aerodynamics 2.	July
AERO 4290	Rotary Wing Aircraft	4	P)	AERO 3250 Aerodynamics 2.	February
AERO 4291	Advanced Computational Aerodynamics	3	P)	AERO 3250 Aerodynamics 2.	July
AERO 4292	Aeroelasticity	3	P)	AERO 3250 Aerodynamics 2.	July
AERO 4351	Aerospace Structures 4	3	P) .	AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.'	July
AERO 4390	Smart Materials and Structures	3	P) .	AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	July
AERO 4490	Advanced Aircraft Design	4	P)	AERO 3450 Aircraft Design 2, AERO 3401 Aerospace Design.	July
AERO 4590	Advanced Flight Mechanics	s 3	P) .	AERO 3500 Flight Mechanics 1.	July

### Notes to Table 2

Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
 Approved elective units of study given by Departments other than the School of Aerospace, Mechanical and Mechatronic Engg may be taken as alternatives, subject to the approval of the head of school.

# Additional units of study for BE(Aeronautical Engineering - Management)

ENGG 2003i	Introduction to Engineering Management	4	N) ELEC3701, MECH3620.	July
ENGG 3002i	Industrial and Engineering Management		Not offered in 2001 (4 credit points).	
AERO 3602	Aviation Operation and Management	4		July
CHNG 3401	Project Economics	4		July
CHNG 4403	Engineering Business Skills	4		July
CHNG 4 5 0 4	Environmental Decision Making	4		July
ENGG 4001	Innovation/International Competitiveness	4		February
ENGG 4002	New Business Creation	4		July
MECH 4650	Workplace Industrial Relations	2	P) 36 credit points of senior units of study.	July
Choose	e one of:			
CHNG 4401	Project Engineering	4		February
or				
ELEC 4701	Project Management	4	P) Advisory Prerequisite: ELEC3701 Management for Engineers.	July
or				
MECH 4110	Professional Engineering	4	P) 36 credit points of Senior units of study.	February
Note				

1. The required total of 24 credit points shall comprise ENGG 2003, ENGG 3002 and 16 credit points from the remaining units of study.

### **Table 2: Chemical Engineering**

Unit of study

#### Credit points

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

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 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 **First Year** MATH Differential Calculus 3 A) HSC 3-unit Mathematics. February, 1001 N) May not be counted with MATH 1901 or 1011. January (short) MATH Linear Algebra 3 A) HSC 3-unit Mathematics. February, 1002 N) May not be counted with MATH 1902 or 1012. January (short) MATH Integral Calculus and 3 A) HSC 4-unit Mathematics or MATH 1001. Julv. Modelling 1003 N) May not be counted with MATH 1903 or 1013. January (short) MATH Statistics 3 A) HSC 2-unit Mathematics. July, N) May not be counted with MATH 1905 or 1015. January (short) CHNG Computing for Chemical 4 P) Advisory prerequisite: CHNG1301 Computing for Chemical Engineering 1A. July 1302 Engineers 1B CHEM Chemistry 1A 1101 A) HSC Mathematics 2 unit course; and the Chemistry component of the 4-unit or February, 3-unit HSC Science course, or 2-unit Chemistry. July, C) Recommended concurrent unit of study: Preferred - MATH 1001 and 1002 or January 1901 and 1902; otherwise - MATH 1011 and 1012. (short) N) May not be counted with CHEM 1001 or 1901 or 1903. Q) CHEM 1101 or a Distinction in CHEM 1001 or equivalent. CHEM Chemistry 1B February, 1102 C) Recommended concurrent unit of study: Preferred - MATH1003 and 1005 or July, 1003 and 1004 or 1903 and 1905 or 1903 and 1904; otherwise-MATH 1004 and January 1005 or 1013 and 1015. (short) N) May not be counted with CHEM 1002 or 1902 or 1904 4 Chemical Engineering CHNG 1001 February Applications CHNG 1101 Chemical Engineering 1A 4 February CHNG Chemical Engineering 1B 1102 4 P) CHNG 1101 Chemical Engineering 1A. July CHNG Chemical Process Case 4 Julv 1201 Studies CHNG Computing for Chemical 4 February 1301 Engineers 1A Second Year MATH Vector Calculus and Complex Variables P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). 4 February, Complex Variables N) May not be counted with MATH 2901. January (short) MATH P) MATH 1002 or 1902 or Distinction in MATH 1012. Matrix Applications 4 February, 2002 N) May not be counted with MATH 2902. January (short) MATH Fourier Series & Differential 4 P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or Julv. 2005 Equations 1903 or 1907). January (short) N) May not be counted with MATH 2905. MATH Linear Programming 2 C) MATH 2001 or 2901, and MATH 2002 or 2902. July 2051 N) MATH 2953. MATH Numerical Methods C) MATH 2001 or 2901. July 2052 N) MATH 2952.

Table	2: Chemical Engineerin	g - con		
Unit of	study	Credit pointsi	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
CHEM 2101	Chemistry 2 (Environmental)	) 8 ( F N	<ul> <li>2) CHEM 1102 or 1902 or 1904 or 1909.</li> <li>2) 6 credit points of Junior Mathematics.</li> <li>3) May not be counted with CHEM 2001 or 2301 or 2502 or 2901.</li> </ul>	February
CHNG 2101	Chemical Engineering 2A	4		February
CHNG 2102	Chemical Engineering 2B	4		July
CHNG 2301	Chemical Engineering Computations	4 F	P) Advisory prerequisites: MATHIOOI, MATH1002, MATH1003, MATH1005, CHNG1301.	February, July
CHNG 2501	Environmental Chem Eng Fundamentals	4		July
CHNG 2601	Materials and Corrosion	4		July
Th	ird Year			
CHNG 3001	Chemical Engineering Laboratory	4 F	P) Advisory prerequisite: CHNG2101 Chemical Engineering 2A; CHNG2102 Chemical Engineering 2B.	February
CHNG 3101	Unit Ops (Heat Transfer)	4 F	P) Advisory prerequisite: CHNG2101 Chemical Engineering 2A; CHNG2102 Chemical Engineering 2B.	July
CHING 3102	Unit Ops (Mass Transfer)	4 F	<ul> <li>P) advisory prerequisites: CHNG2101 Chemical Engineering 2A; CHNG2102 Chemical Engineering 2B.</li> </ul>	February
CHNG 3103	Unit Ops (Particle Mechanics)	4 F	<ul> <li>P) advisory prerequisites: CHNG2101 Chemical Engineering 2A; CHNG2102 Chemical Engineering 2B.</li> </ul>	July
CHNG 3104	Unit Ops (Fluid Mechanics)	4 F	<ul> <li>advisory prerequisites: CHNG2101 Chemical Engineeruig 2A; CHNG2102 Chemical Engineering 2B.</li> </ul>	February
CHNG 3105	Thermodynamics 1	4, F	<ul> <li>advisory prerequisites: CHNG2101 Chemical Engineering 2A; CHNG2102 Chemical Engineering 2B.</li> </ul>	February
CHNG 3106	Thermodynamics 2	4 F	P) Advisory prerequisite: CHNG3105 Thermodynamics 1.	July
CHING 3107	Reaction Engineering 1	4		July
CHING 3301	Process Modelling	4 F	P) Advisory prerequisite: CHNG2301 Chemical Engineering Computations.	February
CHNG 3302	Process Control 1	4		February
CHNG 3401	Project Economics	4		July
Fo	urth Year			
CHNG 4001	Practical Experience	0 F	P) advisory prerequisite: 28 credit points of 3rd year units.	July
CHNG 4002	Thesis	8 F	P) Advisory prerequisite: Students should have completed (or be enrolled in) all other 4th Year core units.	February
CHNG 4201	Chemical Engineering Design 1	4		February
CHNG 4202	Chemical Engineering Design 2	8		July
CHNG 4401	Project Engineering	4		February
CHNG 4402	Process Plant Risk Management	4		February
### Table 2: Chemical Engineering - continued

Unit of study Credit points	A) Assumed Knowledge Q) Qualifying C) Corequisite N) Prohibition	P) Prerequisite Offered
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### Notes to Table 2

1. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge and/or prerequisite requirements will be as prescribed by that Faculty.

2. Students doing any of the combined degree options BE/BA, BE/BCom or BE/BSc will be exempt from First Year core units of study MATH 1052 and CHNG 1201.

3. Students doing the combined degree option BE/BCom will also replace the Second Year core units of study MATH 2001, MATH 2002, MATH 2051, MATH 2051 and MATH 2052 with STAT 2002 and STAT 2004.

4. Acceptable alternatives to CHEM 2101 are CHEM 2001 and CHEM 2201.

# Resolutions of the Faculty of Engineering relating to Table 2

### **Bachelor of Engineering in Chemical Engineering**

Candidates for this degree are required to complete all the core units of study in Table 2 (total 164 credit points). They are also required to gain at least 12 credit points from the Fourth Year electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below.

### Bachelor of Engineering in Chemical Engineering (Bio-Process Engineering)

Candidates for this degree are required to complete all the core units of study in Table 2 (total 164 credit points). They are also required to complete CHNG 2701, CHNG 2702, MICR 2007, MICR 2008 and CHNG 4501, as well as gaining at least 4 credit points from the Fourth Year electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below.

### Bachelor of Engineering in Chemical Engineering (Computer-Aided Process Engineering)

Candidates for this degree are required to complete all the core units in Table 2 (total 164 credit points). They are also required to complete CHNG 2302 and CHNG 3303, as well as gaining at least 12 credit points of suitable electives (as indicated by the Department).

### Bachelor of Engineering in Chemical Engineering (Environmental and Energy Engineering)

Candidates for this degree are required to complete all the core units in Table 2 (total 164 credit points). They are also required to complete CHNG 2502 and CHNG 3501, as well as gaining at least 12 credit points of suitable electives (as indicated by the Department).

### **Bachelor of Engineering in Chemical Engineering (Management)**

Candidates for this degree are required to complete all the core units in Table 2 (total 164 credit points). They are also required to complete ENGG 2003 and ENGG 3002, as well as gaining at least 8 credit points from the following electives:

CHING 4403	Engineering Business Skills	4	July
CHING 4504	Environmental Decision Making	4	July
ENGG 4001	Innovation/International Competitiveness	4	February
ENGG 4002	New Business Creation	4	July
MECH 4650	Workplace Industrial Relations	2 P) 36 credit points of senior units of study.	July

### Combined Degree (Bachelor of Engineering in Chemical Engineering with either a Bachelor of Arts or Bachelor of Science)

Candidates in these combined degree options are 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 credit points from the Fourth Year 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 these combined degree programs.

### Combined Degree (Bachelor of Engineering in Chemical Engineering with a Bachelor of Commerce)

Candidates in this combined degree option are 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 credit points from the Fourth Year electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below. This total of 152 credit points is only sufficient to be awarded a Bachelor of Engineering in Chemical Engineering as part of this 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.

Table	Table 2: Chemical Engineering - continued				
Unit of	C study p	Credit ooints		A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
Reco Se	ommended elective cond Year	u	nit	s of study	
CHNG 2701	Fundamentals of Bioprocess Engineering 1	4	P)	Advisory prerequisite: CHEM1101, CHEM1201.	February
CHNG 2702	Fundamentals of Bioprocess Engineering 2	4	P)	advisory prerequisite: CHEM1101, CHEM1201.	July
CHNG 2302	Process Data Management	4			February
CHNG 2502	Clean Products and Processes	4	P)	advisory prerequisite: CHNG2501.	July
ENGG 2003	Introduction to Engineering Management	4	N)	ELEC3701, MECH3620.	July
AERO 2300	Mechanics of Solids 1	4	P)	12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
ELEC 1001	Introductory Electrical Engineering	4	P) N)	Advisory Prerequisite: MATH1001 Differential Calculus. ELEC1102 Foundations of Electronic Circuits.	July
Th	ird Year				
MICR 2007	Microbiology for Engineers A	4			February
MICR 2008	Microbiology for Engineers B	4			July
CHNG 3303				Not offeredin2001.	
CHNG 3501				Not offered in 2001.	
ENGG 3002	Industrial and Engineering Management			Not offered in 2001 (4 credit points).	
Fo	urth Year				
ENGG 4002	New Business Creation	4			July
IREL 1001	Macro Industrial Relations	6			February
ENGG 4001	Innovation/International Competitiveness	4			February
CHNG 4003	Advances in Chemical Engineering A			Not offered in 2001.	
CHNG 4004	Advances in Chemical Engineering B			Not offered in 2001.	
CHNG 4006	Professional Option	2	P)	advisory prerequisites: Passed at least 144 credit points.	July
CHNG 4101	Separation Processes	4	P)	Advisory prerequisites: CHNG3101, CHNG3102, CHNG3103, CHNG3104.	July
CHNG 4102	Transport Phenomena			Not offered in 2001.	
CHING 4103	Advances in Polymer Engineering	4			July
CHNG 4104	Reaction Engineering 2			Not offered in 2001.	
CHNG 4105	Advanced Thermodynamics			Not offered in 2001.	
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.	February
CINC	A dwan and Eluid Dynamics	_		Not officed in 2001	

CHNG Advanced Fluid Dynamics <sup>4 3 0 1</sup> Modelling

Not offered in 2001.

# Table 2: Chemical Engineering - continued

Unit of	study	Credit points;	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
CHING 4304	Process Control 2	4 P	) CHNG 3302 Process Control 1.	February
CHING 4305	Process Systems Engineering	g 4 N	) CHNG 4303 Optimisation Techniques.	July
CHING 4403	Engineering Business Skills	4		July
CHING 4501	Biochemical Engineering	8 P	) CHNG 2701 & CHNG 2702 Fundamentals of Bioprocess Engineering 1 & 2; MICR 2007 Microbiology for Engineers A; MICR 2008 Microbiology for Engineers B.	July
CHNG 4504	Environmental Decision Making	4		July
CHNG 4506	Advanced Environmental Engineering	4 P N	) All four components of Unit Operations; CHNG 3106 Thermodynamics 2. B: Not offered in 2001.	February
CHNG 4601	Advanced Particle Mechanics	4 P	) All four components of Unit Operations. Not offered in 2001.	July
CHNG 4604	Chemical Modelling of Aqueous Systems	4 P	) CHNG3101, CHNG3102, CHNG3103, CHNG3104 and CHNG 3106.	February

### Note

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.

# Additional units of study for BE Chemical Engineering (Management)

Core u	unit of study			
ENGG 2003	Introduction to Engineering Management	4	N) ELEC3701, MECH3620.	July
ENGG 3002	Industrial and Engineering Management		Not offered in 2001 (4 credit points).	
ENGG 4001	Innovation/International Competitiveness	4		February
MECH 4110	Professional Engineering	4	P) 36 credit points of Senior units of study.	February
CHING 4403	Engineering Business Skills	4		July
CHING 4504	Environmental Decision Making	4		July
<b>MECH</b> 4630	Introduction to Operations Research		Not offered in 2001.	
<b>MECH</b> 4650	Workplace Industrial Relations	2	P) 36 credit points of senior units of study.	July
ENGG 4002	New Business Creation	4		July

### Note

ENGG 2003, and ENGG 3002 are compulsory units of study for the management stream. The remaining 8 credit points required come from the Table above.

In the year 2000, there will only be entry into first year (ie, no advanced standing into the later years of this stream will be possible).

# Table 3: Civil Engineering

Unit of study

Credit points

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

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 of study offered by faculties other than Engineering.

Core Fi	e units of study rst Year			
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1005	Statistics	3	<ul><li>A) HSC 2-unit Mathematics.</li><li>N) May not be counted with MATH 1905 or 1015.</li></ul>	July, January (short)
CiVL 1051	Dynamics	5	<ul> <li>A) Mathematics 3 unit course and Science 4 unit course (or the Physics core of 3-4 unit Science) at the HSC.</li> <li>N)MECH 1510.</li> </ul>	July
CHEM 1401	Chemistry 1E	6	<ul><li>P) Mathematics 2-unit course and a satisfactory knowledge of 2-unit Chemistry or the Chemistry component of the 3 or 4-unit Science HSC course.</li><li>N) CHEM 1101, CHEM 1102.</li></ul>	February, January (short)
GEOL 1501	Engineering Geology 1	6	N) GEOL 1002.	February
CIVL 1001	Civil Engineering 1	4	A) 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.	February
CiVL 1052	Statics	5	<ul><li>A) Mathematics 3 unit course at the HSC.</li><li>N)MECH1500 Mechanical Engineering 1, MECH1501 Engineering Statics.</li></ul>	February
CIVL 1004	Computational Engineering	4	N) COMP 1001 Introductory Programming or COMP 1002 Introductory Computer Science.	July
ELEC 1001	Introductory Electrical Engineering	4	<ul><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li><li>N) ELEC1102 Foundations of Electronic Circuits.</li></ul>	July
Se	cond Year			
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differential Equations	4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MATH 2051	Linear Programming	2	C) MATH 2001 or 2901, and MATH 2002 or 2902. N) MATH 2953.	July
MATH 2052	Numerical Methods	2	C) MATH 2001 or 2901. N) MATH 2952.	July
CIVL 2409	Engineering Geology 2	4	A) Either GEOL 1002 or GEOL 1501 Engineering Geology.	July
CIVL 2204 C	Introduction to Structural Concepts	4	<ul><li>A) CIVL1051 Dynamics and CIVL1052 Statics.</li><li>N) CIVL2203 Structural Design, CIVL2101 Properties of Materials.</li></ul>	July

Table	3: Civil Engineering - c	contin	ued	
Unit of	study	Credit pointsi	<ul><li>A) Assumed Knowledge Q) Qualifying P) Prerequisite</li><li>C) Corequisite N) Prohibition</li></ul>	Offered
CIVL 2201	Structural Mechanics	6	A) CIVL 1051 Dynamics and CIVL 1052 Statics.	February
CIVL 2610	Fluids 1	6	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005.	February
CIVL 2004	Engineering Communication	is 2		February
CIVL 2205	Introduction to Structural Design	4	<ul><li>A) CIVL1051 Dynamics and CIVL1052 Statics.</li><li>N) CIVL2203 Structural Design, CIVL2101 Properties of Materials.</li></ul>	July
CIVL 2801	Engineering Construction 1	4		July
Th	ird Year			
CIVL 3204	Structural Analysis	6	A) CIVL 2201 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations.	February
CIVL 3206	Steel Structures 1	6	A) CIVL 2201 Structural Mechanics.	July
CIVL 3223	Concrete Structures: Behaviour	3	<ul><li>A) CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design.</li><li>N) CIVL 3205 Concrete Structures 1.</li></ul>	February
CIVL 3224	Concrete Structures: Design	3	<ul><li>A) CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design.</li><li>N) CIVL 3205 Concrete Structures 1.</li></ul>	July
CIVL 3401	Soil Mechanics A	4	A) CIVL 2201 Structural Mechanics.	February
CIVL 3402	Soil Mechanics B	4	A) CrVL 3401 Soil Mechanics A.	July
CIVL 3501	Surveying 1	4	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005.	February
CIVL 3602	Fluids 2	4	A) CIVL 2610 Fluids 1.	July
CIVL 3701	Transportation Engineering and Planning	2		July
CIVL 3005	Engineering Communication 2	ns! 2	A) CIVL 2004 Engineering Communications 1.	July
CIVL 3207	Risk and Reliability Analysis	s 2	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005, CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts, CIVIL2205 Introduction to Structural Design.	February
CIVL 3802	Engineering Construction 2	4	A) Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge.	February
Fo	urth Year			
CIVL 4014	Thesis/Design/Project	5	<ul><li>P) 40 credit points of Senior Subjects.</li><li>N) CIVL 4013 Honours Thesis/Design/Project or CIVL4015.</li></ul>	February, Full Year (starts Feb)
CIVL 4008	Practical Experience	0	P) 28 credit points of Senior courses.	February
CIVL 4803	Engineering Management	4	N) CIVL 3803 Project Appraisal.	February
CIVL 4016	Professional Practice- Civil Engineering	5		July
CIVL 4903	Civil Engineering Design	6	A) CIVL 3225 or CIVL3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL3224 Concrete Structures - Design and CIVL 3227 or CIVL3206 Steel Structures 1.	February

Notes to Table 3

1. For core units of study offered by iDther than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by the Faculty.

### Table 3: Civil Engineering - continued

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition O	offered

# 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 for the study in Table 3 (160 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 1999 onwards (that is, Bachelor of Engineering in Civil Engineering with either a Bachelor of Arts, Bachelor of Science or Bachelor of Commerce) are required to complete all of the core units of study in Table 3 (160 credit points), except for Bachelor of Commerce where ELEC 1001, CIVL 3207 and CIVL 3005 are not required, therefore only 152 credit points are needed. This total of 160 credit points (or 152 credit points for Bachelor of Commerce) 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 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 units 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.

# 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.

		Acceptable alternative
CHEM 1401	Chemistry IE	CHEM 1101 and CHEM 1102
GEOL 1501	Engineering Geology 1	GEOL 1001 and GEOL 1002
MATH 2001	Vector Calculus and Complex Variables	STAT 2002 (ForBE/BCom degrees only)
MATH 2005	Fourier Series & Differential Equations	STAT2004 (ForBE/BCom degrees only)
CIVL 1004	Computational Engineering	COMP 1001 and COMP 1002 or MECHISOO or MECHISIO or MECH1801
CIVL 1052	Statics	MECH1500 or MECH1501
CIVL 1051	Dynamics	MECH1500 or MECH 1501
ELEC 1001	Introductory Electrical Engineering	PHYS1202 or PHYS1001 and PHYS1003 or ELEC 2002
CIVL 2409	Engineering Geology 2	GEOL 2001 and GEOL 2002 and GEOL 2003
CIVL 4014	Thesis/Design/Project	CIVL 4013

# Recommended elective units of study First Year

COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMP 1901.</li> </ul>	February, July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
GEOL 1001	Earth and its Environment	6	A) No previous knowledge of Geology assumed.	February
GEOL 1002	Earth Processes and Resources	6	A) No previous knowledge of Geology assumed.	July

Table	3: Civil Engineering -	continue	ed	
Unit of	study	Credit pointsi	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
Se	cond Year			
ASNS 1001	Modern Asian History and Culture 1	6		February
ASNS 1002	Modern Asian History and Culture 2	6		July
ARPH 1001	Introduction to Archaeolog	у б		February, January (short)
<b>ARPH</b> 1002	Introduction to Australian Archaeology	6		July
DESC 9101	Introduction to Autocad	4 ( N	<ul> <li>Q) Preference given to Design Computing and Digital Media students.</li> <li>N) Available to CH005 and CH006 and CH008 and CH009 students only with written permission from the lecturer. Same applies to students from other faculties (e.g. Engineering) and Study Abroad.</li> </ul>	February, July, January (short)
DESC 9100	Introduction to Archicad	4 ( N	<ul> <li>Q) Preference given th Design Computing and Digital Media students.</li> <li>N) Available to CH005, CH006, and new undergraduate degrees students only with written permission from the lecturer. Same applies to students from other Faculties (e.g. Engineering) and Study Abroad.</li> </ul>	February, July, January (short)
INFO 1000	Information Technology Tools	6		February, July, January (short)
Fo	urth Year			
IREL 1001	Macro Industrial Relations	6		February
CIVL 4222	Finite Element Methods	5 A	A) CIVL 3204 Structural Analysis.	February
CHING 4504	Environmental Decision Making	4		July
MECH 4220	Environmental Engineering	g 6 H N	<ul> <li>P) 24 credit points of third year units of study.</li> <li>N) MECH4240 Energy and the Environment and MECH4230 Environmental Acoustics and Noise Control.</li> </ul>	February
CIVL 4221	Bridge Engineering	5 A	A) CIVL 3225 or CIVL3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL3224 Concrete Structures - Design and CIVL 3227 or CIVL3206 Steel Structures 1.	February
CIVL 4218	Concrete Structures 2	5 A	A) CIVL 3223 or CIVL 3225 Concrete Structures - Behaviour, CIVL 3224 or CIVL, 3226 Concrete Structures - Design.	July
CIVL 4219	Structural Dynamics	5 A	A) CIVL 3204 Structural Analysis.	February
CIVL 4220	Steel Structures 2	5 A	A) CFVL3206 or CIVL 3227 Steel Structures 1.	July
CIVL 4406	Environmental Geotechnics	s 5 A	A) CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	July
CIVL 4407	Geotechnical Engineering	5 A	A) CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	February
CIVL 4607	Environmental Fluids 1	5		February
CIVL 4608	Environmental Fluids 2	5 A	A) Material covered in Environmental Fluids 1.	July
CIVL 4609	Water Resources Engineering	5		July
CIVL 4807	Project Formulation	5 A	A) Completion of CIVL 3803 Project Appraisal or equivalent knowledge.	July
GEOL	Environmental Geology:	4 P)	24 credit points of Science units of study. See prerequisites for Senior Geology.	February

2004 Hazards

# Table 3: Civil Engineering - continued

Table	able 5. Civil Engineering - continued				
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered	
GEOL 2005	Environmental Geology: Resources	4	P) 24 credit points of Science units of study. See prerequisites for Senior Geology.	July	
CIVL 3804	Contracts, Formulation and Management	5		July	
CIVL 3805	Project Scope, Time and Cos Management	t 6		February	
CIVL 4808	Project Management & Information Technol	4	A) Sufficient knowledge of information technology systems & communications capabilities.	February	
CIVL 4809	Project Planning and Tendering	4	A) Completion of CIVL2801 Engineering Construction 1 and CIVL3802 Engineering Construction 2 or the equivalent knowledge.	July	
CIVL 4810	Project Quality Risk and Procurement Mgt	6		July	

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 points 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 4014 Thesis by CIVL 4013 Thesis Honours.
- 4. CIVL 4014 may be completed in one semester only with written approval from the Head of Civil Engineering.

5. Recommended elective streams are:

Construction Engineering and Management Stream: CIVL 4807

Structural Engineering Stream: CIVL 4221, CIVL 4222, CIVL 4218, CIVL 4219, CIVL 4220

Environmental Stream: CIVL 4406, CIVL 4607, CIVL 4608, CIVL 4609, CHNG 4504, (MECH 4220)

Geotechnical Engineering Stream: CIVL 4222, CIVL 4406, CIVL 4407, GEOL 2004, GEOL 2005

# **Table 4: Computer Engineering**

Credit         A) Assumed Knowledge         Q) Qualifying         P) Prerequisite           Unit of study         points         C) Corequisite         N) Prohibition	Offered
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# Core units of study

Candidates for the degree of Bachelor of Engineering in Computer 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 recommended or approved by the Faculty.

Fi	rst year			
COMP 1001	Introductory Programming	6	<ul><li>A) HSC 3-unit Mathematics.</li><li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li></ul>	February, July, January (short)
			N) May not be counted with COMP 1901.	
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit.	February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
PHYS 1001	Physics 1 (Regular)	6	<ul><li>A) HSC Physics or HSC 4-unit Science.</li><li>C) Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902.</li><li>N) May not be counted with PHYS 1002 or 1901.</li></ul>	February
PHYS 10032	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
Se	cond year			
COMP 2002	Design and Data Structures	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	February
COMP 2003	Languages and Logic	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>P) MATH 1004 or 1904 or Econometrics or MATH 2009.</li> <li>N) May not be counted with COMP 2903.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July
COMP 2004	Programming Practice	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2101	Circuit Analysis	4	<ul> <li>P) Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February

# Table 4: Computer Engineering - continued

Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 2301	Signals and Systems	4	P) Advisory Prerequisite: MATH1001 Differential Calculus, and MATH1002 Linear Algebra, and MATH1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.	July
			N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).	
ELEC 2401	Introductory Electronics	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	July
ELEC 2601	Microcomputer Systems	4	<ul><li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li><li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li></ul>	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	ul 4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
PHYS	Physics 2Ee	4		July
2203	ind yoon			
COMP 30093	Operating Systems	4	<ul> <li>Q) COMP 2004 or 2904.</li> <li>P) COMP 2001 or 2901 or ELEC 2601.</li> <li>N) May not be counted with COMP 3909.</li> </ul>	February
COMP 3100 <sub>3</sub>	Software Engineering	4	<ul><li>P) COMP 2004 or 2904.</li><li>N) May not be counted with COMP 3800.</li></ul>	July
ELEC 3302	Fundamentals of Feedback Control	4	<ul><li>P) Advisory Prerequisite: ELEC 2301 Signals and Systems.</li><li>N) MECH3800 Systems Control and CHNG3302 Process Control.</li></ul>	July
ELEC 3303	Digital Signal Processing	4	<ul><li>P) Advisory Prerequisite: ELEC2301 Signals and Systems.</li><li>N) Prohibition: ELEC4303 Digital Signal Processing.</li></ul>	February
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3403	Switching Devices-High Speed Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite:ELEC2301 Signals and Systems.	February
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
ELEC 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering. COMP3007 Networked systems</li> </ul>	July
Fo	urth vear		1) EEECOOS Internet Engineering, COMI 5007 Networked Systems.	
ELEC 4601	Computer Design	4	P) Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	February
ELEC 4602	Real Time Computing	4	P) Advisory Prerequisites: ELEC3601 Digital Systems Design and COMP3100 Software Engineering.	February
ELEC 4702	Practical Experience	0		February
ELEC	Thesis	12	P) A minimum of 36 credit points from third and fourth year units of study.	July

<sup>4703</sup> 

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## Table 4: Computer Engineering - continued

	Credit	A) Assumed Knowledge Q) C	Jualifying	P) Prerequisite	
Unit of study	points	Ć) Corequisite N) Prohibition		C	)ffered

### 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 1203 Physics 1EE is an acceptable alternative to PHYS 1003 Physics (Technological).

3. Students who have completed one or more of these units of study toward the Bachelor of Science degree shall, in their place, complete an equivalent number of credit points from units of study in the table below of Recommended Elective Units of Study for BE (Computer Engineering) or such other units of study as are approved by the Head of School.

# Resolutions of the Faculty of Engineering relating to Table 4

### **BE (Computer Engineering)**

In addition to gaming credit for the 152 credit points of core units of study set out in Table 4, candidates are required to complete at least 28 credit points of 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

In addition to gaining credit for the 152 credit points of core units of study set out in Table 4, candidates must complete at least 8 credit points of units of study (at least 4 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Computer 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 (Computer Engineering)/BMedSc

Candidates are required to gain credit for the 140 credit points of core units of study in Table 4 excluding ELEC 4703 Thesis. They are also required to complete the 12 credit point unit of study ELEC 4705 Interdisciplinary Thesis and at least 8 credit points of units of study (at least 4 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Computer Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science

### **BE (Computer Engineering)/BCom**

In addition to gaining credit for the 152 credit points of core units of study set out in Table 4, candidates must complete at least 8 credit points of units of study (at least 4 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Computer Engineering).

Candidates are also required to complete at least 100 credit points of units of study in the Faculty of Economics (listed in Table A for the Bachelor of Commerce degree). The Computer Science units of study in Table 4 maybe counted, to a maximum of 20 credit points, in the 100 credit points. They may also be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce. No other units of study in Table 4 or the table of recommended electives may be counted in the 100 credit points or used to satisfy a minor or major. Candidates should refer to the joint resolutions of the Faculties of Engineering and Economics for additional information.

## 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.

Reco	Recommended elective units of study					
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February		
<b>ELEC</b> 4 3 0 1	Computer Control System Design	4	P) Advisory Prerequisite: ELEC3302 Fundamentals of Feedback Control.	February		
ELEC 4401	Electronic Design	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC3302 Fundamentals of Feedback Control and ELEC3401 Electronic Devices and Circuits.	February		
ELEC 4402	Integrated Circuit Design	4	P) Advisory Prerequisite: ELEC3401 Electronic Devices and Circuits.	February		
<b>ELEC</b> 4502	Digital Communication Systems	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February		
ELEC 5506	Optical Networks	4	<ul> <li>P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.</li> <li>NB: Not offered in 2001.</li> </ul>	July		
ELEC 5606	Multimedia Systems and Applications	4	<ul> <li>A) COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.</li> <li>NB: Not offered in 2001.</li> </ul>	July		

Table 4: Computer Engineering - continued					
Unit of	study	Credit points;	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered	
ELEC 5608	Electronic Commerce	4 P N	<ul> <li>P) Advisory prerequisites: COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li><i>IB: Not offered in 2001.</i></li> </ul>	July	
<b>ELEC</b> 5610	Computer and Network Security	4 A N	ELEC4601 Computer Design and ELEC4501 Data Communication Networks. B: Not offered in 2001.	July	
<b>ELEC</b> 5611	Advanced Computer Engineering	4 P	P) Advisory Prerequisite: ELEC4601 Computer Design. Offered.	July	
Note					

The units of study in this table may not all be available every year.

# **Table 5: Electrical Engineering**

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition	Offered

# Core units of study

Candidates for the degree of Bachelor of Engineering in Electrical 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 recommended or approved by the Faculty.

Fi	rst year			
COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMP 1901</li> </ul>	February, July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit.	February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
PHYS 1001	Physics 1 (Regular)	6	<ul><li>A) HSC Physics or HSC 4-unit Science.</li><li>C) Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902.</li><li>N) May not be counted with PHYS 1002 or 1901.</li></ul>	February
PHYS 10032	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
Se	cond year			
COMP 2002	Design and Data Structures	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook</li> </ul>	February
COMP 2004	Programming Practice	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2101	Circuit Analysis	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
ELEC 2301	Signals and Systems	4	<ul> <li>P) Advisory Prerequisite: MATH1001 Differential Calculus, andMATH1002 Linear Algebra, and MATH1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.</li> <li>N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).</li> </ul>	July

Table	5: Electrical Engineerin	ng - co	ontinued	
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 2401	Introductory Electronics	4	<ul><li>P) Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits.</li><li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li></ul>	July
ELEC 2601	Microcomputer Systems	4	<ul> <li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li> <li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li> </ul>	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P): MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	14	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
PHYS 2203	Physics 2Ee	4		July
Th	ird year			
ELEC 3102	Engineering Electromagnetics	4	P) Advisory Prerequisites: PHYS2203 Physics2EE andELEC2101 Circuit Analysis.	February
ELEC 3201	Electrical Energy Systems Fundamentals	4	P) Advisory Prerequisite: ELEC 2101 Circuit Analysis.	February
ELEC 3302	Fundamentals of Feedback Control	4	<ul><li>P) Advisory Prerequisite: ELEC 2301 Signals and Systems.</li><li>N) MECH3800 Systems Control and CHNG3302 Process Control.</li></ul>	July
ELEC 3303	Digital Signal Processing	4 '	<ul><li>P) Advisory Prerequisite: ELEC2301 Signals and Systems.</li><li>N) Prohibition: ELEC4303 Digital Signal Processing.</li></ul>	February
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	February
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
Fo	urth year			
ELEC 4702	Practical Experience	0		February
ELEC 4703	Thesis	12	P) A minimum of 36 credit points from third and fourth year units of study.	July

### Notes to Table 5

1. For units of study offered by a Faculty other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites, will be as prescribed by that Faculty.

2. PHYS 1203 Physics 1EE is an acceptable alternative to PHYS 1003 (Technological).

# Resolutions of the Faculty of Engineering relating to Table 5

### **BE(Electrical Engineering)**

In addition to gaining credit for the 132 credit points of core units of study set out in Table 5, candidates are required to complete at least 48 credit points of 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.

### Table 5: Electrical Engineering - continued

ı	Init	of	study
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### Credit A) Ass points C) Co

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

### **BE(Electrical Engineering - Management)**

In addition to gaining credit for the 132 credit points of core units of study set out in Table 5, candidates are required to complete at least 36 credit points of units of study (at least 28 of which must be at the 4 or 5 level) 6om the table of recommended elective units of study for BE (Electrical Engineering) excluding ELEC 3701 Management for Engineers and ELEC 4701 Project Management. Further credit of 24 credit points shall be gained by completing the units of study listed in the table of additional units of study for BE (Electrical Engineering - Management).

### **BE(Electrical Engineering)/BSc or BA**

In addition to gaining credit for the 132 credit points of core units of study set out in Table 5, candidates are required to complete at least 28 credit points of 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 (Electrical Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science or of the Faculties of Engineering and Arts.

### **BEfElectrical Engineering)/BMedSc**

Candidates are required to gain credit for the 120 credit points of core units of study in Table 5 excluding ELEC 4703 Thesis. They are also required to complete the 12 credit point unit of study ELEC 4705 Interdisciplinary Thesis and at least 28 credit points of 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 (Electrical Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science.

### **BEfElectrical Engineering)/BCom**

In addition to gaining credit for the 132 credit points of core units of study set out in Table 5, candidates are required to complete at least 28 credit points of 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 (Electrical Engineering).

Candidates are also required to complete at least 100 credit points of units of study in the Faculty of Economics (listed in Table A for the Bachelor of Commerce degree). The 20 credit points of Computer Science units of study in Table 5 may be counted in the 100 credit points and may be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce. No other units of study in Table 5 or the table of recommended electives may be counted in the 100 credit points or used to satisfy a minor or major. Candidates should refer to the joint resolutions of the Faculty of Economics and Business for additional information.

### BE (Electrical Engineering)/BCom and admitted to first year prior to 1998

Candidates who commenced first year prior to 1998, in addition to satisfying the core requirements set out in Table 5, are required to gain credit for at least 24 credit points of units of study (at least 8 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Electrical Engineering).

Candidates should refer to the joint resolutions of the Faculty of Engineering and the Faculty of Economics and Business for additional information.

# 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

111	nu year			
COMP 3100	Software Engineering	4	<ul><li>P) COMP 2004 or 2904.</li><li>N) May not be counted with COMP 3800.</li></ul>	July
ELEC 3101	Circuit Theory and Design	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, and ELEC2301 Signals and Systems.	July
ELEC 3103	Electrical Engineering Design	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, ELEC2301 Signals and Systems, ELEC2401Introductory Electronics, and ELEC2601 Microcomputer Systems.	July
<b>ELEC</b> 3202	Power Electronics and Drives	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, and ELEC2401 Introductory Electronics.	July
ELEC 3402	Communications Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3403	Switching Devices-High Speed Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
<b>ELEC</b> 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering, COMP3007 Networked systems.</li> </ul>	July

Table	5: Electrical Engineering	g - c	ontinued	
Unit of	study I	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February
ELEC 3801	Fundamentals of Biomedical Engineering	4	P) Advisory Prerequisite: ELEC2401 Introductory Electronics or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A.	February
Fo	urth year			
ELEC 4201	Electrical Systems Modelling & Analysis	4	P) Advisory Prerequisite: ELEC3201 Fundamentals of Electrical Energy Systems.	February
ELEC 4301	Computer Control System Design	4	P) Advisory Prerequisite: ELEC3302 Fundamentals of Feedback Control.	February
ELEC 4302	Image Processing and Computer Vision	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC4303 Digital Signal Processing.	July
ELEC 4401	Electronic Design	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC3302 Fundamentals of Feedback Control and ELEC3401 Electronic Devices and Circuits.	February
ELEC 4402	Integrated Circuit Design	4	P) Advisory Prerequisite: ELEC3401 Electronic Devices and Circuits.	February
ELEC 4501	Data Communication Networks	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4502	Digital Communication Systems	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4503	Error Control Coding	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4601	Computer Design	4	P) Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	February
ELEC 4602	Real Time Computing	4	<ul> <li>P) Advisory Prerequisites: ELEC3601 Digital Systems Design and COMP3100 Software Engineering.</li> </ul>	February
<b>ELEC</b> 4701	Project Management	4	P) Advisory Prerequisite: ELEC3701 Management for Engineers.	July
ELEC 4801	Biomedical Engineering Systems	4	A) ELEC3801 Fundamentals of Biomedical Engineering. NB: Not offered in 2001.	July
ELEC 5501	Communication Networks (Advanced)	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks.	July
ELEC 5502	Satellite Communication Systems	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	July
ELEC 5503	Optical Communication Systems	4	P) Advisory Prerequisites: ELEC3402 Communications Electronics, ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	July
ELEC 5504	Cellular Radio Engineering	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 5505	Advanced Digital Transmissions	4	<ul> <li>A) ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.</li> <li>NB: Not offered in 2001.</li> </ul>	July
ELEC 5506	Optical Networks	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications. NB: Not offered in 2001.	July
ELEC 5603	Biologically Inspired Signal Processing	4	NB: Not offered in 2001.	July
ELEC 5604	Adaptive Pattern Recognition	4	NB: Not offered in 2001.	July

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Table	Table 5: Electrical Engineering - continued				
Unit of	study	Credit pointsi	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition		
ELEC 5606	Multimedia Systems and Applications	4 A N	A) COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems. <i>IB: Not offered in 2001.</i>	July	
ELEC 5608	Electronic Commerce	4 Р Л	<ul> <li>Advisory prerequisites: COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>Not offered in 2001.</li> </ul>	July	
<b>ELEC</b> 5610	Computer and Network Security	4 A N	A) ELEC4601 Computer Design and ELEC4501 Data Communication Networks. <i>IB: Not offered in 2001.</i>	July	
<b>ELEC</b> 5611	Advanced Computer Engineering	4 P	P) Advisory Prerequisite: ELEC4601 Computer Design. Offered.	July	
Notes					

1. For units of study offered by a Faculty other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites will be as prescribed by that Faculty.2. The units of study in this table may not all be available every year

# Additional units of study for BE(Electrical Engineering - IVIanagement)

ENGG 2003	Introduction to Engineering Management	4	N) ELEC3701, MECH3620.	July
ENGG 3002	Industrial and Engineering Management		Not offered in 2001 (4 credit points).	
ENGG 4001	Innovation/International Competitiveness	4		February
CHING 3401	Project Economics	4		July
CHING 4401	Project Engineering	4		February
ELEC 4701	Project Management	4	P) Advisory Prerequisite: ELEC3701 Management for Engineers.	July
MECH 4110	Professional Engineering	4	P) 3 6 credit points of Senior units of study.	February
CHING 4403	Engineering Business Skills	4		July
<b>CHING</b> 4504	Environmental Decision Making	4		July
MECH 4650	Workplace Industrial Relations	2	P) 36 credit points of senior units of study.	July
ENGG 4002	New Business Creation	4		July

Note

The required total of 24 credit points shall comprise ENGG 2003, ENGG 3002 and 16 credit points from the remaining units of study in the table.

# Table 5A: Electrical Engineering (Information Systems)

	Credit	A) Assumed Knowledge	Q) Qualifying	P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohil	bition		Offered

**Core units of study** This degree stream 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.

Fir	st year			
COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMP 1901.</li> </ul>	February, July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit	February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	A) HSC 3-unit Mathematics, N) May not be counted with MATH 1902 or 1012.	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
PHYS 1001	Physics 1 (Regular)	6	<ul> <li>A) HSC Physics or HSC 4-unit Science.</li> <li>C) Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902.</li> <li>N) May not be counted with PHYS 1002 or 1901.</li> </ul>	February
PHYS 10032	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
Se	cond year			
<b>COMP</b> 2002	Design and Data Structures		<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	February
COMP 2004	Programming Practice		<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2101	Circuit Analysis		<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
ELEC 2301	Signals and Systems		<ul> <li>P) Advisory Prerequisite: MATH1001 Differential Calculus, and MATH1002 Linear Algebra, and MATH1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.</li> <li>N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).</li> </ul>	July

Table 5A: Electrical Engineering (Information Systems) - continued				
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 2401	Introductory Electronics		<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	July
ELEC 2601	Microcomputer Systems	4	<ul> <li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li> <li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li> </ul>	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	14	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
PHYS 2203	Physics 2Ee	4		July
Th	ird year			
COMP 3100	Software Engineering	4	P) COMP 2004 or 2904. N) May not be counted with COMP 3 800.	July
ELEC 3102	Engineering Electromagnetics	4	P) Advisory Prerequisites: PHYS2203 Physics2EE andELEC2101 Circuit Analysis.	February
ELEC 3302	Fundamentals of Feedback Control	4	<ul><li>P) Advisory Prerequisite: ELEC 2301 Signals and Systems.</li><li>N) MECH3800 Systems Control and CHNG3302 Process Control.</li></ul>	July
ELEC 3303	Digital Signal Processing	4	<ul><li>P) Advisory Prerequisite: ELEC2301 Signals and Systems.</li><li>N) Prohibition: ELEC4303 Digital Signal Processing.</li></ul>	February
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3402	Communications Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3403	Switching Devices-High Speed Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite:ELEC2301 Signals and Systems.	February
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
Fo	urth year			
ELEC 4401	Electronic Design	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC3302 Fundamentals of Feedback Control and ELEC3401 Electronic Devices and Circuits.	February
ELEC 4501	Data Communication Networks	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4502	Digital Communication Systems	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4601	Computer Design	4	P) Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	February
ELEC 4602	Real Time Computing	4	<ul> <li>P) Advisory Prerequisites: ELEC3601 Digital Systems Design and COMP3100 Software Engineering.</li> </ul>	February
ELEC 4702	Practical Experience	0		February
ELEC 4703	Thesis	12	P) A minimum of 36 credit points from third and fourth year units of study.	July

### Table 5A: Electrical Engineering (Information Systems) - continued

	Credit	A) Assumed Knowledge C	Q) Qualifying	P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibit	tion		Offered

### Notes to Table 5A

1. For units of study offered by a Faculty other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites, will be as prescribed by that Faculty.

2. PHYS 1203 Physics 1EE is an acceptable alternative to PHYS 1003 (Technological).

# Resolutions of the Faculty of Engineering relating to Table 5A

### 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 and Information 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 units of study for BE(Electrical Engineering - Information Systems) Third year

	e			
ELEC 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering, COMP3007 Networked systems.</li> </ul>	July
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February
Fo	urth year			
ELEC 4302	Image Processing and Computer Vision .	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC4303 Digital Signal Processing.	July
ELEC 4402	Integrated Circuit Design	4	P) Advisory Prerequisite: ELEC3401 Electronic Devices and Circuits.	February
ELEC 4503	Error Control Coding	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 5501	Communication Networks (Advanced)	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks.	July
ELEC 5502	Satellite Communication Systems	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	July
ELEC 5503	Optical Communication Systems	4	P) Advisory Prerequisites: ELEC3402 Communications Electronics, ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	July
ELEC 5504	Cellular Radio Engineering	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 5505	Advanced Digital Transmissions	4	<ul> <li>A) ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.</li> <li>NB: Not offered in 2001.</li> </ul>	July
ELEC 5506	Optical Networks	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications. NB: Not offered in 2001.	July
ELEC 5603	Biologically Inspired Signal Processing	4	NB: Not offered in 2001.	July
ELEC 5606	Multimedia Systems and Applications	4	<ul> <li>A) COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.</li> <li>NB: Not offered in 2001.</li> </ul>	July

Table	Fable 5A: Electrical Engineering (Information Systems) - continued				
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered	
ELEC 5608	Electronic Commerce	4	<ul> <li>P) Advisory prerequisites: COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>NB: Not offered in 2001.</li> </ul>	July	
ELEC 5610	Computer and Network Security	4	A) ELEC4601 Computer Design and ELEC4501 Data Communication Networks. <i>NB: Not offered in 2001.</i>	July	
ELEC 5611	Advanced Computer Engineering	4	P) Advisory Prerequisite: ELEC4601 Computer Design. Offered.	July	
NT 4					

**Note** The units of study in this table may not all be available every year.

# Table 6: Mechanical Engineering (Mechanical)

Unit of study

Credit points

A) Assumed Knowledge Q) Qualifying C) Corequisite N) Prohibition P) Prerequisite

Offered

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 Fir	e units of study st Year			
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
<b>MATH</b> 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1005	Statistics	3	<ul><li>A) HSC 2-unit Mathematics.</li><li>N) May not be counted with MATH 1905 or 1015.</li></ul>	July, January (short)
MECH 1530	Engineering Mechanics	8	N) CIVL1052 Statics MECH1501 Engineering Statics MECH1511 Introductory Dynamics MECH1510 Kinematics and Dynamics MECH1500 Mechanical Engineering 1.	July
<b>MECH</b> 1540	Introductory Mechanical Engineering	5	N) A E R O 1 6 0 1 Aerospace Manufacturing, MECH1500 Mechanical Engineering 1, MECH1800 Computational Engineering 1A.	February
MECH 1600	Manufacturing Technology	4	N) AERO 1600 Workshop Technology.	July
MECH 1820	Introduction to Computing	6	N) MECH1800 Computational Engineering 1A MECH1801 Computational Engineering 1C INFO 1000 Information Technology Tools.	February
AERO 1801	Computer Engineering Applications	3	NB: Web page: problemsolvers. aero. usyd. edu. au.	July
CHEM 14013	Chemistry IE	6	<ul><li>P) Mathematics 2-unit course and a satisfactory knowledge of 2-unit Chemistry or the Chemistry component of the 3 or 4-unit Science HSC course.</li><li>N) CHEM 1101, CHEM 1102.</li></ul>	February, January (short)
<b>ELEC</b> 1001	Introductory Electrical Engineering	4	<ul><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li><li>N) ELEC1102 Foundations of Electronic Circuits.</li></ul>	July
Se	cond Year			
<b>MATH</b> 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 20022.6	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
<b>MATH</b> 2005	Fourier Series & Differential Equations	4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MATH 20522,6	Numerical Methods	2	C) MATH 2001 or 2901. N) MATH 2952.	July
MECH 2201	Thermodynamics 1	4	N) MECH 2200 Thermofluids.	February
MECH 2300	Materials 1	4	N) CIVL 2101 Properties of Materials.	July
MECH 2400	Mechanical Design 1	6		July
<b>MECH</b> 2500	Engineering Dynamics 1	4	P) MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	July

Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
AERO 2201 <sub>7</sub>	Fluid Mechanics 1	4 F N N	P) MATH 1001, MATH 1002, MATH 1003. N)AERO2701 Space Engineering!. NB: Web page: <u>www.aero.usyd.edu.au/aero/aerodyn.html</u> .	July
AERO 2300	Mechanics of Solids 1	4 F	P) 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
ELEC 20014	Electrical and Electronic Engineering	6 H N	<ul> <li>P) ELEC 1001 Introductory Electrical Engineering.</li> <li>N) ELEC 2003 Electrical and Electronic Engineering A, and ELEC2101 Circuit Analysis, and ELEC2401 Introductory Electronics, and ELEC2601 Microcomputer Systems.</li> </ul>	February
Th	ird Year			
MECH 32005	Thermal Engineering 1	7 I N	<ul><li>P) MECH 2201 Thermodynamics 1 or MECH 2200 Thermofluids.</li><li>N) MECH 3201 Thermodynamics 2.</li></ul>	February
MECH 32115	Fluid Mechanics 2	4 I N	<ul> <li>P) AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1.</li> <li>N) AERO3250 Aerodynamics 2.</li> </ul>	July
MECH 33005	Materials 2	4 I	P) MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	July
MECH 3310 <sub>5</sub>	Mechanics of Solids 2	4 H	P) AERO 2300 Mechanics of Solids 1 and MATH 2005.	February
MECH 3400 <sub>2.6</sub>	Mechanical Design 2A	4 I	P) MECH 2400 Mechanical Design 1.	February
MECH 3410	Mechanical Design 2B	4 I	P) MECH 2400 Mechanical Design 1.	July
MECH 3500	Engineering Dynamics 2	4 I	P) MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	February
MECH 3600	Manufacturing Engineering	6 H	P) MECH 1600 Manufacturing Technology.	February
MECH 3610 <sub>2,6</sub>	Team Project	2 H	P) 30 credit points of second year units of study.	July
MECH 36202	Industrial Management	5		July
MECH 3800	Systems Control	4 I	P) MATH 2001 and MATH 2005.	July
Fo	urth Year			
MECH 4101 <sub>8</sub>	Thesis A	0 1	P) 36 credit points of Third Year units of study.	February, July
MECH 4102 <sub>8</sub>	Thesis B	12 I	P) MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	February, July
MECH 4110	Professional Engineering	4 I	P) 36 credit points of Senior units of study.	February
MECH 4120	Professional Communication	14 I	P) 32 credit points of third year units of study.	July
MECH 4130	Practical Experience	0 H	P) 28 credit points of second year units of study.	February, <sup>July</sup>

# Table 6: Mechanical Engineering (Mechanical) - continued

### Table 6: Mechanical Engineering (Mechanical) - continued

	Credit	A) Assumed Knowledge	Q) Qualifying	P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohi	bition		Offered

### Notes to Table 6

1. For core units offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite 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 of BE/BCom, BE/LLB and BE/BA.

3. For CHEM 1401, note (2) above also applies. 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 Services, up to 12 credit points and subject to timetabling constraints. Candidates for the combined degree BE/BMedSci should enrol in CHEM 1102 (instead of CHEM 1401) as well as BIOL 1003.

4. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in ELEC 2003 Electrical and Electronics Engineering A (4 cp).

5. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 3202 Heat Transfer (3 cp) and should enrol in an additional 12 credit points selected from the following units of study: MECH 3201, MECH 3210, MECH 3300 and MECH 3310.

6. 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 of BE/BMedSci.

7. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics, MATH 2051 (2cp).

8. Candidates for the combined degree BE/BmedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102),

# 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 required 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.

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering combined with Bachelor of Arts or Bachelor of Commerce or Bachelor of Law 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 11 credit points of elective units of study which must be chosen from mainstream electives.

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering combined with Bachelor of Medical Science required to gain credit for all core units of study set out in Table 6 except those marked as (6). Additional credit necessary to satisfy Section 9 shall he " gained by completing at least 20 credit points of elective units of study which must be chosen from mainstream electives.

# 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.

		Acceptable alternative
<b>CHEM</b> 1401	Chemistry IE	СНЕМ 1101
MECH 1530	Engineering Mechanics	PHYS1001
MECH 1820	Introduction to Computing	СОМР1001
<b>AERO</b> 1801	Computer Engineering Applications	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 Levels 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 Department, Mechanical and Mechatronic Engineering.

# Recommended elective units of study

### Mainstream electives

<b>MECH</b> 4210	Computational Fluid Dynamics	4	P) 1	MECH	3210	Fluid Mee	chanic.							July
MECH	Environmental	Engineering	6	P)	24	credit	points	of	third	year	units	of	study.	February
4220	N) MECH4240 Energy and the Environment and MECH4230 Environmental													
			A	Acoust	ics and	l Noise Co	ontrol.							

Unit of	study	points:	> C) Corequisite N) Prohibition	Offered
MECH 4230	Environmental Acoustics & Noise Control	2	<ul><li>P) 24 credit points of third year units of study.</li><li>N) MECH 4220 Environmental Engineering.</li></ul>	February
MECH 4240	Energy and the Environment	4	<ul><li>P) 24 credit points of Senior units of study.</li><li>N) MECH4220 Environmental Engineering.</li></ul>	February
MECH 4250	Air Conditioning and Refrigeration	3	P) MECH 3200 Thermal Engineering 1.	February
MECH 4260	Combustion and Fire Safety	3	P) MECH 3200 Thermal Engineering 1.	February
<b>MECH</b> 4310	Advanced Engineering Materials	6	<ul><li>P) MECH 3300 Materials 2.</li><li>N) MECH 4315 Advanced Aerospace Materials.</li></ul>	July
<b>MECH</b> 4410	Advanced Design and Analysis 1	3	P) MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	February
<b>MECH</b> 4420	Advanced Design and Analysis 2	3	P) MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	July
MECH 4510	Machine Vibration and Monitoring	3	P) MECH 3500 Engineering Dynamics 2.	July
MECH 4605	Industrial Engineering	8	<ul> <li>P) MATH 2001 and MATH 2005 and MECH 3620 Industrial Management.</li> <li>N) MECH 4610 Industrial and Engineering Management MECH 4620 Industrial Ergonomics MECH 4635 Introduction to Operations Research.</li> </ul>	February
MECH 4610	Industrial Engineering and Management	2	<ul><li>P) MECH 3620 Industrial Management.</li><li>N) MECH 4605 Industrial Engineering.</li></ul>	February
MECH 4620	Industrial Ergonomics	2	N) MECH 4605 Industrial Engineering.	February
MECH 4635	Introduction to Operations Research	4	<ul><li>P) MATH1005 MATH2001 MATH2002 MATH2005.</li><li>N) MECH4600 Industrial Engineering.</li></ul>	February
<b>MECH</b> 4640	Product Life Cycle Design	2	P) MECH3600 Manufacturing Engineering.	July
MECH 4650	Workplace Industrial Relations	2	P) 36 credit points of senior units of study.	July
MECH 4700	Robotic Systems	4	P) MECH 3500 Engineering Dynamics 2.	July
<b>MECH</b> 4900	Orthopaedic Engineering	4	P) MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.	February
<b>MECH</b> 4910	Biomechanics and Biomaterials	4	P) 36 credit points of third year units of study.	July
AERO 4303	Aerospace Structures 3	6	<ul><li>P) AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2.</li><li>N) AERO 4301 Applied Numerical Stress Analysis.</li></ul>	February
O	ther electives			
ASNS 2601	Asian Studies 1A	4		February
ASNS 2602	Asian Studies 1B	4	P) ASNS 2601.	July
ASNS 2603	Asian Studies 2A	4	P) ASNS2602.	February
ASNS 2604	Asian Studies 2B	4	P) ASNS2603.	July
<b>CIVL</b> 3701	Transportation Engineering and Planning	2		July
ELEC 3801	Fundamentals of Biomedical Engineering	4	P) Advisory Prerequisite: ELEC2401 Introductory Electronics or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A.	February
<b>BIOL</b> 1001	Concepts in Biology	6	A) HSC 2-unit Biology course. N) May not be counted with BIOL 1901.	February, January (short)

Table	Table 6: Mechanical Engineering (Mechanical) - continued					
Unit of study		Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered		
CHNG 4504	Environmental Decision Making	4		July		
ENGG 4001	Innovation/International Competitiveness	4		February		
ENGG 4002	New Business Creation	4		July		
IREL 1001	Macro Industrial Relations	6		February		

# Table 7: Mechanical Engineering (Mechatronics)

Credit

points

Unit of study

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

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 Fin	e units of study rst Year			
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1005	Statistics	3	<ul><li>A) HSC 2-unit Mathematics.</li><li>N) May not be counted with MATH 1905 or 1015.</li></ul>	July, January (short)
MECH 1530	Engineering Mechanics	8	N) CIVL1052 Statics MECH1501 Engineering Statics MECH1511 Introductory Dynamics MECH1510 Kinematics and Dynamics MECH1500 Mechanical Engineering 1.	July
MECH 1540	Introductory Mechanical Engineering	5	N) A E R O 1 6 0 1 Aerospace Manufacturing, MECH1500 Mechanical Engineering 1, MECH1800 Computational Engineering 1A.	February
MECH 1600	Manufacturing Technology	4	N) AERO 1600 Workshop Technology.	July
MECH 1802	C Programming	3	NB: Web page: www.acfr.usyd.edu.au/teaching/Ist-year/mech1802/.	July
MECH 1820	Introduction to Computing	6	N) MECH1800 Computational Engineering 1A MECH1801 Computational Engineering 1C INFO 1000 Information Technology Tools.	February
CHEM 14013	Chemistry IE	6	<ul><li>P) Mathematics 2-unit course and a satisfactory knowledge of 2-unit Chemistry or the Chemistry component of the 3 or 4-unit Science HSC course.</li><li>N) CHEM 1101, CHEM 1102.</li></ul>	February, January (short)
ELEC 1001	Introductory Electrical Engineering	4	<ul><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li><li>N) ELEC1102 Foundations of Electronic Circuits.</li></ul>	July
Se	cond Year			
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002 <sub>2,5</sub>	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differential Equations	4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MATH 2052 <sub>2,5</sub>	Numerical Methods	2	C) MATH 2001 or 2901. N) MATH 2952.	July
MECH 2201	Thermodynamics 1	4	N) MECH 2200 Thermofiuids.	February
MECH 2400	Mechanical Design 1	6		July
MECH 2500	Engineering Dynamics 1	4	P) MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	July
MECH 2700	Mechatronics 1	6		July

Table	7: Mechanical Enginee	ering (	Mechatronics) - continued	
Unit of	study	Credit pointsi	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
AERO 22016	Fluid Mechanics 1	4	<ul> <li>P) MATH 1001, MATH 1002, MATH 1003.</li> <li>N)AERO2701 Space Engineering 1.</li> <li>NB: Web page: <u>www.aero.usyd.edu.au/aero/aerodyn.html</u>.</li> </ul>	July
AERO 2300	Mechanics of Solids 1	4	P) 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
ELEC 2001	Electrical and Electronic Engineering	6	<ul> <li>P) ELEC 1001 Introductory Electrical Engineering.</li> <li>N) ELEC 2003 Electrical and Electronic Engineering A, and ELEC2101 Circuit Analysis, and ELEC2401 Introductory Electronics, and ELEC2601 Microcomputer Systems.</li> </ul>	February
Th	ird Year			
MECH 3400 <sub>2,5</sub>	Mechanical Design 2A	4	P) MECH 2400 Mechanical Design 1.	February
MECH 34102	Mechanical Design 2B	4	P) MECH 2400 Mechanical Design 1.	July
MECH 3500	Engineering Dynamics 2	4	P) MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	February
MECH 36004	Manufacturing Engineering	6	P) MECH 1600 Manufacturing Technology.	February
MECH 3610 <sub>2,5</sub>	Team Project	2	P) 30 credit points of second year units of study.	July
MECH 36202	Industrial Management	5		July
MECH 3700	Mechatronics 2	5	P) MECH 2700 Mechatronics 1.	February
MECH 3800	Systems Control	4	P) MATH 2001 and MATH 2005.	July
ELEC 3202	Power Electronics and Drives	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, and ELEC2401 Introductory Electronics.	July
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
Fo	urth Year			
MECH 4101 <sub>7</sub>	Thesis A	0	P) 36 credit points of Third Year units of study.	February, July
MECH 41027	Thesis B	12	P) MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	February, July
MECH 4110	Professional Engineering	4	P) 3 6 credit points of Senior units of study.	February
MECH 4120	Professional Communication	n 4	P) 32 credit points of third year units of study.	July
MECH 4130	Practical Experience	0	P) 28 credit points of second year units of study.	February, July

### Notes to Table 7

1. For core units offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite 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 of BE/BCom, BE/LLB and BE/BA.

3. For CHEM 1401, note (2) above also applies. 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 Services, up to 12 credit Points and subject to timetabling constraints. Candidates for the combined degree BE/BMedSci should enrol in CHEM 1102 (instead of CHEM 1401) as well as BIOL 1003.

4. for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 3601 Manufacturing Systems (2 cp).

5. 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 of BE/BMedSci.

6. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics, MATH 2051 (2cp).

7. Candidates for the combined degree BE/BmedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101) and MECH 4102)

### Table 7: Mechanical Engineering (Mechatronics) - continued

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition	Offered

# 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.

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) combined with Bachelor of Arts or Bachelor of Law or Bachelor of 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 13 credit points of elective units of study which must be chosen from mainstream electives.

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Mechatronics) combined with Bachelor of Medical Science required to gain credit for all core units of study set out in Table 6 except those marked as (5). Additional credit necessary to satisfy Section 9 shall be gained by completing at least 20 credit points of elective units of study which must be chosen from mainstream electives.

## 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

		Acceptable alternative
CHEM 1401	Chemistry IE	СНЕМ 1101
MECH 1530	Engineering Mechanics	PHYS1001
MECH 1802	C Programming	COMP1001
MECH 1820	Introduction to Computing	COMP1001

### 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 Levels 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 Department, Mechanical and Mechatronic Engineering.

Recommended elective units of study Mainstream electives						
<b>MECH</b> Advanced Design and 4410 Analysis 1	3	P) MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	February			
<b>MECH</b> Advanced Design and 4420 Analysis 2	3	P) MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	July			
MECH Machine Vibration and 4510 Monitoring	3	P) MECH 3500 Engineering Dynamics 2.	July			
MECH Product Life Cycle Design 4640	2	P) MECH3600 Manufacturing Engineering.	July			
MECH Workplace Industrial 4650 Relations	2	P) 36 credit points of senior units of study.	July			
MECH Robotic Systems 4700	4	P) MECH 3500 Engineering Dynamics 2.	July			
<b>MECH</b> Microprocessors in 4710 Engineered Products	6	P) ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits.	February			
MECH Sensors and Signals 4720	6	P) MECH 3500 Engineering Dynamics 2 and MECH 3800 Systems Control and ELEC 3401 Electronics Devices & Circuits and ELEC 3601 Digital Systems Design.	February			
<b>MECH</b> Computers in Real-Time 4730 Control and Inst	6	P) ELEC 3601 Digital Systems Design and ELEC 3401 Electronics Devices & Circuits.	February			

Table	7: Mechanical Enginee	ering (	(Mechatronics) - continued	
Unit of	study	Credit points	<ul><li>A) Assumed Knowledge Q) Qualifying P) Prerequisite</li><li>C) Corequisite N) Prohibition</li></ul>	Offered
O	her electives			
ASNS 2601	Asian Studies 1A	4		February
ASNS 2602	Asian Studies 1B	4	P) ASNS 2601.	July
ASNS 2603	Asian Studies 2A	4	P) ASNS2602.	February
ASNS 2604	Asian Studies 2B	4	P) ASNS2603.	July
BIOL 1001	Concepts in Biology	6	<ul><li>A) HSC 2-unit Biology course.</li><li>N) May not be counted with BIOL 1901.</li></ul>	February, January (short)
CIVL 3701	Transportation Engineering and Planning	2		July
ELEC 3801	Fundamentals of Biomedica Engineering	14	<ul> <li>P) Advisory Prerequisite: ELEC2401 Introductory Electronics or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
ENGG 4001	Innovation/International Competitiveness	4		February
ENGG 4002	New Business Creation	4		July
CHNG 4 5 0 4	Environmental Decision Making	4		July
IREL 1001	Macro Industrial Relations	6.		February
MECH 4220	Environmental Engineering	6	<ul><li>P) 24 credit points of third year units of study.</li><li>N) MECH4240 Energy and the Environment and MECH4230 Environmental Acoustics and Noise Control.</li></ul>	February
MECH 4910	Biomechanics and Biomaterials	4	P) 36 credit points of third year units of study.	July

# Table 8: Project Engineering and Management (Civil)

L	Init	of	study
L	אווונ	U	รเนนง

Credit A) points C

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

Candidates for the degree of Bachelor of Engineering in Project Engineering and Management (Civil) 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 Fin	e units of study rst Year			
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1005	Statistics	3	<ul><li>A) HSC 2-unit Mathematics.</li><li>N) May not be counted with MATH 1905 or 1015.</li></ul>	July, January (short)
CIVL 1051	Dynamics	5	<ul><li>A) Mathematics 3 unit course and Science 4 unit course (or the Physics core of 3-4 unit Science) at the HSC.</li><li>N)MECH1510.</li></ul>	July
CHEM 1401	Chemistry IE	6	<ul><li>P) Mathematics 2-unit course and a satisfactory knowledge of 2-unit Chemistry or the Chemistry component of the 3 or 4-unit Science HSC course.</li><li>N) CHEM 1101, CHEM 1102.</li></ul>	February, January (short)
CIVL 1001	Civil Engineering 1	4	A) 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.	February
CIVL 1052	Statics	5	<ul><li>A) Mathematics 3 unit course at the HSC.</li><li>N) MECH1500 Mechanical Engineering 1, MECH1501 Engineering Statics.</li></ul>	February
CIVL 1004	Computational Engineering	4	N) COMP 1001 Introductory Programming or COMP 1002 Introductory Computer Science.	July
ACCT 1003	Financial Accounting Concepts	6	N) Terminating unit. Cannot be counted with ACCT1001 and ACCT1002.	February
ACCT 1004	Management Accounting Concepts	6	N) Terminating unit. Cannot be counted with ACCT1001 and ACCT1002.	July
Se	cond Year			
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differential Equations	4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MATH 2051	Linear Programming	2	C) MATH 2001 or 2901, and MATH 2002 or 2902. N) MATH 2953.	July
MATH 2052	Numerical Methods	2	C) MATH 200 lor 2901. N) MATH 2952.	July
GEOL 1501	Engineering Geology 1	6	N) GEOL 1002.	February
CIVL 2204	Introduction to Structural Concepts	4	<ul><li>A) CIVL1051 Dynamics and CIVL1052 Statics.</li><li>N) CIVL2203 Structural Design, CIVL2101 Properties of Materials.</li></ul>	July
CIVL 2201	Structural Mechanics	6	A) CIVL 1051 Dynamics and CIVL 1052 Statics.	February

Table	8: Project Engineering	and M	lanagement (Civil) — continued	
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
CIVL 2004	Engineering Communication	is 2		February
CIVL 2205	Introduction to Structural Design	4	<ul><li>A) CIVL1051 Dynamics and CIVL1052 Statics.</li><li>N) CIVL2203 Structural Design, CIVL2101 Properties of Materials.</li></ul>	July
CIVL 2801	Engineering Construction 1	4		July
IREL 1002	Micro Industrial Relations	6		July
Th	nird Year			
CIVL 3401	Soil Mechanics A	4	A) CIVL 2201 Structural Mechanics.	February
CIVL 3501	Surveying 1	4	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005.	February
CIVL 3701	Transportation Engineering and Planning	2		July
CIVL 3005	Engineering Communication 2	ns 2	A) CIVL 2004 Engineering Communications 1.	July
CIVL 3802	Engineering Construction 2	4	A) Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge.	February
CIVL 2610	Fluids 1	6	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005.	February
CIVL 3805	Project Scope, Time and Cos Management	st 6		February
CIVL 3804	Contracts, Formulation and Management	5		July
CIVL 3803	Project Appraisal	4	N) CIVL 4803 Engineering Management.	February
Fo	ourth Year			
CIVL 4014	Thesis/Design/Project	5	<ul><li>P) 40 credit points of Senior Subjects.</li><li>N) CIVL 4013 Honours Thesis/Design/Project or CIVL4015.</li></ul>	February, Full Year (starts Feb)
CIVL 4008	Practical Experience	0	P) 28 credit points of Senior courses.	February
CIVL 4016	Professional Practice- Civil Engineering	5		July
CIVL 4807	Project Formulation	5	A) Completion of CIVL 3803 Project Appraisal or equivalent knowledge.	July
CIVL 4810	Project Quality Risk and Procurement Mgt	6		July
CIVL 4808	Project Management & Information Technol	4	A) Sufficient knowledge of information technology systems & communications capabilities.	February
CIVL 4809	Project Planning and Tendering	4	<ul> <li>A) Completion of CIVL2801 Engineering Construction 1 and CIVL3802 Engineering Construction 2 or the equivalent knowledge.</li> </ul>	July

Note to Table 8

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 the Faculty.

# Table 8: Project Engineering and Management (Civil) - continued

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition Of	fered

# Resolutions of the Faculty of Engineering relating to Table 8 Degree Eligibility

Candidates for the degree of Bachelor of Engineering in Project Engineering and Management (Civil) are expected to complete all the core units for study in Table 8 (162 credit points). They are also required to gain at least 30 credit points from the third and fourth year table of electives listed below.

Candidates commencing a combined degree program (that is a Bachelor of Engineering in Project Engineering and Management (Civil) with a Bachelor of Commerce) are required to complete all of the core units of study in Table 8 except for ACCT 1003, ACCT 1004 and IREL 1002, which are not required, therefore only 144 credit points are needed. However, a minimum of 8cp from the 3rd and 4th year tables of electives listed below must be taken. This total of 152 credit points is only sufficient to be awarded a Bachelor of Engineering in Project Engineering and Management (Civil) as part of an approved combined degree program. The remaining 88 credit points for the combined degree will be taken in the Faculty of Economics and candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics.

### 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 units 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.

# 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 8.

		Acceptable alternative
CHEM 1401	Chemistry 1E	CHEM 1101 and CHEM 1102
GEOL 1501	Engineering Geology 1	GEOL 1001 and GEOL 1002
MATH 2001	Vector Calculus and Complex Variables	STAT 2002 (For BE/BCom degrees only)
MATH 2005	Fourier Series & Differential Equations	STAT 2004 (For BE/BCom degrees only)
CIVL 1004	Computational Engineering	COMP 1001 and COMP 1002 or MECH 1800 or MECH 1810 or MECH 1801
CIVL 1052	Statics	MECH 1500 or MECH 1501
CIVL 1051	Dynamics	MECH 1500 or MECH 1501
CIVL 4014	Thesis/Design/Project	CIVL 4013

# Recommended elective units of study

# Third Year

CIVL 3204	Structural Analysis	6	A) CIVL 2201 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations.	February
CIVL 3102	Materials Aspects in Design	4	A) CIVL 2101 Properties of Materials.	July
CIVL 3207	Risk and Reliability Analysis	2	A) MATH 1001, MATH 1002, MATH 1003, MATH 1005, CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts, CrVTL2205 Introduction to Structural Design.	February
CIVL 3206	Steel Structures 1	6	A) CIVL 2201 Structural Mechanics.	July
CIVL 3223	Concrete Structures: Behaviour	3	<ul><li>A) CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design.</li><li>N) CIVL 3205 Concrete Structures 1.</li></ul>	February
CIVL 3224	Concrete Structures: Design	3	<ul><li>A) CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design.</li><li>N) CIVL 3205 Concrete Structures 1.</li></ul>	July
CIVL 3402	Soil Mechanics B	4	A) CIVL 3401 Soil Mechanics A.	July
CIVL 3602	Fluids 2	4	A) CIVL 2610 Fluids 1.	July

Table	8: Project Engineering	and M	Management (Civil) - continued	
Unit of	study	Credit points:	<ul><li>A) Assumed Knowledge Q) Qualifying P) Prerequisite</li><li>C) Corequisite N) Prohibition</li></ul>	Offered
Fo	ourth Year			
ECON 1001	Introductory Microeconomics	6	A) HSC 2 unit Mathematics.	February, January (short)
CIVL 4222	Finite Element Methods	5	A) CIVL 3204 Structural Analysis.	February
CIVL 4221	Bridge Engineering	5	A) CIVL 3225 or CIVL3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL3224 Concrete Structures - Design and CIVL 3227 or CIVL3206 Steel Structures 1.	February
CIVL 4218	Concrete Structures 2	5	A) CIVL 3223 or CIVL 3225 Concrete Structures - Behaviour, CIVL 3224 or CIVL 3226 Concrete Structures - Design.	July
CIVL 4219	Structural Dynamics	5	A) CIVL 3204 Structural Analysis.	February
CIVL 4220	Steel Structures 2	5	A) CIVL3206 or CIVL 3227 Steel Structures 1.	July
CIVL 4406	Environmental Geotechnics	5	A) CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	July
CIVL 4407	Geotechnical Engineering	. 5	A) CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	February
CIVL 4607	Environmental Fluids 1	5		February
CIVL 4608	Environmental Fluids 2	5	A) Material covered in Environmental Fluids 1.	July
CIVL 4609	Water Resources Engineering	5		July
CIVL 4903	Civil Engineering Design	6	A) CIVL 3225 or CIVL3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL3224 Concrete Structures - Design and CIVL 3227 or CIVL3206 Steel Structures 1.	February

# Notes

1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.

Choice of electrics as shown in the above table will depend upon subject availability, innetability and prerequisite conditions.
 For the BE Project Engineering and Management (Civil) degree, students must take at least 22 elective units of study at third and fourth year level, however, 2 x 4 credit points 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.
 Honours candidates replace the core unit of study CIVL 4014 Thesis by CIVL 4013 Thesis Honours.
 Civil 4014 member when we have a previous of the faculty of Engineering and subject to the subject he may be replaced with CIVL 4014 Thesis by CIVL 4013 Thesis Honours.

4. CIVL 4014 may be replaced with CIVL 4015 with written approval from the Head of Civil Engineering.

# **Table 9: Telecommunications Engineering**

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition	Offered

# Core units of study

Candidates for the degree of Bachelor of Engineering in Telecommunications 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 recommended or approved by the Faculty.

Fi	rst year			
COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMP 1901.</li> </ul>	February, July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit.	February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
PHYS 1001	Physics 1 (Regular)	6	<ul><li>A) HSC Physics or HSC 4-unit Science.</li><li>C) Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902.</li><li>N) May not be counted with PHYS 1002 or 1901.</li></ul>	February
PHYS 10032	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
Se	cond year			
COMP 2002	Design and Data Structures	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	February
COMP 2004	Programming Practice	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2101	Circuit Analysis	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
ELEC 2301	Signals and Systems	4	<ul> <li>P) Advisory Prerequisite: MATH1001 Differential Calculus, andMATH1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.</li> <li>N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).</li> </ul>	July

Table	9: Telecommunications	s Engi	neering - continued	
Unit of	study	Credil: points;	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 2401	Introductory Electronics	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	July
ELEC 2601	Microcomputer Systems	4	<ul> <li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li> <li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li> </ul>	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	ul 4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
PHYS 2203	Physics 2Ee	4		July
Th	urd year			
ELEC 3102	Engineering Electromagnetics	4	P) Advisory Prerequisites: PHYS2203 Physics2EE and ELEC2101 Circuit Analysis.	February
ELEC 3302	Fundamentals of Feedback Control	4	<ul><li>P) Advisory Prerequisite: ELEC 2301 Signals and Systems.</li><li>N) MECH3800 Systems Control and CHNG3302 Process Control.</li></ul>	July
ELEC 3303	Digital Signal Processing	4	<ul><li>P) Advisory Prerequisite: ELEC2301 Signals and Systems.</li><li>N) Prohibition: ELEC4303 Digital Signal Processing.</li></ul>	February
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3402	Communications Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	February
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
Fo	ourth year			
ELEC 4501	Data Communication Networks	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4502	Digital Communication Systems	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4702	Practical Experience	0		February
ELEC 4703	Thesis	12	P) A minimum of 36 credit points from third and fourth year units of study.	July

### Notes to Table 9

1. For units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites will be as prescribed by that Faculty. 2. PHYS 1203 Physics 1EE is an acceptable alternative to PHYS 1003 (Technological).

# Resolutions of the Faculty of Engineering relating to Table 9

### BE(Telecommunications Engineering)

In addition to gaining credit for the 140 credit points of core units of study set out in Table 9, candidates are required to complete at least 40 credit points of 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.
### Table 9: Telecommunications Engineering - continued

	Credit	A) Assumed Knowledge Q) (	Qualifying	P) Prerequisite	
Unit of study	points	Ć) Corequisite N) Prohibition	n	(	Offered

#### BE(Telecommunications Engineering)/BSc or BA

In addition to gaining credit for the 140 credit points of core units of study set out in Table 9, candidates are required to complete at least 20 credit points of units of study (at least 8 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Telecommunications Engineering).

Candidates should refer to the joint resolutions of the Faculties of Engineering and Science or of the Faculties of Engineering and Arts.

#### BE(Telecommunications Engineering)/BMedSc

Candidates are required to gain credit for the 128 credit points of core units of study in Table 9 excluding ELEC 4703 Thesis. They are also required to complete the 12 credit point unit of study ELEC 4705 Interdisciplinary Thesis and at least 20 credit points of units of study (at least 8 of which must be at the 4 or 5 level) from the table of recommended elective units of study for BE (Telecommunications Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science

#### BE(TelecommunicationsEngineering)/BCom

In addition to gaining credit for the 140 credit points of core units of study set out in Table 9, candidates are required to complete at least 20 credit points of 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).

Candidates are also required to complete at least 100 credit points of units of study in the Faculty of Economics (listed in Table A for the Bachelor of Commerce degree). The 20 credit points of Computer Science units of study in Table 9 may be counted in the 100 credit points and may be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce. No other units of study in Table 9 or the table of recommended electives may be counted in the 100 credit points or used to satisfy a minor or major. Candidates should refer to the joint resolutions of the Faculty of Engineering and the Faculty of Economics and Business for additional information.

### 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

Th	ird year		•	
COMP 3100	Software Engineering	4	<ul><li>P) COMP 2004 or 2904.</li><li>N) May not be counted with COMP 3800.</li></ul>	July
ELEC 3101	Circuit Theory and Design	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, and ELEC2301 Signals and Systems.	July
ELEC 3403	Switching Devices-High Speed Electronics	4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
ELEC 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering, COMP3007 Networked systems.</li> </ul>	July
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February
Fo	urth year			
ELEC 4401	Electronic Design	4	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC3302 Fundamentals of Feedback Control and ELEC3401 Electronic Devices and Circuits.	February
ELEC 4503	Error Control Coding	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4601	Computer Design	4	P) Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	February
ELEC 4602	Real Time Computing	4	P) Advisory Prerequisites: ELEC3601 Digital Systems Design and COMP3100 Software Engineering.	February
ELEC 4701	Project Management	4	P) Advisory Prerequisite: ELEC3701 Management for Engineers.	July
ELEC 5501	Communication Networks (Advanced)	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks.	July

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Table	able 9: Telecommunications Engineering - continued					
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered		
ELEC 5502	Satellite Communication Systems	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	July		
ELEC 5503	Optical Communication Systems	4	P) Advisory Prerequisites: ELEC3402 Communications Electronics, ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	July		
ELEC 5504	Cellular Radio Engineering	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February		
ELEC 5505	Advanced Digital Transmissions	4	<ul> <li>A) ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.</li> <li>NB: Not offered in 2001.</li> </ul>	July		
ELEC 5506	Optical Networks	4	<ul> <li>P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.</li> <li>NB: Not offered in 2001.</li> </ul>	July		
ELEC 5606	Multimedia Systems and Applications	4	<ul> <li>A) COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.</li> <li>NB: Not offered in 2001.</li> </ul>	July		
ELEC 5610	Computer and Network Security	4	A) ELEC4601 Computer Design and ELEC4501 Data Communication Networks. <i>NB: Not offered in 2001.</i>	July		

Notes

For units of study offered by a Faculty other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites will be as prescribed by that Faculty.
 The units of study in this table may not all be available every year.

## Table 10: Software Engineering

Unit of study Credit points	A) Assumed Knowledge Q) Qualifying C) Corequisite N) Prohibition	P) Prerequisite Offered
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## Core units of study

Candidates for the degree of Bachelor of Engineering in Software 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 recommended or approved by the Faculty.

Fi	rst year			
COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMB 1001</li> </ul>	February, July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>N) May not be counted with COMP 1901.</li><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit.	February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
PHYS 10032	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
Se	cond year			
INFO 2000	System Analysis and Design	4	<ul><li>Q) INFO 1000 or COMP 1000 or 1001 or 1901 or COMP 1002 or 1902.</li><li>N) May not be counted with COMP 2000.</li></ul>	February
COMP 2002	Design and Data Structures	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	February
COMP 2004	Programming Practice	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2301	Signals and Systems	4	<ul> <li>P) Advisory Prerequisite: MATH1001 Differential Calculus, and MATH1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.</li> <li>N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).</li> </ul>	July
ELEC 2401	Introductory Electronics	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	July
ELEC 2601	Microcomputer Systems	4	<ul> <li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li> <li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li> </ul>	February

	8	Cradit	A) Assumed Knowledge (A) Qualifying (D) Proceedings	
Unit of	study	points	C) Corequisite N) Prohibition	Offered
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	ul 4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
Th	ird year			
COMP 3001	Algorithms	4	<ul> <li>Q) COMP 2002 or 2902.</li> <li>P) MATH 1004 or 1904 and 8 credit points in Intermediate Mathematics and/or Statistics and/or Econometrics.</li> <li>N) May not be counted with COMP 3901.</li> </ul>	July
COMP 3008	Object-Oriented Systems	4	<ul><li>Q) COMP 2004 or 2904.</li><li>N) May not be counted with COMP3908.</li></ul>	February
COMP 3009	Operating Systems	4	<ul><li>Q) COMP 2004 or 2904.</li><li>P) COMP 2001 or 2901 or ELEC 2601.</li><li>N) May not be counted with COMP 3909.</li></ul>	February
COMP 3100	Software Engineering	4	<ul><li>P) COMP 2004 or 2904.</li><li>N) May not be counted with COMP 3800.</li></ul>	July
COMP 3205	Product Development Project	ct 4	<ul> <li>P) COMP 3008 or 3908.</li> <li>NB: Students intending to major in Computer Science are advised to enrol in one of COMP 3201, 3202, 3203, 3204 or 3205, 3206 or 3809.</li> </ul>	February, July
ELEC 3601	Digital Systems Design	4	P) Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP2001 Computer Systems.	July
ELEC 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC 1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering, COMP3007 Networked systems.</li> </ul>	July
Fo	ourth year			
COMP 44053	Formal Methods		Not available in 2001.	
ELEC 4602	Real Time Computing	4	P) Advisory Prerequisites: ELEC3601 Digital Systems Design and COMP3100 Software Engineering.	February
ELEC 4604	Engineering Software Requirements	4	P) Advisory Prerequisite: COMP3100 Algorithms, COMP3205 Product Development Project, ELEC3601 Digital Systems Design and ELEC3701 Management for Engineers.	July
ELEC 4702	Practical Experience	0		February
ELEC 4704	Software Project Management	4	P) Advisory Prerequisites: COMP3100 Algorithms, COMP3205 Product Development Project and ELEC3701 Management for Engineers.	February
ELEC	Thesis	12	P) A minimum of 36 credit points from third and fourth year units of study.	July

#### Notes to Table 10

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 1203 Physics 1EE is an acceptable alternative to PHYS 1003 (Technological).
 3. In 2001, COMP 4405 will be replaced by COMP 4401 Software Engineering (Adv. Topic).

## Resolutions of the Faculty of Engineering relating to Table 10

#### BE(Software Engineering)

In addition to gaining credit for the 134 credit points of core units of study set out in Table 10, candidates are required to complete at least 46 credit points of units of study (at least 20 of which are at the 4 or 5 level) from the table of recommended elective units of study for BE (Software 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.

#### Table 10: Software Engineering - continued

Credit	A) Assumed Knowledge Q	) Qualifying P) P	rerequisite
points	<li>C) Corequisite N) Prohibit</li>	ion	Offered

## BE(Software Engineering)/BSc or BA

Unit of study

In addition to gaining credit for the 134 credit points of core units of study set out in Table 10, candidates must complete at least 26 credit points of units of study (at least 12 of which are at the 4 or 5 level) from the table of recommended elective units of study for BE (Software Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science or of the Faculties of Engineering and Arts.

#### BE(Software Engineering)/BMedSc

Candidates are required to gain credit for the 122 credit points of core units of study in Table 10 excluding ELEC 4703 Thesis. They are also required to complete the 12 credit point unit of study ELEC 4705 Interdisciplinary Thesis and at least 26 credit points of 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 (Software Engineering). Candidates should refer to the joint resolutions of the Faculties of Engineering and Science

#### **BE(Software Engineering)/BCom**

In addition to gaining credit for the 134 credit points of core units of study set out in Table 10, candidates must complete at least 26 credit points of units of study (at least 12 of which are at the 4 or 5 level) from the table of recommended elective units of study for BE (Software Engineering).

Candidates are also required to complete at least 100 credit points of units of study in the Faculty of Economics (listed in Table A for the Bachelor of Commerce degree). The Computer Science units of study in Table 10 may be counted, to a maximum of 20 credit points, in the 100 credit points. They may also be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce. No other units of study in Table 10 or the table of recommended electives may be counted in the 100 credit points or used to satisfy a minor or major. Candidates should refer to the joint resolutions of the Faculty of Engineering and the Faculty of Economics and Business for additional information.

### 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 BE(Software Engineering)**

Fi	rst year			
PHYS 1001	Physics 1 (Regular)	6	<ul> <li>A) HSC Physics or HSC 4-unit Science.</li> <li>C) Recommended concurrent units of study: MATH 1001. and 1002 or 1901 and 1902.</li> <li>N) May not be counted with PHYS 1002 or 1901.</li> </ul>	February
Se	econd year			
ELEC 2101	Circuit Analysis	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
Th	nird year			
I SYS 3000	Information Systems Management	4	Q) INFO 2000 or COMP 2000 or ISYS 2006.	July
COMP 3004	Computer Graphics	4	<ul> <li>Q) COMP 2004 or 2904.</li> <li>P) COMP 2002 or 2902 and MATH 1002 or 1902 and 8 credit points in Intermediate Mathematics and/or Statistics and/or Econometrics.</li> <li>N) May not be counted with COMP 3904.</li> </ul>	July
COMP 3102	User Interfaces	4	<ul><li>Q) COMP 2004 or 2904.</li><li>N) May not be counted with COMP 3802.</li></ul>	July
COMP 3204	Software Engineering Project	4	C) COMP 3100 or 3800. NB: Students intending to major in Computer Science are advised to enrol in one of COMP 3201, 3202, 3203, 3204, 3205, 3206 or 3809.	July
ELEC 3103	Electrical Engineering Design	4	P) Advisory Prerequisites: ELEC2101 Circuit Analysis, ELEC2301 Signals and Systems, ELEC2401 Introductory Electronics, and ELEC2601 Microcomputer Systems.	July
ELEC 3302	Fundamentals of Feedback Control	4	<ul><li>P) Advisory Prerequisite: ELEC 2301 Signals and Systems.</li><li>N) MECH3800 Systems Control and CHNG3302 Process Control.</li></ul>	July
ELEC 3401	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	February

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## Table 10: Software Engineering - continued

Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February
Fo	urth year			
INFO 4300	Information Systems (Advanced Topic)	4	P) Credit in ISYS 3000. NB: This unit may be available in February or July semester; it may not always be offered.	February, July
COMP 4305	Networked Systems (Advanced Topic)	4	P) Credit in COMP 3007. NB: This unit may be available in February or July semester; it may not always be offered.	February, July
COMP 4307	Distributed Systems (Advanced Topic)	4	P) Credit in COMP 3007 or Credit in COMP 3009. NB: This unit may be available in February or July semester; it may not always be offered.	February, July
COMP 4309	Object-Oriented Systems (Advanced Topic)	4	P) Credit in COMP 3008. NB: This unit may be available in February or July semester; it may not always be offered.	February, July
COMP 4400	Operating Systems (Advanced Topic)	4	P) Credit in COMP 3009. NB: This unit may be available in February or July semester; it may not always be offered.	February, July
COMP 4401	Software Engineering (Advanced Topic)	4	P) Credit in COMP 3100. NB: This unit may be available in February or July semester; it may not always be offered.,	February, July
ELEC 4302	Image Processing and Computer Vision	4.	P) Advisory Prerequisites: ELEC2301 Signals and Systems, and ELEC4303 Digital Signal Processing.	July
ELEC 4501	Data Communication Networks	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4601	Computer Design	4	P) Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	February
ELEC 5606	Multimedia Systems and Applications	4	<ul> <li>A) COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems.</li> <li>NB: Not offered in 2001.</li> </ul>	July
ELEC 5608	Electronic Commerce	4	<ul> <li>P) Advisory prerequisites: COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>NB: Not offered in 2001.</li> </ul>	July
ELEC 5610	Computer and Network Security	4	A) ELEC4601 Computer Design and ELEC4501 Data Communication Networks. <i>NB: Not offered in 2001.</i>	July
ELEC 5611	Advanced Computer Engineering	4	P) Advisory Prerequisite: ELEC4601 Computer Design. Offered.	July

Notes

1. For units of study offered by a Faculty other than the Faculty of Engineering, any assumed knowledge, prerequisites and corequisites will be

as prescribed by that Faculty 2. The units of study in this table may not all be available every year.

## Table 11: Mechanical Engineering (Biomedical)

Credit

points

Unit of study

A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition

Offered

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) 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 Fi	e units of study rst Year			
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1005	Statistics	3	<ul><li>A) HSC 2-unit Mathematics.</li><li>N) May not be counted with MATH 1905 or 1015.</li></ul>	July, January (short)
MECH 1530	Engineering Mechanics	8	N) CIVL1052 Statics MECH1501 Engineering Statics MECH1511 Introductory Dynamics MECH1510 Kinematics and Dynamics MECH1500 Mechanical Engineering 1.	July
MECH 1545	Introductory Professional Engineering	3	N) A E R O 1 6 0 1 Aerospace Manufacturing MECH1500 Mechanical Engineering 1.	February
MECH 1820	Introduction to Computing	6	N) MECH1800 Computational Engineering 1A MECH1801 Computational Engineering 1C INFO 1000 Information Technology Tools.	February
AERO 1801	Computer Engineering Applications	3	NB: Web page: problemsolvers.aero.usyd.edu.au.	July
BIOL 1003	Human Biology	6	<ul><li>A) HSC 2-unit Biology course.</li><li>N) May not be counted with BIOL 1903.</li></ul>	July, January (short)
CHEM 1401	Chemistry IE	6	<ul><li>P) Mathematics 2-unit course and a satisfactory knowledge of 2-unit Chemistry or the Chemistry component of the 3 or 4-unit Science HSC course.</li><li>N) CHEM 1101, CHEM 1102.</li></ul>	February, January (short)
ELEC 1001	Introductory Electrical Engineering	4	<ul><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li><li>N) ELEC1102 Foundations of Electronic Circuits.</li></ul>	July
Se	cond Year			
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differential Equations	4	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MATH 2052	Numerical Methods	2	C) MATH 2001 or 2901. N) MATH 2952.	July
MECH 1600	Manufacturing Technology	4	N) AERO 1600 Workshop Technology.	July
MECH 2201	Thermodynamics 1	4	N) MECH 2200 Thermofluids.	February
MECH 2300	Materials 1	4	N) CIVL 2101 Properties of Materials.	July
MECH 2400	Mechanical Design 1	6		July

Unit of	study	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
		Point	-)	
MECH 2500	Engineering Dynamics 1	4	P) MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	July
MECH 2900	Anatomy and Physiology for Engineers	4	P) Biology BIOL 1001 or some previous biology experience.	February
AERO 22012	Fluid Mechanics 1	4	<ul> <li>P) MATH 1001, MATH 1002, MATH 1003.</li> <li>N) AERO2701 Space Engineering 1.</li> <li>NB: Webpage: <u>www.aero.usyd.edu.au/aero/aerodyn.html</u>.</li> </ul>	July
ELEC 2003	Electrical and Electronic Engineering A	4	<ul> <li>P) ELEC 1001 Introductory Electrical Engineering.</li> <li>N) ELEC 2001 Electrical and Electronic Engineering, and ELEC2101 Circuit Analysis, and ELEC2401 Introductory Electronics, and ELEC2601 Microcomputer Systems.</li> </ul>	February
Th	ird Year			
AERO 2300	Mechanics of Solids 1	4	P) 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
MECH 3211	Fluid Mechanics 2	4	<ul><li>P) AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1.</li><li>N) AERO3250 Aerodynamics 2.</li></ul>	July
MECH 3300	Materials 2	4	P) MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	July
MECH 3400	Mechanical Design 2A	4	P) MECH 2400 Mechanical Design 1.	February
MECH 3410	Mechanical Design 2B	4	P) MECH 2400 Mechanical Design 1.	July
MECH 3500	Engineering Dynamics 2	4	P) MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	February
MECH 3600	Manufacturing Engineering	6	P) MECH 1600 Manufacturing Technology.	February
MECH 3620	Industrial Management	5		July
MECH 3800	Systems Control	4	P) MATH 2001 and MATH 2005.	July
MECH 3910	Biomedical Technology	3		February
MECH 3920	Biomedical Design Project	2	N) MECH 3610 Team Project.	July
ELEC 3801	Fundamentals of Biomedical Engineering	4	P) Advisory Prerequisite: ELEC2401 Introductory Electronics or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A.	February
Fo	urth Year			
MECH 3310	Mechanics of Solids 2	4	P) AERO 2300 Mechanics of Solids 1 and MATH 2005.	February
<b>MECH</b> 4101	Thesis A	0	P) 36 credit points of Third Year units of study.	February, July
MECH 4102	Thesis B	12	P) MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	February, July
MECH 4110	Professional Engineering	4	P) 36 credit points of Senior units of study.	February
MECH 4120	Professional Communication	4	P) 32 credit points of third year units of study.	July
MECH 4130	Practical Experience	0	P) 28 credit points of second year units of study.	February, July
MECH 4900	Orthopaedic Engineering	4	P) MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.	February
MECH	Biomechanics and	4	P) 36 credit points of third year units of study.	July

MECH Biomechanics and 4910 Biomaterials

#### Table 11: Mechanical Engineering (Biomedical) - continued

Unit of study	Credit points	A) Assumed Knowledg C) Corequisite N) P	ge Q) Qualifying rohibition	P) Pre	erequisite		Offered
ELEC Biomedical Engineering 4801 Systems	4 . Ni	A) ELEC3801 B: Not offered in 2001.	Fundamentals	of ,	Biomedical	Engineering.	July

#### Notes to Table 11

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. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics MATH 2051 (2cp).

## Resolutions of the Faculty of Engineering relating to Table 11

Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) and candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) combined with Bachelor of Science are required to gain credit for all core units of study set out in Table 11. Additional credit necessary to satisfy Section 9 shall be gained by completing at least 12 credit points of elective units of study.

## 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 11.

		Acceptable alternative
MECH 1530	Engineering Mechanics	PHYS 1001
MECH 1820	Introduction to Computing	COMP 1001
AERO 1801	Computer Engineering Applications	COMP 1001
AERO 1801	Computer Engineering Applications	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 Levels should seek advice from their Department before enrolling.

## Resolutions of the Department of Mechanical and Mechatronic Engineering relating to Table 11

#### Note

Units of study not included in this table may also be selected subject to the approval of the Head of Department, Mechanical and Mechatronic Engineering.

## Recommended elective units of study

			5	
ENGG 4001	Innovation/International Competitiveness	4		February
MECH 4210	Computational Fluid Dynamics	4	P) MECH 3210 Fluid Mechanic.	July
MECH 4230	Environmental Acoustics & Noise Control	2	<ul><li>P) 24 credit points of third year units of study.</li><li>N) MECH 4220 Environmental Engineering.</li></ul>	February
MECH 4240	Energy and the Environment	4	<ul><li>P) 24 credit points of Senior units of study.</li><li>N) MECH4220 Environmental Engineering.</li></ul>	February
MECH 4310	Advanced Engineering Materials	6	<ul><li>P) MECH 3300 Materials 2.</li><li>N) MECH 4315 Advanced Aerospace Materials.</li></ul>	July
MECH 4610	Industrial Engineering and Management	2	<ul><li>P) MECH 3620 Industrial Management.</li><li>N) MECH 4605 Industrial Engineering.</li></ul>	February
MECH 4620	Industrial Ergonomics	2	N) MECH 4605 Industrial Engineering.	February
MECH 4635	Introduction to Operations Research	4	<ul><li>P) MATH1005 MATH2001 MATH2002 MATH2005.</li><li>N) MECH4600 Industrial Engineering.</li></ul>	February
AERO 4303	Aerospace Structures 3	6	<ul><li>P) AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2.</li><li>N) AERO 4301 Applied Numerical Stress Analysis.</li></ul>	February

Table 11: Mechanical Engineering (Biomedical) - continued					
Unit of study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered		
BCHM Genes and Proteins 2001	8 Q) 6 N)	<ul> <li>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.</li> <li>May not be counted with AGCH 2001 or BCHM 2101 or 2901.</li> </ul>	January (short)		
MICR Introductory Microbiology 2001	8 Q) P) N)	<ul> <li>) Pass average in 12 credit points of first year Biology.</li> <li>6 credit points of first year Chemistry.</li> <li>) May not be counted with MICR 2003 or 2901.</li> </ul>	February		

1 401		0		
Unit of	study	Credit points	<ul><li>A) Assumed Knowledge Q) Qualifying P) Prerequisite</li><li>C) Corequisite N) Prohibition</li></ul>	Offered
<b>Core</b> Fin	e units of study rst Year			
AERO 1600	Workshop Technology	4	N) MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	February
AERO 1701	Introduction to Aerospace Engineering	3		February
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004i	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
MECH 1530	Engineering Mechanics	8	N) CIVL1052 Statics MECH1501 Engineering Statics MECH1511 Introductory Dynamics MECH1510 Kinematics and Dynamics MECH1500 Mechanical Engineering 1.	July
MECH 1820	Introduction to Computing	6	N) MECH1800 Computational Engineering 1A MECH1801 Computational Engineering 1C INFO 1000 Information Technology Tools.	February
Se	cond Year			
AERO 2300	Mechanics of Solids 1	4	P) 12 credit points of first year Maths (i.e Maths 1001,1002,1003,1005).	February
AERO 2701	Space Engineering 1	8	N) AERO2201 Fluid Mechanics 1 AERO2500 Introductory Flight Mechanics and Performance.	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	14	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
MECH 2201	Thermodynamics 1	4	N) MECH 2200 Thermofluids.	February
MECH 2300	Materials 1	., 4	N) CIVL 2101 Properties of Materials.	July
MECH 2400	Mechanical Design 1	6		July
MECH 2500	Engineering Dynamics 1	4	P) MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	July
ELEC 2101	Circuit Analysis	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	February
ELEC 2401	Introductory Electronics	4	<ul> <li>P) Advisory Prerequisite: ELEC1102 Foundations of Electronic Circuits.</li> <li>N) ELEC2001 Electrical and Electronic Engineering, and ELEC2002 Electrical Technology, and ELEC2003 Electrical and Electronic Engineering A.</li> </ul>	July
Th	ird Year			
AERO 3301	Aerospace Structures 1	4	P) AERO 2300 Mechanics of Solids 1.	February
AERO 3351	Aerospace Structures 2	4	P) AERO 2300 Mechanics of Solids 1.	July

Table	12: Aeronautical Engin	neering	g (Space Engineering) - continued	
Unit of	study	Credil points!	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
AERO 3401	Aerospace Design	4	<ul><li>P) MECH 2400 Mechanical Design 1.</li><li>N) AERO 3400 Aircraft Design 1.</li></ul>	February
AERO 3500	Flight Mechanics 1	4	P) AERO 2500 Introductory Flight Mechanics and Performance.	July
AERO 3700	Space Engineering 2	8	P) AERO 2701 Space Engineering 1.	July
MECH 3201	Thermodynamics 2	4	<ul><li>P) MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1.</li><li>N) MECH 3200 Thermal Engineering 1.</li></ul>	February
MECH 3300	Materials 2	4	P) MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	July
MECH 3500	Engineering Dynamics 2	4	P) MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	February
ELEC 3102	Engineering Electromagnetics	4	P) Advisory Prerequisites: PHYS2203 Physics2EE and ELEC2101 Circuit Analysis.	February
<b>ELEC</b> 3 4 0 1	Electronic Devices and Circuits	4	P) Advisory Prerequisites: ELEC2401 Introductory Electronics and ELEC2101 Circuit Analysis.	February
ELEC 3402	Communications Electronic	s 4	P) Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	July
Fo	urth Year			
AERO 4201	Propulsion	4	P) MECH 3201 Thermodynamics 2.	July
AERO 4303	Aerospace Structures 3	6	<ul><li>P) AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2.</li><li>N) AERO 4301 Applied Numerical Stress Analysis.</li></ul>	February
AERO 4400	Aircraft Design 3	6	P) AERO 3450 Aircraft Design 2 AERO 3401 Aerospace Design.	February
AERO 4500	Flight Mechanics 2	6	P) AERO 3500 Flight Mechanics 1.	February
AERO 4600	Practical Experience	0	P) 40 credit points of 3rd year UOS.	July
AERO 4700	Space Engineering 3	4	P) AERO 3700 Space Engineering 2.	February
AERO 4950	Thesis Preparation	2	P) 40 credit points of 3rd year UOS.	February, July
AERO 4900	Thesis or Design Project	10	P) 40 Credit Points of 3rd Year UOS AERO 4950 Thesis Preparation.	February, July
AERO 4920	Seminar	2	P) 40 credit points of 3rd Year UOS.	July
				-

Notes

1. MATH 1005 Statistics is an ace:eptable;ilternative to MATH 1004.

### Resolutions of the Faculty of Engineering relating to Table 12

#### Degree eligibility

BE(Aeronautical)(Space Engineering)

In addition to gaining credit for the 160 credit points of core units of study set out in Table 3, candidates are required to complete at least 32 credit points of elective units of study from Table 2, recommended elective units of study for BE (Aeronautical) (Space Engineering). A mininum of 192 credit points is required to be eligible for the award of the degree of BE (Aeronautical) (Space Engineering).

#### Acceptable alternative units of study

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent Advanced level unit, 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.

Students undertaking Study Abroad in their final year of the degree must enrol in the AERO 4620 Aeronautical International Exchange Program unit of study as an alternative to a semester's standard units.

Table	12: Aeronautical Engin	neering	g (Space Engineering) - continued	
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
Reco Fin	ommended electiv rst Year	ve ur	nits of study	
AERO 1801	Computer Engineering Applications	3	NB: Web page: problemsolvers.aero.usyd.edu.au.	July
PHYS 1500	Astronomy	6	A) No assumed knowledge of Physics.	July
Se	cond Year			
AERO 2201	Fluid Mechanics 1	4	<ul> <li>P) MATH 1001, MATH 1002, MATH 1003.</li> <li>N)AERO2701 Space Engineering 1.</li> <li>NB: Web page: <u>www.aero.usyd.edu.au/aero/aerodyn.html</u>.</li> </ul>	July
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2052	Numerical Methods	2	C) MATH 2001or2901. N) MATH 2952.	July
Th	ird Year			
AERO 3200	Aerodynamics 1	4	P) AERO 2201 Fluid Mechanics 1.	February
AERO 3250	Aerodynamics 2	4	<ul><li>P) AERO 2201 Fluid Mechanics 1.</li><li>N) MECH 3211 Fluid Mechanics 2.</li></ul>	July
AERO 3501	Flying Operations	2	P) AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1.	February
AERO 3602	Aviation Operation and Management	4		July
Fo	urth Year			
AERO 4250	Aerodynamics 4	3	P) AERO 3250 Aerodynamics 2.	July
AERO 4290	Rotary Wing Aircraft	4	P) AERO 3250 Aerodynamics 2.	February
AERO 4291	Advanced Computational Aerodynamics	3	P) AERO 3250 Aerodynamics 2.	July
AERO 4292	Aeroelasticity	3	P) AERO 3250 Aerodynamics 2.	July
AERO 4351	Aerospace Structures 4	3	P) AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	July
AERO 4390	Smart Materials and Structures	3	P) AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	July
AERO 4490	Advanced Aircraft Design	4	P) AERO 3450 Aircraft Design 2, AERO 3401 Aerospace Design.	July
AERO 4590	Advanced Flight Mechanics	\$ 3	P) AERO 3500 Flight Mechanics 1.	July
ELEC 4502	Digital Communication Systems	4	P) Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 5502	Satellite Communication Systems	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	July

### Notes

Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
 Approved elective units of study given by Departments other than the School of Aerospace, Mechanical and Mechatronic Engineering may be taken as alternatives, subject to the approval of the head of school.

## Table 13: Advanced Engineering and Faculty-wide elective subjects

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition	Offered

Candidates for the degree of Bachelor of Engineering in any discipline. These elective subjects are available for advanced engineering students and students in all disciplines of engineering. 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. Students are eligible for the advanced engineering stream of engineering by obtaining a UAI of 98+ in the NSW HSC or equivalent, or by obtaining a Distinction average in Years 1 and 2 of their engineering course.

<b>ENGG</b> 1001	Interdisciplinary Project	12	P) UAI score of at least 98. Students considering this option are advised to see their Head of Department.	February
			N) Mutually exclusive with a number of other first year units of study. As these will	

Mutually exclusive with a number of other first year units of study. As these will vary depending on the branch of Engineering, students considering this option are advised to see their Head of Department prior to enrolment.

ENGG 1002	Introduction to Engineering Leadership	2		July
ENGG 2002	Advanced Engineering Project	2	P) Only students who have been named on the Dean's list at the end of Year 1 will be eligible.	July
ENGG 2003	Introduction to Engineering Management	4	N) ELEC3701, MECH3620.	July
ENGG 2006	Advances in Engineering Leadership	2	P) ENGG 1002.	July
ENGG 3001	Technology Education	2	P) Only students who have been named on the Dean's list at the end of Year 2 will be eligible.	July
ENGG 3002	Industrial and Engineering Management		Not available in 2001 (4 credit points).	
ENGG 4002	New Business Creation	4		July
ENGG 4003	Economic, Social & Ethical Aspects of En	4		July
ENGG 4004	Advanced Engineering Design Project	12	<ul> <li>P) Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group.</li> <li>N) AERO4900, AERO4950, CHNG4201, CHNG4202, CIVL4013, CIVL4014, ELEC4703.MECH4102,.</li> </ul>	February, July

Note

These units of study are elective units of study available in any discipline of engineering.

## Table 14: Electronic Commerce

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition	Offered

## Core units of study

Candidates for the degree of Bachelor of Engineering in Electronic 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 recommended or approved by the Faculty.

Fi	st year			
ACCT 1003	Financial Accounting Concepts	6	N) Terminating unit. Cannot be counted with ACCT1001 and ACCT1002.	February
ACCT 1004	Management Accounting Concepts	6	N) Terminating unit. Cannot be counted with ACCT1001 and ACCT1002.	July
COMP 1001	Introductory Programming	6	<ul> <li>A) HSC 3-unit Mathematics.</li> <li>C) Students intending to major in Computer Science are advised to enrol in MATH 1003 and 1004 or 1004 and 1005 or 1903 and 1904 or 1904 and 1905 in their first year.</li> <li>N) May not be counted with COMP 1901.</li> </ul>	February. July, January (short)
COMP 1002	Introductory Computer Science	6	<ul><li>P) COMP 1001 or 1901.</li><li>N) May not be counted with COMP 1902.</li></ul>	February, July, January (short)
ELEC 1101	Foundations of Computer Systems	6	A) HSC Maths 3 unit.	February
MATH 1001	Differential Calculus	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1901 or 1011.</li></ul>	February, January (short)
MATH 1002	Linear Algebra	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1902 or 1012.</li></ul>	February, January (short)
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A) HSC 4-unit Mathematics or MATH 1001.</li><li>N) May not be counted with MATH 1903 or 1013.</li></ul>	July, January (short)
MATH 1004	Discrete Mathematics	3	<ul><li>A) HSC 3-unit Mathematics.</li><li>N) May not be counted with MATH 1904.</li></ul>	July, January (short)
Se	cond year			
CLAW 2006	Legal Issues for eCommerce:	8	P) 48 credit points at level 1000.	February, July
COMP 2002	Design and Data Structures	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2902.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	February
COMP 2004	Programming Practice	4	<ul> <li>Q) COMP 1002 or 1902.</li> <li>N) May not be counted with COMP 2904.</li> <li>NB: See prerequisites for Senior Computer Science units of study. Consult Departmental Handbook.</li> </ul>	July, January (short)
ELEC 2301	Signals and Systems	4	<ul> <li>P) Advisory Prerequisite: MATH1001 Differential Calculus, and MATH1002 Linear Algebra, and MATH1003 Integral Calculus and Modelling, and MATH1004 Discrete Mathematics.</li> <li>N) MATH3019 Signal Processing and MATH3909 Signal Processing (Adv).</li> </ul>	July
ELEC 2601	Microcomputer Systems	4	<ul><li>P) Advisory Prerequisite: ELEC1101 Foundations of Computer Systems.</li><li>N) ELEC2001 Electrical and Electronic Engineering and ELEC2003 Electrical Electronic Engineering A.</li></ul>	February
INFO 2000	System Analysis and Design	4	<ul><li>Q) INFO 1000 or COMP 1000 or 1001 or 1901 or COMP 1002 or 1902.</li><li>N) May not be counted with COMP 2000.</li></ul>	February
MATH 2001	Vector Calculus and Complex Variables	4	<ul><li>P) MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2901.</li></ul>	February, January (short)

Table	14: Electronic Comme	rce - c	continued	
Unit of	study	Credit points	A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered
MATH 2002	Matrix Applications	4	<ul><li>P) MATH 1002 or 1902 or Distinction in MATH 1012.</li><li>N) May not be counted with MATH 2902.</li></ul>	February, January (short)
MATH 2005	Fourier Series & Differentia Equations	14	<ul><li>P) MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li><li>N) May not be counted with MATH 2905.</li></ul>	July, January (short)
МКТ <b>G</b> 2001	Marketing Principles	8	<ul> <li>P) ECON1001, ECON1002, ECMT1010 and ECMT1020.</li> <li>C) ACCT1001 orACCT1003.</li> <li>NB: Marketing units of study commence in second year, but prerequisites must be completed in first year.</li> </ul>	February, January (short)
Th	ird year			
ACCT 3006	ecommerce Business Model	s 8	<ul><li>A)INFO1000.</li><li>P) 48 credit points at level 1000.</li></ul>	July
COMP 3009	Operating Systems	4	<ul> <li>Q) COMP 2004 or 2904.</li> <li>P) COMP 2001 or 2901 or ELEC 2601.</li> <li>N) May not be counted with COMP 3909.</li> </ul>	February
EBUS 3001	Introduction to Electronic Commerce Systems		Not offered in 2001.	
EBUS 3002	Introduction to Electronic Commerce Technology		Not offered in 2001.	
ELEC 3502	Random Signals and Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	February
ELEC 3503	Introduction to Digital Communications	4	P) Advisory Prerequisite: ELEC2301 Signals and Systems.	July
ELEC 3603	Introduction to Computing Systems		Not offered in 2001.	
ELEC 3604	Internet Engineering	4	<ul> <li>P) Advisory prerequisites: ELEC1101 Foundations of Computer systems, COMP2002 Design and Data Structures and COMP2004 Programming Practice.</li> <li>N) ELEC5609 Internet Engineering, COMP3007 Networked systems.</li> </ul>	July
Fo	ourth year			
ELEC 4501	Data Communication Networks	4	P) Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February
ELEC 4702	Practical Experience	0		February
ELEC 4703	Thesis	12	P) A minimum of 3 6 credit points from third and fourth year units of study.	July
EBUS 5001	Electronic Commerce Programming		Not offered in 2001.	
EBUS 5002	Electronic Commerce Systems		Not offered in 2001.	
ELEC 5610	Computer and Network Security	4	A) ELEC4601 Computer Design and ELEC4501 Data Communication Networks. <i>NB: Not offered in 2001.</i>	July
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#### Notes to Table 14

1. For units of study offered by a faculty other than the Faculty of Engineering, any assumed knowledge and prerequisites will be as prescribed by that faculty. 2. Some of the units of study shown will not be available until after 2001 and are not listed in the Engineering handbook. For a description of

these units of study, see the web pages of the School of Electrical and Information Engineering.

## Resolutions of the Faculty of Engineering relating to Table 14

#### **BE(Electronic Commerce)**

In addition to gaining credit for the 162 credit points of core units of study set out in Table 14, candidates are required to complete at least 18 credit points of units of study from the table of recommended elective units of study for BE (Electronic Commerce), of which at least 6 credit points are to be from Group A and at least 12 credit points from Group B. 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.

#### Table 14: Electronic Commerce - continued

	Credit	A) Assumed Knowledge Q) Qualifying P) Prerequisite	
Unit of study	points	C) Corequisite N) Prohibition Of	ffered

#### **BE(Electronic Commerce)/BCom**

Candidates are required to gain credit for the 150 credit points comprising all of the units of study in Table 14 except for ACCT 1003 and ACCT 1004. Candidates must also complete at least 10 credit points of units of study from Group B of the table of recommended elective units of study for BE (Electronic Commerce).

Candidates are also required to complete at least 100 credit points of units of study in the Faculty of Economics and Business (listed in Table A for the Bachelor of Commerce degree). The Computer Science units of study in Table 14 may be counted, to a maximum of 20 credit points, in the 100 credit points. They may also be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce. No other unit of study used to satisfy the requirements described in the previous paragraph may be counted in the 100 credit points or used to satisfy a minor or major.

Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics and Business for additional information.

#### 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

G	oup A			
ECMT 1011	Econometrics 1A Stream 1	6	A) 4 unit Maths. N) MATH 1005, MATH 1905.	February
ECMT 1021	Econometrics 1B Stream 1	6	<ul> <li>A) 4 unit Maths.</li> <li>C) ECMT 1011.</li> <li>N) MATH 1005, MATH 1905.</li> <li>NB: Other than in exceptional circumstances, it is strongly recommended that students do not undertake Econometrics IB before attempting IA.</li> </ul>	July
ECON 1001	Introductory Microeconomics	6	A) HSC 2 unit Mathematics.	February, January (short)
ECON 1002	Introductory Macroeconomics	6	A) HSC 2 unit Mathematics.	July, January (short)
ELEC 1102	Foundations of Electronic Circuits	6	<ul><li>A) HSC Physics 2 unit.</li><li>P) Advisory Prerequisite: MATH1001 Differential Calculus.</li></ul>	July
<b>TPTM</b> 2001	Logistics & Supply Chain for e-Business	8	<ul><li>A) ECHS2305, IREL2010.</li><li>P) 48 credit points of level 1000 study.</li></ul>	July
ACCT 3005	IT Assurance and Control	8	A) INFO 1000. P) ACCT2003.	February
Gr	oup B			
PHYS 1001	Physics 1 (Regular)	6	<ul><li>A) HSC Physics or HSC 4-unit Science.</li><li>C) Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902.</li><li>N) May not be counted with PHYS 1002 or 1901.</li></ul>	February
PHYS 1003	Physics 1 (Technological)	6	<ul> <li>A) HSC 2-unit Physics or HSC 4-unit Science or PHYS 1001 or 1002 or 1901 or equivalent.</li> <li>C) For Science students: Recommended concurrent units MATH 1003 and 1005 or 1903 and 1905.</li> <li>N) For Science students: May not be counted with PHYS 1004 or 1902.</li> </ul>	February, July
COMP 3001	Algorithms	4	<ul> <li>Q) COMP 2002 or 2902.</li> <li>P) MATH 1004 or 1904 and 8 credit points in Intermediate Mathematics and/or Statistics and/or Econometrics.</li> <li>N) May not be counted with COMP 3901.</li> </ul>	July
ELEC 3701	Management for Engineers	4	P) Advisory Prerequisite: Nil.	February
MATH 3024	Elementary Cryptography and Protocols	4	P) 12 credit points of Intermediate Mathematics. Strongly advise MATH 2008 or 2908.	February
MATH 3925	Public Key Cryptography (Advanced)	4	P) 12 credit points from Intermediate or senior mathematics. Strongly recommend MATH 3902.	July

Table	Cable 14: Electronic Commerce - continued						
Unit of	study	Credit points		A) Assumed Knowledge Q) Qualifying P) Prerequisite C) Corequisite N) Prohibition	Offered		
ELEC 4502	Digital Communication Systems	4	P)	Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February		
ELEC 4604	Engineering Software Requirements	4	P)	Advisory Prerequisite: COMP3100 Algorithms, COMP3205 Product Development Project, ELEC3601 Digital Systems Design and ELEC3701 Management for Engineers.	July		
ELEC 4704	Software Project Management	4	P)	Advisory Prerequisites: COMP3100 Algorithms, COMP3205 Product Development Project and ELEC3701 Management for Engineers.	February		
EBUS 5003	Electronic Commerce Engineering			Not offered in 2001.			
EBUS 5004	The Impacts and Challenges of Electronic Commerce	8		Not offered in 2001.			
ELEC 5501	Communication Networks (Advanced)	4	P)	Advisory Prerequisites: ELEC3502 Random Signals and Communications, ELEC3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks.	July		
ELEC 5504	Cellular Radio Engineering	4	P)	Advisory Prerequisites: ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications.	February		
ELEC 5505	Advanced Digital Transmissions	4	A) NE	ELEC3502 Random Signals and Communications, and ELEC3503 Introduction to Digital Communications. <i>B: Not offered in 2001.</i>	July		
ELEC 5606	Multimedia Systems and Applications	4	A) NE	COMP3100 Software Engineering, ELEC 4303 Digital Signal Processing, and ELEC 4501 Data Communication Systems. <i>3: Not offered in 2001.</i>	July		

Notes

For units of study offered by a faculty other than the Faculty of Engineering, any assumed knowledge and prerequisites will be as prescribed by that faculty.
 The units of study in this table may not all be available every year.
 Some of the units of study shown will not be available until after 2001 and are not listed in the Engineering handbook. For a description of these units of study, see the web pages of the School of Electrical and Information Engineering.

## CHAPTER 4 Regulations

## Undergraduate degree requirements

## Bachelor of Engineering: Resolutions of the Senate

### 1. Specialisations

- (1) The degree of Bachelor of Engineering shall be awarded in the following specialisations:
  - (i) Aeronautical Engineering (including Space and Management)
  - (ii) Chemical Engineering (including Bio Process,
  - Environmental and Energy, Process and Computer Systems and Management)
  - (iii) Civil Engineering (including Environmental,
  - Geotechnical, Structural engineering; Construction
  - Management)
  - (iv) Computer Engineering
  - (v) Electrical Engineering (including Management)
  - (vi) Mechanical Engineering (including Management)(vii) Mechanical Engineering (Mechatronics) (including Management)
  - (viii) Mechanical (Biomedical) Engineering
  - (ix) Project Engineering and Management (Civil)
  - (x) Software Engineering
  - (xi) Telecommunications Engineering
  - (xii) e Commerce
- (2) (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), Bachelor of Science (BSc) Bachelor of Medical Science (B MedSc)
  (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.
- (3) The testamur for the degree of Bachelor or Engineering shall specify the specialisation for which it is awarded.
- (4) (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.
- (5) 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:
- (1) A 'unit of study' shall comprise such lectures, tutorial instruction, essays, exercises and practical work as the Faculty may prescribe.
- (2) 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.
- (3) '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.
- (4) 'Elective' unit of study means a unit of study other man a core unit of study.

- (5) '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.
- (6) '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

- (1) The units of study for the degree shall each have a credit point value.
- (2) The units of study which may be taken for the degree are:(i) the units of study set out in the tables appended to mese resolutions; and
  - (ii) such other units of study as are approved by the Faculty.
- (3) 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.
- (4) 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.
- (5) 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

- (1) A final examination shall be prescribed for each unit of study.
- (2) 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.
- (3) 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

- (1) Except with the permission of the Faculty, a candidate in the first year of attendance shall enrol in First Year units of study with a total of not less than 48 credit points and not more than 54 credit points.
- (2) 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 First Year and/or Second Year units of study only;
(ii) the candidate shall enrol in any core units 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(2);

(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.

- (3) The Faculty may in special circumstances grant dispensation from the requirements of subsections (1) and (2)...
- (4) 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.
- (5) 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.
- (6) 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

- (1) 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.
- (2) 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.
- (3) 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.
- (4) 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 First Year, Second Year, Third Year or Fourth Year.

#### 8. Levels of Award

- The degree of Bachelor of Engineering shall be awarded in two grades, namely, the Pass degree and the Honours degree.
- (2) (i) There shall be three classes of Honours, namely, Class I, Class II and Class HI.
- (ii) Second Class Honours may be awarded in two divisions, namely Division 1 and Division 2.
- (3) 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

(1) To qualify for the award of a Pass degree a candidate shall, unless granted exemption by the Faculty under subsection(2) 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.

- (2) 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.
- (3) 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

- (1) 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.
- (2) The Faculty may prescribe any Third Year or Fourth Year of study as being an Honours unit of study.
- (3) 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.
- (4) 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, BE/BA or BE/BMedSc degrees.
- (5) A candidate for an Honours degree who has failed to be placed in any Honours classification may be awarded a Pass degree.
- (6) 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: Resolutions of the Faculty

#### Minimum and maximum completion times

1. That the minimum time for completion of the BE degree shall be two years and the maximum shall be eight years.

## 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.
- 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 Second orThird Year 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.

## Joint Resolutions of the Faculties of Engineering and Economics and Business (BE/BCom)

- 1. Candidature for this combined degree program is a minimum of 5 years of full-time study.
- Candidates qualify for the two degrees of the combined program (a separate testamur being awarded for both the BE and the BCom) by completing the following:

   (a) The units of study prescribed for the BE specialization. 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 and Business (listed in Table A for the Bachelor of Commerce degree) worth at least 100 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 inTable A, or one major and one minor from subjectslisted in Table A.

Note that a major is a sequence of 44 credit points as described for each subject in Table A; a minor in a subject comprises a sequence 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.

(c) No unit of study taken to satisfy the requirements for the BE degree may be counted in the 100 credit points in the Faculty of Economics nor be used to satisfy a minor or major except that:

(i) Computer Science units of study may be counted, to a maximum of 20 credit points, in the 100 credit points. They may also be used to satisfy the requirement for a minor (or second major) for the Bachelor of Commerce.
(ii) Eight credit points of second year Statistics units of study, as prescribed by the Faculty of Economics, may be counted in the 100 credit points and may be used in place of first-year level Econometrics to satisfy the requirements for a major or minor.

- 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 and Business.

- 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.

#### **Previous joint resolution**

The previous joint resolutions, which apply to those entering the combined degree as second year students up to and including 1998, appear in Volume 1 of the 1996 Calendar.

## 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.
- 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 Second Year units of study and 24 of which must be from Third Year 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 (or parts 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 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 Science (BE/BMedSc)

1. A student may proceed concurrently to the degrees of Bachelor of Medical Science and any stream of the Bachelor of Engineering (except Civil Engineering or Electronic Commerce). To qualify for the award of the pass degrees, a student shall complete units of study totalling at least 240 credit points including:

(a) at least 160 credit points from prescribed Engineering units of study, including an interdisciplinary thesis (see note 2(e) below);

(b) at least 24 credit points from Junior Science units of study (which may be common with those of 2(a)), but including CHEM 1102 Chemistry 1B, BIOL1003 Human Biology and 12 credit points of Mathematics;

(c) 40 credit points of Intermediate core units of study as listed in Table IV of units of study for the BMedSc; (d) at least 24 credit points of Senior units of study taken from the subject areas of Anatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology, Immunology, Infectious Diseases, Microbiology, Pharmacology and Physiology as listed in Table IV;

(e) a 12 credit point interdisciplinary thesis jointly supervised by departments from Engineering and Science.

- Students who are so qualified may be awarded honours in the BE degree or undertake an honours course in the BMedSc degree.
- Students may abandon the combined degree course and elect to complete either a BMedSc or a BE in accordance with the resolutions governing those degrees.
- 5. Students will be under the general supervision of the Faculty of Engineering.
- 6. The Deans of the Faculties of Engineering and Science shall jointly exercise authority in any matter concerning the combined degrees not otherwise dealt with in these resolutions.

## Student guide to regulations

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 (and satisfy any requirements on recommended electives) of your chosen branch of engineering,
- gain credit for a minimum of 192 credit points,
- complete a period of practical experience in engineering and
  be a candidate for a minimum of two years and a maximum
- of 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.

A core unit of study is one that must be passed to fulfil the requirements for the degree. 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 recommended elective units of study for each branch of engineering are listed in tables.

Descriptions of each unit of study, in numerical order, are also provided in this document.

#### 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.

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.

#### 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 submitted to the Student Centre (Carslaw) within 7 days of the incident, and a copy given to the Department. 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 must gain not less than 192 credit points, and satisfy all requirements on core and recommended elective units of study.

The minimum time in which you can qualify for the degree is four years. 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 a part-time basis or externally.

#### Classification into years

Students are classified as being in First Year, Second Year, Third Year or Fourth Year according to the year from which the majority of their credit points are being taken.

#### Changing your specialisation

Students who wish to change their specialisation (eg, from Chemical to Mechanical) must obtain written Faculty approval. Such a change may entail an extra year (or more) of study.

#### First year enrolment

In your first year of attendance you must enrol in at least 48, and no more than 54, credit points.

#### Second and later year enrolments

The minimum enrolment for re-enrolling students is normally 36 credit points and the maximum is normally 60 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 60 credit points limit require written Faculty permission.

Second Year students must include in their enrolment any outstanding First year 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, Third Year students must include in their enrolment any outstanding First Year and Second Year core units of study, etc.

Your enrolment in any 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 wish to take the opportunity of transferring to the Faculty of Science at the end of your Second (or Third) BE year, you should consult the appropriate Faculty of Science resolutions relating to this double degree.

#### Advice for students

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 after each semester 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.

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 Board of Examiners may award a concessional pass (PCON) instead of a Fail. A PCON is treated as a full pass for progression purposes.

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.

A grade of R denotes that a unit of study has been satisfactorily completed.

#### Exemption from attendance at classes

If you enrol in a unit of study which you have previously attempted you may be granted exemption by the Department from attendance at laboratory or practical classes.

#### **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 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 10 weeks, is normally undertaken after you complete some or all of the prescribed Third Year 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 Third Year, or undertake a part at the end of Second Year and complete the work experience at the end of Third 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.

#### Honours degree

Conditions for the award of Honours are described elsewhere. Note that there is no special admission procedure to an Honours program.

## An alternative to the combined BE/BSc degree program

Many Engineering students take the opportunity of gaining the BE and Bsc degrees over five years. As well as the combined BE/BSc degree (described previously), there is a second option (henceforth referred to as the double degree BSc/BE program).

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 Third Year of the BE degree. 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 men transfer back to the Faculty of Engineering in order to complete their BE degrees.

If you wish to take the opportunity of transferring to the Faculty of Science at the end of your Second Year(or Third Year) BE year, you should consult the appropriate Faculty of Science resolutions relating to this double degree.

If you are interested in proceeding towards the 'double degree' it is essential that you plan your units of study carefully in your First Year, so that you fulfil prerequisite requirements for the Second Year Science units of study which you must take in your Second Year.

Application to transfer to the Faculty of Science should be made at the end of your second (or third) year of studies.

Applications for transfer to the Faculty of Science are available at the Student Centre and the Faculty of Science and Faculty of Engineering Offices.

#### 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 must make application through the Universities Admissions Centre by the advertised closing date.

Your application will be considered on the basis of academic merit. 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 First Year and Second Year 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.

#### Advanced Engineering Program

The Faculty makes special provision for First Year students who have achieved outstanding academic results before coming to the Faculty. For students who achieve a UAI of 98+ with 4 Unit Mathematics and Science (4 Units from Physics, Chemistry, Engineering Science or Science). HSC students in this category will be granted exemption for half of their

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Semester 1 material, and may choose to commence study in the July Semester or undertake a special interdisciplinary engineering project in a group with other Advanced Students. Students can apply to enter this arrangement on enrolment in their first year by discussing their options with the Dean or Head of Department.

The optional Advanced Engineering Program continues through years 2 and 3 with special subjects available only to those students named on the Dean's List for Excellence in the previous year.

#### Discontinuation and variation of enrolment

Please note that **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.

There are three categories of discontinuation results used to record discontinuations: 'Withdrawn', 'Discontinued - Not to count as failure', and 'Discontinued - Fail'. *These results are dependent upon the time of year you 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 - Not to count as failure (DNF)**, 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 - Not to count as failure' appear on an official transcript of your academic record.

If your enrolment is **Discontinued - Fail (DF)**, 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 - Fail'. 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 submitting a 'Variation of Enrolment' form to the Engineering Faculty Office. You should note your reasons for discontinuing on this form.

#### 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.

You may enrol in a unit of study given in first semester (or full-year) prior to 31 March. You may enrol in a unit of study given in second semester prior to 31 August.

Discontinuations from units of study are described below. Before 31 March (First Semester HECS deadline) You may withdraw from any unit of study without academic or financial penalty. Your discontinuation result will be 'Withdrawn'.

After 31 March

• You may withdraw from Second Semester units of study without academic or financial penalty.

- If you drop a First Semester (or full-year) unit of study between 31 March and the seventh teaching week of First 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 a result of 'Discontinued - Fail'.
   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.

After August 31 (Second Semester HECS deadline)

- You cannot drop any unit of study without penalty;
- If you drop a Second Semester unit of study between 31 August and the seventh week of teaching of Second 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 a result of 'Discontinued - Fail'.
   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 -Not to count as failure';
- You remain liable for the HECS payment for these units of study.

There is no way these rules can be varied, so it is in your best interests to ensure that your enrolment is correct.

You should note that variations of enrolment are subject to all the other rules relating to enrolment in the BE degree unit of study.

#### Weighted average mark

The Faculty uses students' weighted average marks ('WAM') 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 - Fail') and dividing by the total number of credit points attempted.

Units of study which have been 'Withdrawn' or 'Discontinued - Not to count as failure' are not included in the WAM calculation.

## Application procedure to re-enrol in the BE degree 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 - Not to count as failure' 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 reenrol 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 man 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 cause as to why you should be allowed to re-enrol in the Faculty of Engineering.

If the Faculty considers that your progress has been particularly unsatisfactory, then it may decide that you should be asked to show cause as to why you should be allowed to reenrol 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 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 cause as to 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 on this occasion (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 it may 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 readmission, 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. Faculty of Engineering Handbook 2001

## CHAPTER 5 Postgraduate study

The Faculty of Engineering offers a wide range 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 Holl way, 1954 Bernard Yarnton Mills, 1959 Robert Thomas Fowler, 1960 James Brydon Rudd, 1962 John Ernest Benson, 1975 Harry George Poulos, 1976 George Kossoff, 1981 Robert Henry Frater, 1982 DEng John Robert Booker Bhushan Lai Karihaloo Yui-Wing Mai Kerry Rowe Nicholas Snowden Trahair Kenneth J. Waldron

Keith Kingsford Watson

#### Doctor of Philosophy

The degree of Doctor of Philosophy is a research degree awarded for a diesis 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 and Information Engineering, Mechanical and Mechatronic Engineering and Civil 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 a pass 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 twelve months.

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 the ME(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.

The minimum 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 48 credit points of coursework or at least 36 credit points of coursework and a design or research project valued at 12 credit points.

Candidates may choose to complete the units of coursework from the same subject area or from related subject areas, in the same department or school, or they may choose to complete

#### Faculty of Engineering Handbook 2001

all subjects from departments other than the one in which they are primarily studying. Candidates may also be given permission 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.

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, - ie, a maximum of 12 credit points. *Aeronautical Engineering* 

There is no coursework program currently available.

#### **Chemical Engineering**

The Department of Chemical Engineering offers the MES course and the MEEP (Master of Environmental Engineering Practice)

#### **Civil Engineering**

The Department of Civil 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 Department of Civil 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 and Information Engineering

The Department of Electrical and Information Engineering offers an MES drawing its coursework from each of the Graduate Diploma areas and permits a flexible program of study to suit the individual needs. All areas of specialisation apply to both Master's and Graduate Diploma programs. If you are completing the MES it is 48 credit points whereas a Graduate Diploma is 36 credit points. Engineers planning to increase their management component of their work can take up to 24 credit points of business subjects within their MES. *Mechanical and Mechatronic Engineering* 

The coursework program is available on both a full- and parttime 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.

## Master of Project Management

The Master of Project Management is awarded after completing 8 course modules (48 credit points), of which 3 (18 credit points) are core subjects. The remainder are selected from a range of elective modules. This course is available through PM Outreach a global Internet based program in project management and is available to both Australian and international students through the Internet. Students wishing to obtain a qualification in project management have the option to take individual modules or add modules together to complete a graduate certificate in project management, graduate diploma of project management or the Masters of Project Management.

The management of this program is through the Department of Civil 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 Project Management - GradDipPM Power Engineering - DipPowEng Computer Systems Engineering - DipCompSystEng Technology Venture Creation Telecommunications - DipTelecomm Environmental Engineering - DipEnvironEng Graduate Certificates are offered on a full fee paying basis. Courses laeding to the award of a graduate certificate are available in the following specialist areas: Electrical Energy Systems Integrated Systems Photonics Project Management Signal Processing Technology Commercialisation Wireless Communications 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. The minimum 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.

### Further information

To obtain further postgraduate information contact: Postgraduate Advisor Graduate School of Engineering Faculty of Engineering, J13 The University of Sydney NSW 2006 Phone: (02) 9351 7084 Fax: (02) 9351 7082 Email: j.harty@eng.usyd.edu.au Web: www.eng.usyd.edu.au Web: www.eng.usyd.edu.au/gse. The brochure *Graduate Programs Engineering 2001* is available from the postgraduate advisor.

## CHAPTER 6 Other Faculty 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 seek help without delay. Discussions are held in strict confidence - simply come to the Faculty Office, in Room 226, Engineering Faculty Building and make an appointment.

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 significandy 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 of the 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 substandard 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, (02) 9351 2416.

President of the Students' Representative Council, (02) 9660 5222.

J.N. Ellis 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, phone (02) 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, phone (02) 93513853.

## List of staff by departments

#### Faculty staff

#### Dean

Professor Judy A Raper, BE PhD U.N.S. W. CPEng, FIChemE FTEAust

#### Pro Dean

Professor Yiu-Wing Mai BSc (Eng) PhD *H.K.*, DEng, FTSE FASME FHKTE FTE Aust

Associate Dean (Postgraduate and Research)

Associate Professor John C Small, BSc(Eng) Lond. PhD, MTEAustMASCE Associate Dean (Undergraduate) Associate Professor Geoffrey W. Barton, BE PhD **Executive** Officer Eric van Wijk BSc ANU GradDipEd GradDipAppEcon UCan Secretary to the Faculty and Finance Officer Michael Whitley, BA(Hons) EastAnglia MCom U.N.S.W. ASA CIA FCIS FICD Dip **Executive Officer Scholarships and External Relations** Lee Glasson BA DipEd Flinders Student Administration Staff Postgraduate Adviser Josephine Harty, BA Macq. Undergraduate Adviser Annamaria Brancato Executive Assistant to the Dean Kay Fielding Administrative Assistant vacant Faculty Librarian Irene Rossendell BA Qld, Dip Lib UNSW, ALIA

#### Advisers to undergraduate students

Aerospace, Mechanical and Mechatronic Engineering To be advised Chemical Engineering Director of Undergraduate Studies -A/Prof G W Barton Director of Teaching and Learning - Dr C A Mitchell First Year-Marjorie Valix Second Year - Dr V Gomes Third Year -Dr C A Mitchell Fourth Year - Dr 1A Furzer Civil Engineering First Year-Associate Professor R.J. Wheen Second Year-Mr N.L. Ings Third Year-Dr D.W. Airey Fourth Year-Associate Professor K.J.R. Rasmussen Electrical and Information Engineering First Yr - Dr Jamie Evans Second Yr - Dr Swamidoss. Sathiakumar Third Yr-Dr Jim Rathmell Fourth Yr-Dr Yash Shrivastava

## Aerospace, Mechanical and Mechatronic Engineering

Head of Department

Assaad R. Masri, BE PhD

P.N. Russell Professor

- Roger I. Tanner, BSc *Brist.* MS *Calif.* PhD *Mane.* FAAFTS FIEAust MASME MAICHE. Appointed 1975
- Lawrence Hargrove Professor

To be advised

- Professors
- Robert W. Bilger, BSc BE NZ DPhil Oxf. FTS FIEAust. Appointed 1976
- Hugh F. Durrant-Whyte, BSc(Eng) Lond. MSE PhD Penn. Appointed 1995
- John H. Kent, BE MEngSc PhD FIEAust. Appointed 2000
- Yiu-Wing Mai, BSc (Eng) PhD tf/fDEng Syd. FTSE FASME FHKIE FIE Aust. Appointed 1987
- Nhan Phan-Thien, BE PhD FAA FIEAust. Appointed 1991

Michael V Swain, BSc, PhD UNSW. Appointed 1997

- Associate Professors
- Assaad R. Masri, BE PhD

Liangchi Zhang, BSc MEng Zhejiang PhD Peking MASME MASPE MJSPE MJSME

- Liyong Tong, BSc MEngSc Dalian PhD B.U.A.A., MIEAust MAIAA
- Eduardo M. Nebot, BS Bahia Blanca MS PhD Colorado State Reader
- Lin Ye, BS Harbin MS PhD BeijinglAA

Senior Lecturers Steven W Armfield, BSc Flinders PhD Douglass J. Auld, BSc BE MEngSc PhD Lynne E. Bilston, MSE PhD Penn. BE MWMG Dissanayake, BSc(Eng) Peradeniya MSc PhD Birm. Andrei Lozzi, BSc UNSW MEngSc PhD Paul J. McHugh, BSc BE David C. Rye, BE Adel. PhD Karkenahalli Srinivas, ME PhD I.I.Sc. Kee Choon Wong, BE PhD, MAIAA Lecturers Peter W Gibbens, BE PhD, MAIAA David P. Boyle, BE, MAIAA **Professional Officer** Jehangir Madhani, MSc Strath, BSc ScotlandUK **Research** Associates Dr Ping Tan, MEngSc Melb Hugh Stone, BE BSc PhD Visiting Professor J. Dennis Bobyn, BSc MSc McGill PhD Toronto Adjunct Associate Professor Robin J. Higgs, MBBS Lond FRCS Edin FRACS FA Orth A Adjunct Lecturer Captain Peter L. Bates, BE

### Chemical Engineering

#### Head of Department

James G Petrie BSc PhD Capetown. Appointed 1997 **Professors** Brian S Haynes, BE PhD U.N.S.W, FIChemE FIEAust CPEng. Appointed 1997 Emeritus Professor Rolf G.H. Prince, AO, BE BSc NZ. PhD, FIChemE HonFIEAust FTSE FREng. Appointed 1969 Jose Romagnoli, BE N. delSur. Arg. PhD Minn. Appointed 1991 Shell Professor of Environmental Engineering James G Petrie BSc PhD Capetown. Appointed 1997 Associate Professors Geoffrey W. B arton, BE PhD Timothy A.G. Langrish, BEiV.Z. DPhil Oxf., MIChemE Senior Lecturers Ian A. Furzer, DSc(Eng) PhD Lond., MIChemE CEng MAIChemE Vincent G. Gomes, BTech MEng PhD Montr. Cynthia A Mitchell, BE Qld PhD UNSW Kelly Thambimuthu, PhD McGill Lecturers Marjorie Valix, BSc, PhD UNSW Dennis McNevin, BE UNSW, PhD, GradDipEd UWS Honorary Appointments Honorary Research Associates David F Bagster, BScApp BSc BE Qld PhD Camb, FIChemE FIEAust CEng G. DeLeon, PhD Belgrade, MAJMM GSA P Dun, BE PhD, MIChE Peter B. Linkson, BE PhD, FIEChemE FAusIMM FGAA CEng Barry W Walsh, BE PhD, MIChemE CEng SPE Wayne A. Davies, BSc PhD, MIEAust Don White, BE Liverpool Research & Development Manager Dr Maurice Barton, BSc Hons Brighton C.O.T. MSc Oxon PhD Aston, FAM Civil Engineering Head of Department Robert J. Wheen, BSc BE MEngSc, FIEAust, MASCE Challis Professor of Civil Engineering John P. Carter, BE PhD, MASCE FIEAust. Appointed

Professor 1990. Appointed Challis Professor 1999 Professors

Ali Ja'afari, BSc ME Tehr MSc PhD Sur. Appointed 2000

Kenny C.S. Kwok, BE PhD Monash, FEEAust. Appointed Professor 1999 Harry G. Poulos, AM, BE PhD DScEng, FIEAust, FASCE, FAA. Appointed Professor 1982 BHP Steel Professor of Steel Structures Gregory J. Hancock, BE BSc PhD, FIEAust. Appointed Professor 1990 Associate Professors Peter Ansourian, BSc BE PhD, FIEAust Kim JR Rasmussen, MEngSc TU Denmark, PhD Stuart G Reid, ME Cant PhD McG John C Small, BSc Lond PhD, FIEAust MASCE Robert J Wheen, BSc BE MEngSc, FIEAust MASCE Adjunct Associate Professor Ian SF Jones, BE UNSW PhD Wat MTEAust Honorary Associate Professor Andrew Abel, Dipling TUBud MSc McM PhD UNSW, CEng, FIM Senior Lecturers David WAirey, BA MPhil PhD Camb Lecturers Abbas ElZein, BE AmerUniLeb MSc PhD Southampton MS ENPC Paris, MJEAust Noel L. Ings, BE MEngSc U.N.S.W., MASCE MIEAust Tim Wilkinson, BSc BE MA PhD Graeme Wood, BEng(Hons) PhD Edin. **Professional Officers** Nigel P. Balaam, BE PhD Timothy S.Hull, BE PhD John P. Papangelis, BE PhD, MIEAust Craig M. Polley, BSc MSc Wisconsin **Emeritus** Professor Nicholas S. Trahair, BSc BE MEngSc PhD DEng, FIEAust Honorary Research Associates Russell Q. Bridge, BE (Hons) U.N.S.W. PhD, FIEAust Howard B. Harrison, BE PhD, MIEAust Harold Roper, BSc PhD Witw. MEngSc, MATMM Richard D. Watkins, BE Qld PhD Aberd., MIEAust Honorary Teaching Associate Ian G. Bowie, MSc Mane, MCSCE MTEAust

## **Electrical and Information Engineering**

Head of School Stephen W. Simpson, BSc PhD, FIEAust Manager, Resources Paul Beed, BBus UWS ASA Manager, Academic Support Services Peter Finneran, BA Executive Officer, Electrical Engineering Foundation Stuart Glanfield, BA DipEd MA Administrative Assistants Maree Belleli Colleen Moore Sylvia Pyman Inge Rogers Katherine Smith Jenny Wong Rita Wong Ping Zhang, BA Fudan PN Russell Professor Trevor William Cole, BE WAust. PhD Camb., FIEAust. Appointed 1980 Professors David Hill, BE BSc QldPhD N'cle(N.S.W), FIEAust FIEEE.

Appointed 1994 Marwan A. Jabri, Maitrise de physique *Paris* PhD. Personal

Chair 1996 Branka S. Vucetic, MSc PhD *Belgrade*. Personal Chair 1999

Branka S. Vucenc, MSC PhD Beigrade. Personal Chair 1999 Hong Yan, BS Nanking I.P.T. MSE Mich PhD Yale. Personal Chair 1997 Associate Professors Robert A. Minasian, BE PhD Melb. MSc(Dist) DipMicrowave Eng(Dist) Lond., MTEE SMIREE FIEAust Stephen W. Simpson, BSc PhD, FIEAust Anthony D. Stokes, BSc BE PhD, FIEAust Hansen Yee, BSc BE PhD, MTEEE Senior Lecturers Richard Coggins, BE, BSc, PhD Iain Collings, BE Melb. PhD ANU Ling Guan, BSc Tianjin MASc PhD Waterloo, SMTEEE Xiheng Hu, DipElecEng Chongoing Indust. Uni. MElecCompEng China PhD Abbas Jamalipour, BSc Isfahan Iran, MSc Sharif Iran, PhD Nagoya David Levy, BSc MSc(Engl) PhD Natal, MTEE James G. Rathmell, BSc BE PhD, SMIREE Graham E. Town, BEN.S.W.I.T. PhD, MIEEE MTJREE Andre van Schaik, MSc Twent PhD Swiss Fed. Inst, of Tech. Yash Shrivastava, BTech ITT Kanpur India, PhD Iowa Lecturers Jamie Evans, BSc BE Newcastle MEngSci PhD Melb. Swamidoss Sathiakumar, BSc American Coll. India BE ME PhD I.I.Sc. **Professional Officers** William Fong, BE WA, MEngSci Ebrahim Gogani, ME Tehr. Polytechnic PhD Brunei Ross Hutton, BE Q.I.T. Van Dong Pham, BE South Australia MEngSci 'UNSW Michael Rados, BSc BE MEngSc Robert G. Sutton, ME UNSW **Research Fellows** Kamal Alameh, BE Beirut MEngSc Melb. PhD Honorary Appointments Emeritus Professors WN. Christiansen, DSc Melb., FInstP FATP FEE FTEAust FAA FTREE(Aust) Hugo K. Messerle, MEngSc DSc Melb. PhD, FTS FIEE FIEAust FTREE FEEEE FAJP Honorary Professor S.Y.R. Hui, BSc Birmingham PhD London Adjunct Associate Professor Peter M. Nickolls, MB BS BSc BE PhD Senior Lecturer Brian Campbell, ME David F. Gosden, ME UNSWMBA, AGSM, MIEAust **Research** Associate Julie Vonwiller, B A(Hons) PhD Macquarie Research Affiliate J.J. Lowke, BSc PhD DipEd Adel.

## 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

#### Faculty of Engineering Handbook 2001

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, phone (02) 9351 3250.

#### Engineering scholarships

UNISEN Scholarships represent an expanded choice of scholarships offering a wide range of cooperative education choices. UNISEN comprises the **Chancellor's Industry Scholarship** (CISE, ordinary degree only, \$11000 pa), the **Dean's Industry Scholarship** (DISE, ordinary and combined degrees, \$4000 pa+ \$3500 for 10 weeks paid work experience) and the **Industrial Experience Placement Scholarship** (IEPS, ordinary and combined degrees, \$1000 pa + \$3500 for 10 weeks paid work experience).

The scholarships web site is at <u>www.eng.usyd.edu.au/</u> scholarships.

WMNeirous Scholarship

For women enrolling in structural (civil) engineering, valued at \$3000 pa for 4 years

EnergyAustralia Scholarship in Engineering

For school leavers undertaking a standard electrical

engineering program, with a complete year in industry, valued at \$44,500 for 5 years.

Contact: Faculty Scholarships Office

Lee Glasson, Executive Officer

Phone: (02) 9351 2834/2131

Fax: (02) 9351 3885

Email: <u>l.glasson@eng.usyd.edu.au</u>

## Student facilities and societies

#### Notice boards

Faculty notice boards, one for First year courses and one for Second year courses, located outside the Student Enquiry Office, second level, Faculty Building. Each of the Engineering departments has a notice board for Third and Fourth year students.

Notice boards 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 notice boards. Students are expected to inspect the notice boards at frequent intervals.

Notices referring to cadetships, scholarships, vacation employment and career opportunities and other matters of this nature are also displayed on the notice boards in and around the Student Enquiry Office, 2nd level, Engineering Faculty Building.

#### The Engineering Library

The Engineering Library is part of the University of Sydney Library and supports the Engineering Faculty. It is located on the ground floor of the PNR Building. The Library has a large collection of Engineering serials (many of which are available electronically), research material such as books, conferences and microfiche collections and multiple copies of

Undergraduate Engineering material. The library's catalogue, databases, internet resource guides and electronic collections are available via the web at <u>www.library.usyd.edu.au</u>.

The library offers electronic database classes and personal assistance with research needs. The librarians are involved in an extensive Information skills program within the Faculty undertaking classes for all Engineering courses during the semester.

Books may be borrowed by Undergraduate students for two weeks with renewals available if the item is not placed on hold for another borrower. Postgraduates and academics are entitled to a two month loan period with renewals available if the item is not required by another borrower. Journals are not borrowable but photocopying facilities are available for print journals and many journals are available in electronic format. Printing facilities are available in the library and remote access is available via the internet. High demand material is also put into a Reserve collection for two hour loan during the day and overnight loan.

The Engineering Library opens from 8.30 am to 7 pm on Monday and Thursday and 8.30 am to 6 pm Tuesday, Wednesday and Friday during semester. Vacation hours are 9 am to 5 pm Monday to Friday.

#### 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 - eg, 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 (PO Box 138) Phone (02) 9929 8544.

#### The Institution of Chemical Engineers

An alternative organisation for Chemical Engineering students is the Institution of Chemical Engineers. The Institution welcomes and values student members, 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, phone (02) 9329 3046.

## 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 student members.

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. Student members receive *The Student Update*, a publication 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, phone (02) 9264 9500.

## 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 out significant revisions 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 PN. 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 Darhngton 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.

## Foundations

#### **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 program 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.

Executive Officer Ms Trish Powers, phone (02) 9351 6743, fax (02) 9351 7180, email <u>t.powers@chem.eng.usyd.edu.au</u>. *The Civil Engineering Foundation* 

The Civil Engineering Foundation exists to assist postgraduate and undergraduate students to achieve their goals in the civil engineering industry. The Foundation acts in all areas nonacademic and is a conduit between academic staff, parents and industry. In addition, the Foundation supports department activities and is an integral part of the department's function.

The Foundation is the arm of the civil engineering industry within the University receives all it's funding from the industry. The Foundation has gained a reputation for holding unusual fund raising activities being widely supported by industry.

This funding is used to foster education and research and to ensure the department is fully equipped to engage in such civil engineering research and development. Many civil engineering consultants, contractors and architects use the department's research capabilities before any major works are commenced.

The Foundation also promotes Lectures, Seminars, Short Courses, Masters programs and technical notes to ensure the Australian civil engineering industry is kept at the fore front of world practice.

Management of the Foundation is through a council of civil engineering industry representatives and department staff who meet regularly to monitor the progress of the department and its students.

The Foundation can be contacted through the Executive Officer:

Phone: (02) 9351 2127 Fax: (02) 9351 6284

Email: foundation@civil.usyd.edu.au.

Electrical Engineering Foundation Electrical and Information Engineering Foundation

The mission of the Electrical and Information Engineering Foundation is to build a successful partnership between the

School of Electrical and Information 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's activities include:
- ٠
- Networking Presenting University Research •
- ٠ Industry Participation in University Research
- **Business Development Facilitation**
- Industry Participation in Curriculum Development •
- Performance Benchmarking
- ٠ Bringing Industry and Students Together
- Encouraging Student and Teaching Excellence ٠
- Entrepreneurship Training ٠
- Sophia Technica Project Alumni Relations ٠
- •

President: Mr Allan Gillespie. Director: Professor Trevor Cole. Executive Officer: Mr Stuart Glanfield. Phone: (02) 9351 7171 Fax: (02) 9351 7172 Email: eef@ee.usyd.edu.au Web: www.ee.usyd.edu.au/eef/.

# General University information

See also the Glossary for administrative information relating to particular terms.

#### Accommodation Service

The Accommodation Service assists students to find offcampus accommodation by maintaining an extensive database of suitable accommodation in various areas but primarily close to University or within easy access via public transport. Level 7, Education Building, A35 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3312 Fax: (02) 9351 8262

TTY: (02) 9351 3412 Email: accomm@stuserv.usyd.edu.au

Web: www.usyd.edu.au/su/accom

#### Admissions Office

The Admissions Office is responsible for overseeing the distribution of offers of admission to undergraduate students through the Universities Admissions Centre (UAC) and can advise prospective local undergraduate students on admission requirements. Postgraduate students should contact the appropriate faculty. Applicants without Australian citizenship or permanent residency should contact the International Office.

Student Centre Ground Floor, Carslaw Building, F07 The University of Sydney NSW 2006 Australia Phone: (02) 9351 4117 or (02) 9351 4118 Fax: (02) 9351 4869

## Email: <u>admissions@records.usyd.edu.au</u>

## Applying for a course

Prospective (intending) undergraduate students must lodge an application form with the Universities Admissions Centre (UAC) by the last working day of September of the year before enrolment for all courses except the graduate dental and medical programs, which require direct application to the faculties of Dentistry and Medicine. Note that some faculties may have additional application procedures.

#### Assessment

For matters regarding assessment, refer to the relevant Department or School.

#### **Casual Employment Service**

The Casual Employment Service helps students find casual and part-time work during their studies and in University vacations. Level 7, Education Building, A35

The University of Sydney NSW 2006 Australia Phone: (02) 9552 2589 Fax: (02) 9552 4713 Email: <u>ces@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/su/cas\_emp</u>

#### Centre for English Teaching

The Centre for English Teaching provides a variety of fulltime English language courses for adult students at all levels of proficiency, including General English from Beginner to Advanced, IELTS preparation, and a range of specific programs in English for Academic Purposes designed to bring international students up to the required English language entry levels for degree programs at the University. Level 2, Building F, 88 Mallett St Camperdown NSW 2006 Phone: (02) 9351 0706 Fax: (02) 9351 0701 Email: <u>info@cet.usyd.edu.au</u> Web: <u>www.usyd.edu.au/cet</u>

#### **Child Care**

Contact the Child Care Coordinator for information about Children's Services for students and staff of the University who are parents. Child Care Coordinator Level 7, Education Building, A35 Phone: (02) 9351 5667 Fax: (02) 9351 7055 TTY: (02) 9351 3412 Email: <u>childc@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/su/childcare</u>

#### Co-op Bookshop

Sells textbooks, reference books, general books and software. Special order services available. The Co-op Bookshop is located at: Sydney University Sports and Aquatic Centre, G09 Cnr Codrington St and Darlington Rd Phone: (02) 9351 3705 or (02) 9351 2807 Fax: (02) 9660 5256 Email: <u>sydu@mail.coop-bookshop.com.au</u> Web: <u>www.coop-bookshop.com.au</u>

#### **Counselling Service**

The Counselling Service aims to help students fulfil their academic, individual and social goals through professional counselling which is free and confidential. Level 7, Education Building, A35 The University of Sydney NSW 2006 Australia Phone: (02) 9351 2228 Fax: (02) 9351 7055 TTY: (02) 9351 3412 Email: counsell@mail.usyd.edu.au Web: www.usyd.edu.au/su/counsel **Disability Services** 

Disability Services is the principal point of contact and advice on assistance available for students with disabilities. The Service works closely with academic and administrative staff to ensure that students receive reasonable accommodations in all areas of their study. Assistance available includes the provision of notetaking, interpreters, and advocacy with academic staff to negotiate assessment and course requirement modifications where appropriate. Level 7, Education Building, A35

The University of Sydney NSW 2006 Australia Phone: (02) 9351 4554 Fax: (02) 9351 7055 Email: disserv@stuserv.usyd.edu.au

#### Web: <u>www.usyd.edu.au/su/disability</u> Enrolment and pre-enrolment

Students entering first year

Details of the enrolment procedures will be sent to new undergraduate students with their 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 week of January. You must attend the University in person or else nominate, in writing, somebody to act on your behalf. On your enrolment day, you pay the compulsory fees for joining the Student Union, the Students' Representative Council and the student sporting

#### General University information

bodies. Fees for certain courses are also payable at enrolment as is upfront HECS if you decide to pay with this option. You also choose your first-year units of study, so it's important to consult the faculty handbook before enrolling. Faculty handbooks can be purchased at the Student Centre, or found on the web at <u>www.usyd.edu.au/studentcentre/enrolments</u>. *Re-enrolling students* 

For re-enrolling students, enrolment is accomplished via preenrolment which is compulsory. A pre-enrolment package is sent to all enrolled students in early October which contains instructions on pre-enrolment procedures.

#### Examinations

The Examinations and Exclusions Office is usually responsible for examination seat numbers, examination timetabling and examination arrangements. This information is available to students via the web (MyUni). Examinations and Exclusions Office

Student Centre

Level 1, Carslaw Building, F07

The University of Sydney

NSW 2006 Australia

Phone: (02) 9351 4005 or (02) 9351 5054 Fax: (02) 9351 7330

Email: exams.office@exams.usyd.edu.au

Note that some faculties, such as the Sydney Conservatorium of Music, make all examination arrangements for the units of study that they offer.

#### Fees

The Fees Office provides advice to students on how to pay fees, where to pay, and if payments have been received. Margaret Telfer Building, K07

The University of Sydney NSW 2006 Australia Phone: (02) 9351 5222

Fax: (02) 9351 4202

#### **Financial Assistance Office**

The University has a number of loan funds and bursaries to assist students who experience financial difficulties. Assistance is not intended to provide the principal means of support but to help in emergencies and to supplement other income.

Level 7, Education Building, A35 The University of Sydney

NSW 2006 Australia Phone: (02) 9351 2416

Fax: (02) 9351 7055

TTY: (02) 9351 3412

Email: <u>fao@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/su/fin\_assist</u>

Freedom of Information

The University of Sydney falls within the jurisdiction of the NSW Freedom of Information Act, 1989. The Act requires information concerning documents held by the University to be made available to the public, to enable a member of the public to obtain access to documents held by the University and to enable a member of the public to ensure that records held by the University concerning his or her personal affairs are not incomplete, incorrect or out of date. By definition, a 'member of the public' includes staff or students of the University.

 Application may be made for access to access University documents, however the Act provides some exemptions to particular documents. The Act contains review and appeal mechanisms which are required to be explained to applicants where applicable. The University is required to report to the public on its FOI activities on a regular basis. The two reports provided are the Statement of Affairs and the Summary of Affairs. The Statement of Affairs contains information about the University, its structure and function and the kinds of documents held. The Summary of Affairs identifies each of the University's policy documents and provides a contact list for those wishing to access these documents. Further information, and copies of the current reports may be found at <u>www.usyd.edu.au/arms/foi/</u>.

• It is a requirement of the Act that applications be processed and a determination be made generally within 21 days. Determinations are made by the University's Registrar.

#### Graduations Office

The Graduations Office is responsible for organising graduation ceremonies and informing students of their graduation arrangements. Ground Floor, Carslaw Building, F07 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3199, (02) 9351 4009 Protocol: (02) 9351 4612 Fax: (02) 9351 5072 Email: <u>d.obrien@exams.usyd.edu.au</u>

#### (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 University Calendar) 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.
- A document outlining the current procedures for appeals against academic decisions is available at the Student Centre, at the SRC, and on the University's web site at www.usyd.edu.au/su/planning/policy/
- If you wish to seek assistance or advice regarding an appeal, contact:

Students' Representative Council Level 1, Wentworth Building, G01 The University of Sydney NSW 2006 Australia Phone: (02) 9660 5222

#### **HECS** and fees

The HECS and Fees Office in the Student Centre can provide advice on your HECS or fee liability at any time. Student Centre

Ground Floor, Carslaw Building, F07

The University of Sydney

NSW 2006 Australia

Phone: (02) 9351 2086, (02) 9351 5659, (02) 9351 5062 Fax: (02) 9351 5081

#### International Student Centre

The International Student Centre consists of the International Office (IO), the International Student Services Unit (ISSU) and the Study Abroad and Exchange Office. The International Office provides assistance with application, admission and enrolment procedures and administers scholarships for international students. The ISSU provides a wide range of international students upport services including arranging arrival accommodation and offering advice and professional counselling. The Study Abroad and Exchange Unit assists both domestic and international students who wish to enrol for Study Abroad or Exchange programs. *International Student Centre* Services Building, G12 The University of Sydney NSW 2006 Australia

Phone: (02) 9351 4079 Fax: (02) 9351 4013

Email: <u>info@io.usyd.edu.au</u> Web: <u>www.usyd.edu.au/international/index/.html</u>
International Student Services Unit Phone: (02) 9351 4749 Fax: (02) 9351 6818 Email: info@issu.usyd.edu.au Web: www.usyd.edu.au/su/issu/ Study Abroad and Exchange Unit Study Abroad Phone: (02) 9351 5841 Fax: (02) 9351 2795 Email: studyabroad@io.usyd.edu.au Web: www.usyd.edu.au/su/io/studyabroad/ Exchange Phone: (02) 9351 5843 Fax: (02) 9351 2795 Email: exchange@io.usyd.edu.au Web: www.usyd.edu.au/su/exchange/ Intranet

USYDnet is the University of Sydney's intranet. It provides easy access to staff and student directories, maps, software and useful resources for both staff and students. As well as delivering information, the intranet provides interactive services such as the Calendar of Events, where staff and students can enter events and publish them university-wide.

MyUni is the personalised section of USYDnet. All staff and students are provided with access to MyUni through a login name and password. This enables them to customise the information they see and also receive delivery of personal information such as exam results and seat numbers. MyUni is a portal from which students and staff can complete tasks that were previously only possible offline. Web enrolment variation is one of the first of many facilities that are helping to move the every day tasks of all members of the university online.

### Learning Centre

The Learning Centre assists students to develop the generic skills which are necessary for learning and communicating knowledge and ideas at university. The Centre is committed to helping students to achieve their academic potential throughout their undergraduate and postgraduate studies. Level 7, Education Building, A35 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3853 Fax: (02) 9351 4865 Email: <u>lc@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/su/lc</u> Library Students are welcome to use any of the 23 libraries in the University. The student ared is also the library horrowards ared

University. The student card is also the library borrower's card. Further details of the libraries, including services provided, locations and opening hours are available on the Library's homepage <u>www.library.usyd.edu.au</u> as well as in the printed *Library Guide*, available at any library. Consult the Library staff for assistance.

The libraries listed below are located on the Camperdown/ Darlington campus unless otherwise specified. Alexander Mackie Curriculum Resources Library Old Teachers College, A22 Phone: (02) 9351 6254 Fax: (02) 9351 7766 Email: curriculum@library.usyd.edu.au Architecture Library Wilkinson Building, G04 Phone: (02) 9351 2775 Fax: (02) 9351 4782 Email: architecture@library.usyd.edu.au Badham Library Badham Building, A16 Phone: (02) 9351 2728 Fax: (02) 9351 3852 Email: badham@library.usyd.edu.au

**Biochemistry Library** Biochemistry Building, (308 Phone: (02) 9351 2231 Fax: (02) 93517699 Email: biochemistry@library.usyd.edu.au Burkitt-Ford Library Sir Edward Ford Building, A27 Phone: (02) 9351 4364 Fax: (02) 9351 7125 Email: burkittford@library.usyd.edu.au Camden Library University Farms, Camden, C15 Phone: (02) 9351 1627 Fax: (02) 4655 6719 Email: camden@library.usyd.edu.au Chemistry Library Chemistry Building, Fl 1 Phone: (02) 9351 3009 Fax: (02) 9351 3329 Email: chemistry@library.usyd.edu.au Dentistry Library United Dental Hospital, 2 Chalmers St, Surry Hills, C12 Phone: (02) 9351 8331 Fax: (02) 9212 5149 Email: dentistry@library.usyd.edu.au Engineering Library P N Russell Building, J02 Phone: (02) 9351 2138 Fax: (02) 9351 7466 Email: engineering@library.usyd.edu.au Fisher Library Eastern Ave, F03 Phone: (02) 9351 2993 Fax: (02) 9351 2890 Email: fishinf@library.usyd.edu.au Geosciences Library Madsen Building, F09 Phone: (02) 9351 6456 Fax: (02) 9351 6459 Email: geosciences@library.usyd.edu.au Health Sciences Library East St, Lidcombe, C42 Phone: (02) 9351 9423 Fax: (02) 9351 9421 Email: h.knight@cchs.usyd.edu.au Law Library Law School, 173-175 Phillip St, Sydney, C13 Phone: (02) 9351 0216 Fax: (02) 9351 0301 Email: library@law.usyd.edu.au Mathematics Library Carslaw Building, F07 Phone: (02) 9351 2974 Fax: (02) 9351 5766 Email madiematics@library.usyd.edu.au Medical Library Bosch Building, D05 Phone: (02) 9351 2413 Fax: (02) 9351 2427 Email: medical@library.usyd.edu.au Music Library Seymour Centre, J09 Phone: (02) 9351 3534 Fax: (02) 9351 7343 Email: music@library.usyd.edu.au Nursing Library 88 Mallett St, Camperdown, M02 Phone: (02) 9351 0541 Fax: (02) 9351 0634 Email: nursing@library.usyd.edu.au

### General University information

Orange library Leeds Parade, Orange Phone: (02) 6360 5594 Fax: (02) 6360 5637 Email: lib@orange.usyd.edu.au Pharmacy Library Pharmacy Building, A15 Phone: (02) 9351 2333 Fax: (02) 9351 4445 Email: pharmacy@library.usyd.edu.au **Physics Library** New Wing, Physics Building, A29 Phone: (02) 9351 2550 Fax: (02) 9351 7767 Email: physics@library.usyd.edu.au Power Research Library Mills Building, A26 Phone: (02) 9351 2148 Fax: (02) 9351 7323 Email: john.spencer@arthist.usyd.edu.au Sydney College of the Arts Library Balmain Rd, Rozelle, N01 Phone: (02) 9351 1036 Fax: (02) 9351 1043 Email: scalib@sca.usyd.edu.au Sydney Conservatorium of Music Library

109 Pitt St, Sydney, C41 Phone: (02) 9230 3701 Fax: (02) 9230 3707 Email: csymes@conmusic.usyd.edu.au

Mathematics Learning Centre

The Mathematics Learning Centre runs bridging courses in mathematics at the beginning of the academic year (fees apply), and provides on-going support during the year through individual assistance and small group tutorials. Level 4, Carslaw Building, F07 The University of Sydney NSW 2006 Australia Phone: (02) 9351 4061

Fax: (02) 9351 5797

Email: mlc@stuserv.usyd.edu.au

## Web: www.usyd.edu.au/su/mlc

Part-time and full-time enrolment Students are normally considered to be enrolled full-time if they have a HECS or fee weighting of at least 0.375 each semester. Anything under this amount is considered a parttime study load. Note that some faculties have minimum study load requirements for satisfactory progress. Privacy

The University is subject to the NSW Privacy and Personal Information Protection Act 1998 (the Act). Central to the Act is Part 2 which contains twelve Information Protection Principles (IPPs) which regulate the collection, management, use and disclosure of personal information.

In response to Section 33 of the Act the University has developed a Privacy Management Plan which includes a new University Privacy Policy incorporating the requirements of the IPPS. Both the Plan and the new University Privacy Policy were endorsed by the Vice-Chancellor on 28 June 2000. The Privacy Management Plan sets out the IPPs and how they apply to functions and activities carried out by the University.

Further information and a copy of the Plan may be found at: www.usyd.edu.au/arms/privacy/. Any questions regarding the Freedom of Information Act, the Privacy and Personal Information Protection Act or the Privacy Management Plan should be directed to:

Tim Robinson: (02) 9351 4263 or Judith Russell: (02) 9351 2684 Email: foi@mail.usyd.edu.au

Student Centre Level 1, Carslaw, F07 The University of Sydney NSW 2006 Australia The Student Centre enquiry counter can assist with the following types of enquiries: General Enquiries: (02) 9351 3023 Academic Records: (02) 9351 4109 Discontinuation of Enrolment: (02) 9351 3023 Handbooks: (02) 9351 5057 Prizes: (02) 9351 5060 Fax: (02) 9351 5081, (02) 9351 5350 (Academic Records)

Student identity cards

Student identity cards will be provided to all commencing students at in-person enrolment or will be mailed to all continuing students who have successfully pre-entrolled. The card must be carried with you at all times on the site of the University, it must be displayed during examinations and must be produced on demand of any member of the staff or any other officer of the University. The card incorporates a photograph which you are required to provide. The photograph is to be colour and passport-sized showing your head and shoulders only. The photograph will be laminated to your student identity card on the day of your in-person enrolment if you are a commencing student. Pre-enrolling continuing students will be advised where to attend to have their photos and cards laminated. Student identity cards also function as transport concession cards for those students deemed eligible by the transport authorities. Transport concession eligibility will be confirmed with the application of a holographic sticker on the card.

### Student Services

Student Services exists to help you achieve your educational goals by providing personal, welfare, and academic support services to facilitate your success at University. Many factors can impact on your wellbeing while studying at University and Student Services can assist you in managing and handling these more effectively. Refer to Accommodation Service, Casual Employment Service, Child Care, Disability Service, Financial Assistance Office, Learning Centre, Mathematics Learning Centre.

Room 711, Level 7, Education Building, A35 The University of Sydney

NSW 2006 Australia

## Web: www.usyd.edu.au/su/stuserv

Timetabling Unit

The timetabling unit in the Student Centre is responsible for producing students' class and tutorial timetables. Students can obtain their Semester 1 timetables from the Wednesday of Orientation Week via the web.

The Sydney Conservatorium of Music operates in accordance with a local calendar of dates and produces a complete timetable for all teaching that it delivers. The timetable is available on enrolment at the Conservatorium.

### Other student assistance

### Careers information

The Careers Centre provides careers information, advice and counselling, and assists in finding course-related employment both while you're studying and when you're ready to commence your career. Ground floor, Mackie Building, K01 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3481 Fax: (02) 9351 5134 Email: info@careers.usyd.edu.au Web: www.careers.usyd.edu.au

### Continuing Education

Unversity Preparation courses; bridging courses; Accounting Extension program; study skills courses; essay writing courses; and many others for career development, skill enhancement and general interest. Centre for Continuing Education Mackie Building, KOI The University of Sydney NSW 2006 Australia Phone: (02) 9351 2907 Fax: (02) 9351 5022 Email: info@cce.usyd.edu.au Web: www.usyd.edu.au/cce University Health Service Offers full general practitioner services and emergency medical care to all members of the University community. University Health Service (Wentworth) Level 3, Wentworth Building, G01 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3484 Fax: (02) 9351 4110 University Health Service (Holme) Ground Floor, Holme Building, A09 The University of Sydney NSW 2006 Australia Phone: (02) 9351 4095 Fax: (02) 9351 4338 Email: director@unihealth.usyd.edu.au Web: www.unihealth.usyd.edu.au/ Koori Centre and Yooroang Garang The Koori Centre provides tutorial assistance: access to computers, Indigenous counsellor, Aboriginal Studies library study rooms, Orientation program at the beginning of the year, and assistance in study and learning skills. Education Unit: courses in Education for ATSI students. Indigenous Studies Unit: aims to increase the awareness of Indigenous Australian issues through courses across the University. Ground Floor, Old Teachers' College, A22 The University of Sydney NSW 2006 Australia Phone: (02) 9351 2046 General Enquiries (02) 9351 7003 Liaison Officer Fax: (02) 9351 6923 Email: koori@koori.usyd.edu.au Web: www.koori.usyd.edu.au/ Language Centre The Language Centre supports the teaching and research of the 34 languages taught through the Faculty of Arts and also offers self-study materials in over 140 languages. Members have access to audio-visual kits, reference books, videos, satellite television, computer software and magazines. The

Office is also responsible for administering University-wide awards and major government funded research scholarships. Research and Scholarships Office Scholarships Administration Room K4.01, Main Quadrangle, A14 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3250 Fax: (02) 9351 3256 Email: scholars @reschols.usyd.edu.au Web: www.usyd.edu.au/su/reschols/scholarships/schol.html

### Student organisations

Students' Representative Council

Level 1, Wentworth Building, G01 The University of Sydney NSW 2006 Australia Phone: (02) 9660 5222 Editors, Honi Soit/Legal Aid (02) 9660 4756 Second-hand Bookshop (02) 9351 0691 Mallett St (02) 9230 3777 Pitt St-Conservatorium Fax: (02) 9660 4260 Email: postmaster@src.usyd.edu.au Sydney University Sports Union Provides services, facilities and clubs for sport, recreation and fitness. Sports and Aquatic Centre, G09 The University of Sydney NSW 2006 Australia Phone: (02) 9351 4960 Fax: (02) 9351 4962 Email: sportsunion @ susu.usyd.edu.au Web: www.susport.com.au University of Sydney Union Provides welfare, social and recreational services to the University community. Holme Building, A09 The University of Sydney NSW 2006 Australia Phone: (02) 9563 6000 Switchboard/Enquiries (02) 9563 6282 Academic Dress (02) 9563 6103 ACCESS Centre, Manning (02) 9563 6269 Campus Store, Holme (02) 9563 6016 Campus Store, Wentworth (02) 9563 6160 Clubs and Societies Office (02) 9563 6010 School Tutoring Coordinator (02) 9563 6032 Union Broadcasting Studio (02) 9563 6115 Welfare & Information Services Manager Fax: (02) 9563 6239 Email: email@usu.usyd.edu.au Web: www.usu.usyd.edu.au/ Women's Sports Association Provides for students, predominantly women, to participate in sport and recreation through the provision of faculties, courses and personnel. Room 214, Sports Centre, A30 The University of Sydney NSW 2006 Australia Phone: (02) 9351 8111, (02) 9351 8112 Fax: (02) 9660 0921 Email: secretary@suwsa.usyd.edu.au Web: www.usyd.edu.au/su/suwsa/welcome.html

Scholarships

The Scholarships Office is the University's internal and external point of contact for matters related to scholarships and awards. It provides information on undergraduate and postgraduate award opportunities available at the University as well as from external funding bodies, and advice to faculties and administrative units on the establishment and administration of their specific awards. The Scholarships

Language Centre also runs courses in Spanish, Russian,

Portugese, Modern Irish and Welsh.

Web: www.usyd.edu.au/langcent

The University of Sydney

NSW 2006 Australia

Fax: (02) 9351 4724

Phone: (02) 9351 2371

Level 2, Christopher Brennan Building, A18

Email: language.enquiries@language.usyd.edu.au

This glossary describes terminology in use at the University of Sydney.

### Academic Board

The Academic Board is the senior academic body within the University. In conjunction with Faculties, the Academic Board has responsibility for approving, or recommending to Senate for approval, new or amended courses and Units of Study (UoSs), and policy relating to the admission of students. (For further information, see the University Calendar) *Academic Cycle* 

Academic Cycle

The Academic Cycle is the program of teaching sessions offered over a year. Currently the cycle runs from the enrolment period for 1st Semester through to the completion of the processing of results at the end of 2nd Semester. (*See also* Stage)

#### Academic Record

The Academic Record is the complete academic history of a student at the University. It includes, among other things, personal details, all Units of Study and Courses taken, assessment results (marks and grades), awards and prizes obtained, infringements of progression rules, approvals for variation in course requirements and course leave, thesis and supervision details.

Access to a student's Academic Record is restricted to authorised University staff. A student's Academic Record is not released to a third party without the written authorisation of the student.

(See also Academic Transcript)

Academic Transcript

An Academic Transcript is a printed statement setting out a student's academic record at the University. There are two forms of Academic Transcripts: External and Internal. *(See also* External Transcript, Internal Transcript)

### Academic Year

An Academic Year is a normal full-time program taken in a course in a year. Some courses consist of stages, which may readily be equated with Academic Year. Others use the aggregation of credit points to do this (eg, 48 credit points = an Academic Year).

(See also Academic Cycle, Stage)

Addresses

All enrolled students need to have a current postal address recorded on FlexSIS to which all Official University correspondence is sent.

(See also Business Address, Permanent Home Address, Semester Address, Temporary Address)

Admission

Admission is governed by the University's Admission Policy and is the process for identifying applicants eligible to receive an initial offer of enrolment in a course at the University. Admission to most courses is based on performance in the HSC with applicants ranked on the basis of their UAI. Other criteria such as a portfolio, interview, audition, or results in standard tests may also be taken into account for certain courses.

Admission (deferment)

An applicant who receives an offer of admission to a course may apply to defer enrolment in that course for one semester or one academic cycle.

### Admission Basis

The main criterion used by a Faculty in assessing an application for admission to a course. The criteria used include, among other things, previous secondary, TAFE or tertiary studies, work experience, Special Admission and the Universities Admission Index (UAI). *Admission Mode* 

Admission Mode is a classification based on how a student was admitted to a course, for example 'UAC or 'direct'. *Admission Period* 

The period during which appHcations for admission to courses are considered. The main Admission Period takes place before the first semester, but there may also be an Admission Period for mid year applicants before the beginning of the second semester and other Admission Periods.

### Admission Reply

A code used by FlexSIS to indicate whether an applicant who has received an offer has accepted the offer or not.

Admission Result

A code used by FlexSIS to indicate the result of a direct application to study at the University (eg, Offer, Unsuccessful, Withdrawn).

Admission Year

The year the student began the course.

Advanced Diplomas

(See Award Course)

Advanced Standing

(See Credit)

Advisor

A member of academic staff appointed in an advisory role for some postgraduate coursework students.

(See also Associate Supervisor, Instrumental Supervisor

(teacher), Research Supervisor, Supervision)

Annual Progress Report

The Annual Progress Report is a form issued by Faculties which is used to monitor a research student's progress each year. The form provides for comments by the student, the Supervisor, the Head of the Department and the Dean (or nominee). The completed form is attached to the student's official file.

FlexSIS records that the form has been sent out and that it has been satisfactorily completed.

APA

Australian Postgraduate Awards. (See also Scholarships, UPA) Appeals

Students may lodge appeals against academic or disciplinary decisions. FlexSIS will record an academic appeal (eg, against exclusion) while they are under consideration and will record the outcome of the appeal. Disciplinary (that is, non-academic) appeals are not recorded on FlexSIS.

Assessment

The process of measuring the performance of students in UoSs and courses. The assessment of performance in a UoS may include examinations, essays, laboratory projects, or assignments.

(See also Board of Examiners, Result Processing, Result Processing Schedule)

Associate Supervisor

A person who is appointed in addition to the Supervisor of a research student who can provide the day-to-day contact with the candidate or provide particular expertise or additional experience in supervision.

(See also Advisor, Instrumental Supervisor (teacher), Research Supervisor, Supervision)

Assumed Knowledge

For some Units of Study, a student is assumed to have passed a relevant subject at the HSC and this is called Assumed Knowledge. While students are generally advised against taking a Unit of Study for which they do not have the assumed knowledge, they are not prevented from enrolling in the Unit of Study.

(See also Prerequisite)

### Attendance Mode

Refers to whether a Unit of Study is taken by the student internally (ie, by attending classes at a campus of the university) or externally (ie, remotely by correspondence or other distance education means). While most Units of Study are offered internally, the Faculty of Health Sciences and the Orange Agricultural College offer Units of Study externally.

### Attendance Type

Refers to whether the student is studying part-time or fulltime. For coursework students this is a function of course load - ie, the proportion being undertaken by the student of the normal full-time load specified for the course in which the student is enrolled. To be considered full-time, a coursework student must undertake at least 0.75 of the normal full-time load over the academic cycle or at least 0.375 if only enrolling in half of an academic year (one semester). It is important to note, however, that, for some purposes, to be considered fulltime a student may need to be enrolled in at least 0.375 in each session. Research students, with the approval of their Faculty, nominate whether they wish to study part-time or full-time. The Attendance Status is then recorded on FlexSIS as part of the application or enrolment process. (See also Coursework, Student Load)

#### AusAID

Australian Agency for International Development. Award Course

An award course is a formally approved program of study that can lead to an academic award granted by the University. The University broadly classifies courses as Undergraduate and Postgraduate (research and coursework). The Award Courses offered by the University are:

Higher Doctorates

Doctor of Philosophy (PhD)

Doctorates by research and advanced coursework

Master's Degree

Graduate Diploma

Graduate Certificate

**Bachelor's Degrees** 

Advanced diplomas

Diplomas Certificates

(See also Major, Minor and Stream)

Bachelor's Degree

The highest undergraduate award offered at the University of Sydney. A Bachelor's degree course normally requires three or four years of full-time study (or the part-time equivalent). (See also Award Course)

Rarrier

A barrier is an instruction placed on a student's FlexSIS record that prevents the student from re-enrolling or graduating. *(See also Deadline (fees), Suppression of Results)* 

Board of Examiners

A Board of Examiners was a body appointed by a Faculty or Board of Studies which met to approve the results of all students undertaking Courses supervised by that Faculty or Board of Studies. Boards of Examiners were dis-established following revision of the University's examination procedures in 2000.

(See also Assessment, Result Processing, Result Processing Schedule)

Board of Studies

An academic body which supervises a course or courses and which is similar to a Faculty except that it is headed by a Chair rather than a Dean and does not supervise PhD candidates. **Bursaries** 

*(See* Scholarships)

**Business** Address

FlexSIS can record a student's Business Address and contact details

(See also Addresses, Permanent Home Address, Semester Address, Temporary Address)

### Cadigal Program

The Cadigal Program is a University wide access and support scheme for Aboriginal and Torres Strait Islanders.

### Campus

The grounds on which the University is situated. There are eleven campuses of the University of Sydney: Burren Street (Australian Graduate School of Management), Camperdown and Darlington ('Main Campus'), Camden (Agriculture and Veterinary Science), Conservatorium (Conservatorium of Music), Cumberland (Health Sciences), Mallett Street (Nursing), Orange (Faculty of Rural Management), Rozelle (Sydney College of the Arts), St James (Law) and Surry Hills (Dentistry).

Census date

(See HECS Census Date)

Ceremony

(See Graduation Ceremony)

Chancellor

The non-executive head of the University. An honorary position, the Chancellor chairs meetings of the University's governing body, the Senate, and presides over graduation ceremonies amongst other duties.

Class list

A listing of all Currently Enrolled students in a particular Unit of Study.

*{See also* Unit of Study*)* 

Combined Course

A course which leads to two awards. For example the Arts/ Law course leads to the separate awards of Bachelor of Arts and Bachelor of Laws.

Combined degree

*(See* Combined Course)

Commencing Student

A student enrolling in an award course at the University of Sydney for the first time. The DETYA Glossary provides a more detailed definition.

Compulsory Subscription Rates

There are two rates for some annual subscriptions: full-time and part-time.

*(See also* Compulsory Subscriptions)

Compulsory Subscription Waiver Provision

Certain students over a certain age or with disabilities or medical conditions may be exempted from the subscription to the sports body.

Students with a conscientious objection to the payment of subscriptions to Unions of any kind may apply to the Registrar for exemption. The Registrar may permit such a student to make the payment to the Jean Foley Bursary Fund instead. *(See also* Compulsory Subscriptions)

### Compulsory Subscriptions

Each enrolled student is liable to pay annual (or semester) subscriptions as determined by the Senate to the student organisations at the University. These organisations are different on different campuses. There are different organisations for undergraduate and postgraduate students.

At the Main Campus, compulsory submissions depend on the level of study:

- Undergraduate the University of Sydney Union, Students Representative Council (SRC) and the University Men's Sports Union or the University Women's Sports Association.
- Postgraduate the University of Sydney Union and the Sydney University Postgraduate Representative Association (ŠUPŘA).

At other campuses, student organisations include:

the Cumberland Student Guild

student organisations at Orange Agricultural College and the Sydney College of the Arts.

{See also Compulsory Subscription Rates, Compulsory Subscription Waiver Provision, Joining Fee, Life membership)

### Confirmation of Enrolment Status Form

A Confirmation of Enrolment Status Form is issued to students after enrolment showing the course and the UoSs they are enrolled in, together with the UoS credit point value of the UoSs and the HECS weights. Until all fees are paid, it is issued provisionally.

A new Confirmation of Enrolment form is produced every time a student's enrolment is varied. For Postgraduate Research students the form also lists candidature details and Supervisor information.

Where students have an appointed adviser, the adviser information is also shown.

Convocation

Convocation is the body comprising all graduates of the University.

Core Unit of Study

A Unit of Study (UoS) that is compulsory for the course or subject area.

(See also Unit of Study (UoS))

#### Coreauisite

A Corequisite is a Unit of Study, which must be taken in the same semester or year as a given Unit of Study (unless it has already been completed). These are determined by the Faculty or Board of Studies concerned, published in the Faculty Handbook and shown in FlexSIS.

(See also Prerequisite, Waiver) Course

(See Award Course)

Course Alias

Each course in FlexSIS is identified by a unique five-digit Alpha-Numeric code.

Course Code

(See Course Alias)

Course Leave

Students (undergraduate and postgraduate) are permitted to apply for a period away from their course without losing their place. Course leave is formally approved by the supervising Faculty for a minimum of one semester and recorded on FlexSIS (leave for periods of less than one semester should be recorded internally by the Faculty). Students on leave are regarded as having an active candidature, but they are not entitled to a student card. At undergraduate level leave is not counted towards the total length of the course. Students who are absent from study without approved leave may be discontinued and may be required to reapply formally for admission. In respect of research students the term 'Suspension of Candidature' was previously used to describe students on course leave.

#### Course (Research)

A classification of courses in which students undertake supervised research leading to the production of a thesis or other piece of written or creative work over a prescribed period of time. The research component of a research course must comprise 66% or more of the overall course requirements.

#### Course Rules

Course Rules govern the allowable enrolment of a student in a Course; eg, a candidate may not enrol in Units of Study having a total value of more than 32 credit points per semester. Course Rules also govern the requirements for the award of the Course; eg, a candidate must have completed a minimum of 144 credit points. Course Rules may be expressed in terms of types of Units of Study taken, length of study, and Credit Points accumulated.

Course Suspension

(See Course Leave)

### Course Transfer

A Course Transfer occurs where a student changes from one course in the University to another course in the University without the requirement for an application and selection (eg, from a PhD to a Master's program in the same Faculty).

Course Type

Course Type is a DETYA code.

### Coursework

Coursework is a classification used to describe those courses that consist of UoSs rather than research work. All

Undergraduate courses are coursework programs.

Postgraduate courses can be either research courses or

coursework courses.

(See also Course (Research)

Credit

Students admitted to a course at the University may be granted Advanced Standing based on previous attainment in another course at the University, or at anouier institution. The credit points granted count towards the course.

Credit may be granted as specific credit or non-specific credit.

Specific credit is the recognition of previously completed studies as directly equivalent to UoSs. Specific credit is recorded on FlexSIS as credit for a particular UoS or UoSs.

Non-Specific credit takes the form of a 'block credit' for a specified number of credit points at a particular level (eg, 12 Junior level credit points). These credit points may be in a particular subject area. The credit is not linked to a specific ŨoS.

### (See also Waiver)

Credit Points

Credit Points are a measure of value indicating the contribution each Unit of Study provides towards meeting course completion requirements stated as a total Credit Point value. Each Unit of Study will have a Credit Point value assigned to it, normally in the range 3 to 24. Resolutions of Senate set the number and level of Credit Points required for graduation.

#### Cross-institutional Enrolment

Cross-institutional Enrolment is an enrolment in Units of Study at one university to count towards an award course at another university. Cross-institutional enrolments incur a HECS liability or tuition fee charge at the institution at which the UoS is being undertaken. Students pay compulsory subscriptions to one university only (usually their home university - ie, the university which will award their degree).

### DAC (Data Audit Committee)

DAC is a sub-committee of the VCAC Enrolment Working Party, chaired by the Registrar, with membership including the Deans, the Student Centre, FlexSIS and the Planning Support Office. Its role is to oversee the integrity and accuracy of the Course and Unit of Study data as strategic university data. It has a role in advising the Academic Board on suggested policy changes with relation to Course and Unit of Study data.

### Deadlines (enrolment variations)

(See Enrolment Variations)

#### Deadlines (fees)

The University has deadlines for the payment of fees (eg, HECS, Compulsory Subscriptions, course fees etc). Students who do not pay fees by these deadlines may have their enrolment cancelled or they may have a barrier placed on the release of their record.

#### (See also Barrier)

Dean

The head of a Faculty or the principal or director of a College (such as the Conservatorium of Music or the Sydney College of Arts).

#### Dean's Certificate

A statement from the Dean certifying that all requirements, including fieldwork and practical work, have been met and that the student is eligible to graduate. Not all Faculties use Deans' Certificates. In Faculties that do, qualified students have 'Dean's Certificate' noted on their academic record.

### DETYA

The Department of Education Training and Youth Affairs is the Commonwealth Government Department responsible for Higher Education. The University is required to provide DETYA with information about its students three times a year. The Government in its funding deliberations uses this information.

Deferment

(See Admission (deferment), Leave)

Degree

(See also Award Course, Bachelor's Degree)

Department

For the purposes of FlexSIS, a Department is the academic unit, which is responsible for teaching and examining a UoS. It may be called a School, a Department, a Centre or a Unit within the University.

Differential HECS

(See Higher Education Contribution Scheme (HECS)) 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 only available to students who already hold an undergraduate degree.

(See also Award Course)

Direct Admissions

For some courses, applications may be made directly to the University. Applications are received by Faculties or the International Office, registered on FlexSIS and considered by the relevant Department or Faculty body. Decisions are recorded on FlexSIS and FlexSIS produces letters to applicants advising them of the outcome.

(See also Admission, UAC Admissions)

Disability Information

Students may inform the University of any temporary or permanent disability, other than a financial disability, which affects their life as a student. Disability Information is recorded in FlexSIS but it is only visible to particular authorised users because of its sensitive nature. *Discipline Codes* 

Discipline Codes are four-letter codes for each area of study available at the university (eg, CHEM Chemistry, ECON Economics)

Discipline Group

A DETYA code used to classify UoSs in terms of the subject matter being taught or being researched.

Discontinuation (Course)

(See Enrolment Variation)

Discontinuation (Unit of Study)

(See Enrolment Variation)

Dissertation

A Dissertation is a written exposition of a topic and may include original argument substantiated by reference to acknowledged authorities. It is a required Unit of Study for some postgraduate award courses in the Faculties of Architecture and Law.

Doctor of Philosophy (PhD)

(See Award Course, Doctorate, PhD)

Doctorate

The Doctorate and the PhD are high-level postgraduate 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 often requires completion of a Master's degree course. Note that the Doctorate course is not available in all Departments at the University of Sydney. (*See also* Award Course, PhD)

Earliest date

(See Research Candidature)

### EFTSU

The Equivalent FuU-Time Student Unit (EFTSU) is a measure of student load expressed as a proportion of the workload for a standard annual program for a student undertaking a full year of study in a particular award course. A student undertaking the standard annual program of study (normally 48 credit points) generates one EFTSU.

EFTYR

The Effective Full-time Enrolment Year (EFTYR) is a calculation of how long, in terms of equivalence to full-time years of enrolment, a student has been enrolled in a course. If a student has always been full-time, the calculation is straightforward (for example, the fifth year of enrolment is EFTYR 5). If the student has had a mixture of part-time and full-time enrolment, this can be equated with an EFTYR. (*See also* Stage)

Enrolment

A student enrolls in a course by registering with the Supervising Faculty in the Units of Study to be taken in the coming year, semester or session. The student pays whatever fees are owing to the University by the deadline for that semester. New students currently pay on the day they enrol which is normally in early February. Students already in a course at the University re-enrol each year or semester; for most students Pre-enrolment is required. (See also Pre-enrolment)

(see also Pre-enronnent)

Enrolment Non Award

Non Award enrolment is an enrolment in a Unit or Units of Study, which does not count towards a formal award of the University. Normally Tuition Fees are levied on non-award Units of Study.

Enrolment Status

A student's enrolment status is either:

- Enrolled; or
- Not enrolled

An enrolment status is linked to an enrolment status reason or category.

Enrolment Status Reason/ Category

Not enrolled status reasons/categories include: Withdrawn, Totally Discontinued, Cancelled, on Leave (suspended), Transferred, Lapsed, Terminated, Qualified and Conferred. *Enrolment Variation* 

Students may vary their enrolment at the beginning of each semester. Each Faculty determines its deadlines for variations, but HECS liability depends on the HECS Census Date. (*See also* HECS)

Enrolment Year

See EFTYR, Stage

Examination

See Examination Paper Code, Examination Period,

Supplementary Exams

Examination Paper Code

A code that identifies each individual examination paper. Used to help organise examinations.

Examination Period

The Examination Period is the time set each semester for the conduct of formal examinations.

Exchange Student

An Exchange student is either a student of this University who is participating in a formally agreed program involving study at an overseas university or an overseas student who is studying here on the same basis. The International Office provides administrative support for some exchanges.

Students at this University will have recorded on their academic record the fact that they have participated in an exchange program.

### Exclusion

The Faculty may ask a student whose academic progress is considered to be unsatisfactory to Show Cause why the student should be allowed to re-enrol. If the Faculty deems the student's explanation unsatisfactory or if the student does not provide an explanation the student may be excluded either from a Unit of Study or from a course. An excluded student may apply to the Faculty for permission to re-enrol. Normally at least two years must have elapsed before such an application would be considered.

University policy relating to exclusion is set out in the Calendar.

*(See also* Senate Appeals)

### External

See Attendance Mode

#### External Transcript

An External Transcript is a certified statement of a student's academic record printed on official university security paper. It includes the student's name, any credit granted, all courses the student was enrolled in and the final course result and all UoSs attempted within each course together with the UoS result (but not any UoS which has the status of Withdrawn). It also includes any scholarships or prizes the student on graduation (one with marks and grades for each UoS and one with grades only). External transcripts are also produced at the request of the student. The student can elect either to have marks appear on the transcript or not.

(See also Academic Transcript, Internal Transcript)

Faculty

A Faculty, consisting mainly of academic staff members and headed by a dean, is a formal part of the University's academic governance structure, responsible for all matters concerning the award courses that it supervises (see the 1999 Calendar, pp 110-111). Usually, a Faculty office administers the Faculty and student or staff inquiries related to its courses. The Calendar sets out the constitution of each of the University's 17 Faculties.

*(See also* Board of Studies, Supervising Faculty) *Fail* 

A mark of less than 50% which is not a Concessional Pass. *[See also* Results]

Fee Paying Students

Fee Paying Students are students who pay tuition fees to the University and are not liable for HECS.

Fee Rate

Local fees are charged in bands, a band being a group of subject areas. The bands are recommended by Faculties and approved by the DV-C (Planning and Resources).

### Fee Type

Fee Type can be International or Local.

FlexSIS

FlexSIS is the computer-based Flexible Student Information System at the University. FlexSIS holds electronically details of courses and UoSs being offered by the University and the complete academic records of all students enrolled at the University. FlexSIS also holds the complete academic records of many (but not all) past students of the university. For past students whose complete records are not held on FlexSIS, there will be a reference on FlexSIS to card or microfiche records where details are kept.

Full-Time Student

(See Attendance Status, EFTSU)

Grade

A Grade is a result outcome for a Unit of Study normally linked wifli a mark range. For example, in most Faculties, a mark in the range 85-100 attracts the Grade 'High Distinction' ('HD').

(See also Mark)

Graduand

A Graduand is a student who has completed all the requirements for an award course but has not yet graduated. *(See also* Graduation, Potential Graduand)

Graduate

A Graduate is a person who holds an award from a recognised tertiary institution.

{See also Graduand, Graduation)

Graduate Certificate

*{See* Award Course*)* 

Graduate Diploma

{See Award Course)

Graduate Register

The Graduate Register is a list of all graduates of the

University.

*{See also* Graduation*) Graduation* 

Graduation is the formal conferring of awards either at a

ceremony or in absentia.

(See also In absentia, Potential Graduand)

Graduation Ceremony

A Graduation Ceremony is a ceremony where the Chancellor confers awards upon graduands. The Registrar publishes annually the schedule of graduation ceremonies.

#### HEC

See Higher Education Contribution Scheme (HECS) HECS Census Date

The date at which a student's enrolment, load and HECS liability are finalised before reporting to DETYA. The following dates apply:

1st Semester, 31 March

• 2nd Semester, 31 August

HECS Code

A code used by DETYA to identify the HECS status of a student (eg, 10 Deferred, 11 Upfront).

Higher Doctorates

*(See Award Course)* 

Higher Education Contribution Scheme (HECS) All students, except international students, local fee-paying students and holders of certain scholarships are obliged to contribute towards the cost of their education under the Higher Education Contribution Scheme (HECS). HECS liability depends on the load being taken.

Current students, except possibly those who began their studies prior to 1997, have a HECS rate charged for each Unit of Study in their degree program which depends on the 'discipline group' it is in, and the 'band' to which the Government has assigned it. Theses are all determined annually by the Government.

Honorary Degrees

A degree Honoris Causa (translated from the Latin as 'for the purpose of honouring') is an honorary award, which is conferred on a person whom the University wishes to honour.

A degree Ad Eundem Gradum (translated as 'at the same level') is awarded to a member of the academic staff who is not a graduate of the University in recognition of outstanding service to the University. The award of an honorary degree is noted on the person's academic record.

Honours

Some degrees may be completed 'with Honours'. This may involve either the completion of a separate Honours Year or additional work in the later years of the course or meritorious achievement over all years of the course. Honours are awarded in a Class (Class 1, Class n, Class HI) and sometimes there are two divisions within Class II. *HSC* 

The HSC is the NSW Higher School Certificate, which is normally completed at the end of year 12 of secondary school. The UAI (Universities Admission Index) is a rank out of 100 that is computed from a student's performance in the HSC.

### In absentia

In absentia is Latin for 'in the absence of'. Awards are conferred in absentia when a graduand does not, or cannot, attend the graduation ceremony scheduled for them.

Those who have graduated in absentia may later request that they be presented to the Chancellor at a graduation ceremony. *(See also* Graduation)

### Instrumental Supervisor (teacher)

All students at the Conservatorium of Music and BMus students on the Camperdown campus have an instrumental teacher appointed.

(See also Advisor, Associate Supervisor, Research Supervisor, Supervision.)

Internal

(See Attendance Mode)

### Internal Transcript

An Internal Transcript is a record of a student's academic record for the University's own internal use. It includes the student's name, SID, address, all courses in which the student was enrolled and the final course result and all UoSs attempted within each course together with the UoS result.

(See also Academic Transcript, External Transcript)

### International Student

An International Student is required to hold a visa to study in Australia and may be liable for international tuition fees. Any student who is not an Australian or New Zealand citizen or a permanent resident of Australia is an international student. New Zealand citizens are not classified as international students but have a special category under HECS that does not permit them to defer their HECS liability.

(See also Local Student, Student Type)

Joining Fee

Students enrolling for the first time pay, in addition, a joining fee for the University of Sydney Union or equivalent student organisation.

(See also Compulsory Subscription)

Leave

(See Course Leave)

Life membership

Under some circumstances (eg, after five full-time years of enrolments and contributions) students may be granted life membership of various organisations, which means they are exempt from paying yearly fees.

(See also Compulsory Subscription)

Load

Load for an individual student is the sum of the weights of all the UoSs in which the student is enrolled.

(See also EFTSU, HECS)

Local Student

A Local Student is either an Australian or New Zealand citizen or Australian permanent resident. New Zealand citizens are required to pay their HECS upfront.

(See also Fee type, HECS, International Student) Major

A Major is a defined program of study, generally comprising specified Units of Study from later stages of the Award Course. Students select and transfer between Majors by virtue of their selection of Units of Study. One or more Majors may be prescribed in order to satisfy course requirements. (*See also* Award Course, Minor and Stream)

### Major Timetable Clash

Used by FlexSIS to denote occasions when a student attempts to enrol in Units of Study which have so much overlap in the teaching times that it has been decided that students must not enrol in the units together.

### Mark

An integer (rounded if necessary) between 0 and 100 inclusive, indicating a student's performance in a UoS. (*See also* Grade)

### 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 an undergraduate level.

(See also Award Course) Method of candidature

A course is either a research course or a coursework course and so the Methods of Candidature are 'Research' and 'Coursework'

(See also Course, Course (Research), Coursework) Minor

A Minor is a defined program of study, generally comprising Units of Study from later stages of the Award Course and requiring a smaller number of Credit Points than a Major. Students select and transfer between Minors (and Majors) by virtue of their selection of Units of Study. One or more Minors may be prescribed in order to satisfy course requirements. (*See also* Award Course, Major and Stream)

Minor Timetable Clash

Used by FlexSIS to denote occasions when a student attempts to enrol in Units of Study which have some identical times of teaching.

Mutually Exclusive Units of Study

(See Prohibited Combinations of Units of Study) MyUni

MyUni is a personalised space for staff and students on the University of Sydney's intranet, called USYDnet. MyUni is used to deliver information and services directly through a central location, while also allowing users to customise certain information. Students are able to access such services as Exam Seat Numbers, Results, Timetables and FlexSIS Enrolment Variations on MyUni.

Non Award

(See Enrolment - Non Award)

OPRS

Overseas Postgraduate Research Scholarship.

Orientation Week

Orientation or 'O Week', takes place during the week prior to lectures in Semester 1. 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 student

(See Attendance Status, EFTSU)

Permanent Home Address

The Permanent Home Address is the address for all official University correspondence both inside and outside of Semester time (eg, during Semester breaks), unless overridden by Semester Address.

(See also Addresses, Business Address, Semester Address, Temporary Address)

PhD

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 in the University of Sydney. (See also Award Course, Doctorate)

Postgraduate

A term used to describe a course leading to an award such as Graduate Diploma, a 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.

Potential Graduand

Potential Graduands are students who have been identified as being eligible to graduate on the satisfactory completion of their current studies.

(See also Graduand, Graduation)

### Pre-enrolment

Pre-enrolment takes place in October for the following year. Students indicate their choice of UoS enrolment for the following year. After results are approved, registered students are regarded as enrolled in those UoSs they chose and for which they are qualified. Their status is 'enrolled' and remains so provided they pay any money owing or comply with other requirements by the due date. Re-enrolling students who do not successfully register in their Units of Study for the next regular session are required to attend the University on set dates during the January/February enrolment period. Preenrolment is also known as Provisional Re-enrolment. *(See also* Enrolment)

### Prerequisite

A prerequisite is a Unit of Study that is required to be completed before another UoS can be attempted. *(See also* Assumed Knowledge, Corequisite, Waiver)

### Prizes

Prizes are awarded by the University, a Faculty or a Department for outstanding academic achievement. Full details can be found in the University Calendar.

### Probationary Candidature

A Probationary Candidate is a student who is enrolled in a postgraduate course on probation for a period of time up to one year. The Head of Department is required to consider the candidate's progress during the period of probation and make a recommendation for normal candidature or otherwise to the Faculty.

Progression

### *(See Course Progression)*

Prohibited Combinations of Units of Study When two or more Units of Study contain a sufficient overlap of content, enrolment in any one such Unit prohibits enrolmen

of content, enrolment in any one such Unit prohibits enrolment in any other identified Unit. A Unit related in this way to any other Unit is linked in Tables of Units of Study via use of the symbol N to identify related prohibited Units.

### Provisional Re-enrolment

*(See* Pre-enrolment)

Qualification

 $\overline{A}$  qualification is an academic attainment recognised by the University.

Registrar

The Registrar is responsible to the Vice-Chancellor for the keeping of official records and associated policy and procedures within the University. *(See the University Calendar for details.)* 

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 Orientation Week. Note that unlike enrolment, registration is not a formal record of Units attempted by the student.

Research Course

*{See* Course (Research))

### Research Supervisor

A Supervisor is appointed to each student undertaking a research postgraduate degree. The person will be a full-time member of the academic staff or a person external to the University appointed in recognition of their association with the clinical teaching or the research work of the University. A Research Supervisor is commonly referred to as a Supervisor. *(See also* Advisor, Associate Supervisor, Instrumental Supervisor (teacher), Supervision)

Resolutions of Senate

Regulations determined by the Senate of the University of Sydney that pertain to degree and diploma course

requirements and other academic or administrative matters. *Result Processing* 

Refers to the processing of assessment results for UoSs. Departments tabulate results for all assessment activities of a UoS and assign preliminary results for each UoS. Preliminary results are considered by the relevant Board of Examiners, which approves final results. Students are notified of results by result notices that list final marks and grades for all UoSs. *(See also Assessment, Examination Period) Result Processing Schedule* The Result Processing Schedule will be determined for each

Academic Cycle. It is expected that all Departments and

Faculties will comply with this schedule.

*(See also* Assessment, Examination Period, Result Processing) *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 85-100

*D* Distinction, a mark of 75-84

CR

Credit, a mark of 65-74

Pass, a mark of 50-64

R

Satisfied requirements. This is used in Pass/Fail only outcomes UCN

Unit of Study continuing. Used at the end of semester for UoSs that have been approved to extend into a following semester. This will automatically flag that no final result is required until the end of the last semester of the UoS. *PCON* 

Pass (Concessional), a mark of 46-49. Use of this grade is restricted to those courses that allow for a Concessional Pass of some kind to be awarded; A student may re-enrol in a Unit of Study for which the result was PCON. Each faculty will determine and state in its course regulations what proportion, if any, may count - eg, 'no more than one sixth of the total credit points for a course can be made up from PCON results'. F

Fail. This grade may be used for students with marks from 46-49 in those faculties which do not use PCON. AF

Absent Fail. Includes non-submission of compulsory work (or non- attendance at compulsory labs etc) as well as failure to attend an examination. W

Withdrawn. Not recorded on an external transcript. This is the result that obtains where a student applies to discontinue a Unit of Study by the HECS Census Date (ie, within the first four weeks of enrolment). *DNF* 

Discontinued - Not to count as failure. Recorded on external transcript. This result applies automatically where a student discontinues after the HECS Census Date but before the end of the seventh week of the semester (or before half of the Unit of Study has run, in the case of Units of Study which are not semester-length). A faculty may determine that the result of DNF is warranted after this date if the student has made out a special case based on illness or misadventure. *DF* 

Discontinued - Fail. Recorded on transcript. This applies from the time DNF ceases to be automatically available up to the cessation of classes for the Unit of Study. *MINC* 

Incomplete, with a mark of at least 50. This result may be used when examiners have grounds (such as illness or misadventure) for seeking further information or for considering additional work from the student before confirming the final mark and passing grade. Except in special cases approved by the Academic Board, this result will be converted to a normal passing mark and grade either:

(a) by the Dean at the review of examination results conducted pursuant to section 2 (4) of the Academic Board policy 'Examinations and Assessment Procedures'; or

(b) automatically to the indicated mark and grade by the third week of the immediately subsequent academic session. Deans are authorised to approve the extension of a MINC grade for individual students having a valid reason for their incomplete status.

### INC

Incomplete. This result is used when examiners have grounds (such as illness or misadventure) for seeking further information or for considering additional work from the student before corifirming the final result. Except in special cases approved by the Academic Board, tins result will be converted to a normal permanent passing or failing grade either:

- (a) by the Dean at the review of examination results conducted pursuant to section 2 (4) of the Academic Board policy 'Examinations and Assessment Procedures'; or
- (b) automatically to an AF grade by the third week of the immediately subsequent academic session. Deans are authorised to approve the extension of a MINC grade for individual students having a vahd reason for their incomplete status.

### UCN

Incomplete. A MINC or INC grade is converted, on the advice of the Dean, to UCN when all or many students in a Unit of Study have not completed the requirements of the Unit. The students may be engaged in practicum or clinical placements, or in programs extending beyond the end of semester (eg, Honours).

Scholarships

Scholarships are financial or other forms of support made available by sponsors to assist Australian and international students to pursue their studies at the University. When a student's means are a criterion, scholarships are sometimes called bursaries.

(See also Prizes)

School

(See Department)

SCR

System Change Request.

### Semester

A semester is the Academic Teaching period of approximately 14 weeks duration. All Units of Study have been semesterised, both at the undergraduate and postgraduate level, except for those components of final honours year or postgraduate courses relating to diesis or other similar research oriented projects for which two or more semesters are normally assigned for completion. Units of Study are taught and examined in either the first semester or the second semester (or in bodi semesters if the course is offered twice). *Semester Address* 

The Semester Address is the address to which all Official University correspondence is sent during semester time, if it is different to the Permanent Address. Unless overridden by a Temporary Address all Official University correspondence during Semester (including Session 4 for students enrolled in Summer School) will be sent to this address.

(See also Addresses, Business Address, Permanent Home Address, Temporary Address)

Senate

The Senate of the University is the governing body of the University.

(See the University Calendar)

Senate Appeals

Senate appeals are held for those students who, after being excluded by the Faculty from a course, appeal to the Senate for readmission. While any student may appeal to the Senate against an academic decision, such an appeal will normally be heard only after the student has exhausted all other avenues ie, the Department, Faculty, Board of Study and, in the case of postgraduates, the Committee for Graduate Studies. (See also Exclusion)

#### Session

A session is a defined teaching period of the University. The two major sessions are called semesters and are defined by the DETYA HECS Census date they contain (eg, first and second semester). The Academic Board must approve variation to the normal session pattern.

Session Address

(See Semester Address) Special Consideration

Candidates who have medical or other serious problems, which may affect performance in any assessment, may request that they be given Special Consideration in relation to the determination of their results.

They can obtain an official form from the Student Centre. The Student Centre stamps the form and the medical or other documentation. The student gives a copy of the material to the Student Centre staff and takes copies to the relevant Departments. The student retains the originals. The dates for which Special Consideration is sought are recorded on FlexSIS and printed on the Examination Register.

Special Permission

(See Waiver)

Sponsorship

Sponsorship is the financial support of a student by a Company or Government body. Sponsors are frequendy invoiced directly.

#### Stage

For the purposes of administration, a course may be divided into stages to be studied consecutively. The stages may be related to sessions or they may relate to an Academic Cycle. Part time students progress through a course more slowly and would often enrol in the same stage more than once. *Status* 

Status is a variable for students both with relation to Course and Unit of Study. With relation to Course, students can have the status of Enrolled or Not Enrolled. Not Enrolled reasons can be Totally Discontinued, Withdrawn, Suspended, Cancelled, Awarded, etc. With relation to Unit of Study, students can have the status of CURENR or WITHDN, Discontinued, etc.

#### Stream

A Stream is a defined program of study, selected from a table of Units of Study. Students enrolled in award courses that involve streams will have the stream recorded in their enrolment record. A student generally enters streams at the time of admission, although some award courses require students to enrol in streams after the completion of Level 1000. Students may transfer between Streams by altering their enrolment status within their Award Course, but only when permitted to do so by Faculty Resolution. (*See also* Award Course, Major and Minor)

#### Student ID card

All students who enrol are issued with an identification card. The card includes the student name, SID, the course code, and a library borrower's bar code. The card identifies the student as eligible to attend classes and must be displayed at formal examinations. It must be presented to secure student concessions and to borrow books from all sections of the University Library.

Student Identifier (SID)

A nine-digit number which uniquely identifies a student at the University.

Student Load

(See Load)

### Study Abroad Program

A scheme administered by the International Education Office which allows international students who are not part of an exchange program, to study UoSs at the University of Sydney, but not towards an award program. In most cases the UoSs studied here are credited towards an award at their home institution.

(See also Exchange Student)

### SubjectArea

A Unit of Study may be associated with one or more Subject Areas. The Subject Area can be used to define Prerequisite and Course Rules - eg, the Unit of Study 'History of Momoyama and Edo Art' may count towards the requirements for the Subject Areas 'Art History and Theory' or, 'Asian Studies'. *Supervising Faculty* 

The Supervising Faculty is the Faculty which has the responsibility for managing the academic administration of a particular course ie, the interpretation and administration of course rules, approving students' enrolments and variations to enrolments. Normally the supervising Faculty is the Faculty offering the course. However, in the case of combined courses, one of the two Faculties involved will usually be designated the Supervising Faculty at any given time. Further, in the case where one course is jointly offered by two or more Faculties (eg, the Liberal Studies course) a Joint Committee may make academic decisions about candidature and the student may be assigned a Supervising Faculty for administration.

The International Office has a supporting role in the administration of the candidatures of international students and alerts the Supervising Faculty to any special conditions applying to these candidatures (eg, that enrolment must be full-time).

(See also Board of Studies)

### Supervision

Supervision refers to a one to one relationship between a student and a nominated member of the academic staff or a person specifically appointed to the position.

(See also Advisor, Associate Supervisor, Instrumental

Supervisor (teacher), Research Supervisor)

Supplementary Examination

(See Supplementary Exams)

Supplementary Exams

Supplementary exams may be offered by Faculties to students who fail to achieve a passing grade or who were absent from assessment due to illness or misadventure.

Suppression of Results

Results for a particular student can be suppressed by the University for the following reasons:

• the student has an outstanding debt to the University

the student is facing disciplinary action.

Suspension

(See Course Leave)

Teaching Department

(See Department)

Temporary address

Students may advise the University of a Temporary Address. Correspondence will be sent to this address between the dates specified by the student.

(See also Addresses, Business Address, Permanent Home Address, Semester Address)

Testamur

A testamur is a certificate of award provided to a graduate usually at a graduation ceremony.

Thesis

A thesis is a major work that is the product of an extended period of supervised independent research.

'Earliest date' is the earliest date at which a research student can submit the thesis.

'Latest date' is the latest date at which a research student can submit the thesis.

Timetable

Timetable refers to the schedule of lectures, tutorials,

laboratories and other academic activities that a student must

attend.

*Transcript* (*See* Academic Transcript)

(See Academic Transcrip

Transfer

(See Course Transfer)

### Tuition Fees

Tuition fees may be charged to students in designated tuition fee-paying courses. Students who pay fees are not liable for HECS.

### UAC

The Universities Admissions Centre (UAC) receives and processes applications for admission to undergraduate courses at recognised universities in NSW and the ACT. Most commencing undergraduate students at the University apply through UAC.

### UAC Admissions

Most local undergraduates (including local undergraduate fee payers) apply through the Universities Admission Centre (UAC).

The University Admissions Office coordinates the processing of UAC applicants with Faculties and Departments and decisions are recorded on the UAC system. Applicants are notified by UAC and an electronic file of applicants who have been made offers of admission to courses at the University is loaded onto FlexSIS. (See also Admission, Direct Admissions)

#### UAI (Universities Admission Index)

The Universities Admission Index (UAI) is a number between 0.00 and 100.00 with increments of 0.05. It provides a measure of overall academic achievement in the HSC that assists universities in Tanking applicants for university selection. The UAI is based on the aggregate of scaled marks in ten units of the HSC.

#### Undergraduate

A 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 (UoS)

A Unit of Study is the smallest stand-alone component of a student's course that is recordable on a student's transcript. UoSs have an integer credit point value, normally in the range 3-24. Each approved UoS is identified by a unique sequence of eight characters, consisting of a four character alphabetical code which usually identifies the Department or subject area, and a four character numeric code which identifies the particular UoS. Units of Study can be grouped by subject and level.

(See also Core Unit of Study, Course, Major)

Unit of Study Enrolment Status

The UoS Enrolment Status indicates whether the student is still actively attending the UoS (ie, currently enrolled) or is no longer enrolled (withdrawn or discontinued)

Unit of Study Group A grouping of Units of Study

A grouping of Units of Study within a course. The Units of Study which make up the groups are defined within FlexSIS. Unit of Study Level

Units of Study are divided into Junior, Intermediate, Senior, Honours, 5th Year, and 6th Year. Most Majors consist of 32 Senior Credit Points in a subject area (either 3000 level Units of Study or a mix of 2000 and 3000 level Units of Study). *University* 

Unless otherwise indicated, University in this document refers to the University of Sydney.

University Medal

*A* Faculty may recommend the award of a University Medal to students qualified for the award of an undergraduate Honours degree or some Masters degrees, whose academic performance is judged outstanding.

*UoS* (See Unit of Study)

UPA

University Postgraduate Award.

### USYDnet

USYDnet is the University of Sydney's intranet system. In addition to the customised MyUni service, it provides access to other services such as Directories (Maps, Staff and Student, Organisations), a Calendar of Events (to which staff and students can submit entries), and a software download area. *Variation of Enrolment* 

(See Enrolment Variation)

### Vice-Chancellor

The chief executive officer of the whole University, responsible for its leadership and management. He is head of both academic and administrative divisions.

### Waiver

In a prescribed course, a Faculty may waive the Prerequisite or corequisite requirement for a Unit of Study or the course rules for a particular student. Waivers do not involve a reduction in the number of credit points required for a course. (*See also* Credit)

### Weighted Average Mark (WAM)

The Weighted Average Mark (WAM) is the average mark in the UoSs completed, weighted according to credit point value and level. The formulae used to calculate the WAMs are course-specific: there are many different WAMs in the University..

Year of First Enrolment (YFE)

The year in which a student first enrols at the University.

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