The University of Sydney

Faculty of Engineering Handbook 2002

University semester and vacation dates 2002

Summer School	
Lectures begin	Wednesday 2 January
Summer School ends	Friday 1 March
Semester J	
Lectures begin	Monday 4 March
Easter recess:	
Last day of lectures	Thursday 28 March
Lectures resume	Monday 8 April
Study vacation: 1 week beginning	Monday 17 June
Examinations commence	Monday 24 June
Semester 1 ends	Saturday 6 July
Semester 2	
Lectures begin	Monday 29 July
Mid-semester recess:	
Last day of lectures	Friday 27 September
Lectures resume	Tuesday 8 October
Study vacation: 1 week beginning	Monday 11 November
Examinations commence	Monday 18 November
Semester 2 ends	Saturday 7 December

Last dates for withdrawal or discontinuation 2002

Semester 1 units of study	
Last day to add a unit	Friday 15 March
Last day for withdrawal	Friday 29 March
Last day to discontinue without failure (DNF)	Friday 26 April
Last day to discontinue (Discontinued - Fail)	Friday 14 June
Semester 2 units of study	
Last day to add a unit	Friday 9 August
Last day for withdrawal	Friday 30 August
Last day to discontinue without failure (DNF)	Friday 13 September
Last day to discontinue (Discontinued - Fail)	Friday 8 November
Full Year units of study	
Last day for withdrawal	Friday 29 March
Last day to discontinue with permission (DNF)	Friday 2 August
Last day to discontinue (Discontinued - Fail)	Friday 8 November

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

The University of Sydney, NSW 2006
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Faculty of Engineering

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Contents

Message from the Dean

I would like to extend a warm welcome to all of you on behalf of the Faculty of Engineering at The University of Sydney.

The Faculty of Engineering, also know as the Peter Nichol Russell Faculty of Engineering in commemoration of its industrial benefactor, Sir Peter Russell, aims to provide you with the best possible education and facilities, to pave the way towards your future career. We have a history of maintaining academic excellence, producing innovative and exciting research, and mentoring our undergraduate and postgraduate students in order that they become Australia's future industrial leaders. Our industry links are stronger than ever and our record with respect to graduate recruitment remains unsurpassed. Over recent years, moreover, our unique Advanced Engineering program has meant the exposure of our high achieving students to ground-breaking design projects and entrepreneurial skills.

One of our central aims, here at The University of Sydney, is to produce engineers of the future who are technically competent, up-to-date with constantly changing technologies, and who are socially and environmentally aware. Because engineering is about applying scientific knowledge, solving complex problems, and exercising social skills, our Faculty will provide you with a strong basis in science which will be invaluable to you both in your later years of undergraduate study and in your chosen career path. This scientific basis will be laid down during the first two years of your undergraduate course and this vital foundation is *the* hallmark of the Peter Nicol Russell Faculty. In addition, all of our students will complete industrial work experience during their degrees, allowing you invaluable contact with industry and an early opportunity to apply the skills you have learnt to the workplace.

Engineers 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 will develop the skills necessary to thrive in the real world and the knowledge required to deal with the challenging social and environmental issues that concern us today. Our standards in teaching excellence mean that you will work with the best academic staff in collaboration with our colleagues from industry. You will work on real problems with real engineers!

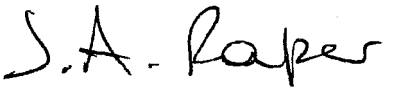
You may have chosen to study engineering because you enjoy proficiency at mathematics and in the sciences or perhaps because you are interested in computer technology or the environment. You may also have a liking for solving problems, being challenged to think in new ways, or making things. These are all characteristics of a good engineer. In addition, engineering is about meeting people and about management - whether of people, projects, time, natural or other resources. You will find that many engineers travel extensively. They also tend to possess high starting salaries and fast, upward career mobility. importantly, they are always in great demand both in Australia and internationally.

If you are one of the increasing number of students who has chosen to take a combined degree, you will become quickly aware of the value and flexibility of these additional studies, both in relation to your future career prospects and to your enjoyment of undergraduate study in general. The Faculty has always encouraged the study of combined programs, meeting the needs of employers who are also interested in graduates with a broad education.

While studying engineering may require more classes and laboratory hours than some other courses and a steady and concentrated effort, it will also prove stimulating and exciting. It will provide you both with the confidence and the technological and managerial skills required to embark upon a wide variety of career options. I would encourage you, moreover, to take every opportunity to participate in the life of the Faculty - whether by taking part in our many sporting activities, participating in the Engineering Revue or becoming involved in many of the activities organized by the Sydney University Engineering Undergraduate Association (SUEUA). I congratulate you for

choosing The University of Sydney as your place of study. I am certain your time here will be a rewarding one.

Professor Judy Raper



Dean, Faculty of Engineering

Letter from the SUEUA President

As the President of the Sydney University Engineering Undergraduate Society (SUEUA) I am writing to all prospective and current Engineering students to highlight all the amazing attributes the Faculty has, and to explain how you can gain the most from your time at university.

I have been a part of the Engineering Faculty for four years now, and I can categorically say that they have been the most fun, interesting and challenging years of my life. Some people say that this enjoyment has come just from the 'university experience', and to some extent this is true, but I believe that it has been my involvement in the Engineering Faculty that has made these years so fantastic and memorable.

Engineering at Sydney University has a reputation for its academic excellence. This reputation is well-earned. From my introductory courses in first year, through to major design subjects in fourth year, I have always been impressed by the quality of the teaching and the dedication of the lecturers, professors and tutors. No matter which end of the academic spectrum you sit, the support, enthusiasm, flexibility and understanding from the staff is amazing - traits that have become very rare in tertiary education in recent years!

The Faculty is also renown for taking studies outside the classroom. A group of mechanical engineers (ranging from 2nd to 4th years) is currentiy building a Formula S AE race-car to compete in an international competition next month, while I will be taking part in an Industry placement program, whereby I work with a company for 6 months and complete my thesis with them. There are virtually no limits on the ways that you can study Engineering.

What does SUEUA do?

SUEUA is fundamentally a social club that complements the academic side of the Faculty. With Engineering being the notoriously time-consuming degree that it is, trust the, social events are a perfect way to take time out and catch up with your friends.

For first-years entering University for the first time, the whole experience can be pretty intimidating, especially when you know no-one. To alleviate this, SUEUA kick-starts each year with a First-Year Camp, specifically designed for you to meet people, chat with older students about what university is really like and to have fun! We always have a stand at the inaugural O-Week, and everyone is welcome to come over and ask us questions or just say 'hi' and get to know some faces.

Throughout the year SUEUA holds regular barbecues, which are a great way to unwind, chat to your friends, meet people from other streams and if the weather is right, demonstrate your prowess on the slip'n'shde! In the sports arena, the Engineering Faculty has always had a very strong sporting reputation (for both the men and women), and this is demonstrated each year with interfaculty sport. SUEUA coordinates the teams for each of the events, and again, everyone is welcome to join in - all you need to do is sign up.

In terms of major events for the year, Engineering is one of the few faculties that still produces a revue. This is a great way to unleash your creative, talented or just enthusiastic side through music, drama, comedy, song, production or props. Performing in the revue will definitely be one of my most memorable experiences from university - and believe the, talent is not a prerequisite!

The Engineering Ball held towards the end of each year is always a fantastic way to slip off the steel-caps and don the dinner-suit. This year's ball was a sell-out, and the evening was an enormous success from all accounts.

SUEUA is also responsible for harbouring relations with various companies and industry bodies. Through our connections we hold various seminars throughout the year, including interview technique and resume writing workshops, so as to help develop the attributes that employers will be seeking for both industry experience and graduate employment.

Obviously this is not an exhaustive description of SUEUA's activities, nor the scope of the Faculty itself. Engineering at

Sydney University has so much to offer so many different people and I would encourage anyone joining our Faculty to get involved and utilise every minute you have here. The friends and experiences that you will leave Engineering with are unique and will remain with you for the rest of your life.

To everyone involved in Engineering - good luck in 2002, have a fantastic year!

Sarah Scurr
SUEUA President 2001

1 Guide to the Faculty

■The Faculty of Engineering

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■The branches of Engineering

Aerospace, Mechanical and Mechatronic Engineering

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Administrative Officer: Anne Robertson
The School of Aerospace, Mechanical and Mechatronic Engineering offers four-year undergraduate programs leading to Bachelor of Engineering degrees in Aeronautical, Mechanical and Mechatronic Engineering as well as specialisation in Biomedical and Space Engineering. There are also five/six-year combined degrees with Science, Commerce, Arts, Medical Science or Law.

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

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

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.

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.

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

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

Space Engineering is the study of the design, testing and implementation of engineering components in one of the most demanding of environments - space. The relative small class sizes in the final two years make for an informal and friendly atmosphere. A student branch of the American Institute of Aeronautics and Astronautics (ALAA) operates in the School, which together with the Royal Aeronautical Society, caters to the professional needs of students.

The first two years of undergraduate study in the School of Aerospace, Mechanical and Mechatronic Engineering provide students with an introduction to engineering science, design and manufacturing methods, management, computing, electronics and flight mechanics 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. Aeronautical students will focus on the fundamentals of flight mechanics and dynamics, aircraft materials and structures, aerodynamics and aircraft design.

In the fourth year, more advanced study is undertaken, which 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, mechatronics, aeronautical and space engineering.

Chemical Engineering

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Head: Professor James G Petrie
Administrative Manager: Ms Linda McGill

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

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

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

Each student completes a common core of units of study, fundamental to the study of chemical engineering, and also takes a number of elective courses, chosen according to his or her particular field of interest from course options listed later. For example there is a suite of electives for students interested in Biochemical Engineering which concerns itself with biochemical methods of pollution control or in any of the biochemical industries such as pharmaceuticals, fermentation or food and dairy processing.

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'lngenieurs 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

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Head: Associate Professor Robert J Wheen
Assistant to Head of Department, Undergraduate Matters: Ms Tmne Blair

The title Civil Engineer is given to one who invents, contrives, designs and constructs for the benefit of the community. Civil engineering covers a wide range including the conception, design, construction and maintenance of those more permanent structures and services such as roads, railways, bridges, buildings, tunnels, airfields, water supply and sewerage systems, dams, pipelines, river improvements, harbours and irrigation systems. In the broader sense civil engineers are charged with the task of producing structures and systems that give the greatest amenity for the funds expended. They have therefore to optimise their schemes in terms of technological performance, impact upon the environment and the financial resources available.

Civil engineers find employment: in government authorities whose concern is the design, construction and maintenance of public services; with consultants whose main interest is the design of civil engineering works; with contractors who carry out the construction work; and in civil engineering industries which manufacture and supply materials, plant and equipment. More recently, many graduates have been recruited by management consultants.

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 and construction.

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 or major design project. 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.

Ocean Technology Group: Located within the Department of Civil Engineering, ocean engineering is a branch of technology based on a combination of eoceanography and classical areas of engineering. Fluid mechanics play an important role, as does environmental engineering. Current areas of investigation include greenhouse gas mitigation and the development of ocean wave energy devices.

The Department has a number of active exchange programs with leading departments overseas. Exchanges with the University of Edinburgh, California (Berkeley) and Ottawa, for example, have seen students in recent years complete part of their degree overseas. The ideal time for an exchange year is all or part of third year.

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, ecommerce and Computer Engineering

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Head: Professor Branka Vucetic
Manager, Academic Support Services: Eric Ring

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

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.

2 Undergraduate units of study

■ Aeronautical Engineering

AERO 1400 Intro to Aircraft Construction & Design

6 credit points. Semester: 2. **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.

AERO 1600 Workshop Technology

4 credit points. **Semester: 1. Classes:** (one 3hr lab)/wk. **Prohibition:** MECH 1600 Manufacturing TechnologyAERO 1 6 0 1 Aerospace Manufacture. **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 (B SP Professional, 1988)

AERO1 6 0 1 Aerospace Manufacture

6 credit points. **Semester:** 1. **Classes:** (1 lec, one 3hr lab)/wk. Prohibition: AERO 1600 Workshop TechnologyMECH 1600 Manufacturing Technology. **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)

AERO1 7 0 1 Introduction to Aerospace Engineering

3 credit points. **Semester: 1. Classes: (1** lec, one 2hr tut/lab)/wk. **Assessment:** Assignments, quizzes 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 modem 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. **Semester: 2. Classes: (1 lec,** one 2hr **lab)/wk. Prohibition:** INFO 1000 Information Technology Tools and ISYS 1003 Foundations of Information Technology. **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; debugging; 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

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. **Semester: 2. Classes:** (three lec, one 1hr lab/tut)/wk. **Prerequisite:** MATH 1001, MATH 1002, MATH 1003. **Prohibition:** MECH 2202 Fluids **1**. **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 non-dimensional parameters, Reynolds number, Mach number, Froude number, Weber number, Knudsen number.

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

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

Introduction to viscosity and compressibility effects. Boundary layer flows; laminar and turbulent layers; skin friction coefficient; flow separation; pressure and friction drag.

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. **Semester:** 1. **Classes:** (1 lec, one 3hr lab)/wk. **Prerequisite:** 12 credit points of first year Maths (ie, Maths 1001,1002,1.003,1005). **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. **Semester:** 1. **Classes:** (3 lec, one 1 hr tut/lab)/wk. **Prerequisite:** MATH 1001,1002,1003. Assessment: 2hr exam, 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 Summaiy

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 (RoskamA&EC, 1979)
Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989)

AERO 2701 Space Engineering 1

8 credit points. **Semester: 1**. **Classes:** (4 lec, one 2hr tut/lab)/wk. **Prohibition:** AERO 2800 Aeronautical Engineering ComputingAERO 2500 Introductory Flight Mechanics and Performance. **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. **Semester:** 1. **Classes:** (1 lec, one 3hr lab)/wk. **Prerequisite:** AERO 1801 Computer Engineering Applications. **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. **Semester:** 1. **Classes:** (3 lec, one 1 hr tut/lab)/wk. **Prerequisite:** AERO 2201 Fluid Mechanics 1. **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. **Semester:** 2. **Classes:** (2 lec, one 1 hr tut,)/wk one 3 hr lab. **Prerequisite:** AERO 2201 Fluid Mechanics 1. **Prohibition:** MECH 3211 Fluid Mechanics 2. **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 one-dimensional 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

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)

ScMichting Boundary Layer Theory (McGraw Hill, 1960)

AERO 3301 Aerospace Structures 1

4 credit points. **Semester: 1. Classes:** 3 lecture, one hr tutorial/lab per week. **Prerequisite:** AERO 2300 Mechanics of Solids **1**. **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. **Semester:** 2. Classes: 3 lec, one 1 hr tut/lab per week. **Prerequisite:** AERO 2300 Mechanics of Solids 1. **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. **Semester:** 1. **Classes: (1** lec, one 3hr tut)/wk. **Prerequisite:** MECH 2400 Mechanical Design 1. **Prohibition:** AERO 3401 Aerospace Design 1. **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. **Semester:** 1. **Classes:** 1 lec, one 3hrtut per week. **Prerequisite:** MECH 2400 Mechanical Design 1. **Prohibition:** AERO 3400 Aircraft Design 1. **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. **Semester: 2. Classes: (1** lec, one 3hr tut)/wk. **Prerequisite:** MECH 2400 Mechanical Design 1. **Assessment:** 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. Semester: 2. Classes: (3 lec, one 1 hr tut/lab)/wk. Prerequisite: AERO 2500 Introductory Flight Mechanics and Performance. 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 their relation to the stability and behaviour of aeronautical systems.

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

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

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

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

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. Semester: 1. 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. Semester: 2. 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. Semester: 2. Classes: 4 lec, one 2hr tut/lab per week; site visits. Prerequisite: AERO 2701 Space Engineering 1. 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.

Syllabus 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. Semester: 1. Classes: (2 lec, one 1 hr tut/lab)/wk. Prerequisite: AERO 3250 Aerodynamics 2. 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)
Benin 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. Semester: 2. Classes: (3 lec, one 1 hr tut/lab)/wk. Prerequisite: MECH 3201 Thermodynamics 2. 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; sub-orbital 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. **Semester:** 2. **Classes:** (2 lec, one 1hrtut/lab)/wk. Prerequisite: AERO 3250 Aerodynamics 2. **Assessment:** Assignments/ lab reports.

Objectives/Outcomes

To develop an understanding of modem 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

Benin 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. **Semester: 1. Classes:** (3 lec, one 1hrtut/lab)/wk. **Prerequisite:** AERO 3250 Aerodynamics 2. **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. **Semester:** 2. **Classes:** (2 lec, one 1hrtut/lab)/wk. **Prerequisite:** AERO 3250 Aerodynamics 2. **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. **Semester: 2. Classes:** (2 lec, one 1 hr tut/lab)/wk. **Prerequisite:** AERO 3250 Aerodynamics 2. **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. **Semester: 1. Classes:** 2 lec/wk plus prac classes. **Prerequisite:** MECH 3310 Mechanics of Solids 2. **Prohibition:** AERO 4303 Aerospace Structures 3. **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. **Semester: 1. Classes:** (3 lec, one 1.5 hr tut/lab)/wk. **Prerequisite:** AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. **Prohibition:** AERO 4301 Applied Numerical Stress Analysis. **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 Memods in Elasticity and Plasticity (Pergamon)
Zienkiewicz The Finite Element Method in Engineering (McGraw-Hill)

AERO 4351 Aerospace Structures 4

3 credit points. **Semester: 2. Classes:** 2 lec, one 1 hr tut/lab)/wk. **Prerequisite:** AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2. **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. **Semester:** 2. **Classes:** 2 lec, 1 hr tut/lab per week. **Prerequisite:** AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2. **Assessment:** 2 hr exam, assignments/lab reports.

Objectives/Outcomes

To develop an understanding of the modem 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/BernouUi-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. **Semester:** 1. **Classes:** (1 lec, one 3hr design class)/wk. **Prerequisite:** AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1. **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. **Semester: 2. Classes:** (one 3hr design class)/wk. **Prerequisite:** AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1. **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. **Semester: 1. Classes:** (4 lec, **1** tut)/wk. **Prerequisite:** AERO 3500 Flight Mechanics 1.

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 (Roskam A&EC, 1979)
D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4590 Advanced Flight Mechanics

3 credit points. Semester: 2. Classes: (2 lec, 1 tut)/wk. Prerequisite: AERO 3500 Flight Mechanics 1.

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. Modem 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 (RoskamA&EC, 1979)
D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modem (McGraw-Hill, 1995)

AERO 4600 Practical Experience

No credit points. **Semester:** 2. **Classes:** 12 weeks of prac work experience. **Prerequisite:** 40 credit points of 3rd year UOS.

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. Normally 12 weeks of practical work experience (375 hours minimum) is required and this is undertaken after the completion of the majority of the 3rd Year 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.

Assessment: Students are expected to obtain a declaration of the type of work and its duration from the employer. The declaration should be signed by a company official and this will be used to determine satisfactory completion of this unit.

AERO 4620 Aeronautical Exchange Program

24 credit points. **Semester: 1, 2. 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. Semester: 1. Classes: 3 lec, one 1 hr tut/lab per week. Prerequisite: AERO 3700 Space Engineering 2. 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 possibilities 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. Semester: 1,2. Classes: Literature survey, design, expt and/or analysis work over whole year. Prerequisite: 40 credit points of 3rd Year UOSAERO 4950 Thesis Preparation. 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.

AERO 4907 **InterdiciplinaryThesis A**

2 credit points. Semester: 1,2. 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 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 timeline, 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 4957 Interdiciplinary Thesis B.

AERO 4920 **Seminar**

2 credit points. Semester: 2. Classes: A mini-conference held at the end of a week midway through the semester. Prerequisite: 40 credit points of 3rd Year UOS. 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. Semester: 1,2. Classes: None. Prerequisite: 40 credit points 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 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. Semester: 1,2. Prerequisite: 40 credit points of 3rd Year UOSAERO 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.

AERO 5301 **Applied Finite Element Analysis**

6 credit points. Semester: 1. Classes: 2 lec/wk plus prac classes. Prohibition: AERO 4301 Applied Numerical Stress AnalysisAERO 4303 Aerospace Structures 3. 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)

■ Chemical Engineering

CHNG 1001 **Chemical Engineering Applications**

4 credit points. Associate ProfessorTim Langrish. Semester: 1. 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.

CHNG1101 Chemical Engineering 1A

4 credit points. Dr Marjorie Valix. **Semester:** 1. **Classes:** Two (1hr) 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 equiUbrium compositions of reacting systems; vapour pressure and humidity.

CHNG 1102 Chemical Engineering 1B

4 credit points. Dr Vincent Gomes. **Semester: 2. Classes:** 4 hours of lectures/tutorials per week for one semester. **Prerequisite:** CHNG 1101 Chemical Engineering 1 **A. 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. Associate ProfessorTim Langrish. **Semester:** 2. **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. **Semester:** 1. **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. Associate Professor Geoff Barton. **Semester:** 2. **Classes:** Two lectures and one tutorial per week for one semester. **Prerequisite:** Advisory prerequisite: CHNG 1301 Computing for Chemical Engineering 1 A. **Assessment:** assessed on pass/fail basis - 1 0 0 % 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. Dr Howard See. Semester: 1. Classes: Two lectures and one tutorial per week; three laboratory sessions in total. Assessment: Laboratory reports; tutorial assignments; 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. Dr Marjorie Valix. Semester: 2. 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. Associate Professor Geoff Barton. Semester: 2. Classes: 4hrs lec & tut/wk. Prerequisite: Advisory prerequisites: MATH 1001, MATH 1002, MATH 1003, MATH 1005, CHNG 1301. 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.

Syllabus Summary

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

CHNG 2302 Process Data Management

4 credit points. Professor Jose Romagnoli. Semester: 1. Classes: 4 hrs/ week of lectures and tutorials for one semester. Assessment: Tutorial assignments and a final examination.

NB: Students enrolled in the Process and Computer Systems Engineering stream must enrol in this unit of study.

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. Professor Jim Petrie. Semester: 1. 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.

Textbooks

CHNG 2502 Clean Products and Processes

4 credit points. Professor Jim Petrie. Semester: 2. Classes: Two (1 hr) lectures and one (1 hr) tutorial per week for one semester. Prerequisite: advisory prerequisite: CHNG 2501. Assessment: Tutorial assignments (both individually and in small groups) and two projects.

NB: Students enrolled in the Environmental and Energy stream must enrol in this unit of study.

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. Associate Professor Tim Langrish. Semester: 2. 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

Uhlig 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. Dr Dennis McNevin. Semester: 1. Classes: one lecture per week and two tutorial/project/lab sessions per week for one semester. Prerequisite: Advisory prerequisite: CHEM 1101, CHEM 1201. 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.

- Enzymes: 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. Stryer4th edition, WH Freeman and Co. NY

CHNG 2702 Fundamentals of Bioprocess Engineering 2

4 credit points. Dr Dennis McNevin. Semester: 2. Classes: one lecture and two tutorial/project/labs per week for one semester. Prerequisite: advisory prerequisite: CHEM 1101, CHEM 1201. 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. Associate Professor Tim Langrish. Semester: 1. Classes: Laboratory sessions as scheduled. Prerequisite: Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. 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.

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

CHNG 3041 Exchange Program 3A

24 credit points. Semester: 1, 2. 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. Semester: 1, 2. Prerequisite: Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approvalof 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 (HeatTransfer)

4 credit points. Dr Howard See. Semester: 2. Classes: Three hours of lectures/tutorials per week for one semester. Prerequisite: Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. Assessment: Tutorial assignments; 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 (MassTransfer)**

4 credit points. Dr Vincent Gomes. Semester: 1. Classes: Three (3) hours of lectures and tutorials per week for one semester. Prerequisite: advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. 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 understanding of several industrially important mass transfer operations (such as distillation, gas absorption and extraction).

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

Syllabus Summary

Diffusion and convection principles. 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 continuous contact and equilibrium stage processes. McCabe-Thiele diagrams. Analysis and design of other mass transfer operations (such as gas absorption) as continuous contact and equilibrium stage processes. Computer-based physical property packages and mass transfer calculations.

CHNG 3103 Unit Ops (Particle Mechanics)

4 credit points. Semester: 2. Classes: Three (1 hr) lectures/tutorials per week for one semester. Prerequisite: advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. 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. Dr Ian Furzer. **Semester:** 1. **Classes:** Four hours of lectures and tutorials per week for one semester. **Prerequisite:** advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. **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. 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. Dr Peter Linkson. **Semester: 1. Classes:** Two (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Prerequisite:** advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. **Assessment:** Assignments; final examination.

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

Objectives/Outcomes

The major objectives are:

(i) To perform energy analyses of process flowsheets.

(ii)To estimate the thermodynamic properties of fluids.

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

Syllabus

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

Estimation of thermodynamic properties of pure components, using (i) first-order fluid models, (ii) charts and tables, and (iii) equations of state. P-V-T relationships 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 volume-explicit equations of state (eg, the virial equation in volume-explicit form); application of pressure-explicit equations of state in computer methods for property prediction.

CHNG 3106 Thermodynamics 2

4 credit points. Dr Vincent Gomes. **Semester:** 2. **Classes:** Two (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Prerequisite:** Advisory prerequisite: CHNG 3105 Thermodynamics 1. **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. Dr Howard See. **Semester: 2. Classes:** Three hours of lectures/tutorials per week for one semester. **Assessment:** Tutorial assignments; final 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;
- 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. Dr Ian Furzer. **Semester: 1. Classes:** Two (1 hr) lectures and one (1 hr) tutorial per week for one semester. **Prerequisite:** Advisory prerequisite: CHNG 2301 Chemical Engineering Computations. **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. Professor Jose Romagnoli. **Semester: 1. 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 3303 Flowsheeting and Optimisation

4 credit points. Associate Professor Geoff Barton. Semester: 1. Classes: 3 hours/week (consisting of a mixture of lectures, tutorials and laboratory sessions) for one semester. Assessment: Tutorial assignments and project work.

NB: Students enrolled in the Process and Computer Systems Engineering stream must enrol in this unit of study.

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

Objectives/Outcomes: It is expected that students will understand the principles and usage of a range of process flowsheeting technologies, as well as the means available for optimising flowsheet behaviour.

Syllabus Summary: Need and uses of process flowsheeting; alternative approaches to flowsheeting; key unit operations; performance and design calculations; consideration of process dynamics; aspects of process optimisation; commercial flowsheeting and design software.

CHNG 3401 Project Economics

4 credit points. Dr Ian Furzer. Semester: 2. 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 3501 Waste Management &Treatment Technology

4 credit points. Professor Jim Petrie. Semester: 1.

NB: Students enrolled in the Environmental and Energy stream must enrol in this elective.

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

CHNG 4001 Practical Experience

No credit points. Dr Marjorie Valix. Semester: 1. Classes: There are no formal classes. Students are required to obtain 10 weeks of practical work experience before entering their 4th Year. Prerequisite: advisory prerequisite: 28 credit points of 3rd year units. 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, through the Chemical Engineering Foundation, and the Careers and Appointments Service will assist wherever possible.

CHNG 4002 Thesis

8 credit points. Dr Howard See. Semester: 1. 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. Prerequisite: Advisory prerequisite: Students should have completed (or be enrolled in) all other 4th Year core units. Assessment: Written thesis and poster.

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 presentation, explaining the aims and achievements of their thesis.

CHNG 4006 Professional Option

2 credit points. Semester: 1,2. Classes: There are no formal classes for this course. Prerequisite: advisory prerequisites: Passed at least 144 credit points. 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. Semester: 1,2. 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. Semester: 1,2. 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. Dr Ian Furzer. Semester: 2. Classes: Four hours of lectures and tutorials per week for one semester. Prerequisite: Advisory prerequisites: CHNG 3102. 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:

- process modelling of multicomponent systems;
- process modelling of environmental systems;
- process modelling of membrane systems for bioengineering.

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. Membrane separation: introduction, types of membranes, separating ability and equipment. 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. Dr Howard See. Semester: 1, 2. Classes: Three hours of lectures/tutorials per week for one semester. Assessment: Tutorial assignments; final examination.

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. Modelling the flow behaviour of complex fluids (eg, slurries, viscoelastic materials).

CHNG 4103 Advances in Polymer Engineering

4 credit points. Dr Vincent Gomes. Semester: 1,2. 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:

- Polymer manufacturing processes.
- Polymer properties in engineering application.
- Polymer processing for value-added products.
- Polymer end-use and recycling.

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. Selecting polymers for engineering applications based on chemical, mechanical, thermal and flow behaviour. Recycle and reuse of polymers.

CHNG 4201 Chemical Engineering Design 1

4 credit points. Associate Professor Geoff Barton. Semester: 1. 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. Mr Donald White. Semester: 2. 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. Semester: 1. 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 Analysis
(in lieu of CHNG 4402 Process Plant Risk Management)

CHNG 4304 Process Control 2

4 credit points. Professor Jose Romagnoli. Semester: 1. Classes: Four hours of lectures, tutorial and laboratory work per week for one semester. Prerequisite: CHNG 3302 Process Control 1. 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. Laboratory experiments and PC laboratory in Process Control.

CHNG 4305 Process Systems Engineering

4 credit points. Professor Jose Romagnoli. Semester: 2. Classes: Two (1 hr) lectures and one (1 hr) tutorial per week for one semester. Prohibition: CHNG 4303 Optimisation Techniques. 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. Mr Donald White. Semester: 1. Classes: 3 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. To impart knowledge resulting in a more global approach to the practice of engineering and engineering management.

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. Mr Donald White. Semester: 1. Classes: Three hours of lectures, class exercises and tutorialsl per week for one semester. Assessment: Participation in class exercises, tutorial work, 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 process plant 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. Dr Maurice Barton. Semester: 1. Classes: Three hours per week of group work with a (nominated) company for one semester, plus 3 one-hour lectures in semester 2. Assessment: Group report and a final examination at the end of 2nd semester.

NB: Students MUST register with Young Achievement Australia early in Semester 1.

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.

Practical: Students are required to commence their project mid-way through 1st semester, then work till the end of 2nd semester.

CHNG 4501 Biochemical Engineering

8 credit points. Dr Dennis McNevin. Semester: 2. Classes: 2 x 2 hr/ week Lectures, 4 x 12 hr/semester Laboratories, 6 x 1 hrTutorials. Prerequisite: CHNG 2701 & CHNG 2702 Fundamentals of Bioprocess Engineering 1 & 2; MICR 2007 Microbiology for Engineers A; MICR 2008 Microbiology for Engineers B. 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.
3. Provide an understanding of the major fundamental aspects of biochemical engineering.
4. Use this fundamental understanding to study some selected industrial applications.

Syllabus Summary

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

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

CHNG 4504 Environmental Decision Making

4 credit points. Professor Jim Petrie. Semester: 2. 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 4605 Mineral Processing

4 credit points. Dr Marjorie Valix. Semester: 2. Classes:Three hours of lectures/tutorials per week for one semester; field trips as arranged. Prerequisite: Unit Operations (all four components). **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.

■ Civil Engineering

CIVL 1001 **Civil Engineering 1**

4 credit points. **Semester:** 1. **Classes:** Lectures: 13hrs; lec/tut-13hrs; lab /drawing office: 26hrs. **Assumed knowledge:** HSC Mathematics Extension 1 and a satisfactory knowledge of HSC Chemistry and HSC Physics. **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. **Semester: 2. Classes:** 1 lecture and one 2 hour computer laboratory session/week. **Prohibition:** COMP 1001 Introductory Programming or COMP 1002 Introductory Computer Science. Assessment: One 2 hr examination at end of semester plus assessment of computer exercises during semester.

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

COMP 1001 Introductory Programming and COMP 1002 Introductory Computer Science are acceptable alternatives.

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 and, hidden surfaces.

Textbooks

Lecture Notes Prepared by Department.

Reference Books

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

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

ES. 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. **Semester: 2. Classes:** 2 hours lectures and 2 hours tutorials per week. **Assumed knowledge:** HSC Mathematics Extension 1 and HSC Physics. **Prohibition:** MECH 1510. **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. **Semester: 1. Classes:** Lectures: 26hrs; tut.: 26hrs. **Assumed knowledge:** HSC Mathematics Extension 1. **Prohibition:** MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics. **Assessment:** Assignment submissions during semester, a mid semester quiz 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 statitically determinate structures.

Outcomes: It is expected that students will be able to analyse simple pin jointed 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. Semester: 1. Classes: 14hrs 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: 14 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. Semester: 1. Classes: lec: 39hrs, tut: 26hrs. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. Assessment: Tutorial submissions, laboratory reports, mid semester quiz and one 3hr 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: The primary object is to understand internal actions (forces and moments) in structures in the following three areas:

- structures resistance to external loads by internal actions,
- the distribution of internal actions within structures, and
- the stresses and strains associated with internal actions.

Outcomes: At the end of this course, students should be able to:

- Understand the basic methods of load transfer in structures (internal actions),
- Determine the distribution of internal actions in a statically determinate structure,
- Calculate the geometric properties of structural sections and understand their significance,
- Calculate the strains and stresses associated with internal actions in structural elements,
- Calculate the deflection in beams,
- Have a basic knowledge of material properties, combined stresses and failure criteria.

Syllabus summary: Introduction; Equilibrium; Internal Actions: BMDs, SFDs, AFDs, andTMDs; Elasticity, Stress and Strain, and Basic Material Properties; Axial Forces: Tension and Compression; Elastic Bending of Beams; Shear Force and Shear Stresses in Beams; Torsion; Deflection of Beams; Pipes and Pressure Vessels; Trusses; Material Properties, Combined Stresses and Yield Criteria; Advanced Bending; Introduction to Buckling and Instability.

Textbooks

Tim Wilkinson, Structural Mechanics Lecture Notes, 2nd edition, Department of Civil Engineering, University of Sydney.

Reference Books/Library Classifications:

Some relevant books may be found in the library in the following areas:
531.38 Elasticity
620.1 Engineering Machanics
620.11 Strength of Materials
624.17 Structural Analysis

CIVL 2204 Introduction to Structural Concepts

4 credit points. Semester: 2. Classes: Lectures: 26 hrs; Design classes 26 hrs. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. Prohibition: CIVL 2203 Structural Design, CIVL 2101 Properties of Materials. Assessment: Design 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 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. Proficiency in the computation of structural loadings including dead, live, wind, snow and earthquake loads.

Textbooks

Introduction to Structural Concepts Lecture Notes, Department of Civil Engineering, University of Sydney.
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 & FN 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. Semester: 2. Classes: Lectures: 26 hours; design classes: 26hrs. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. CIVL 2201 Structural Mechanics. Prohibition: CIVL 2203 Structural Design, CIVL 2101 Properties of Materials. Assessment: Design class assignments and one 1.5hr closed book mid semester exam covering the steel course component and one 3 hr closed book exam covering the concrete and timber course components at the end of semester.

Intermediate core unit of study 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 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.
or
SAA AS4100 - Steel Structures Code
SAA AS3600 - Concrete Structures Code, and
SAA AS 1720.1 -Timber Structures Code, and
SAA AS1170 - Loading Code, Parts I and II

Reference Books

Gorenc, Tinyou and Syan, Steel Designers' Handbook, (6th ed.) (UNSW Press)
Warner, Rangan, Hall and Faulkes, Concrete Structures (Longmans)
Timber Design Handbook, SAAHB108-1998

CIVL 2409 Engineering Geology 2

4 credit points. Semester: 2. Classes: 26hrs lec, 26hrs lab. Field Excursions in the Sydney area, as appropriate. Assumed knowledge: Either GEOL1002 or GEOL1501 Engineering Geology. 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).

C1VL 2610 Fluids 1

6 credit points. **Semester:** 1. **Classes:** 26hrs lec, 42hrs lab/tut. **Assumed knowledge:** MATH 1001, MATH 1002, MATH 1003, MATH 1005. **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 assigments, 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. Flow 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).
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).
Nakayama and Boucher, Introduction to Fluid Mechanics (Butterworth and Heinemann)
Nalluri and Featherstone, Civil Engineering Hydraulics (Blackwell Science)

CIVL 2801 Engineering Construction 1

4 credit points. **Semester:** 2. **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. **Semester:** 2. **Classes:** 26hrs discussion/oral presentation. **Assumed knowledge:** CIVL 2004 Engineering Communications **1. 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 3204 Structural Analysis

6 credit points. **Semester:** 1. **Classes:** 42hrs lec & 42hrs tut. **Assumed knowledge:** CIVL 2201 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations. **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, M.J Clarke Structural Analysis 2, (Univ of Sydney)

Reference Books

Popov, Introduction to the Mechanics of Solids (Prentice Hall)
Parkes, Braced Frameworks (Pergamon)
Timoshenko and Young, Theory of Structures (McGraw Hill)

CIVL 3207 Risk and Reliability Analysis

2 credit points. **Semester:** 1. **Classes:** 16hrs lec; 12hrs tut. **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. **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, the design point, reliability based design, simulation methods, system effects.

Textbooks

Spiegel et al, Probability and Statistics, 2nd ed Schaum's Outline Series, Mc Graw-Hill, 2000

Reference books

Blockley (ed.) Engineering Safety (McGraw-Hill, 1992).
Madsen, Krenk and Lind,Methods of Structural Safety (Prentice-Hall, 1986).
Melchers, Structural Reliability Analysis and Prediction (Ellis Horwood/ Wiley, 1987).

CIVL 3225 Concrete Structures: Behaviour

4 credit points. A/Prof. S. G. Reid. **Semester:** 1. **Classes:** Lectures: 30 hrs; tut/lab/drawing office: 9hrs. **Assumed knowledge:** CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and

CIVL 2205 Introduction to Structural Design. Prohibition: CIVL 3205 Concrete Structures 1, CIVL 3223 Concrete Structures - Behaviour. Assessment: One 3 hr exam plus reports and 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 abasic 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 Outcome: Proficiency in basic methods of reinforced concrete analysis and interpretation of results.

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

Textbooks

Warner et al., Concrete Structures (Longman 1998)
Standards Australia Specification - current editions
AS3600 Concrete Structures Code
AS HB2.2 Structural Engineering Standards

Reference Book

Park and Paulay, Reinforced Concrete Structures
Library Classification: 624.183

CIVL 3226 Concrete Structures: Design

4 credit points. A/Prof. S. G. Reid. Semester: 2. Classes: Lectures: 30 hrs: tut/lab/drawing office: 22 hrs. Assumed knowledge: CIVL 2201 Structural Mechanics and CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. Prohibition: CIVL 3205 Concrete Structures 1, CIVL 3224 Concrete Structures: Design. 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 of study for the degree in Project Engineering and Management (Civil).

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; to provide a basic understanding of materials aspects of cement-based materials and concrete.

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

Syllabus summary: The reinforced concrete truss analogy (shear/torsion/and detailing implications). Introduction to the 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.

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
Campbell-Allen and Roper, Concrete Structures: Materials Maintenance and Repair (Longman Scientific and Technical)
Soroka, Portland Cement Paste and Concrete (MacMillan, Australia, 1979)
Akroyd, Concrete - Its Properties and Manufacture (Pergamon.)

Reference Books

Concrete Design Handbook, Cement and Concrete Association of Australia
Reinforcement Detailing Handbook, Concrete Institute of Australia

Reference Books

Concrete Design Handbook, Cement and Concrete Association of Australia
Reinforcement Detailing Handbook, Concrete Institute of Australia
Library classification: 624.183

CIVL 3227 Steel Structures 1

8 credit points. Semester: 2. Classes: Lectures: 39 hrs; tut/lab/drawing office: 39hrs, lab 4hrs. Assumed **knowledge:** CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. Prohibition: CIVL 3206 Steel Structures 1, CIVL 3102 Materials Aspects in Design. Assessment: Tutorial submissions, integrated design exercise, laboratory reports, mid-semester quiz and end of semester examination.
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 behaviour and design of steel members, connections and structures. To relate the properties of metals to the design of structures.

Outcomes: At the end of this course students should:

- Be familiar with the behaviour of steel strucutures, in particular the various forms of buckling and failure,
- Have a working knowledge of AS4100, and be competent in designing a simple structure to AS4100,
- Have knowledge of the material aspects of steel manufacture, and material associated failures/issues in structural steel design.

Syllabus Summary: The behaviour of steel members and structures - manufacturing technology of metals, fracture, fatigues, fire and corrosion aspects in the design and use of steel structures, properties of cross-sections, local buckling, elastic beams, plastic beams, tension members, compression members, effective lengths and elastic in-plane frame buckiling, lateral buckling of beams, in-plane bending of beam columns, lateral buckling of beam-columns, biaxial bending of beam-columns, bolted and welded connections.

Textbooks

G.I. Hancock, M.J. Clarke and T.J. Wilkinson CIVIL 3227 Steel Structures 1, printed lecture notes, Department of Civil Engineering, University of Sydney
William d. Callister Jr., Materials Science and Enginnering - an introduction (4th ed.) (Wiley)
Standards Australia Specification - current editions
AS 1170 Parts 1 and 2 Loading Code, and
AS4100 Steel Structures Code; or
ASHB2.2 Structural Engineering Standards for Civil Engineering Students (preferred alternative to above standards)
(AISC) Economic Structural Steelwork
Steel sections product literature

Reference Books

AISC Design Capacity Tables for Structural Steel
Trahair and Bradford, Behaviour and Design of Steel Structures
Internet resources will also be given
Library Classification: 624.17,624.182

CIVL 3401 **Soil Mechanics A**

4 credit points. Semester: 1. Classes: 26hrs lec, 26hrs lab/tut. Assumed knowledge: CIVL 2201 Structural Mechanics. 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. Semester: 2. Classes: 16 hrs lec/tut., Project Work. Assumed knowledge: CIVL 3401 Soil Mechanics A. Assessment: One 2hr test at mid-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 Engineering Surveying

4 credit points. Semester: 1. Classes: lec: 26hrs, fieldwork/pract.: 24hrs. Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005. 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. Brinker, P. Wolf Elementary Surveying (Harper Collins Publishers).

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

CIVL 3602 Fluids 2

4 credit points. Semester: 2. Classes: Lectures: 26hrs; tut.: 26hrs. Assumed knowledge: CIVL 2610 Fluids 1. 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).

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).

Nakayama and Boucher, Introduction to Fluid Mechanics (Butterworth and Heinemann)

Nalluri and Featherstone, Civil Engineering Hydraulics (Blackwell Science)

CIVL 3701 Transportation Engineering and Planning

2 credit points. Semester: 2. 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, 1997).

ICAO Airport Planning Manual.

Rural Road Design (Austroads 1989).

Pavement Design (Austroads 1992).

CIVL 3802 Engineering Construction 2

4 credit points. Semester: 1. Classes: 26hrs lec & 26hrs tut. Assumed knowledge: Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge. 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 Prof. A. Jaafari. Semester: 1. 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, Ireson 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 Prof. A. Jaafari, Mr. Stephen Hibbert. **Semester: 2. Assessment:** Class tests and coursework, and a possible final examination, as generally advised at the commencement of the course.

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 Prof. A. Jaafari, Mr. Ted Tooher. **Semester: 1. 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 subj ect 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 fmalisation. 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 4001 **Thesis/Design/Project A**

No credit points. **Semester: 1,2. Classes:** Literature survey, design, experimental and/or analysis work. Working arrangements are generally informal, but formal contact will compromise consultations with the academic supervisor. **Prerequisite:** 40 credit points of Senior Subjects. **Prohibition:** CIVL 4003 and CIVL 4004. **Assessment:**Thesis plan and progress report must be submitted for assessment. Students will generally work in pairs or groups of three, although the planning and writing of the thesis plan will be done individually.

Objectsives/Outcomes: This unit of study provides an opportunity for students to conduct original investigation and research work or major project work. Students will gain skills in design, analysis and management by undertaking a research project.

CIVL 4002 Thesis/Design/Project B

5 credit points. Semester: 1,2. Classes: Literature survey, design, experimental and/or analysis work. Working arrangements are generally informal, but formal contact will comprise consultations with the academic supervisor. **Prerequisite:** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001. **Prohibition:** CIVL 4003 and CIVL 4004. Assessment: Students will generally work in pairs or groups of three, although the planning and writing of the thesis or final design report itself will be done individually; - ie, a seperate thesis or design report must be submitted by each student. A bound thesis documents 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: This unit of study provides an opportunity for students to conduct original investigation and research work or major project work. Students will gain skills in design, analysis and management by undertaking a research project.

CIVL 4003 Honours Thesis/Design/Project A

No credit points. **Semester:** 1, 2. **Classes:** Literature survey, design, experimental and/or analysis work. Working arrangements are generally informal, but formal contact will comprise consultations with the academic supervisor. **Prerequisite:** 40 credit points of senior subjects. Invitation to enrol from the Head of Department of Civil Engineering. **Prohibition:** CIVl4001 and CIVL 4002. **Assessment:** Thesis plan and progress report must be submitted for assessment. Students will generally work in pairs, although the planning and writing of the thesis plan will be done individually.

Objectives/Outcomes: This unit of study provides and opportunity for students to conduct original investigation and research wotk or major project work. Students will gain skills in design, analaysis and management by undertaking a research project. The level of originality for an honours thesis/project/ design is greater than that required for the ordinary thesis unit of study. This unit of study should be completed sucessfully for the award of Honours in the civil stream of B achelor of Engineering.

CIVL 4004 Honours Thesis/Design/Project B

10 credit points. **Semester: 1, 2. Classes:** Literature survey, design, experimental and/or analysis work. **Prerequisite:** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4003. Invitation to enrol from Head of Department of Civil Engineering. **Prohibition:** CIVl4001 and CIVL 4002. **Assessment:** Students will generally work in pairs, although the planning and writing of the thesis or final design report itself will be done individually; - ie, a seperate thesis or design report must be submitted by each student. A bound thesis document is to be submitted for assessment.

Objectives/outcomes: This unit of study provides an opportunity for students to conduct original investigation and research work or major project work. Students will gain skills in design, analysis and management by undertaking a research project.

The level of originality for an honours thesis/project/design is greater than that required for CIVL 4002. This unit of study should be completed sucessfully for the award of Honours in the civil stream of Bachelor of Engineering.

CIVL 4008 Practical Experience

No credit points. **Semester: 1. Classes:** 12wks practical work experience (375hrs minimum). **Prerequisite:** 28 credit points of Senior courses. **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 this is mainly undertaken after the completion of some or all of the prescribed Senior core courses and before enrolment in the final year of study. The University Careers and Appointments Service 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 4016 Professional Practice- Civil Engineering

5 credit points. Semester: 2. 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).
Wearne Civil Engineering Contracts (Thomas Telford).
Professional Practice Course Notes (Dept. Civil Engineering, University of Sydney)

CIVL 4218 Concrete Structures 2

5 credit points. Semester: 2. Classes: 26hrs lec. 26hrs tut. Assumed knowledge: CIVL 3223 or CIVL 3225 Concrete Structures - Behaviour, CIVL 3224 or CIVL 3226 Concrete Structures - Design. 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, yield line analysis of slabs, strip equilibrium analysis of slabs, the analysis of time-dependent effects in concrete structures models of concrete creep and shrinkage, design of composite t-beams, 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 Code, or
AS HB2.2 Structural Engineering Standards.
Reference books
Lin and Burns Design of Prestressed Concrete Structures (Wiley).
Park and Gamble Reinforced Concrete Slabs (Wiley).
Other books as indicated in classes.

CIVL 4219 Structural Dynamics

5 credit points. **Semester:** 1. **Classes:** 26hrs lec. 26hrs tut. **Assumed knowledge:** CIVL 3204 Structural Analysis. **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, transient dynamic analysis, earthquake loading on structures, 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 earthquake and 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. **Semester: 2. Classes:** 28hrs lec. 28hrs tut. **Assumed knowledge:** CIVL 3206 or CIVL 3227 Steel Structures **1**. **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 including flexural-torsional buckling analysis. Advanced connections - behaviour, analysis and design.

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, 4th Edition, (AISC 1994).
Syam and Chapman Design of Structural Steel Hollow Section Connections (AISC, 1996).
Reference books
Bulson Stability of Flat Plates (Chatto & Windus, 1970).
Hancock Design of Cold-Formed Structures (AISC, 1994).
Other books as indicated during classes.
Library Classification: 624.17,624.182

CIVL 4221 Bridge Engineering

5 credit points. Semester: 1. Classes: 26hrs lec & 26hrs tut. 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. 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. Semester: 1. Classes: Sem: 26hrs lec & 26hrs tut.
Assumed knowledge: CIVL 3204 Structural Analysis. 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, 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: 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. Semester: 2. Classes: Lectures and tutorials - 52 hours. Assumed knowledge: CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B. 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, including 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 and 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. Semester: 1. Classes: Lectures and tutorials - 52 hours. Assumed knowledge: CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B. 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 Engineering and Project Engineering and Management (Civil).

Syllabus Summary: Site investigation and field measurements. Behaviour, selection and design of shallow foundations. Strip and raft foundations. Pile foundation analysis and design. Foundations on rock. Cam clay theory and application.

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).

CIVL 4607 Environmental Fluids 1

5 credit points. Semester: 1. Classes: 26 hrs 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).

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. Semester: 2. Classes: 26hrs lec, 26hrs tut. Assumed knowledge: Material covered in Environmental Fluids 1. Assessment: By tests and assignment submissions, as indicated on WebCT.
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 major parameters affecting ocean wave generation; describe the processes of ocean wave transmission; calculate energy transfer by waves; describe the behaviour of waves in shallow water; explain the fundamental principles of sediment transport; describe sediment transport processes in rivers; describe coastal sediment transport processes; explain basic performance requirements for breakwaters, and factors considered in their design; describe several fluid structures, together with associated fluid-structure interaction, including, but not limited to, spillways, stilling basins, bridge piers, water supply intakes; describe design considerations for flood detention basins; explain the principles of advanced flood routing techniques utilising computer programs.

Textbooks

Computer Applications in Hydraulic Engineering (Haestad Press).
Shore Protection Manual Vol. 1, Dept of the Army, Coastal Engineering Research Centre, US Army Corps of Engineers, 1984.

CIVL 4609 Water Resources Engineering

5 credit points. Semester: 2. 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 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. **Semester:** 1. **Classes:** 26hrs lec, 26hrs tut. **Prohibition:** CIVL 3803 Project Appraisal. **Assessment:** Class tests, coursework and final examination 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. **Semester: 2. Classes:** Tutorials/workshops 52 hours. **Assumed knowledge:** Completion of CIVL 3803 Project Appraisal or equivalent knowledge. **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 & Info Technology

4 credit points. Coordinator Prof. A. Jaafari, Dr. Milad Saad. Semester: 1. 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 project 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 Prof. A. Jaafari Tutor: Dr. K K Manivong. **Semester:** 2. **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 B achelor of Proj ect 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 Prof. A. Jaafari. Semester: 2. Assessment: based on both coursework and class tests, details of which will be advised at the commencement of the unit.

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. Semester: 1. Classes: 13hrs lec & 39hrsof drawing office work. 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. 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 particular 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
Austroads Bridge Design Specification
AS 1720 - Timber Engineering Code
(Purchase of separate codes is recommended)

■ Electrical Engineering

ELEC 1001 Introductory Electrical Engineering

4 credit points. Semester: 2. Classes: Two lec/wk and nine 3hr lab/tut. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus. Prohibition: ELEC 1102 Foundations of Electronic Circuits. Assessment: Lab reports and assignments and a 2hr exam at end of semester.
Core unit of study for Civil, Mechanical and Mechatronics Engineering. Recommended elective unit of study for Aeronautical Engineering.

Syllabus

Electricity: definitions and conventions. SI units. Charge and energy conservation laws. Electrical energy sources. Ohm's law. Voltage and current measurements. Conductivity and resistance. Power dissipation. Kirchhoff's laws. Current and voltage dividers. Potentiometers. Measurement of resistance. Thevenin's theorem. Loop currents and node voltages. Reciprocity theorem. Linearity and principle of superposition. Voltage-to-current source conversion. Delta-star conversion. Loading effect of a voltage source. Combined voltage supply circuits. Time varying voltages and currents. Average and effective values. Energy dissipation and storage. Capacitance, inductance. Steady-state DC behaviour of capacitors and inductors. Natural response of first order circuits. Transients. C and L response to square and triangular voltages.

Alternating current quantities. Magnitude, period, frequency and phase. Complex algebra. AC behaviour of resistance, inductance and capacitance. Introduction to AC circuits. RL and RC series circuits. Impedence concept. Phasor and locus diagrams. Equivalent series and parallel impedences. Admittance. Power in AC circuits. Power triangle. Power factor. RLC series circuit behaviour. Series resonance. Introduction to AC network.

Analysis. RLC parallel circuit. Parallel resonance. Series-parallel circuits. Introduction to filters. Single phase transmission line. Domestic distribution. Wiring and grounding. Dual-voltage AC supply. Power factor correction. Nonlinear circuit elements. Introduction to semiconductors. Diodes. Transistors. V-I characteristics.. Nonlinear circuit analysis. Load line and operating point.

ELEC 1101 Foundations of Computer Systems

6 credit points. Semester: 1, Summer. Classes: Six contact hours per week combining lectures, laboratory work, computing, tutorials and presentations. Assumed knowledge: HSC Maths Extension 1. Assessment: Laboratory performance, presentations, reports and assignments plus a 3-hr exam at the end of the semester.
Core unit of study for Computer, Electrical, Software and Telecommunications Engineering.

Syllabus

Number systems and codes, Parity; Logic gates and Boolean Algebra, Universal logic gates (Nand gates); Combinational logic circuits; Design and construct project; Flip-flops and related devices; Digital Arithmetic: operations and circuits, Two's complement addition and subtraction, Overflow; Counters and registers, Shift register applications; Design of synchronous, sequential circuits, Designs of synchronous, cascadable counters (BCD and binary); Integrated circuit logic families; Tri-state signals and data-buses; MSI logic circuits, Applications of multiplexers, demultiplexers, decoders, priority encoders, magnitude comparators; Applications 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. Semester: 2. Classes: Six contact hours per week combining lectures, laboratory work, computing, tutorials and projects. Assumed knowledge: HSC Physics. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus. Assessment: Presentations, reports and assignments plus two 2hr exams at the end of the semester.
Core unit of study for Computer, Electrical, 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. Semester: 1. Classes: (Three lec and 3hrs lab/tut) per wk. 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. Assessment: Lab reports and assignments and a 3hr exam at end of semester.
Core unit of study for Mechanical and Mechatronics 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. Semester: 1. Classes: (3 lec and a 3hr lab/tut) per week. 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. Assessment: Lab reports and assignments and a 3hr exam at end of semester.

Core unit of study for Mechanical Engineering (Biomedical)

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. Semester: 1. Classes: (Two lec and 2 hrs tut) per week. 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. Assessment: Assignments and a 2hr exam at end of semester.

Core unit of study for Computer, Electrical 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 2102 **Engineering Computing**

4 credit points. Semester: 1. Classes: (One lecture and a 2 hour computer based lab session) per week. Prerequisite: Prerequisite: 36 credit points. Prohibition: Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1 A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing. Assessment: Assessment of laboratory work and assignments, through semester examinations and an exam at the end of the semester.

Core unit of study for Electrical, Computer, Software and Telecommunications Engineering and Electronic Commerce.

Syllabus

Basic features of Matlab. The Matlab desktop. Interactive use with the command window. Performing arithmetic, using complex numbers and mathematical functions. Writing script and function m-files. Matrix manipulations. Control flow. Two dimensional graphics. Application of Matlab to simple problems from circuit theory, electronics, signals and systems and control. Matlab based studies in numerica methods applicable to a range of problems such as solution of ordinary differential equations, random processes, interpolation and extrapolation, etc. Introduction to symbolic mathematics in Matlab. Applications, including the derivation of network functions for simple problems in circuit analysis. Introduction to the use of Simulink for system modelling and simulation.

ELEC 2301 **Signals and Systems**

4 credit points. Semester: 2. Classes: (Two lec and an average of 2 hrs lab/tut) per week. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 integral Calculus and Modelling. Prohibition: Prohibition: MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv). Assessment: Lab, assignments and a 2hr exam at end of semester.

Core unit of study for Computer, Electrical, 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 (LT!) 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. Semester: 2. Classes: (Two lec and an average of 2hrs tut) per week. 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. Assessment: Lab work and a 2hr exam at end of semester.

Core unit of study for Computer, Electrical, 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. Semester: 1. Classes: (Two lec and an average of 2 hrs lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. Prohibition: ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A. Assessment: Lab, assignments and a 2hrexam at end of semester.

Core unit of study for Computer, Electrical, 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.

EBUS 3001 **Introduction to E-Commerce Systems**

4 credit points. Semester: 1. Classes: (1 lec, a 1 hr tut and 2hr of on-line self study) per week. Prerequisite: Advisory Prerequisites: ACCT1004 Management Accounting and Concepts, and COMP 1002 IntroductoryComputer Science. Assessment: Three assignments and a 2hr exam at end of semester.

Core unit of study for Electronic Commerce. Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

Syllabus

This unit examines the main issues involved in designing successful Internet services. The unit of study is designed around the idea that electronic commerce systems are new communication channels between entities. The e-commerce systems are then classified from the communication perspective, depending on what kind of entities it communicates, and

therefore defining what are the main user requirements. The unit will adress these issues through four modules:

1. Fundamentals
2. Business to consumer systems
3. Business to business systems
4. Business to employee systems

These modules will require a considerable amount of on-line self study

ELEC 3101 Circuit Theory and Design

4 credit points. Semester: 2. Classes: Assignments, labs and an exam at the end of semester. Prerequisite: Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 2301 Signals and Systems. Assessment: Assignments, labs and an exam at the end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
The main aim of the course is to teach the theory and design of active and passive analog filters. Topics covered include: Review of network functions; approximation techniques such as Butterworth, Chebyshev characteristics; filter sensitivity to parameters; passive network synthesis; active RC filters; switched capacitor filters.

ELEC 3102 Engineering Electromagnetics

4 credit points. **Semester:** 1. **Classes:** (Two lect and a 2hr tut) per week. Prerequisite: Advisory Prerequisites:PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering). **Assessment:** Questions in lect/tut and a 2hr exam at end of semester.
Core unit of study for Electrical and Telecommunications Engineering. Recommended elective unit of study for Computer and Software 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. **Semester:** 2. **Classes:** (One lec and a 2 hr lab) per week. **Prerequisite:** Advisory Prerequisites:ELEC 2101 Circuit Analysis, ELEC 2301 Signals and Systems, ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems. **Assessment:** Lab, assignments and a 1hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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

4 credit points. Semester: 1. Classes: (Two lec and a 2 hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 2101 Circuit Analysis. Assessment: Assignments, a quiz and a 2hr exam at end of semester.
Core unit of study for Electrical Engineering. Recommended elective unit of study for Computer, Software and Telecommunications 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. **Semester: 2. Classes:** (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics. Assessment: Lab reports, assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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. Semester: 2. Classes: (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 2301 Signals and Systems. Prohibition: MECH 3800 Systems Control and CHNG 3302 Process Control. Assessment: Tutorial/Laboratory work, a mid semester exam and a 2hr exam at end of semester.
Core unit of study for Computer, Electrical and Telecommunications Engineering. Recommended elective unit of study for Software Engineering.
Syllabus
History and review of control. Linear, time invariant systems. Review of the Laplace transform. Modelling of physical processes: differential equations, transfer functions, state variables. Dynamic response and relation to poles and zeros. Design specifications in the time domain. Block diagrams and signal flow graphs; Mason's rule. Steady state accuracy and stability; the Routh criterion. Analysis and design using the root locus. Proportional, integral and derivative control; lead and lag compensators. Frequency response design methods; the Nyquist stability criterion; gain and phase margins; compensator design. Introduction to state variable feedback and design of estimators.

ELEC 3303 Digital Signal Processing

4 credit points. **Semester: 1. Classes:** (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 2301 Signals and Systems. **Prohibition:** Prohibition: ELEC 4303 Digital Signal Processing. **Assessment:** Lab reports, assignments and a 2hr exam at end of semester.
Core unit of study for Computer, Electrical and Telecommunications Engineering. Recommended elective unit of study for Software 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. Semester: 1. Classes: (2 lec and a 2hr lab) per week. Prerequisite: Advisory Prerequisites: ELEC 2401 Introductory Electronics. Assessment: Lab and a 2hr exam at end of semester.
Core unit of study for Computer, Electrical 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. **Semester: 2. Classes:** (2 lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. **Assessment:** Practical work and a 2hr exam at end of semester.

Core unit of study for Telecommunications Engineering. Recommended elective unit of study for Computer, Electrical and Software 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 and Electronics
4 credit points. Semester: 2. Classes: (2 lec and 2 hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. Assessment: Practical work and a 2hr exam at end of semester. Core unit of study for Computer Engineering. Recommended elective unit of study for Electrical, Software 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. Semester: 1. **Classes:** (2 lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite:ELEC 2301 Signals and Systems. **Assessment:** Assignment and lab marks and an exam at end of semester.
Core unit of study for Computer, Electrical 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, suppressed-sideband 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. **Semester:** 2. **Classes:** (2 lec and 2 hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 2301 Signals and Systems. Assessment: Assignment and lab marks and an exam at end of semester.
Core unit of study for Computer, Electrical 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. **Semester: 2. Classes:** Two lec per week and nine 3-hr lab sessions. **Prerequisite:** Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems. **Assessment:** A 2 hr exam at end of semester.
Core unit of study for Computer, Electrical, 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. Semester: 2. Classes: 2 lec and a 2hr lab/tut per week. 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. 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 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. programming 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. **Semester:** 1. **Classes:** (2 lec and 1 hr tut) per week. **Assessment:** Web Based Teaching, assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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. Semester: 1. Classes: (2 lec and an average of 2hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A. Assessment: Lab reports and a 2hr exam at end of semester. Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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 Power Systems
4 credit points. **Semester:** 1. **Classes:** (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 3201 Fundamentals of Electrical Energy Systems. **Assessment:** Assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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. Semester: 1. Classes: (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 3302 Fundamentals of Feedback Control. Assessment: Assignments, midterm quiz and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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. Semester: 2. Classes: (Two lec and a 1-Hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 2301 Signals and Systems, and ELEC 4303 Digital Signal Processing. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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 (MRI) systems and three-dimensional (3D) imaging. Image analysis and computer vision; edge detection and boundary extraction, region and object representation, image segmentation and pixel classification, texture analysis and scene detection and matching.

ELEC 4402 Integrated Circuit Design

4 credit points. Semester: 1. Classes: (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits. Assessment: A design project and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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 4403 Electronic Design

6 credit points. Semester: 1. Classes: (Two lec and an average of 2-1/2 hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 2301 Signals and Systems, and ELEC 3302 Fundamentals of Feedback Control and ELEC 3401 Electronic Devices and Circuits. Prohibition: ELEC 4401 Electronic Design. Assessment: Assignments and/or quizzes, lab work and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software 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 4501 Data Communication Networks

4 credit points. Semester: 1. Classes: Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assignments, lab work and a 2hr exam at end of semester.

Core unit of study for Telecommunications Engineering. Recommended elective unit of study for Computer, Electrical and Software Engineering.

Syllabus

Networking principles. Multiplexing - FDM, TDM, STDM, CDM. Network topologies and circuit, packet and message switching concepts. Introductory queuing and traffic theory for circuit switched and packet switched networks. Local area network architectures. Network protocols - the 7 layer ISO / OSI model, physical, data link, and network layer implementations in LANs and public networks. Upper layer protocols. Optical fibre networks and architectures. Multi-channel optical communication systems. Introduction to FDDI, DQDB and interworking of LANs with wide area high speed networks. Comprehensive broadband networks for user access. Standards.

ELEC 4502 Digital Communication Systems

4 credit points. Semester: 1. Classes: (2 lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assignments, lab work and a 2hr exam at end of semester.

Core unit of study for Telecommunications Engineering. Recommended elective unit of study for Computer, Electrical and Software Engineering and Electronic Commerce.

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. Semester: 1. Classes: (2 lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software 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, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording, convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission, multidimensional codes, turbo codes.

ELEC 4601 Computer Design

4 credit points. Semester: 1. Classes: (2 lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design. Assessment: Assignments, lab reports and a 2hr exam at end of semester.

Core unit of study for 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. **Semester:** 1. Classes: (Two lec and 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisites: ELEC 3601 Digital Systems Design and COMP 3100 Software Engineering. **Assessment:** Lab marks, reports and a 2hr exam at the end of semester.
Core unit of study for 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. **Semester:** 2. Classes: (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: COMP 3100 Algorithms, COMP 3205 Product Development Project, ELEC 3601 Digital Systems Design. **Assessment:** Lab work, project and a 2h exam at end of semester.
Core unit of study for Software Engineering. Recommended elective unit of study for Computer, Electrical and Telecommunications 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. **Semester: 2. Classes:** (Two lec and one 2hr tutorial/ workshop) per week. **Prerequisite:** Advisory Prerequisite: ELEC 3701 Management for Engineers. **Assessment:** Assignments and in-course involvement, and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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
No credit points. **Semester: 1**. **Assessment:** Assessment in this course 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 Computer, Electrical, Software and Telecommunications Engineering and Electronic Commerce.

ELEC 4703 Thesis
12 credit points. **Semester:** 2. **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. **Prerequisite:** A minimum of 36 credit points from third and fourth year units of study. **Assessment:** Thesis, final presentation and interim progress submissions.
Core unit of study for Computer, Electrical, Software and Telecommunications Engineering and Electronic Commerce.
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 eqivalent 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. **Semester:** 1. **Classes:** (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisites: COMP 3100 Algorithms, ELEC 3601 Digital Systems Design. **Assessment:** Lab work, project and a 2h exam at end of semester.
Core unit of study for Software Engineering. Recommended elective unit of study for Computer, Electrical and Telecommunications Engineering and Electrical Commerce.
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 4801 Biomedical Engineering Systems
4 credit points. **Semester:** 2. **Classes:** (Two lec and a 2hr lab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 3801 Fundamentals of Biomedical Engineering. **Assessment:** Assignments, lab and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
Advanced medical imaging- X-ray, ultrasound, magnetic resonance imaging (MRI), nuclear imaging, confocal microscopy, computed tomography (CT). Medical image processing - pattern recognition, image compression, chromosome analysis. Functional electrical stimulation - bladder and bowel control, cerebellar and mid-brain stimulation, limb control, walking in paraplegics. Advanced intrumentation - automated blood pressure measurement and control, automated anaesthesia, artificial insulin injectors, biophotonics and optical fibre sensors. Laboratory experiments - respiratory measurements, blood pressure measurement, image processing and pattern recognition.

ELEC 5201 Electrical Systems Control
4 credit points. **Semester:** 2. **Classes:** (Two lec and a 2 hr tut/project) per week. **Prerequisite:** Advisory Prerequisites: ELEC 3201 Fundamentals of Electrical Energy Systems, and ELEC 4201 Electrical Power Systems. **Assessment:** Assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
This unit aims to cover major issues and techniques in the modern electricity industry. The topics will be selected from the following: progress of deregulation and open-access; market structures and operation; advanced analysis; control and security;

planning; risk management; software tools. The assumed knowledge may be less than that stated depending on the topics covered.

ELEC 5301 Nonlinear and Adaptive Control

4 credit points. Semester: 2. Classes: (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3302 Fundamentals of Feedback Control, and ELEC 4301 Computer Control System Design. Assessment: Assignments, labs and an exam at the end of semester.

This unit aims to cover major issues and techniques in modern systems engineering, control and automation. The emphasis'is on analysis and control of more complex systems than studied in earlier units - ie, large and/or nonlinear systems. The topics will be selected from.the following: modelling complexity; nonlinear systems; system simulation; model reduction; optimal control; predictive control; stability; fuzzy and neural control; applications in energy systems, telecommunications, biomedical and transport systems.

The assumed knowledge may be less than that-stated depending on the topics covered.

ELEC 5501 Advanced Communication Networks

4 credit points. Semester: 2. Classes: (2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks. Assessment: Assignments, reports and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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. Semester: 2. Classes: (2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems. Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software 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 satellite 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. Semester: 1. Classes: 2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3402 Communications Electronics, ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assessment: Assignments and a 2hr exam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software 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, multi-channel multiplexing techniques, optical fibre communication systems.

ELEC 5504 Cellular Radio Engineering

4 credit points. Semester: 1. Classes: (2 lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assignments and a 2hrexam at end of semester.

Recommended elective unit of study for Computer, Electrical, Software 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.

ELEC 5505 Advanced Digital Transmissions

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

Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

Syllabus

This unit of study will address techniques and issues relating to digital transmission in modern advanced communication systems. The aim is to provide general theory for transmission, and examine its application in a number of current advanced systems. The specific systems to be considered may vary from year to year, and may include: Next generation wireless systems, CDMA standards, high speed xDSL modems, voice band modems, ISDN systems, and FDMA systems.

The following topics will be covered:

Information theory: Entropy, Source coding, Channel capacity, Bounds on communication, Bandwidth and power allocation. Channel characteristics: Modelling of communication channels, Multi-user communication channels, Fading channels, Wireline channels. Advanced Modulation Techniques: A selection from the following: DMT, OFDM, CDMA, ADSL, HFC, ISDN, and voiceband modems.

Receiver structures: Matched filter, Equalization, Fractional sampling, Diversity reception, Adaptive receivers.

A selection of the following topics will also be covered: Data packet design, Training sequences, Transmission overheads, Synchronization, Timing recovery, Power control, Implementation, Advanced error control techniques.

ELEC 5506 Optical Networks

4 credit points. Semester: 2. Classes: (2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications. Assessment: Assignments and a 2hr exam at end of semester.

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/SONET, FDDI, ATM, Fibre Channel.

ELEC 5521 **Radio Frequency Engineering**
4 credit points. Semester: 1. Classes: (2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 3402 Electronic Devices and Circuits. **Assessment:** Assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
This unit of study is concerned with the design, specification, implementation and support of radio frequency systems such as in mobile communications. It 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 and large signal characteristics; introduction to device modelling and circuit simulation.

ELEC 5522 **Antennas and Propagation**
4 credit points. Semester: 2. Classes: (2 lec and a 1 hr tut) per week. Prerequisite: Advisory Prerequisites: MATH 2001 Complex Variables, and ELEC 3102 Engineering Electromagnetics. Assessment: Assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
This unit of study 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 theory 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 5601 **Advanced Real Time Computing**
4 credit points. **Semester:** 2. **Classes:** (Two lec and a 2hr iab/tut) per week. **Prerequisite:** Advisory Prerequisite: ELEC 4602 Real Time Computing. **Assessment:** Lab mark and a 2hr exam at the end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
Modelling of real-time systems, design techniques, analysis and prediction of real-time behaviour, advanced scheduling techniques, simulation, verification and validation, communications, distributed real-time systems, reliability and fault tolerance, hardware architectures, CASE tools for real-time systems. Standards for real-time languages and operating systems.

ELEC 5603 **Biologically Inspired Signal Processing**
4 credit points. Semester: 2. 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 Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
Introduction to artificial intelligence, review of knowledge representation techniques. Introduction to artificial neural networks. Artificial neural networks training algorithms. Neural networks training strategies. Hardware implementation s of neural networks. Analog and digital very large scale integration friendly learning algorithms. Applications: intracardiac electrogram classification, optical character recognition.

ELEC 5604 **Adaptive Pattern Recognition**
4 credit points. Semester: 2. Classes: (Two lec and a 1hr lab/tut) per week. Assessment: Assignments and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
Mathematical preliminaries: probability theory, random vectors, decision theories. Statistical approaches: feature extraction, nonlinear mapping, quadratic and linear classifiers, nonparametric estimation and classification. Fuzzy set approach: operations on fuzzy sets, the use of fuzzy sets in pattern recognition. Neural-net implementations: generalised perception, associative memories, self-organised neural nets, integrated neural-net computing environment, linking of symbolic and numeric processing.

ELEC 5606 **Multimedia Systems and Applications**
4 credit points. **Semester:** 2. **Classes:** (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: COMP 3100 Software Engineering, ELEC 3303 Digital Signal Processing, and ELEC 4501 Data Communication Systems. **Assessment:** Lab mark and a 2hr exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
This course covers the design and implementation of interactive networked multimedia processing and communication applications. The course will cover principles of switched networks, local area networks, wide area networks and their interoperability. Standards and protocols will be studied as as examples, including the International Telecommunications Union (ITU) H.320 and H.323 series for conferencing, and H. 324 for phony. Video and audio coding principles will be covered and associated protocols and standards studied.

ELEC 5608 **Electronic Commerce**
4 credit points. **Semester:** 2. Classes: (2 lec and 2 hr lab/tut) per week. Prerequisite: Advisory prerequisites: COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. **Assessment:** Lab mark and an exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications 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 5610 **Computer and Network Security**
4 credit points. Semester: 2. Classes: (2 lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisites: ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks. Assessment: Assignment and lab marks and an exam at end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
Physical security; discretionary and mandatory access control; biometrics; information-flow models of security; covert channels; models for integrity; cryptography; authentication; electronic cash; viruses; firewalls; electronic voting; risk assessment; secure Web browsers; electronic warfare.

ELEC 5611 **Advanced Computer Engineering**
4 credit points. Semester: 2. Classes: (Two lec and a 2hr lab/tut) per week. Prerequisite: Advisory Prerequisite: ELEC 4601 Computer Design. Assessment: Laboratory and a 2hr exam at the end of semester.
Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.
Syllabus
This unit of study is comprised of a selection of topics covering advanced computer architecture and advanced digital engineering. They may be chosen from the following.
Advanced Computer Architecture: Processor organisation, parallelism, scalability, language and application driven architectures, design tools and methodologies.
Advanced Digital Engineering: Advanced hardware description language skills for ASIC and FPGA design; CAD methodologies; designing for low power high speed, small area, low cost and testability; system design exercises.

■ Mechanical Engineering

MECH 1501 **Engineering Statics**
4 credit points. Semester: 2. Classes: 1 x 2hr plus 1 x 1hr lec-tut session/wk. Prohibition: MECH 1500 Mechanical Engineering. 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. Semester: 2. Classes: lectures, problem solving workshop, and tutorial. Prohibition: MECH 1530 Engineering Mechanics.MECH 1510 Kinematics and Dynamics. 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 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: Dynamics (vol 2) SI Edition, Addison Wesley

MECH 1530 Engineering Mechanics

8 credit points. Semester: 2. Classes: lectures, problem solving workshop and tutorial. Prohibition: CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1. 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 acceleration
- 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. Semester: 1. Classes: Professional Engineering: 3 x 1 hr lecture-tute perweekMechatronics Design: 2 hr lecture-tute perweek. Prohibition: AERO 1601 Aerospace Manufacturing, MECH 1500 Mechanical Engineering 1, MECH 1800 Computational Engineering 1A. 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. Semester: 1. Classes: 3 x 1 hr lecture-tute per week. Prohibition: AERO 1601 Aerospace ManufacturingMECH 1500 Mechanical Engineering 1. 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. Semester: 2. Classes: One 3 hour lab per week. Prohibition: AERO 1600 Workshop Technology. 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: lathe, mill, grinder, drill, shaper, detaining 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.

MECH1802 C Programming

3 credit points. Semester: 2. Classes: 1 hr lec and 2 hr lab/week. Assessment: One 2 hr exam and computer exercises.

NB: Webpage: www.acfr.usyd.edu.au/teaching/lst-year/mechl802/

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

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

McConnell Code Complete (Microsoft Press, 1994)

MECH 1820 Introduction to Computing

6 credit points. Semester: 1. Classes: Lecture and computer labs. Prohibition: MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools. DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadISYS 1003 Foundations of Information Technology. 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 Matlab (Prentice Hall, 1995)

Excerpts from Etter, Engineering problem solving with Matlab (Prentice Hall, 1993)

MECH 2201 Thermodynamics 1

4 credit points. Semester: 1. Classes: (2 lec and one 3hr lab/tut)/wk. Prohibition: MECH 2200 Thermofluids. 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. Semester: 2. Classes: 1 lecture/wk and labs and tuts. Prerequisite: MATH 1001, MATH 1002, MATH 1003. Prohibition: MECH 2200 Thermofluids, AERO 2201 Fluid Mechanics 1. Assessment: One 11/2 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

Potter and Wiggert, Mechanics of Fluids, Prentice-Hall.

Library Classification: 536.7,621.4,532., 620.106

MECH 2300 Materials 1

4 credit points. Semester: 2. Classes: 2 lectures and 1 hr tut/wk plus three 3 hr lab sessions. Prohibition: CIVL 2101 Properties of Materials. 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 Introducjtion to Microstrucjtures, Processing and Design (Pergamon, 1986)

Bailey The Role of Microstructure in Metal (Metallurgical Services, 1966)

Bailey Introductory Practical Metallography (Metallurgical Services, 1966)
Bailey The Structure and Strength of Metal (Metallurgical Services, 1967)
John Understanding Phase Diagrams (Macmillan, 1974)
Library Classification: 620, 624, 666-679.

MECH 2400 Mechanical Design 1

6 credit points. Semester: 2. 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. Semester: 2. Classes: Two lec/wk, three 3 hr lab sessions and ten 2 hr tutorials. Prerequisite: MATH 1001 MATH 1002and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics. 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. Semester: 2. 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. Semester: 1. Classes: 3 hrs/wk, including lectures and laboratory sessions. Prerequisite: Biology BIOL 1001 or some previous biology experience. 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 3201 Thermodynamics 2

4 credit points. Semester: 1. Classes: (2 lec and 1 x 1 hr tut)/week and laboratory work. Prerequisite: MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. Prohibition: MECH 3200 Thermal Engineering 1. Assessment: One 2hr exam, assignments and laboratory reports.
Third year year core unit of study for the degree in Aeronautical, Mechanical and Space Engineering

Syllabus summary

Thermodynamics: availability, statistical entropy and second law of thermodynamics, generalised charts for properties, engine characteristics, gas mixtures, psychrometry, air conditioning and refrigeration, thermodynamics of combustion.

Objectives

To develop an understanding of the basic principles of thermodynamic cycles, gas mixtures, combustion and chemical equilibrium.

Expected outcomes

Ability to tackle and solve a range of complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures.

Textbooks

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

Library Classification: 536.7,621.4

MECH3202 Heat Transfer

3 credit points. **Semester:** 1. Classes: 1 lec, 1 tut/week and laboratory work. **Prerequisite:** MECH 2201 Thermodynamics 1. **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.

Textbooks

Incropera and De Witt Fundamentals of Heat and Mass Transfer (Wiley)

MECH 3211 **Fluid Mechanics 2**

4 credit points. **Semester: 2. Classes:** (2 lec, one 1 hr tut,)/wk one 3 hr lab. **Prerequisite:** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **Prohibition:** AERO 3250 Aerodynamics 2. **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 one-dimensional 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)

Berrin 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. **Semester:** 2. **Classes:** 2 lec/wk plus 1 tut/wk & two labs. **Prerequisite:** MECH 2300 Materials 1 andAERO 2300 Mechanics of Solids 1. **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, structure-property relationships, selection of materials in mechanical design.

Objectives

(a) to understand the relationship between properties of materials and their microstructures; and

(b) to improve mechanical design based on knowledge of mechanics and properties of materials.

Expected outcomes

Students should gain the capabilities to select proper materials for simple engineering design.

Textbooks

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)

GalUster, Jr.Materials Science and Engineering-An Introduction (John Wiley & Sons)

Bolton Engineering Materials Technology (Butterworth Heinemann)

Ashby Materials Selection in Mechanical Design (Pergamon Press)

Library Classification: 620-624,666-679

MECH 3310 Mechanics of Solids 2

4 credit points. **Semester:** 1. **Classes:** 2 lec/wk plus 1 tut/wk. **Prerequisite:** AERO 2300 Mechanics of Solids 1 andMATH 2005. 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

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. **Semester: 1. Classes:** 2 lectures & one 1 hr drawing office session/wk. **Prerequisite:** MECH 2400 Mechanical Design **1. 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 prqvide 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

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

MECH3410 Mechanical Design 2B

4 credit points. **Semester: 2. Classes:** 2 lectures & one 1 hr drawing office session/wk. **Prerequisite:** MECH 2400 Mechanical Design 1. **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: 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

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. **Semester: 1. Classes:** 2 lec and **1** tut/ wk plus laboratory sessions. **Prerequisite:** MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005). **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. **Semester:** 1. **Classes:** lec: 3hrs/wk; plus an average of 2hrs/wk for tut, lab and industrial visits. Prerequisite: MECH 1600 Manufacturing Technology. **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

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. Semester: 1. **Classes:** 2 hrs/wk lec; plus industrial visits. Prerequisite: MECH 1600 Manufacturing Technology. 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

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. **Semester: 2. Classes:** One hr/week for team consultations and several lectures on relevant topics; presentations in final two weeks of Semester. **Prerequisite:** 30 credit points of second year units of study. **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. **Semester: 2.**

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. **Semester:** 1. **Classes:** 2 hr lectures plus a 3 hr lab/wk. **Prerequisite:** MECH 2700 Mechatronics 1. **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

MECH 3800 Systems Control

4 credit points. Semester: 2. Classes: 2 lec and 1 tut/week plus laboratory sessions. Prerequisite: MATH 2001 and MATH 2005. 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 Maflab 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. **Semester:** 1. **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. **Semester: 2. 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 outline and potential benefit to the health care system.

MECH 4101 Thesis A

No credit points. **Semester: 1, 2. 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 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 the Fourth year of the 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 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 outlined 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 formal Progress Report.

MECH 4102 Thesis B

12 credit points. **Semester: 1,2. 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 their 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 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 Rolling Prize may be awarded for the best graduation thesis.

MECH 4103 Interdisciplinary Thesis A

No credit points. Semester: 1,2. 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 1st 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 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. Semester: 1,2. 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 (Meclianical 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 penally 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 4110 Professional Engineering

4 credit points. Semester: 1. Classes: Lectures/consultations/student presentations - 4hr/week for one semester.. Prerequisite: 36 credit points of Senior units of study. 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. Semester: 2. 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. Prerequisite: 32 credit points of third year units of study. 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

No credit points. Semester: 1, 2. Classes: 12 weeks of practical work experience. Prerequisite: 28 credit points of second year units of study. Assessment: A writtten 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. Semester: 2. Classes: 2 lectures and one tutorial per week. Prerequisite: MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2. Assessment: Tutorial work and projects.
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. Semester: 1. Classes: 5 hrs/wk plus two Saturday field-trips. 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. 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. Semester: 1. Classes: 2 lec and 1 tut/w. Prerequisite: 24 credit points of third year units of study. Prohibition: MECH 4220 Environmental Engineering. 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. Semester: 1. Classes: 3hrs per week. Prerequisite: 24 credit points of Senior units of study. Prohibition: MECH 4220 Environmental Engineering. 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

Students will be able to carry out economic and environmental impact analyses for energy systems.

Textbooks

No text or reference books are set. Preliminary reading can be made on the Web at www.ieagreen.org.uk.

MECH 4250 Air Conditioning and Refrigeration

3 credit points. Semester: 1. Classes: 1.5hr lecture and 1 hr tut/wk. Prerequisite: MECH 3200 Thermal Engineering 1. 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. Semester: 1. Classes: 1.5hr lecture and 1 hr tut/wk. Prerequisite: MECH 3200 Thermal Engineering 1. 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. Semester: 2. Classes: 3 lec/wk plus 3 tut & lab/wk. Prerequisite: MECH 3300 Materials 2. Prohibition: MECH 4315 Advanced Aerospace Materials. Assessment: Quiz, log book, presentation and final report.

Fourth year elective unit of study.

Syllabus summary:

Advanced ceramics, superalloys, shape memory alloys and polymers, advanced polymer matrix composites, piezoceramic materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, structure integrity and reliability, toughening mechanisms.

Objectives:

To understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering structures.

Expected outcomes:

Students should gain the capabilities: (a) to define structure-property relationships of advanced engineering materials, (b) to improve the performance of engineering structures through tailoring materials microstructure and manufacturing processes, and (c) to conduct failure diagnosis of simplified failure cases of engineering structures

Textbooks

Lecture notes

Reference books

Ashby, Materials Selection in Mechanical Design (Pergamon, 1993)
Atkins and Mai, Elastic and Plastic Fracture (Ellis Horwood, 1985)
Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)
Chawala, Composite Materials (Springer-Verlag, 1987)
Crawford, Plastic Engineering (second edition, 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, Modern 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. Semester: 2. Classes: 3 lec/wk plus 3 tut & lab/wk. Prerequisite: MECH 3300 Materials 2. Prohibition: MECH 4310 Advanced Engineering Materials. Assessment: Quiz, log book, presentation and final report.

Fourth year elective unit of study

Syllabus summary:

Advanced ceramics, superalloys, shape memory alloys and polymers, advanced polymer matrix composites, piezoceramic materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, structure integrity and reliability, toughening mechanisms.

Objectives:

o understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering structures.

Expected outcomes:

Students should gain the capabilities: (a) to define structure-property relationships of advanced engineering materials, (b) to improve the performance of engineering structures through tailoring materials microstructure and manufacturing processes, and (c) to conduct failure diagnosis of simplified failure cases of engineering structures.

Textbooks

Lecture notes

Reference books

Ashyby, Materials Selection in Mechanical Design (Pergamon, 1993)
Atkins and Mai, Elastic and Plastic Fracture (Eilis 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, Modern Ceramic Engineering (M Dekker, 1982)

MECH 4410 **Advanced Design and Analysis 1**

3 credit points. Semester: 1. Classes: 2 hrs/wk. Prerequisite: MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B. Assessment: Assessment is based on three assignments, 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 design analysis techniques (in particular the Finite Element Method).

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 typical machinery such as fans, ore grinding mills and vibrating screens. Overviews of the wide range of mechanical machines and structures are followed by summaries of bearings, shafting, couplings and baseplates. Assignment 1 (20%) is the concept design of a materials handling device or similar. This is followed by extensive class time use of the finite element method in stress and vibration analysis, with specific use of the STRAND FE code, starting with basic elements and leading into Assignment 2 (30%) on a typical machine structural element. Assignment 3 (40%) follows from Assignment 2 and rounds off the course by completing the turnkey design and arrangement of a fan or vibrating screen. Topics included along the way are design for fatigue, vibrational considerations, welding and bolting, NDT during manufacture and service, and failure modes of machines.

Textbooks

Norton, 'Machine Design - an integrated approach'

Reference books

Lecture Notes
Shigley and Mischke, 'Mechanical Engineering Design' 5th Edition
Adams and Askenazi, 'Building Better Products with Finite Element Analysis'
Gurney, 'Fatigue of Welded Structures'
Blackler, '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. Semester: 2. Classes: 2 hrs/wk. Prerequisite: MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B. Assessment: Assessment is based on three assignments, 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).

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. Strong 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 Mech4410 but inherently complements it with respect to the design and analysis related topics covered. These include mechanical design with steel structural hollow sections, design with aluminium and composites, design fundamentals of container cranes / stacker reclaimers / shiploaders, structural dynamics and design for fatigue, operational troubleshooting / failure modes / design rectification techniques, design audits, quality management, machinery monitoring (strain, vibration), safety features and guarding for machines, introduction to hydraulics. The course includes considerable 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.

Textbooks

Norton, 'Machine Design - an integrated approach'

Reference books

Lecture Notes
Shigley and Mischke, 'Mechanical Engineering Design' 5th Edition
Adams and Askenazi, 'Building Better Products with Finite Element Analysis'
Gurney, '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. Semester: 2. Classes: 3 hrs/wk including tutorials and practical sessions. Prerequisite: MECH 3500 Engineering Dynamics 2. 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
- 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. Semester: 1. Classes: 3 lec/wk plus associated tut and lab work and industrial visits. Prerequisite: MATH 2001 andMATH 2005 andMECH 3620 Industrial Management. Prohibition: MECH 4610 Industrial and Engineering ManagementMECH 4620 Industrial ErgonomicsMECH 4635 Introduction to Operations Research. 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

Taha, 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. Semester: 1. Classes: 2hrs lec and tut/wk plus industrial visits. Prerequisite: MECH 3620 Industrial Management. Prohibition: MECH 4605 Industrial Engineering. 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

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. Semester: 1. Classes: 2hrs/wk. Prohibition: MECH 4605 Industrial Engineering. Assessment: Assignments and exam. Fourth year elective unit of study.

Objectives

Introduce ergonomics and increase awareness of the ergonomics issues; provide information about humans, particularly in the workplace; provide practical information and sources to allow the human-environment performance to be optimised; provide opportunity to apply ergonomics principles; encourage students to consider the human in all their work.

Expected outcomes '

Students will be aware of ergonomics and be able to undertake a basic ergonomics assessment with a measure of confidence. Students should also be able to identify potential ergonomics issues, source information and call in specialist expertise appropriately.

Textbooks
Stevenson, 'Notes on the Principles of Ergonomics' (available from the Uni Copy Centre) Reference to many other materials is expected.
Library Classification: 612, 620, 005, 658, 158...lots more

MECH 4635 **Introduction to Operations Research**

4 credit points. Semester: 1. Classes: 4 hrs/wk. Prerequisite: MATH 1005MATH 2001 MATH 2002MATH 2005. **Prohibition:** MECH 4600 Industrial Engineering. 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
Tana, 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. **Semester:** 2. Classes: 2 hrs/wk. **Prerequisite:** MECH 3600 Manufacturing Engineering. **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. Semester: 2. Classes: 20 hrs of lectures and tutorials. Prerequisite: 36 credit points of senior units of study. 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 4701 **Modern Estimation and Control**

6 credit points. Semester: 1. Classes: 3 lectures and one 3hr lab/tut per week. Prerequisite: MECH 3800 Systems Control or AERO 3500 Flight Mechanics 1. Assessment: Assignments and exams.
Fourth year elective unit of study.

Syllabus Summary

This unit of study comprises three parts:

a) Modelling: State-space system models, models of uncertainty, information and stochastic processes

b) Control: Modem control theory, controllability and observability analysis, dynamic programming, LQR design, Multi-Input Multi-Output Systems, introduction to single play and multi-play game theory.

c) Estimation: Probabilistic estimators and Kalman filter design, separation principle.

This course will provide a number of case studies so that the link to key theoretical foundations are developed, and will provide students with practical experience in the estimation and control of systems though the use of real data.

Objectives

To provide a holistic view of modern control system design through the analysis of real systems. To provide a strong theoretical understanding in both estimation and control algorithms and how and when they are applied.

Expected Outcomes

Students will be able to design, analyse and implement modern control and estimation solutions to a variety of practical automation problems.

MECH 4710 **Microprocessors in Engineered Products**

6 credit points. Semester: 1. Classes: (3 lec and one 2hr lab/tut)/wk. **Prerequisite:** ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits. **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 modern 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

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 4721 Sensors and Signals A

4 credit points. Semester: 2. Classes: 3 hours lectures per week, 1 hour of Lab/Tutorial per week. Prerequisite: MECH 3700 Mechatronics 2. Assessment: Assignments, Tutorials and a Sensor Design.

Syllabus Summary

This course starts by providing a background to the signals and transforms required to understand modern sensors. It goes on to provide an overview of the workings of typical active sensors (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

The course covers the following topics:

a) SIGNALS: Complex signals, Convolution, The Fourier Transform, Modulation, Frequency shifting

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS: THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging, Radio Tags and Transponders, Range Tacking, Doppler Measurement, Phase Measurement

d) SENSORS AND THE ENVIRONMENT: Atmospheric Effects, Target Characteristics, Clutter Characteristics, Multipath

e) ACTIVE SENSORS: ADVANCED TECHNIQUES: Probability of Detection, Angle Measurement and Tracking, Combined Range/Doppler and Angle Tracking, Frequency Modulation and the Fast Fourier Transform, High Range Resolution, Wide Aperture Methods, Synthetic Aperture Methods (SAR)

Objectives

The course aims to provide students with a good practical knowledge of a broad range of sensor technologies, operational principles and relevant signal processing techniques.

Expected Outcomes

A good understanding of active sensors, their outputs and applicable signal processing techniques. An appreciation of the basic sensors that are available to engineers and when they should be used.

MECH 4730 Computers in Real-Time Control and Inst

6 credit points. Semester: 1. Classes: (3 lec and one 2hr lab/tut)/wk. Prerequisite: ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits. 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

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. Semester: 2. Classes: 4hrs of tut/lab classes/wk. Prerequisite: MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2. 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 the biomechanics of the musculo-skeletal system and to the fundamentals of biomedical engineering as applied to orthopaedic devices used for the replacement and repair of the diseased or damaged skeleton.

Expected outcomes

Students will become acquainted with the physical properties of human bones and joints. They will understand how the skeleton functions as an engineering structure. They will learn the physical characteristics of the materials from which the musculoskeletal system is fabricated and be able to adapt basic engineering principles to the design and fabrication of prosthetic joints and to other devices used for replacement and repair of bones and joints.

MECH 4910 Biomechanics and Biomaterials

4 credit points. Semester: 1. Classes: 4 hrs of lecture/tut/lab per week. Prerequisite: 36 credit points of third year units of study. 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 the biomaterials and biomechanics fields, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems.

Expected outcomes

Students should be able to:

- Apply static and dynamic mechanical analyses to the human body to describe motion.
- Understand the mechanical behaviour of biological tissues and the types of models used to describe this behaviour.
- Understand all the factors involved in the selection of a biomaterial for tissue replacement, including mechanical, biocompatibility, material property and fixation factors.
- Improve their written and oral communication skills in a technical setting.

The students should gain a basic understanding of the major 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)

■ Interdisciplinary units of study

ENGG 1001 Interdisciplinary Project

12 credit points. **Semester:** 1. 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. Although 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. **Semester:** 2. **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. Semester: 2. Classes: 2 hours tutorials per week for one semester. This unit of study will be offered in either February or July Semesters. **Prerequisite:** Only students who have been named on the Dean's list at the end of Year 1 will be eligible. **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, outlining the problem and its solution, as well as making an oral presentation
- prepare a business plan with respect to an industrial or research project.

ENGG 2003 Introduction to Engineering Management

4 credit points. **Semester:** 2. **Classes:** Two (1 hr) lectures and one (1 hr) tutorial per week one semester. **Prohibition:** ELEC 3701, MECH 3620. **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. Semester: Summer.

ENGG 2005 Introductory Engineering Project

6 credit points. Semester: Summer.

ENGG 2006 Advances in Engineering Leadership

2 credit points. Semester: 2. Classes: Weekly lectures/tutorials will be supplemented by a practical session at the end of the Semester. Prerequisite: ENGG 1002. 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 2007 Introductory Engineering Project

8 credit points. Semester: Summer.

ENGG 3001 **Technology Education**

2 credit points. Semester: 2. Classes: 2 hours tutorials per week for one semester. This unit of study will be offered in either February or July Semesters. Prerequisite: Only students who have been named on the Dean's list at the end of Year 2 will be eligible. 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. **Semester:** 1. **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 rules of international competitiveness; effects of globalisation on Australia's economic performance; the competitiveness of Australian firms; the generation of employment and wealth; the changing requirements on the engineer; the engineer as manager and strategist; the role of innovation in business management; product innovation and commercialisation.

Textbooks

Text and reference books

See list supplied by lecturer

ENGG 4002 New Business Creation

4 credit points. **Semester:** 2. **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 **Commercial Engineering Practice**

4 credit points. Semester: 2. Classes: 2 contact hours per week. Assessment: Assignment essay during and a 2hr exam at end of semester.

Of value to all branches of Engineering and approved as a recommended elective unit of study for Electrical, Computer, Telecommunications and Software Engineering in 2002.

Syllabus

Covers the day to day practices that industry expects of engineers working in the commercial environment, including:

1. Workplace relationships.
2. Managing and being managed.
3. Workplace, workforce and commercial ethics.
4. What the Marketing Department wants.
5. What the Production Department wants.
6. Workplace communication.
7. Conflict resolution.
8. Time and meeting management.
9. Report writing and presentation.
10. Commercial law and Alternative Dispute Resolution.
11. Intellectual property: inventions, patents and copyright.
12. Introduction to quality systems.

ENGG 4004 **Advanced Engineering Design Project**

12 credit points. Semester: 2. 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. 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, CIVL 4013, CIVL 4014, ELEC 4703,MECH 4102,. Assessment: Assessment will be on the basis of a written report and oral presentations. Satisfactory tutorial performance and group participation is also required.

Obj ectives/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.

ENGG 5601 **Greenhouse Gas Mitigation**

6 credit points. Semester: 2.

ENGS 2601 **Chemical Engineering Science 2A**

8 credit points. Semester: 1. Classes: 4 lec, one 1 hr tut & one 2hr tut/wk; and three 3hr prac/semester. Prerequisite: CHEM 1102 or 1902 or 1904 or 12 credit points of Junior Physics or 12 credit points of Junior Mathematics. Corequisite: CHEM 2202 or 2902. Assessment: One 3hr exam, project and lab assessment.

As for Chemical Engineering Science Auxiliary with, in addition, the following:

An integrated introductory treatment of the transport of momentum, heat and mass.

Fluid statics: application to pressure measurement and forces on storage vessels. Inviscid flow theory: application to flow measurement. Conservation of momentum; forces on fittings. Laminar flow of Newtonian fluids in pipes: derivation of velocity profile, flow rate and frictional loss. Turbulent flow in pipes: application of dimensional analysis, friction factors; energy balances for pipe flow systems. Pumps: theory of reciprocating and centrifugal pumps; cavitation and NPSH.

Heat conduction: rectilinear and cylindrical geometry. Convection: concept and use of the heat transfer coefficient. Dimensional analysis and dimensionless correlations for heat transfer in pipe flow. Natural convection. Simple heat exchangers.

Diffusion models and examples. Convection and dilute diffusion. Diffusion coefficients in gases, liquids and polymers. Mass transfer coefficients, interfacial conditions. Dimensional analysis, correlations. Heat and mass transfer analogies. Absorption of dilute and concentrated vapours. Heat and mass transfer, wet-bulb temperature.

Textbooks

As for Chemical Engineering Science Auxiliary; and

Hewitt, Shire, *St.* Bott. Process Heat Transfer. CRC Press: Begel House, 1994

Others as advised during classes

ENGS 2602 **Chemical Engineering Science 2B**

8 credit points. Semester: 2. Classes: 4 lec, one 1 hr tut, one 2hr tut/wk; and three 3hr prac/semester. Prerequisite: ENGS 2601. Assessment: One 3hr exam, project and lab assessment.

See description under Chemical Engineering Science 2A.

■ Units of study from other faculties

CHEM 1401 **Chemistry 1E**

6 credit points. Semester: 1. Classes: (3 lec & one 3 hr lab/tut session)/wk. Prerequisite: HSC Mathematics and a satisfactory knowledge of Chemistry. Prohibition: CHEM 1101, CHEM 1102. Assessment: one 3 hr exam at end of unit (other assessment details provide at the beginning of the unit).

Consists of the following specially selected topics of importance to engineering, together with sufficient fundamental inorganic, organic and physical chemistry to support these topics. A detailed syllabus is available from the School of Chemistry.

Electrochemistry: Fundamental principles of electrochemistry will be Considered in relation to corrosion, energy storage and fuel cells.

Polymer chemistry: A discussion of the formation and structure/properties relationships in common types of polymers.

Materials: The correlation between properties and materials and the chemical structure will be discussed with special reference to electrical conductivity.

Textbooks

List available from School of Chemistry.

Library classification: U541—U547 (Fisher Library).

GEOL1501 **Engineering Geology 1**

6 credit points. Semester: 1. Classes: 39 hrs lec, 26 hrs lab. Field excursions in the Sydney region, as appropriate. Prohibition: GEOL 1002. Assessment: Practical laboratory work, assignment, and a combined theory and practical exam.

First year core unit of study for the degree in Civil Engineering, unless the unit of study GEOL 1002 has been completed. Second year core unit of study for the degree in Project Engineering and Management (Civil).

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

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

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

Textbooks

T.West Geology Applied to Engineering; or

A. Holmes Principles of Physical Geology 4th Edition.

MATH 2051 **Linear Programming**

2 credit points. Semester: 2, Summer. Classes: (1 lec & 1 tut)/wk. Corequisite: MATH 2001 or 2901, and MATH 2002 or2902. Prohibition: MATH 2953.

Linear Programming (weeks 1-7): Many decisions taken in industry and commerce involve the need to maximise or minimise quantities (such as profit, wastage, distance travelled) subject to certain conditions (such as availability of raw materials, production capacities). Linear programming is an

important technique for solving such optimisation problems. The unit will discuss the mathematical formulation of these problems, graphical solutions, the simplex algorithm (with and without artificial variables), and duality. Some of the tutorials will use Matlab.

Boundary Value Problems (weeks 8-13): This is an introduction to the numerical solution of boundary value problems for differential equations. A selection of problems in ordinary, elliptic and parabolic differential equations will be solved using the shooting method, the method of finite differences and the method of lines. Computation will be performed in Matlab.

Textbooks

Choo, KG and Henderson, J. Lecture Notes for Linear Programming.

References

Calvert, JE and Voxman, WL. Linear Programming. Harcourt, Brace Janovich, 1989.
Swanson, LW. Linear Programming, Basic Theory and Applications. McGraw-Hill, 1987.
Tana, HA. Operations Research: An Introduction. 5th edn, Macmillan, 1992.
Thie, PR. An Introduction to Linear Programming and Game Theory. Wiley, 1988.
Winston, WL. Introduction to Mathematical Programming: Applications and Algorithms. 2nd edn, Duxbury, 1995.

(For references for Boundary Value Problems, see MATH 2052.)

MATH 2052 Numerical Methods

2 credit points. Semester: 2, Summer. Classes: (1 lec & 1 computer tut)/ wk. Corequisite: MATH 2001 or 2901. Prohibition: MATH 2952.

This option is an introduction to the theory and techniques of numerical approximation and analysis. The unit is heavily computer oriented and gives students individual programming practice featuring Matlab.

Major topics: Errors. Numerical solution of algebraic and transcendental equations - iteration, chord, Newton-Raphson and bisection methods; order of convergence. Polynomial interpolation, splines and curve fitting. Numerical integration - composite trapezoidal and Simpson rules; Gaussian quadrature. Numerical solution of ordinary differential equations - Runge-Kutta methods; stability and stiffness.

Textbooks

References

Gerald, CF and Wheatley, PO. Applied Numerical Analysis. 5th edn, Addison-Wesley, 1994.

PHYS1202 Physics 1E

6 credit points. **Semester:** 1.

PHYS1203 Physics 1EE

4 credit points. **Semester:** 1.

PHYS2203 Physics 2EE

4 credit points. **Semester: 2.**

3 Tables of undergraduate courses

Table 1: Aeronautical Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Core units of study			
■ First Year			
AERO 1600 Workshop Technology	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO 1801 Computer Engineering Applications	3	N INFO 1000 Information Technology Tools and ISYS 1003 Foundations of Information Technology. *NB: Web page: problemsolvers.aero.usyd.edu.au.*	2
AERO 1701 Introduction to Aerospace Engineering	3		1
PHYS 1003 Physics 1 (Technological)	6	A HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. C For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). N May not be counted with PHYS 1004 or 1902.	1,2
MATH 1001 Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005' Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
MECH 1530 Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1820 Introduction to Computing	6	N MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
■ Second Year			
AERO 2201 Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. *NB: Web page: www.aero.usyd.edu.au/aero/aerodyn.html.*	2
AERO 2300 Mechanics of Solids 1	4	P 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
AERO 2500 Intro Flight Mechanics and Performance	4	p MATH 1001,1002,1003.	1
MATH 2001 Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2005 Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MECH 2201 Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2300 Materials 1	4	N CIVL 2101 Properties of Materials.	2
MECH 2400 Mechanical Design 1	6		2
MECH 2500 Engineering Dynamics 1	4	P MATH 1001MATH 1002andMECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
■ Third Year			
AERO 3200 Aerodynamics 1	4	P AERO 2201 Fluid Mechanics 1.	1
AERO 3250 Aerodynamics 2	4	P AERO 2201 Fluid Mechanics 1. N MECH 3211 Fluid Mechanics 2.	2
AERO 3301 Aerospace Structures 1	4	p AERO 2300 Mechanics of Solids 1.	1
AERO 3351 Aerospace Structures 2	4	P AERO 2300 Mechanics of Solids 1.	2
AERO 34002 Aircraft Design 1	3	p MECH 2400 Mechanical Design 1. N AERO 3401 Aerospace Design 1.	1
AERO 34502 Aircraft Design 2	3	p MECH 2400 Mechanical Design 1.	2
AERO 3500 Flight Mechanics 1	4	P AERO 2500 Introductory Flight Mechanics and Performance.	2
MECH 3201 Thermodynamics 2	4	P MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. N MECH 3200 Thermal Engineering 1.	1

Table 1: Aeronautical Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MECH 3300 Materials 2	4	**p** MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3500 Engineering Dynamics 2	4	**p** MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
■ Fourth Year			
AERO 4200 Aerodynamics 3	3	**p** AERO 3250 Aerodynamics 2.	1
AERO 4201 Propulsion	4	**p** MECH 3201 Thermodynamics 2.	2
AERO 4303 Aerospace Structures 3	6	**p** AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. **N** AERO 4301 Applied Numerical Stress Analysis.	1
AERO 4400 Aircraft Design 3	6	**P** AERO 3450 Aircraft Design 2 AERO 3400 Aircraft Design 1.	1
AERO 4500 Flight Mechanics 2	6	**P** AERO 3500 Flight Mechanics 1.	1
AERO 4600 Practical Experience	0	**P** 40 credit points of 3rd year UOS.	2
AERO 4950 Thesis Preparation	2	**P** 40 credit points of 3rd year UOS.	1,2
AERO 4900 Thesis or Design Project	10	**P** 40 credit points of 3rd Year UOS AERO 4950 Thesis Preparation.	1,2
AERO 49203 Seminar	2	**P** 40 credit points of 3rd Year UOS.	2

Notes

1. MATH 1004 Discrete Mathematics is an acceptable alternative to MATH 1005
2. Students enrolled in BE/BCom enrol in AERO 3401 Aerospace Design as an alternative to AERO 3400 & AERO 3450.
3. Students enrolled in BE/BCom are exempt from this unit.

Resolutions of the Faculty of Engineering relating to Table 1: degree eligibility

BE (Aeronautical)

In addition to gaining credit for the core units of study set out in Table 1, candidates are required to complete 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 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. Additional units of study from the table of recommended elective units of study for BE (Aeronautical) are also required. A minimum 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 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 of Commerce.

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

■ First Year			
AERO 1400 Intro to Aircraft Construction & Design	**6**	*NB: Permission required for enrolment.*	2
ELEC 1001 Introductory Electrical Engineering	**4**	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
■ Second Year			
AERO 2800 Aeronautical Engineering Computing	**4**	P AERO 1801 Computer Engineering Applications.	1
MATH 2002 Matrix Applications	**4**	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2052 Numerical Methods	**2**	C MATH 2001 or 2901. N MATH 2952.	2, Summer
■ Third Year			
AERO 3501 Flying Operations	**2**	P AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. *NB: Permission required for enrolment.*	1
AERO 3600 Aviation Technology	**4**		1
AERO 3602 Aviation Operation and Management	**4**		2
ENGG 2003 Introduction to Engineering Management	**4**	N ELEC 3701, MECH 3620.	2
■ Fourth Year			
AERO 4250 Aerodynamics 4	**3**	P AERO 3250 Aerodynamics 2.	2

Table 1: Aeronautical Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
AERO 4290	Rotary Wing Aircraft	4	p AERO 3250 Aerodynamics 2.	1
AERO 4291	Advanced Computational Aerodynamics	3	p AERO 3250 Aerodynamics 2.	2
AERO 4292	Aeroelasticity	3	p AERO 3250 Aerodynamics 2.	2
AERO 4351	Aerospace Structures 4	3	P AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4390	Smart Materials and Structures	3	p AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4490	Advanced Aircraft Design	4	P AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	P AERO 3500 Flight Mechanics 1.	2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
2. 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.

Table 2: Chemical Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Chemical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional 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

■ FirstYear

MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
CHEM 1101	Chemistry 1A	6	A HSC Chemistry and Mathematics. C Recommended concurrent units of study: 6 credit points of Junior Mathematics. N May not be counted with CHEM 1001 or 1901 or 1903 or 1905 or 1906 or 1909.	1,2
CHEM 1102	Chemistry 1B	6	Q CHEM 1101 or a Distinction in CHEM 1001 or equivalent. C Recommended concurrent units of study: 6 credit points of Junior Mathematics including MATH 1003 or 1903. N May not be counted with CHEM 1002 or 1902 or 1904 or 1907 or 1908.	1,2
CHNG 1001	Chemical Engineering Applications	4		1
CHNG 1101	Chemical Engineering 1A	4		1
CHNG 1102	Chemical Engineering 1B	4	P CHNG 1101 Chemical Engineering 1A.	2
CHNG 1201	Chemical Process Case Studies	4		2
CHNG 1301	Computing for Chemical Engineers 1A	4		1
CHNG 1302	Computing for Chemical Engineers 1B	4	p Advisory prerequisite: CHNG 1301 Computing for Chemical Engineering 1A.	2

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	p MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	p MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	C MATH 2001 or 2901, and MATH 2002 or 2902. N MATH 2953.	2, Summer
MATH 2052	Numerical Methods	2	C MATH 2001 or 2901. N MATH 2952.	2, Summer
CHEM 2101	Chemistry 2 (Environmental)	8	p 6 credit points of Junior Mathematics. Q CHEM 1102 or 1902 or 1904 or 1909. N May not be counted with CHEM 2001 or 2301 or 2901 or2903or2311 or2312or2502.	1
CHNG 2101	Chemical Engineering 2A	4		1
CHNG 2102	Chemical Engineering 2B	4		2
CHNG 2301	Chemical Engineering Computations	4	P Advisory prerequisites: MATH 1001, MATH 1002, MATH 1003, MATH 1005, CHNG 1301.	2
CHNG 2501	Environmental Chem Eng Fundamentals	4		1
CHNG 2601	Materials and Corrosion	4		2

■ Third Year

CHNG 3001	Chemical Engineering Laboratory	4	p Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3101	Unit Ops (Heat Transfer)	4	p Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	2
CHNG 3102	Unit Ops (Mass Transfer)	4	p advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3103	Unit Ops (Particle Mechanics)	4	p advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	2
CHNG 3104	Unit Ops (Fluid Mechanics)	4	p advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3105	Thermodynamics 1	4	p advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3106	Thermodynamics 2	4	P Advisory prerequisite: CHNG 3105 Thermodynamics 1.	2
CHNG 3107	Reaction Engineering 1	4		2

Table 2: Chemical Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
CHNG 3301 Process Modelling	4	P Advisory prerequisite: CHNG 2301 Chemical Engineering Computations.	1
CHNG 3302 Process Control 1	4		1
CHNG 3401 Project Economics	4		2
■ **Fourth Year**			
CHNG 4001 Practical Experience	0	P advisory prerequisite: 28 credit points of 3rd year units.	1
CHNG 4002 Thesis	8	P Advisory prerequisite: Students should have completed (or be enrolled in) all other 4th Year core units.	1
CHNG 4201 Chemical Engineering Design **1**	4		1
CHNG 4202 Chemical Engineering Design 2	8		2
CHNG 4401 Project Engineering	4		1
CHNG 4402 Process Plant Risk Management	4		1

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/B Sc 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 2005, 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:

CHNG 4403	Engineering Business Skills	4	*NB: Students MUST register withYoung Achievement Australia early in Semester 1.*		1
CHNG 4504	Environmental Decision Making	4			2
ENGG 4001	Innovation/International Competitiveness	4			**1**
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*		2
MECH 4630	Introduction to Operations Research	*Not on offer in 2002 (4 credit points).*			
MECH 4650	Workplace Industrial Relations	2	P 36 credit points of senior units of study.		2

Combined degree (Bachelor of Engineering in Chemical Engineering with either 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 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.

Recommended elective units of study for BE (Chemical)

■ **Second Year**

CHNG 2701	Fundamentals of Bioprocess Engineering 1	4	p	Advisory prerequisite: CHEM 1101, CHEM 1201.	1

Table 2: Chemical Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
CHNG 2702	Fundamentals of Bioprocess Engineering 2	4	p advisory prerequisite: CHEM 1101, CHEM 1201.	2
CHNG 2302	Process Data Management	4	*NB: Students enrolled in the Process and Computer Systems Engineering stream must enrol in this unit of study.*	1
CHNG 2502	Clean Products and Processes	4	p advisory prerequisite: CHNG 2501. *NB: Students enrolled in the Environmental and Energy stream must enrol in this unit of study.*	2
ENGG 2003	Introduction to Engineering Management	4	N ELEC 3701, MECH 3620.	2
AERO 2300	Mechanics of Solids 1	4	p 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
■ Third Year				
MICR 2007	Microbiology for Engineers A	4		1
MICR 2008	Microbiology for Engineers B	4		2
CHNG 3303	Flowsheeting and Optimisation	4	*NB: Students enrolled in the Process and Computer Systems Engineering stream must enrol in this unit of study.*	1
CHNG 3501	Waste Management & Treatment Technology	4	*NB: Students enrolled in the Environmental and Energy stream must enrol in this elective.*	1
ENGG 3002	Industrial and Engineering Management	4	p ENGG 2003. N MECH 4610.	1
■ Fourth Year				
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*	2
WORK 1001	Foundations of Industrial Relations	6	N IREL 1001. *NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.*	1
ENGG 4001	Innovation/International Competitiveness	4		1
CHNG 4003	Advances in Chemical Engineering A		*Not on offer in 2002.*	
CHNG 4004	Advances in Chemical Engineering B		*Not on offer in 2002.*	
CHNG 4006	Professional Option	2	P advisory prerequisites: Passed at least 144 credit points. *NB: Permission required for enrolment.*	1,2
CHNG 4101	Separation Processes	4	P Advisory prerequisites: CHNG 3102.	2
CHNG 4102	Transport Phenomena	4		1,2
CHNG 4103	Advances in Polymer Engineering	4		1,2
CHNG 4104	Reaction Engineering 2		*Not on offer in 2002.*	
CHNG 4105	Advanced Thermodynamics		*Not on offer in 2002.*	
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. *NB: Permission required for enrolment.*	1
CHNG 4301	Advanced Fluid Dynamic Modelling		*Not on offer in 2002.*	
CHNG 4304	Process Control 2	4	P CHNG 3302 Process Control 1.	1
CHNG 4305	Process Systems Engineering	4	N CHNG 4303 Optimisation Techniques.	2
CHNG 4403	Engineering Business Skills	4	*NB: Students MUST register with Young Achievement Australia early in Semester I.*	1
CHNG 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.	2
CHNG 4502	Advanced Topics in Environmental Engineering		*Not on offer in 2002.*	
CHNG 4504	Environmental Decision Making	4		2
CHNG 4505	Advanced Environmental Engineering		*Not on offer in 2002.*	
CHNG 4601	Advanced Particle Mechanics		*Not on offer in 2002.*	
CHNG 4602	Mineral Processing (Extractive Metallurgy		*Not on offer in 2002.*	
CHNG 4604	Chemical Modelling of Aqueous Systems		*Not on offer in 2002.*	
CHNG 4605	Mineral Processing	4	p Unit Operations (all four components).	2

Table 2: Chemical Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
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)				
ENGG 2003	Introduction to Engineering Management	4	N ELEC 3701, MECH 3620.	2
ENGG 3002	Industrial and Engineering Management	4	P ENGG 2003. N MECH 4610.	1
ENGG 4001	Innovation/International Competitiveness	4		1
MECH 4110	Professional Engineering	4	P 36 credit points of Senior units of study.	1
CHNG 4403	Engineering Business Skills	4	*NB: Students MUST register with Young Achievement Australia early in Semester 1.*	1
CHNG 4504	Environmental Decision Making	4		2
MECH 4630	Introduction to Operations Research		*Not on offer in 2002.*	
MECH 4650	Workplace Industrial Relations	2	p 36 credit points of senior units of study.	2
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*	2

Notes
1. 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.
2. 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		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Civil Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units of study offered by faculties other than Engineering.				
Core units of study				
■ **First Year**				
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
CIVL 1051	Dynamics	5	**A** HSC Mathematics Extension 1 and HSC Physics. **N** MECH 1510.	2
CHEM 1401	Chemistry IE	6	**P** HSC Mathematics and a satisfactory knowledge of Chemistry. **N** CHEM 1101, CHEM 1102.	1
GEOL 1501	Engineering Geology 1	6	**N** GEOL 1002.	1
CIVL 1001	Civil Engineering 1	4	**A** HSC Mathematics Extension 1 and a satisfactory knowledge of HSC Chemistry and HSC Physics.	1
CIVL 1052	Statics	5	**A** HSC Mathematics Extension 1. **N** MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics.	1
CIVL 1004	Computational Engineering	4	**N** COMP 1001 Introductory Programming or COMP 1002 Introductory Computer Science.	2
ELEC 1001	Introductory Electrical Engineering	4	**P** Advisory Prerequisite: MATH 1001 Differential Calculus. **N** ELEC 1102 Foundations of Electronic Circuits.	2
■ Second Year				
MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901 or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH 1002 or 1902 or Distinction in MATH 1012. **N** May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	**P** MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **N** May not be counted with MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	**C** MATH 2001 or 2901, and MATH 2002 or 2902. **N** MATH 2953.	2, Summer
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901. **N** MATH 2952.	2, Summer
CIVL 2409	Engineering Geology 2	4	**A** Either GEOL 1002 or GEOL 1501 Engineering Geology.	2
CIVL 2204	Introduction to Structural Concepts	4	**A** CIVL 1051 Dynamics and CIVL 1052 Statics. **N** CIVL 2203 Structural Design, CIVL 2101 Properties of Materials.	2
CIVL 2201	Structural Mechanics	6	**A** CIVL 1051 Dynamics and CIVL 1052 Statics.	1
CIVL 2610	Fluids 1	6	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 2004	Engineering Communications 1	2		1
CIVL 2205	Introduction to Structural Design	4	**A** CIVL 1051 Dynamics and CIVL 1052 Statics. CIVL 2201 Structural Mechanics. **N** CIVL 2203 Structural Design, CIVL 2101 Properties of Materials.	2
CIVL 2801	Engineering Construction 1	4		2
■ 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.	1
CIVL 3227	Steel Structures 1	8	**A** CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. **N** CIVL 3206 Steel Structures 1, CIVL 3102 Materials Aspects in Design.	2
CIVL 3225	Concrete Structures: Behaviour	4	**A** CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. **N** CIVL 3205 Concrete Structures 1, CIVL 3223 Concrete Structures - Behaviour.	1
CIVL 3226	Concrete Structures: Design	4	**A** CIVL 2201 Structural Mechanics and CIVL 2204 Introduction to Structural Concepts and CrVL 2205 Introduction to Structural Design. **N** CIVL 3205 Concrete Structures 1, CIVL 3224 Concrete Structures: Design.	2
CIVL 3401	Soil Mechanics A	4	**A** CIVL 2201 Structural Mechanics.	1
CIVL 3402	Soil Mechanics B	4	**A** CIVL 3401 Soil Mechanics A.	2
CIVL 3501	Engineering Surveying	4	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3602	Fluids 2	4	**A** CIVL 2610 Fluids 1.	2

Table 3: Civil Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
CIVL 3701	Transportation Engineering and Planning	2		2
CIVL 3005	Engineering Communications 2	2	**A** CIVL 2004 Engineering Communications 1.	2
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, CIVIL 2205 Introduction to Structural Design.	1
CIVL 3802	Engineering Construction 2	4	**A** Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge.	1
■ Fourth Year				
CIVL 4001	Thesis/Design/Project A	0	**P** 40 credit points of Senior Subjects. **N** CIVL 4003 and CIVL 4004.	1,2
CIVL 4002	Thesis/Design/Project B	5	**P** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001. **N** CIVL 4003 and CIVL 4004. *NB: Permission required for enrolment.*	1,2
CIVL 4008	Practical Experience	0	**P** 28 credit points of Senior courses.	1
CIVL 4803	Engineering Management	4	**N** CIVL 3803 Project Appraisal.	1
CIVL 4016	Professional Practice- Civil Engineering	5		2
CIVL 4903	Civil Engineering Design	6	**A** CIVL 3225 or CIVL 3223 Concrete Structures - Behaviour, CIVL 3226 or CIVL 3224 Concrete Structures - Design and CTVL 3227 or CIVL 3206 Steel Structures 1.	1

Notes to Table 3

1. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by the Faculty.

Resolutions of the Faculty of Engineering relating to Table 3

Degree eligibility

Candidates for the degree of Bachelor of Engineering in Civil Engineering are expected to complete all the core units for the study in Table 3 (160 credit points). They are also required to gain at least 32 credit points from the elective units of study listed under 'Resolutions of the Department of Civil Engineering'. Of the 32 credit points of study, at least 20 of these must be from Fourth Year 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 CTVL 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:

	Unit of study		*Acceptable alternative.*
CHEM 1401	Chemistry IE	6	*CHEM 1101 and CHEM 1102.*
GEOL 1501	Engineering Geology 1	6	*GEOL 1001 and GEOL 1002.*
MATH 2001	Vector Calculus and Complex Variables	4	*STAT 2002 (forBE/BCom degrees only).*
MATH 2005	Fourier Series & Differential Equations	4	*STAT 2004 (for BE/BCom degrees only).*
CIVL 1004	Computational Engineering	4	*COMP 1001 and COMP 1002 or MECH1800 or MECH1810 or MECH1801.*
CIVL 1052	Statics	5	*MECH1500 or MECH 1501.*
CIVL 1051	Dynamics	5	*MECH 1500 or MECH 1501.*
ELEC 1001	Introductory Electrical Engineering	4	*PHYS1202 orPHYS lOOlandPHYS 1003 or ELEC 2002.*
CIVL 2409	Engineering Geology 2	4	*GEOL 2001 and GEOL 2002 and GEOL 2003.*
CIVL 4001	Thesis/Design/Project A	0	*CIVL 4003.*
CIVL 4002	Thesis/Design/Project B	5	*CIVL 4004.*

Recommended elective units ol'study

■ FirstYear

COMP 1001	Introductory Programming	6	A HSC Mathematics Extension 1. 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. N May not be counted with COMP 1901.	Summer
COMP 1002	Introductory Computer Science	6	p COMP 1001 or 1901. N May not be counted with COMP 1902.	Summer

Table 3: Civil Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
INFO 1000	Information Technology Tools	6		Summer
ASNS 1001	Modem Asian History and Cultures 1	6		1
ASNS 1002	Modern Asian History and Cultures 2	6		2
ARCL 1001	Art & Archaeology of the Classical World	6		1
ARNE 1001	Archaeology of the Near East	6		1
■ Second Year				
DESC 9101	Introduction to Autocad	4	Q Preference given to Design Computing and Digital Media students. 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 (eg, Engineering) and Study Abroad. *NB: Permission required for enrolment.*	1.2, Summer
DESC 9100	Introduction to Archicad	4	Q Preference given to Design Computing and Digital Media students. N Available to CH005, CH006, and new undergraduate degrees students only with written permission from the lecturer. Same applies to students from other Faculties (eg, Engineering) and Study Abroad. *NB: Permission required for enrolment.*	1,2, Summer
■ Fourth Year				
WORK 1001	Foundations of Industrial Relations	6	*N* IREL 1001. *NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.*	1
CIVL 4222	Finite Element Methods	5	A CIVL 3204 Structural Analysis.	1
CHNG 4504	Environmental Decision Making	4		2
MECH 4220	Environmental Engineering	6	P 24 credit points of third year units of study. N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
CIVL 4221	Bridge Engineering	5	A CIVL 3225 or CIVL 3223 Concrete Structures - Behaviour, CIVL 3226 or CTVL 3224 Concrete Structures - Design and CTVL 3227 or CTVL 3206 Steel Structures 1.	1
CIVL 4218	Concrete Structures 2	5	A CIVL 3223 or CTVL 3225 Concrete Structures - Behaviour, CIVL 3224 or CIVL 3226 Concrete Structures - Design.	2
CIVL 4219	Structural Dynamics	5	A CTVL 3204 Structural Analysis.	1
CIVL 4220	Steel Structures 2	5	A CIVL 3206 or CIVL 3227 Steel Structures 1.	2
CIVL 4406	Environmental Geotechnics	5	A CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	2
CIVL 4407	Geotechnical Engineering	5	A CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	1
CIVL 4607	Environmental Fluids 1	5		1
CIVL 4608	Environmental Fluids 2	5	A Material covered in Environmental Fluids 1.	2
CIVL 4609	Water Resources Engineering	5		2
CIVL 4807	Project Formulation	5	A Completion of CIVL 3803 Project Appraisal or equivalent knowledge.	2
GEOL 2004	Environmental Geology and Climate Change	4	P 24 credit points of Science units of study.	1
GEOL 2005	Environmental Geology: Resources	4	p 24 credit points of Science units of study.	2
CIVL 3804	Contracts, Formulation and Management	5		2
CIVL 3805	Project Scope, Time and Cost Management	6		1
CIVL 4808	Project Management & Info Technology	4	A Sufficient knowledge of information technology systems & communications capabilities.	1
CIVL 4809	Project Planning and Tendering	4	A Completion of CIVL 2801 Engineering Construction 1 and CTVL 3802 Engineering Construction 2 or the equivalent knowledge.	2
CIVL 4810	Project Quality Risk and Procurement Mgt	6		2

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 credit points of study at Fourth Year level, two 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 units of study CIVL 4001 and CTVL 4002 Thesis by CIVL 4003 and CTVL 4004 Thesis Honours.
4. CTVL 4002 may be completed in the February semester with written approval from the Head of Civil Engineering.
5. Recommended elective streams are:

Construction Engineering and Management Stream: CTVL 4807, CIVL 3804, CIVL 3805, CTVL 4808, CTVL 4809, CTVL 4810.
Structural Engineering Stream: CIVL 4221, CTVL 4222, CTVL 4218, CIVL 4219, CIVL 4220.
Environmental stream: CTVL 4406, CTVL 4607, CTVL 4608, CTVL 4609, CHNG 4504, (MECH 4220).
Geotechnical Engineering stream: CIVL 4222, CIVL 4406, CIVL 4407, GEOL 2004, GEOL 2005.

Table 4: Computer Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester

Candidates for the degree of Bachelor of Engineering in Computer Engineering are required to gain credit for a prescribed number of credit points of core and recommended elective units of study. The core units of study are set out in Table 4. The recommended elective units of study consist of:

- all level 3, 4 and 5 ELEC and EBUS units which do not appear in Table 4 (see chapter 2 for a list of all ELEC and EBUS units of study); and
- such other units of study as may be so designated from time to time by the Head of the School of Electrical and Information Engineering.

Note that not all recommended elective units of study shall be available each year.

Bachelor of Engineering in Computer Engineering

Candidates for the 4-year Bachelor of Engineering in Computer Engineering degree are required to complete a total of not less than 192 credit points comprising:

- all 156 credit points of core units of study; and
- at least 24 credit points of recommended elective units of study, of which at least 20 credit points must be at the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

Bachelor of Engineering in Computer Engineering in a combined degree course

Candidates in the combined degree course of Bachelor of Engineering in Computer Engineering with the Bachelor of Science, Bachelor of Arts, Bachelor of Commerce or Bachelor of Medical Science are required to complete

- all 156 credit points of core units of study prescribed for the BE in Computer Engineering; and
- at least 4 credit points of recommended elective units of study at the 4 or 5 level; and
- such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second Faculty concerned.

Core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths Extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics. **P** Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics. **C** Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902. **N** May not be counted with PHYS 1002 or 1901.	1
PHYS 1003	Physics 1 (Technological)	6	**A** HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. **C** For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). **N** May not be counted with PHYS 1004 or 1902.	1,2
SOFT 1001	Software Development 1	6	**A** HSC Mathematics Extension 1. **N** May not be counted with SOFT 1901 or COMP (1001 or 1901).	1,2
SOFT 1002	Software Development 2	6	**Q** SOFT (1001 or 1901) or COMP (1001 or 1901). **N** May not be counted with SOFT 1902 or COMP (1002 or 1902).	1,2

■ Second year

COMP 2003	Languages and Logic	4	**P** MATH 1004 or 1904 or Econometrics or MATH 2009. **Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with COMP 2903.	2
ELEC 2101	Circuit Analysis	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	**P** Prerequisite: 36 credit points. **N** Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**P** Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** Prohibition: MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	2
ELEC 2401	Introductory Electronics	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
ELEC 2601	Microcomputer Systems	4	**P** Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. **N** ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH 1002 or 1902 or Distinction in MATH 1012. **N** May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	**P** MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **N** May not be counted with MATH 2905.	2, Summer
PHYS 2203	Physics 2EE	4		2
SOFT 2001	Concurrent Programming	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2901.	2

Table 4: Computer Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
SOFT 2004	Software Development Methods 1	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2904 or COMP (2004 or 2904).	1
■ Third year				
COMP 3009	Operating Systems	4	p COMP 2001 or 2901 or NETS 2008 or 2908 or ELEC 2601. Q COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3909.	1
COMP 3100	Software Engineering	4	p COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3800.	2
ELEC 3302	Fundamentals of Feedback Control	4	p Advisory Prerequisite: ELEC 2301 Signals and Systems. N MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	P Advisory Prerequisite: ELEC 2301 Signals and Systems. N Prohibition: ELEC 4303 Digital Signal Processing.	1
ELEC 3401	Electronic Devices and Circuits	4	P Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3403	Switching Devices and Electronics	4	P Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	2
ELEC 3502	Random Signals and Communications	4	P Advisory Prerequisite:ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	P Advisory Prerequisite: ELEC 2301 Signals and Systems.	2
ELEC 3601	Digital Systems Design	4	P Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
ELEC 3604	Internet Engineering	4	P Advisory prerequisites:ELEC 1101 Foundations of Computer systems, COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. N ELEC 5609 Internet Engineering, COMP 3007 Networked systems.	2
■ Fourth year				
ELEC 4601	Computer Design	4	P Advisory Prerequisites: ELEC 3403 Switching Devices and High Speed Electronics, and ELEC 3601 Digital Systems Design.	1
ELEC 4602	Real Time Computing	4	P Advisory Prerequisites: ELEC 3601 Digital Systems Design and COMP 3100 Software Engineering.	1
ELEC 4702	Practical Experience	0		1
ELEC 4703	Thesis	12	P A minimum of 36 credit points from third and fourth year units of study.	2

Notes

1. The Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions (as required by the Faculty of Science) being met.
2. Candidates for the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

Table 5: Electrical Engineering

Unit of study CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Semester

Candidates for the degree of Bachelor of Engineering in Electrical Engineering are required to gain credit for a prescribed number of credit points of core and recommended elective units of study. The core units of study are set out in Table 5. The recommended elective units of study consist of:

- all level 3,4 and 5 ELEC and EBUS units which do not appear in Table 5 (see chapter 2 for a list of all ELEC and EBUS units of study); and
- COMP 3100 Software Engineering; and
- such other units of study as may be so designated from time to time by the Head of the School of Electrical and Information Engineering.

Note that not all recommended elective units of study shall be available each year.

Bachelor of Engineering in Electrical Engineering

Candidates for the 4-year Bachelor of Engineering in Electrical Engineering degree are required to complete a total of not less than 192 credit points comprising

- all 136 credit points of core units of study; and
- at least 44 credit points of recommended elective units of study, of which at least 28 credit points must be at the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

Bachelor of Engineering in Electrical Engineering in a combined degree course

Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Science, Bachelor of Arts, Bachelor of Commerce or Bachelor of Medical Science are required to complete

- all 136 credit points of core units of study prescribed for the BE in Electrical Engineering; and
- at least 24 credit points of recommended elective units of study, of which at least 16 credit points must be at the 4 or 5 level; and
- such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second Faculty concerned.

Bachelor of Engineering in Electrical Engineering (Information Systems)

Candidates for the Bachelor of Engineering in Electrical Engineering (Information Systems) degree are required to proceed in accordance with the rules in force prior to 2002.

Bachelor of Engineering in Electrical Engineering (Management)

Candidates for the Bachelor of Engineering (Management) degree are required to complete a total of not less than 192 credit points comprising

- all 136 credit points of core units of study; and
- at least 32 credit points of recommended elective units of study excluding ELEC 3701 Management for Engineers and ELEC 4701 Project Management, of which least 16 credit points must be at the 4 or 5 level; and
- 24 credit points from the units of study listed in the Table of additional units of study for Electrical Engineering (Management) below.

Core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	A HSC Maths Extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics. P Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics. C Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902. N May not be counted with PHYS 1002 or 1901.	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. c For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). N May not be counted with PHYS 1004 or 1902.	1,2
SOFT 1001	Software Development 1	6	A HSC Mathematics Extension 1. N May not be counted with SOFT 1901 or COMP (1001 or 1901).	1,2
SOFT 1002	Software Development 2	6	Q SOFT (1001 or 1901) or COMP (1001 or 1901). N May not be counted with SOFT 1902 or COMP (1002 or 1902).	1,2

■ Second year

ELEC 2101	Circuit Analysis	4	p Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	p Prerequisite: 36 credit points. N Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	p Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. N Prohibition: MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	2
ELEC 2401	Introductory Electronics	4	P Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
ELEC 2601	Microcomputer Systems	4	p Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
MATH 2001	Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer

Table 5: Electrical Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MATH 2005 Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
PHYS 2203 Physics 2EE	4		2
SOFT 2001 Concurrent Programming	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2901.	2
SOFT 2004 Software Development Methods 1	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2904 or COMP (2004 or 2904).	1
■ **Third year**			
ELEC 3102 Engineering Electromagnetics	4	P Advisory Prerequisites:PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	1
ELEC 3201 Electrical Energy Systems	4	p Advisory Prerequisite: ELEC 2101 Circuit Analysis.	1
ELEC 3302 Fundamentals of Feedback Control	4	p Advisory Prerequisite: ELEC 2301 Signals and Systems. N MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303 Digital Signal Processing	4	p Advisory Prerequisite: ELEC 2301 Signals and Systems. N Prohibition: ELEC 4303 Digital Signal Processing.	1
ELEC 3401 Electronic Devices and Circuits	4	p Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3502 Random Signals and Communications	4	P Advisory Prerequisite:ELEC 2301 Signals and Systems.	1
ELEC 3503 Introduction to Digital Communications	4	p Advisory Prerequisite: ELEC 2301 Signals and Systems.	2
ELEC 3601 Digital Systems Design	4	p Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
■ **Fourth year**			
ELEC 4702 Practical Experience	0		1
ELEC 4703 Thesis	12	p A minimum of 36 credit points from third and fourth year units of study.	2

Notes

1. The Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions (as required by the Faculty of Science) being met.
2. Candidates for the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

Additional units of study for Electrical Engineering (Management)

ENGG 2003 Introduction to Engineering Management	4	N ELEC 3701, MECH 3620.	2
ENGG 3002 Industrial and Engineering Management	4	p ENGG 2003. N MECH 4610.	1
ENGG 4001 Innovation/International Competitiveness	4		1
CHNG 3401 Project Economics	4		2
CHNG 4401 Project Engineering	4		1
ELEC 4701 Project Management	4	P Advisory Prerequisite: ELEC 3701 Management for Engineers.	2
MECH 4110 Professional Engineering	4	p 36 credit points of Senior units of study.	1
CHNG 4403 Engineering Business Skills	4	*NB: Students MUST register with Young Achievement Australia early in Semester 1.*	1
CHNG 4504 Environmental Decision Making	4		2
MECH 4650 Workplace Industrial Relations	2	p 36 credit points of senior units of study.	2
ENGG 4002 New Business Creation	4	*NB: Permission required for enrolment.*	2

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 6: Mechanical Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy Section 9 shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1)relating to core units of study offered by faculties other than Engineering.			

Core units of study

■ FirstYear

MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 orl901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 orECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1540	Introductory Mechanical Engineering	5	N AERO 1601 Aerospace Manufacturing, MECH 1500 Mechanical Engineering 1, MECH 1800 Computational Engineering 1A.	1
MECH 1600	Manufacturing Technology	4	N AERO 1600 Workshop Technology.	2
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
AERO 1801	Computer Engineering Applications	3	N INFO 1000 Information Technology Tools and ISYS 1003 Foundations of Information Technology. *NB: Web page: probletnsolvers.aero.usyd.edu.au.*	2
CHEM 1401[3]	Chemistry IE	6	P HSC Mathematics and a satisfactory knowledge of Chemistry. N CHEM 1101, CHEM 1102.	1
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2

■ **Second Year**

MATH 2001	Vector Calculus and Complex Variables	4	P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002[2,6]	Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MATH 2052[2,6]	Numerical Methods	2	C MATH 2001 or 2901. N MATH 2952.	2, Summer
MECH 2201	Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2300	Materials 1	4	N CIVL 2101 Properties of Materials.	2
MECH 2400	Mechanical Design 1	6		2
MECH 2500	Engineering Dynamics 1	4	P MATH 1001MATH 1002and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
AERO 2201?	Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. *NB: Web page: www.aero.usyd.edu.au/aero/aerodyn.html.*	2
AERO 2300	Mechanics of Solids 1	4	P 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
ELEC 2001"	Electrical and Electronic Engineering	6	P ELEC 1001 Introductory Electrical Engineering. N ELEC 2003 Electrical and Electronic Engineering A, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.	1

■ **Third Year**

MECH 3201[5]	Thermodynamics 2	4	p MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. N MECH 3200 Thermal Engineering 1.	1
MECH 3202[5]	Heat Transfer	3	P MECH 2201 Thermodynamics 1.	1
MECH 3211[5]	Fluid Mechanics 2	4	P AERO 2201 Fluid Mechanics lor MECH 2202 Fluids 1. N AERO 3250 Aerodynamics 2.	2
MECH 3300[5]	Materials 2	4	P MECH 2300 Materials 1 andAERO 2300 Mechanics of Solids 1.	2
MECH 3310[5]	Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 andMATH 2005.	1
MECH 3400[2.6]	Mechanical Design 2A	4	p MECH 2400 Mechanical Design 1.	1
MECH 3410	Mechanical Design 2B	4	p MECH 2400 Mechanical Design 1.	2
MECH 3500	Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1

Table 6: Mechanical Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MECH 3600 Manufacturing Engineering	6	p MECH 1600 Manufacturing Technology.	1
MECH 3610[2,6] Team Project	2	p 30 credit points of second year units of study.	2
MECH 3620[2] Industrial Management	5		2
MECH 3800 Systems Control	4	p MATH 2001 and MATH 2005.	2
■ **Fourth Year**			
MECH 4101[8] Thesis A	0	p 36 credit points of Third Year units of study.	1,2
MECH 4102[8] Thesis B	12	p MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110 Professional Engineering	4	p 36 credit points of Senior units of study.	1
MECH 4120 Professional Communication	4	p 32 credit points of third year units of study.	2
MECH 4130 Practical Experience	0	p 28 credit points of second year units of study.	1,2

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 Sciences, up to 12 credit points and subject to timetabling constraints. Candidates for the combined degree BE/BMedSc 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 credit points).
5. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 3202 Heat Transfer (3 credit points) and should enrol in an additional 12 credit points selected from the following units of study: MECH 3201, MECH 3211, 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 (2 credit points) instead of AERO 2201 (4 credit points) and should take an additional unit of study in mathematics, MATH 2051 (2 credit points).
8. Candidates for the combined degree BE/BMedSc 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 east 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 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 6.

Unit of study	*Acceptable alternative.*
CHEM 1401 Chemistry IE	*CHEM 1101.*
MECH 1530 Engineering Mechanics	*PHYS1001.*
MECH 1820 Introduction to Computing	*COMP1001.*
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 School of Aerospace, Mechanical and Mechatronic Engineering relating to Table 6

Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Recommended elective units of study

■ **Mainstream electives**

MECH 4210 Computational Fluid Dynamics	4	p MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.	2
MECH 4220 Environmental Engineering	6	p 24 credit points of third year units of study. N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
MECH 4230 Environmental Acoustics & Noise Control	2	p 24 credit points of third year units of study. N MECH 4220 Environmental Engineering.	1
MECH 4240 Energy and the Environment	4	p 24 credit points of Senior units of study. N MECH 4220 Environmental Engineering.	1

Table 6: Mechanical Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MECH 4250	Air Conditioning and Refrigeration	3	**P** MECH 3200 Thermal Engineering 1.	1
MECH 4260	Combustion and Fire Safety	3	**P** MECH 3200 Thermal Engineering 1.	1
MECH 4310	Advanced Engineering Materials	6	**P** MECH 3300 Materials 2. **N** MECH 4315 Advanced Aerospace Materials.	2
MECH 4410	Advanced Design and Analysis 1	3	**P** MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	**P** MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	2
MECH 4510	Machine Vibration and Monitoring	3	**P** MECH 3500 Engineering Dynamics 2.	2
MECH 4605	Industrial Engineering	8	**P** MATH 2001 andMATH 2005 andMECH 3620 Industrial Management. **N** MECH 4610 Industrial and Engineering ManagementMECH 4620 Industrial ErgonomicsMECH 4635 Introduction to Operations Research.	1
MECH 4610	Industrial Engineering and Management	2	**P** MECH 3620 Industrial Management. **N** MECH 4605 Industrial Engineering.	1
MECH 4620	Industrial Ergonomics	2	**N** MECH 4605 Industrial Engineering.	1
MECH 4635	Introduction to Operations Research	4	**P** MATH 1005MATH 2001MATH 2002MATH 2005. **N** MECH 4600 Industrial Engineering.	1
MECH 4640	Product Life Cycle Design	2	**P** MECH 3600 Manufacturing Engineering.	2
MECH 4650	Workplace Industrial Relations	2	**P** 36 credit points of senior units of study.	2
MECH 4701	Modern Estimation and Control	6	**P** MECH 3800 Systems Control or AERO 3500 Flight Mechanics 1.	1
MECH 4900	Orthopaedic Engineering	4	**P** MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.	2
MECH 4910	Biomechanics and Biomaterials	4	**P** 36 credit points of third year units of study.	1
AERO 4301	Applied Numerical Stress Analysis	6	**P** MECH 3310 Mechanics of Solids 2. **N** AERO 4303 Aerospace Structures 3.	1
■ Other electives				
ASNS 2601	Asian Studies 1A	4		1
ASNS 2602	Asian Studies 1B	4	**P** ASNS 2601.	.. 2
ASNS 2603	Asian Studies 2A	4	**P** ASNS 2602.	1.
ASNS 2604	Asian Studies 2B	4	**P** ASNS 2603.	2
CIVL 3701	Transportation Engineering and Planning	2		2
ELEC 3801	Fundamentals of Biomedical Engineering	4	**P** Advisory Prerequisite: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A.	1
BIOL 1001	Concepts in Biology	6	**A** HSC Biology. **N** May not be counted with BIOL 1901 or 1500.	1, Summer
CHNG 4504	Environmental Decision Making	4		2
ENGG 4001	Innovation/International Competitiveness	4		1
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*	2
WORK 1001	Foundations of Industrial Relations	6	N IREL1001. *NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.*	1

Table 7: Mechatronic Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Mechatronic 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 1001 Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005 Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 orECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
MECH 1530 Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1540 Introductory Mechanical Engineering	5	N AERO 1601 Aerospace Manufacturing, MECH 1500 Mechanical Engineering 1, MECH 1800 Computational Engineering 1A.	1
MECH 1600 Manufacturing Technology	4	N AERO 1600 Workshop Technology.	2
MECH 1802 C Programming	3	*NB: Web page: www.acfr.usyd.edu.au/teaching/lst-year/mechl802/.*	2
MECH 1820 Introduction to Computing	6	*N* MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
CHEM 14013 Chemistry IE	6	p HSC Mathematics and a satisfactory knowledge of Chemistry. N CHEM 1101, CHEM 1102.	1
ELEC 1001 Introductory Electrical Engineering	4	p Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
■ **Second Year**			
MATH 2001 Vector Calculus and Complex Variables	4	P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 20022.5 Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005 Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MATH 20522.5 Numerical Methods	2	c MATH 2001 or 2901. N MATH 2952.	2, Summer
MECH 2201 Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2400 Mechanical Design 1	6		2
MECH 2500 Engineering Dynamics 1	4	P MATH 1001MATH 1002andMECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
MECH 2700 Mechatronics 1	6		2
AERO 22015 Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. *NB: Web page: www.aero.usyd.edu.au/aero/aerodyn.html.*	2
AERO 2300 Mechanics of Solids 1	4	p 12 credit points of first year Maths (ie. Maths 1001,1002,1003,1005).	1
ELEC 2001 Electrical and Electronic Engineering	6	P ELEC 1001 Introductory Electrical Engineering. N ELEC 2003 Electrical and Electronic Engineering A, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.	1
■ Third Year			
MECH 34002.5 Mechanical Design 2A	4	p MECH 2400 Mechanical Design 1.	1
MECH 34102 Mechanical Design 2B	4	p MECH 2400 Mechanical Design 1.	2
MECH 3500 Engineering Dynamics 2	4	p MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3600" Manufacturing Engineering	6	p MECH 1600 Manufacturing Technology.	1
MECH 36102.5 Team Project	2	P 30 credit points of second year units of study.	2
MECH 36202 Industrial Management	5		2
MECH 3700 Mechatronics 2	5	P MECH 2700 Mechatronics 1.	1
MECH 3800 Systems Control	4	p MATH 2001 and MATH 2005.	2
ELEC 3202 Power Electronics and Drives	4	p Advisory Prerequisites: ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics.	2

Table 7: Mechatronic Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
ELEC 3401	Electronic Devices and Circuits	4	**p** Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3601	Digital Systems Design	4	**p** Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
■ Fourth Year				
MECH 4101'	Thesis A	0	**p** 36 credit points of Third Year units of study.	1,2
MECH 4102?	Thesis B	12	**p** MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110	Professional Engineering	4	**p** 36 credit points of Senior units of study.	1
MECH 4120	Professional Communication	4	**p** 32 credit points of third year units of study.	2
MECH 4130	Practical Experience	0	**p** 28 credit points of second year units of study.	• 1,2

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 Mechatronic 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 Sciences, up to 12 credit points and subject to timetabling constraints. Candidates for the combined degree BE/BMedSc 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 credit points).
5. These units of study are core for candidates for the degree of Bachelor of Engineering in Mechatronic Engineering and the combined degree BE/BSc, but not for candidates for the combined degrees of BE/BMedSc.
6. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2 credit points) instead of AERO 2201 (4 credit points) and should take an additional unit of study in mafhematics,MATH 2051 (2 credit points).
7. Candidates for the combined degree BE/BMedSc should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).

Resolutions of the Faculty of Engineering relating to Table 7

Candidates for the degree of Bachelor of Engineering in Mechatronic Engineering, and candidates for the degree of Bachelor of Engineering in Mechatronic Engineering 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 Mechatronic Engineering 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 east 13 credit points of elective units of study which must be chosen from mainstream electives. Candidates for the degree of Bachelor of Engineering in Mechatronic 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 (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.

Unit of study			*Acceptable alternative.*
CHEM 1401	Chemistry IE	6	*CHEM 1101.*
MECH 1530	Engineering Mechanics	8	*PHYS1001.*
MECH 1802	C Programming	3	*COMP 1001.*
MECH 1820	Introduction to Computing	6	*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 School of Aerospace, Mechanical and Mechatronic Engineering relating to Table 7

Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

MECH 4410	Advanced Design and Analysis 1	3	p MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	P MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	2
MECH 4510	Machine Vibration and Monitoring	3	p MECH 3500 Engineering Dynamics 2.	2
MECH 4640	Product Life Cycle Design	2	p MECH 3600 Manufacturing Engineering.	2
MECH 4650	Workplace Industrial Relations	2	p 36 credit points of senior units of study.	2
MECH 4701	Modem Estimation and Control	6	p MECH 3 800 Systems Control or AERO 3500 Flight Mechanics 1.	1
MECH 4721	Sensors arid Signals A	4	p MECH 3700 Mechatronics 2.	2
MECH 4710	Microprocessors in Engineered Products	6	p ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits.	1
MECH 4730	Computers in Real-Time Control and Inst	6	p ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits.	1

Table 7: Mechatronic Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
■ Other electives				
ASNS 2601	Asian Studies 1A	4		1
ASNS 2602	Asian Studies 1B	4	**P** ASNS 2601.	2
ASNS 2603	Asian Studies 2A	4	**P** ASNS 2602.	1
ASNS 2604	Asian Studies 2B	4	**P** ASNS 2603.	2
BIOL 1001	Concepts in Biology	6	**A** HSC Biology. **N** May not be counted with BIOL 1901 or 1500.	1, Summer
CIVL 3701	Transportation Engineering and Planning	2		2
ELEC 3801	Fundamentals of Biomedical Engineering	4	**P** Advisory Prerequisite: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A.	1
ENGG 4001	Innovation/International Competitiveness	4		1
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*	2
CHNG 4504	Environmental Decision Making	4		2
WORK 1001	Foundations of Industrial Relations	6	**N** IREL 1001. *NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.*	1
MECH 4220	Environmental Engineering	6	**P** 24 credit points of third year units of study. **N** MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
MECH 4910	Biomechanics and Biomaterials	4	**P** 36 credit points of third year units of study.	1

Table 8: Project Engineering and Management (Civil)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
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 units of study			
■ First Year			
MATH 1001 Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005 Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
CIVL 1051 Dynamics	5	A HSC Mathematics Extension 1 and HSC Physics. N MECH1510.	2
CHEM 1401 Chemistry 1E	6	p HSC Mathematics and a satisfactory knowledge of Chemistry. N CHEM 1101, CHEM 1102.	1
CIVL 1001 Civil Engineering 1	4	A HSC Mathematics Extension 1 and a satisfactory knowledge of HSC Chemistry and HSC Physics.	1
CIVL 1052 Statics	5	A HSC Mathematics Extension 1. N MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics.	1
CIVL 1004 Computational Engineering	4	N COMP 1001 Introductory Programming or COMP 1002 Introductory Computer Science.	2
ACCT 1003 Financial Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	1
ACCT 1004 Management Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	2
■ Second Year			
MATH 2001 Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002 Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005 Fourier Series & Differential Equations	4	p MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MATH 2051 Linear Programming	2	C MATH 2001 or 2901, and MATH 2002 or 2902. N MATH 2953.	2, Summer
MATH 2052 Numerical Methods	2	c MATH 2001 or 2901. N MATH 2952.	2, Summer
GEOL 1501 Engineering Geology 1	6	N GEOL 1002.	1
CIVL 2204 Introduction to Structural Concepts	4	A CTVL 1051 Dynamics and CIVL 1052 Statics. N CTVL 2203 Structural Design, CIVL 2101 Properties of Materials.	2
CIVL 2201 Structural Mechanics	6	A CTVL 1051 Dynamics and CTVL 1052 Statics.	1
CIVL 2004 Engineering Communications 1	2		1
CIVL 2205 Introduction to Structural Design	4	A CIVL 1051 Dynamics and CTVL 1052 Statics. CTVL 2201 Structural Mechanics. N CIVL 2203 Structural Design, CTVL 2101 Properties of Materials.	2
CIVL 2801 Engineering Construction 1	4		2
WORK 1002 Foundations of Human Resource Management	6	N IREL 1002. *NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.*	2
■ Third Year			
CIVL 3401 Soil Mechanics A	4	A CIVL 2201 Structural Mechanics.	1
CIVL 3501 Engineering Surveying	4	A MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3701 Transportation Engineering and Planning	2		2
CIVL 3005 Engineering Communications 2	2	A CIVL 2004 Engineering Communications 1.	2
CIVL 3802 Engineering Construction 2	4	A Completion of CTVL 2801 Engineering Construction 1 or equivalent knowledge.	1
CIVL 2610 Fluids 1	6	A MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3805 Project Scope, Time and Cost Management	6		1
CIVL 3804 Contracts, Formulation and Management	5		2
CIVL 3803 Project Appraisal	4	N CIVL 4803 Engineering Management.	1

Table 8: Project Engineering and Management (Civil) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
■ Fourth Year				
CIVL 4001	Thesis/Design/Project A	0	**p** 40 credit points of Senior Subjects. **N** CIVL 4003 and CIVL 4004.	1,2
CIVL 4002	Thesis/Design/Project B	5	**P** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001. **N** CIVL 4003 and CIVL 4004. *NB: Permission required for enrolment.*	1,2
CIVL 4008	Practical Experience	0	**P** 28 credit points of Senior courses.	1
CIVL 4016	Professional Practice- Civil Engineering	5		2
CIVL 4807	Project Formulation	5	**A** Completion of CIVL 3803 Project Appraisal or equivalent knowledge.	2
CIVL 4810	Project Quality Risk and Procurement Mgt	6		2
CIVL 4808	Project Management & Info Technology	4	**A** Sufficient knowledge of information technology systems & communications capabilities.	1
CIVL 4809	Project Planning and Tendering	4	**A** Completion of CIVL 2801 Engineering Construction 1 and CIVL 3802 Engineering Construction 2 or the equivalent knowledge.	2

Notes 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.

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 WORK 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

	Unit of study		*Acceptable alternative.*
CHEM 1401	Chemistry IE	6	*CHEM 1101 and CHEM 1102.*
GEOL 1501	Engineering Geology 1	6	*GEOL 1001 and GEOL 1002.*
MATH 2001	Vector Calculus and Complex Variables	4	*STAT 2002 (forBE/BCom degrees only).*
MATH 2005	Fourier Series & Differential Equations	4	*STAT2004 (forBE/BCom degrees only).*
CIVL 1004	Computational Engineering	4	*COMP1001 and COMP1002 or MECH1800 orMECH 1810 or MECH1801.*
CIVL 1052	Statics	5	*MECH1500 or MECH 1501.*
CIVL 1051	Dynamics	5	*MECH 1500 or MECH 1501.*
CIVL 4001	Thesis/Design/Project A	0	*CTVL4003.*
CIVL 4002	Thesis/Design/Project B	5	*CIVL 4004.*

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.	1
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, CIVIL 2205 Introduction to Structural Design.	1
CIVL 3227	Steel Structures 1	8	A CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. N CIVL 3206 Steel Structures 1, CIVL 3102 Materials Aspects in Design.	2
CIVL 3225	Concrete Structures: Behaviour	4	A CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. N CIVL 3205 Concrete Structures 1, CIVL 3223 Concrete Structures - Behaviour.	1
CIVL 3226	Concrete Structures: Design	4	A CIVL 2201 Structural Mechanics and CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design. N CIVL 3205 Concrete Structures 1, CTVL 3224 Concrete Structures: Design.	2
CIVL 3402	Soil Mechanics B	4	A CTVL 3401 Soil Mechanics A.	2

Table 8: Project Engineering and Management (Civil) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
CIVL 3602	Fluids 2	4	**A** CIVL 2610 Fluids 1.	2
■ Fourth Year				
ECON 1001	Introductory Microeconomics	6	**A** Mathematics.	1, Summer
CIVL 4222	Finite Element Methods	5	**A** CIVL 3204 Structural Analysis.	1
CIVL 4221	Bridge Engineering	5	**A** 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.	1
CIVL 4218	Concrete Structures 2	5	**A** CIVL 3223 or CIVL 3225 Concrete Structures - Behaviour, CIVL 3224 or CTVL 3226 Concrete Structures - Design.	2
CIVL 4219	Structural Dynamics	5	**A** CIVL 3204 Structural Analysis.	1
CIVL 4220	Steel Structures 2	5	**A** CIVL 3206 or CIVL 3227 Steel Structures 1.	2
CIVL 4406	Environmental Geotechnics	5	**A** CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	2
CIVL 4407	Geotechnical Engineering	5	**A** CIVL 3401 Soil Mechanics A, CIVL 3402 Soil Mechanics B.	1
CIVL 4607	Environmental Fluids 1	5		1
CIVL 4608	Environmental Fluids 2	5	**A** Material covered in Environmental Fluids 1.	2
CIVL 4609	Water Resources Engineering	5		2
CIVL 4903	Civil Engineering Design	6	**A** CIVL 3225 or CTVL 3223 Concrete Structures - Behaviour, CIVL 3226 or CTVL 3224 Concrete Structures - Design and CIVL 3227 or CIVL 3206 Steel Structures 1.	1

Notes

1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.
2. For the BE Project Engineering and Management (Civil) degree, students must take at least 30 elective credit points at third and fourth year level, however, two 4 credit points 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 4001 and CIVL 4002 Thesis by CTVL 4003 and CTVL 4004 Thesis Honours.
4. CIVL.4002 may be completed in February semester with written approval from the Head of Civil Engineering.

Table 9: Telecommunications Engineering

Unit of study CP **A:** Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Semester

Candidates for the degree of Bachelor of Engineering in Telecommunications Engineering are required to gain credit for a prescribed number of credit points of core and recommended elective units of study. The core units of study are set out in Table 9. The recommended elective units of study consist of:

- all level 3,4 and 5 ELEC and EBUS units which do not appear in Table 9 (see chapter 2 for a list of all ELEC and EBUS units of study); and
- COMP 3100 Software Engineering; and
- such other units of study as may be so designated from time to time by the Head of the School of Electrical and Information Engineering.

Note that not all recommended elective units of study shall be available each year.

Bachelor of Engineering in Telecommunications Engineering

Candidates for the 4-year Bachelor of Engineering in Telecommunications Engineering degree are required to complete a total of not less than 192 credit points comprising

- all 144 credit points of core units of study; and
- at least 36 credit points of recommended elective units of study, of which at least 20 credit points must be at the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

Bachelor of Engineering in Telecommunications Engineering in a combined degree course

Candidates for the combined degree course of Bachelor of Engineering in Telecommunications Engineering with the Bachelor of Science, Bachelor of Arts, Bachelor of Commerce or Bachelor of Medical Science are required to complete

- all 144 credit points of core units of study prescribed for the BE in Telecommunications Engineering; and
- at least 16 credit points of recommended elective units of study, of which at least 8 credit points must be at the 4 or 5 level; and
- such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second Faculty concerned.

Gore units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths Extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics. **P** Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics. **C** Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902. **N** May not be counted with PHYS 1002 or 1901.	1
PHYS 1003	Physics 1 (Technological)	6	**A** HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. **C** For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). **N** May not be counted with PHYS 1004 or 1902.	1,2
SOFT 1001	Software Development 1	6	**A** HSC Mathematics Extension 1. **N** May not be counted with SOFT 1901 or COMP (1001 or 1901).	1,2
SOFT 1002	Software Development 2	6	**Q** SOFT (1001 or 1901) or COMP (1001 or 1901). **N** May not be counted with SOFT 1902 or COMP (1002 or 1902).	1,2

■ Second year

ELEC 2101	Circuit Analysis	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	**P** Prerequisite: 36 credit points. **N** Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**P** Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** Prohibition: MATH 3019 Signal Processing and-MATH 3919 Signal Processing (Adv).	2
ELEC 2401	Introductory Electronics	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
ELEC 2601	Microcomputer Systems	4	**P** Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. **N** ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH 1002 or 1902 or Distinction in MATH 1012. **N** May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	**P** MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **N** May not be counted with MATH 2905.	2, Summer
PHYS 2203	Physics 2EE	4		2
SOFT 2001	Concurrent Programming	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2901.	2
SOFT 2004	Software Development Methods 1	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2904 or COMP (2004 or 2904).	1

Table 9: Telecommunications Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
■ Third year				
ELEC 3102	Engineering Electromagnetics	4	P Advisory Prerequisites:PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	1
ELEC 3302	Fundamentals of Feedback Control	4	P Advisory Prerequisite: ELEC 2301 Signals and Systems. N MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	p Advisory Prerequisite: ELEC 2301 Signals and Systems. N Prohibition: ELEC 4303 Digital Signal Processing.	1
ELEC 3401	Electronic Devices and Circuits	4	p Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3402	Communications Electronics	4	p Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	2
ELEC 3502	Random Signals and Communications	4	p Advisory Prerequisite:ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	P Advisory Prerequisite: ELEC 2301 Signals and Systems.	2
ELEC 3601	Digital Systems Design	4	P Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
B Fourth year				
ELEC 4501	Data Communication Networks	4	P Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4502	Digital Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4702	Practical Experience	0		1
ELEC 4703	Thesis	12	P A minimum of 36 credit points from third and fourth year units of study.	2

Notes

1. The Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions (as required by the Faculty of Science) being met.
2. Candidates for the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

Table 10: Software Engineering

Unit of study CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Semester

Candidates for the degree of Bachelor of Engineering in Software Engineering are required to gain credit for a prescribed number of credit points of core and recommended elective units of study. The core units of study are set out in Table 10. The recommended elective units of study consist of:

- ELEC 2101 Circuit Analysis plus all level 3,4 and 5 ELEC and EBUS units which do not appear in Table IO (see chapter 2 for a list of all ELEC and EBUS units of study); and
- all level 3 and 4 COMP, INFO and IS YS units of study listed in the Faculty of Science handbook; and
- such other units of study as may be so designated from time to time by the Head of the School of Electrical and Information Engineering.

Note that not all recommended elective units of study shall be available each year.

Bachelor of Engineering in Software Engineering

Candidates for the 4-year Bachelor of Engineering in Software Engineering degree are required to complete a total of not less than 192 credit points comprising:

- all 144 credit points of core units of study; and
- at least 36 credit points of recommended elective units of study (including at least 16 credit points from ELEC units of study), of which at least 16 credit points must be at the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

Bachelor of Engineering in Software Engineering in a combined degree course

Candidates for the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Science, Bachelor of Arts, Bachelor of Commerce or Bachelor of Medical Science are required to complete:

- all 144 credit points of core units of study prescribed for the BE in Software Engineering; and
- at least 16 credit points of recommended elective units of study (including at least 8 credit points from ELEC units of study), of which at least 4 credit points must be at the 4 or 5 level; and
- such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second Faculty concerned.

Core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	A HSC Maths Extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics. P Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics. C Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902. N May not be counted with PHYS 1002 or 1901.	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. C For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). N May not be counted with PHYS 1004 or 1902.	1,2
SOFT 1001	Software Development 1	6	A HSC Mathematics Extension 1. N May not be counted with SOFT 1901 or COMP (1001 or 1901).	1,2
SOFT 1002	Software Development 2	6	Q SOFT (1001 or 1901) or COMP (1001 or 1901). N May not be counted with SOFT 1902 or COMP (1002 or 1902).	1,2

■ Second year

ELEC 2102	Engineering Computing	4	P Prerequisite: 36 credit points. N Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	P Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. N Prohibition: MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	2
ELEC 2401	Introductory Electronics	4	P Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
ELEC 2601	Microcomputer Systems	4	P Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
INFO 2000	System Analysis and Design	4	Q INFO 1000 or ISYS 1003 or SOFT (1001 or 1901) or COMP (1001 or 1901 or 1002 or 1902).	1, Summer
INFO 2005	Personal Database Tools	4	Q INFO 1000 or ISYS 1003 or SOFT (1001 or 1901) or COMP (1001 or 1901 or 1002 or 1902). N May not be counted with COMP 3005 or 3905.	2
MATH 2001	Vector Calculus and Complex Variables	4	P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
SOFT 2001	Concurrent Programming	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2901.	2

Table 10: Software Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
SOFT 2004 Software Development Methods 1	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2904 or COMP (2004 or 2904).	1
■ **Third year**			
COMP 3001 Algorithms	4	P MATH 1004 or 1904 and 8 credit points in Intermediate Mathematics and/or Statistics and/or Econometrics. Q COMP 2002 or 2902 or 2111 or 2811. N May not be counted with COMP 3901.	2
COMP 3008 Object-Oriented Systems	4	Q COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3908.	1
COMP 3009 Operating Systems	4	p COMP 2001 or 2901 or NETS 2008 or 2908 or ELEC 2601. Q COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3909.	1
COMP 3100 Software Engineering	4	P COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3800.	2
COMP 3205 Product Development Project	4	P COMP 3008 or 3908. *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.*	1,2
ELEC 3601 Digital Systems Design	4	p Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
ELEC 3604 Internet Engineering	4	p Advisory prerequisites:ELEC 1101 Foundations of Computer systems, COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. N ELEC 5609 Internet Engineering, COMP 3007 Networked systems.	2
■ **Fourth year**			
ELEC 4602 Real Time Computing	4	P Advisory Prerequisites: ELEC 3601 Digital Systems Design and COMP 3100 Software Engineering.	1
ELEC 4604 Engineering Software Requirements	4	p Advisory Prerequisite: COMP 3100 Algorithms, COMP 3205 Product Development Project, ELEC 3601 Digital Systems Design.	2
ELEC 4702 Practical Experience	0		1
ELEC 4704 Software Project Management	4	P Advisory Prerequisites: COMP 3100 Algorithms, ELEC 3601 Digital Systems Design.	1
ELEC 4703 Thesis	12	p A minimum of 36 credit points from third and fourth year units of study.	2

Notes

1. The Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level " units of study (if available) subject to prerequisite conditions (as required by the Faculty of Science) being met.
2. Candidates for the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

Table 11: Mechanical Engineering (Biomedical)

Unit of istudy	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester

Candidates for the degree of B achelor 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 units of study

■ FirstYear

MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 orECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1545	Introductory Professional Engineering	3	N AERO 1601 Aerospace ManufacturingMECH 1500 Mechanical Engineering 1.	1
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
AERO 1801	Computer Engineering Applications	3	N INFO 1000 Information Technology Tools and ISYS 1003 Foundations of Information Technology. *NB: Web page: problemsolvers.aero.usyd.edu.au.*	2
BIOL 1003	Human Biology	6	A HSC Biology. N May not be counted with BIOL 1903 or 1500 or EDUH 1016.	2, Summer
CHEM 1401	Chemistry IE	6	P HSC Mathematics and a satisfactory knowledge of Chemistry. N CHEM 1101, CHEM 1102.	1
ELEC 1001	Introductory Electrical Engineering	4	p Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	p MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	p MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MATH 2052	Numerical Methods	2	C MATH 2001 or 2901. N MATH 2952.	2, Summer
MECH 1600	Manufacturing Technology	4	N AERO 1600 Workshop Technology.	2
MECH 2201	Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2300	Materials 1	4	N CIVL2101 Properties of Materials.	2
MECH 2400	Mechanical Design 1	6		2
MECH 2500	Engineering Dynamics 1	4	P MATH 1001MATH 1002and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
MECH 2900	Anatomy and Physiology for Engineers	4	P Biology BIOL 1001 or some previous biology experience. *NB: Permission required for enrolment.*	1
AERO 2201	Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. *NB: Web page: www.aero.usyd.edu.au/aero/aerodyn.html.*	2
ELEC 2003	Electrical and Electronic Engineering A	4	P ELEC 1001 Introductory Electrical Engineering. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer.	1

■ Third Year

AERO 2300	Mechanics of Solids 1	4	p 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
MECH 3211	Fluid Mechanics 2	4	p AERO 2201 Fluid Mechanics 1or MECH 2202 Fluids 1. N AERO 3250 Aerodynamics 2.	2
MECH 3300	Materials 2	4	P MECH 2300 Materials 1 andAERO 2300 Mechanics of Solids 1.	2
MECH 3400	Mechanical Design 2A	4	P MECH 2400 Mechanical Design 1.	1
MECH 3410	Mechanical Design 2B	4	P MECH 2400 Mechanical Design 1.	2
MECH 3500	Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3600	Manufacturing Engineering	6	P MECH 1600 Manufacturing Technology.	1

Table 11: Mechanical Engineering (Biomedical) (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MECH 3620 Industrial Management	5		2
MECH 3800 Systems Control	4	p MATH 2001 and MATH 2005.	2
MECH 3910 Biomedical Technology	3		1
MECH 3920 Biomedical Design Project	2	N MECH 3610 Team Project.	2
ELEC 3801 Fundamentals of Biomedical Engineering	4	P Advisory Prerequisite: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A.	1
■ **Fourth Year**			
MECH 3310 Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 andMATH 2005.	1
MECH 4101 Thesis A	0	P 36 credit points of Third Year units of study.	1,2
MECH 4102 Thesis B	12	P MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110 Professional Engineering	4	P 36 credit points of Senior units of study.	1
MECH 4120 Professional Communication	4	p 32 credit points of third year units of study.	2
MECH 4130 Practical Experience	0	p 28 credit points of second year units of study.	1,2
MECH 4900 Orthopaedic Engineering	4	P MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.	2
MECH 4910 Biomechanics and Biomaterials	4	P 36 credit points of third year units of study.	1
ELEC 4801 Biomedical Engineering Systems	4	P Advisory Prerequisite: ELEC 3801 Fundamentals of Biomedical Engineering. *NB: Permission required for enrolment.*	2

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 (2 credit points) instead of AERO 2201 (4 credit points) and should take an additional unit of study in mathematics MATH 2051 (2 credit points).

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.

Unit of study		*Acceptable alternative.*
MECH 1530 Engineering Mechanics	8	*PHYS1001.*
MECH 1820 Introduction to Computing	6	*COMP1001.*
AERO 1801 Computer Engineering Applications	3	*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 School of Aerospace, Mechanical and Mechatronic Engineering relating to Table 11

Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Recommended elective units of study

ENGG 4001 Innovation/International Competitiveness	4		1
MECH 4210 Computational Fluid Dynamics	4	P MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.	2
MECH 4230 Environmental Acoustics & Noise Control	2	P 24 credit points of third year units of study. N MECH 4220 Environmental Engineering.	1
MECH 4240 Energy and the Environment	4	p 24 credit points of Senior units of study. N MECH 4220 Environmental Engineering.	1
MECH 4310 Advanced Engineering Materials	6	P MECH 3300 Materials 2. N MECH 4315 Advanced Aerospace Materials.	2
MECH 4610 Industrial Engineering and Management	2	p MECH 3620 Industrial Management. N MECH 4605 Industrial Engineering.	1
MECH 4620 Industrial Ergonomics	2	N MECH 4605 Industrial Engineering.	1
MECH 4635 Introduction to Operations Research	4	P MATH 1005MATH 2001MATH 2002MATH 2005. N MECH 4600 Industrial Engineering.	1

Table 11: Mechanical Engineering (Biomedical) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
AERO 4303	Aerospace Structures 3	6	P AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. N AERO 4301 Applied Numerical Stress Analysis.	1
BCHM 2001	Genes and Proteins	8	Q 6 credit points of Junior Chemistry which must include one of CHEM 1101,1102,1901, 1902,1903, 1904 or, with the permission of the Head of Department, exceptional performance in CHEM 1001 or 1002. N May not be counted with AGCH 2001 orBCHM2101 or 2901.	Summer
MICR 2001	Introductory Microbiology	8	p 6 credit points of Junior Chemistry. Q 6 credit points of Junior Biology. N May not be counted with MICR 2003 or 2901. *NB: It is highly recommended that students complete 12 credit points of Junior Biology and MBLG 2001 or 2101 or 2901.*	1

Table 12: Aeronautical Engineering (Space Engineering)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Core units of study			
■ FirstYear			
AERO 1600 Workshop Technology	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO 1701 Introduction to Aerospace Engineering	3		1
ELEC 1102 Foundations of Electronic Circuits	6	A HSC Physics. P Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001 Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1004[1] Discrete Mathematics	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1904.	2, Summer
MECH 1530 Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1820 Introduction to Computing	6	N MECH 1800 ComputationalEngineering 1AMECH 1801 ComputationalEngineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModeUingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
■ Second Year			
AERO 2300 Mechanics of Solids 1	4	P 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
AERO 2701 Space Engineering 1	8	N AERO 2800 Aeronautical Engineering ComputingAERO 2500 Introductory Flight Mechanics and Performance.	1
MATH 2001 Vector Calculus and Complex Variables	4	p MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2005 Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MECH 2201 Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2300 Materials 1	4	N CIVL 2101 Properties of Materials.	2
MECH 2400 Mechanical Design 1	6		2
MECH 2500 Engineering Dynamics 1	4	P MATH 1001MATH 1002andMECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
ELEC 2101 Circuit Analysis	4	P Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2401 Introductory Electronics	4	p Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
■ Third Year			
AERO 3301 Aerospace Structures 1	4	P AERO 2300 Mechanics of Solids 1.	1
AERO 3351 Aerospace Structures 2	4	p AERO 2300 Mechanics of Solids 1.	2
AERO 3401 Aerospace Design	4	P MECH 2400 Mechanical Design 1. N AERO 3400 Aircraft Design 1.	1
AERO 3500 Flight Mechanics 1	4	p AERO 2500 Introductory Flight Mechanics and Performance.	2
AERO 3700 Space Engineering 2	8	P AERO 2701 Space Engineering 1.	2
MECH 3201 Thermodynamics 2	4	p MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. N MECH 3200 Thermal Engineering 1.	1
MECH 3300 Materials 2	4	p MECH 2300 Materials 1 andAERO 2300 Mechanics of Solids 1.	2
MECH 3500 Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
ELEC 3102 Engineering Electromagnetics	4	P Advisory Prerequisites:PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	1
ELEC 3401 Electronic Devices and Circuits	4	p Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3402 Communications Electronics	4	p Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	2
■ Fourth Year			
AERO 4201 Propulsion	4	p MECH 3201 Thermodynamics 2.	2
AERO 4303 Aerospace Structures 3	6	P AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. N AERO 4301 Applied Numerical Stress Analysis.	1

Table 12: Aeronautical Engineering (Space Engineering) (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
AERO 4400 Aircraft Design 3	6	P AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1.	1
AERO 4500 Flight Mechanics 2	6	P AERO 3500 Flight Mechanics 1.	1
AERO 4600 Practical Experience	0	p 40 credit points of 3rd year UOS.	2
AERO 4700 Space Engineering 3	4	p AERO 3700 Space Engineering 2.	1
AERO 4950 Thesis Preparation	2	p 40 credit points of 3rd year UOS.	1,2
AERO 4900 Thesis or Design Project	10	p 40 credit points of 3rd Year UOSAERO 4950 Thesis Preparation.	1,2
AERO 4920 Seminar	2	p 40 credit points of 3rd Year UOS.	2

Notes
1. MATH 1005 Statistics is an acceptable alternative to MATH 1004

Resolutions of the Faculty of Engineering relating to the above Table: Degree eligibility

BE (Aeronautical) (Space Engineering)

In addition to gaining credit for the core units of study set out in Table 12, candidates are required to complete units of study from the table of 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.

Recommended elective units of study

■ First Year

AERO 1801	Computer Engineering Applications	3	N INFO 1000 Information Technology Tools and ISYS 1003 Foundations of Information Technology. *NB: Web page: problemsolvers. aero.usyd.edu.au.*	2
PHYS 1500	Astronomy	6	A No assumed knowledge of Physics.	2

■ SecondYear

AERO 2800	Aeronautical Engineering Computing	4	P AERO 1801 Computer Engineering Applications.	1
MATH 2002	Matrix Applications	4	p MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2052	Numerical Methods	2	C MATH 2001 or 2901. N MATH 2952.	2, Summer

■ Third Year

AERO 3501	Flying Operations	2	p AERO 2500 Introductory Flight Mechanics and Performance;AERO 2201 Fluid Mechanics 1. *NB: Permission required for enrolment.*	1
AERO 3602	Aviation Operation and Management	4		2
AERO 3200	Aerodynamics 1	4	p AERO 2201 Fluid Mechanics 1.	1
AERO 3250	Aerodynamics 2	4	p AERO 2201 Fluid Mechanics 1. N MECH 3211 Fluid Mechanics 2.	2

■ Fourth Year

AERO 4250	Aerodynamics 4	3	p AERO 3250 Aerodynamics 2.	2
AERO 4291	Advanced Computational Aerodynamics	3	p AERO 3250 Aerodynamics 2.	2
AERO 4351	Aerospace Structures 4	3	P AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4390	Smart Materials and Structures	3	p AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4490	Advanced Aircraft Design	4	p AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	p AERO 3500 Flight Mechanics 1.	2
ELEC 4502	Digital Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 5502	Satellite Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

Notes
1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
2. 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

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
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.				
ENGG 1001	Interdisciplinary Project	12	P UAIscoreofatleast98.Studentsconsideringthisoptionareadvisedtoseetheir Head of Department. N 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. *NB: Permission required for enrolment.*	1
ENGG 1002	Introduction to Engineering Leadership	2	*NB: Permission required for enrolment.*	2
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. *NB: Permission required for enrolment.*	2
ENGG 2003	Introduction to Engineering Management	4	N ELEC 3701, MECH 3620.	2
ENGG 2004	Introductory Engineering Studies	4	*NB: Permission required for enrolment.*	Summer
ENGG 2005	Introductory Engineering Project	6	*NB: Permission required for enrolment.*	Summer
ENGG 2006	Advances in Engineering Leadership	2	P ENGG 1002.	2
ENGG 2007	Introductory Engineering Project	8	*NB: Permission required for enrolment.*	Summer
ENGG 2008	Engineering Studies C	6	*NB: Permission required for enrolment.*	Summer
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. *NB: Permission required for enrolment.*	2
ENGG 3002	Industrial and Engineering Management	4	p ENGG 2003. N MECH 4610,	1
ENGG 4002	New Business Creation	4	*NB: Permission required for enrolment.*	2
ENGG 4003	Commercial Engineering Practice	4		2
ENGG 4004	Advanced Engineering Design Project	12	p Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group. N AERO 4900, AERO 4950, CHNG 4201, CHNG 4202, CTVL 4013, CIVL 4014, ELEC 4703,MECH4102,. *NB: Permission required for enrolment.*	2

Note
These units of study are elective units of study available in any discipline of engineering.

Table 14: Electronic Commerce

Unit of study CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Semester

Candidates for the degree of B achelor of Engineering in Electronic Commerce are required to gain credit for a prescribed number of credit points of core and recommended elective units of study. The core units of study are set out in Table 14. The recommended elective units of study are set out in the table of recommended electives below.
Note that not all recommended elective units of study shall be available each year.

Bachelor of Engineering in Electronic Commerce

Candidates for the 4-year Bachelor of Engineering in Electronic Commerce degree are required to complete a total of not less than 192 credit points comprising:

- all 166 credit points of core units of study; and
- at least 14 credit points of recommended elective units of study, of which at least 6 credit points are to be from Group A and at least 8 credit points from Group B; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

Bachelor of Engineering in Electronic Commerce combined with Bachelor of Commerce

Candidates for the combined degree course of Bachelor of Engineering in Electronic Commerce with the Bachelor of Commerce are required to complete:

- 155 credit points of core units of study prescribed for the BE in Electronic Commerce comprising all of the units of study in Table 14 except ACCT 1003 and ACCT 1004; and
- at least 6 credit points of recommended elective units of study from group B; and
- such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the Faculty of Economics and Business.

Core units of study

S First year

ACCT 1003	Financial Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	1
ACCT 1004	Management Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	2
ELEC 1101	Foundations of Computer Systems	6	A HSC Maths Extension 1.	1, Summer
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A HSC Mathematics. N May not be counted with MATH 1905 or 1015 or ECMT 1010 or 1020 or STAT 1021 or 1022.	2, Summer
SOFT 1001	Software Development 1	6	A HSC Mathematics Extension 1. N May not be counted with SOFT 1901 or COMP (1001 or 1901).	1,2
SOFT 1002	Software Development 2	6	O SOFT (1001 or 1901) or COMP (1001 or 1901). N May not be counted with SOFT 1902 or COMP (1002 or 1902).	1,2

■ Second year

CLAW 2006	Legal Issues for ecommerce	8	P 48 credit points at level 1000.	1,2
ELEC 2102	Engineering Computing	4	P Prerequisite: 36 credit points. N Prohibition: AERO 1801 Computer Engineering Applications, CHNG 1301 Computing for Chemical Engineers 1A, CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	P Advisory Prerequisite: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. N Prohibition: MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	2
ELEC 2601	Microcomputer Systems	4	P Advisory Prerequisite: ELEC 1101 Foundations of Computer Systems. N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
INFO 2000	System Analysis and Design	4	Q INFO 1000 or ISYS 1003 or SOFT (1001 or 1901) or COMP (1001 or 1901 or 1002 or 1902).	1, Summer
MATH 2001	Vector Calculus and Complex Variables	4	P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	P MATH 1002 or 1902 or Distinction in MATH 1012. N May not be counted with MATH 2902.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MKTG 2001	Marketing Principles	8	P ECON 1001, ECON 1002, ECMT 1010 and ECMT 1020. C ACCT 1001 or ACCT 1003. *NB: Marketing units of study commence in secondyear, but prerequisites must be completed in first year.*	1
SOFT 2001	Concurrent Programming	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2901.	2
SOFT 2004	Software Development Methods 1	4	Q SOFT (1002 or 1902) or COMP (1002 or 1902). N May not be counted with SOFT 2904 or COMP (2004 or 2904).	1

■ Third year

ACCT 3006	ecommerce Business Models	8	A INFO 1000. P 48 credit points at level 1000.	2
COMP 3009	Operating Systems	4	P COMP 2001 or 2901 or NETS 2008 or 2908 or ELEC 2601. Q COMP 2004 or 2904 or SOFT 2004 or 2904. N May not be counted with COMP 3909.	1

Table 14: Electronic Commerce (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
EBUS 3001	Introduction to E-Commerce Systems	4	p Advisory Prerequisites: ACCT 1004 Management Accounting and Concepts, and COMP 1002 IntroductoryComputer Science.	1
EBUS 3002	Introduction to E-Commerce Technology		*Not on offer in 2002.*	
ELEC 3502	Random Signals and Communications	4	p Advisory Prerequisite:ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	P Advisory Prerequisite: ELEC 2301 Signals and Systems.	2
ELEC 3603	Introduction to Computing Systems		*Not on offer in 2002.*	
ELEC 3604	Internet Engineering	4	P Advisory prerequisites:ELEC 1101 Foundations of Computer systems, COMP 2002 Design and Data Structures and COMP 2004 Programming Practice. N ELEC 5609 Internet Engineering, COMP 3007 Networked systems.	2
MKTG 3010	Electronic marketing	8	A INFO 1000. P MKTG 2001.	2, Summer
■ Fourth year				
ELEC 4501	Data Communication Networks	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4702	Practical Experience	0		1
ELEC 4703	Thesis	12	P A minimum of 36 credit points from third and fourth year units of study.	2
EBUS 5001	E-Commerce Programming		*Not on offer in 2002.*	
EBUS 5002	E-Commerce Systems		*Not on offer in 2002.*	
ELEC 5610	Computer and Network Security	4	P Advisory Prerequisites: ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks.	2

Recommended elective units of study

■ Group A

ECMT 1011	Econometrics 1A Stream 1	6	A Mathematics Extension 2. N MATH 1005, MATH 1905.	1
ECMT 1021	Econometrics 1B Stream 1	6	A Mathematics Extension 2. C ECMT 1011. N MATH 1005, MATH 1905. *NB: Other than in exceptional circumstances, it is strongly recommended that students do not undertake Econometrics 1B before attempting 1A.*	2
ECON 1001	Introductory Microeconomics	6	A Mathematics.	1, Summer
ECON 1002	Introductory Macroeconomics	6	A Mathematics.	2, Summer
TPTM 2001	Logistics & Supply Chain for e-Business	8	A ECHS 2305, IREL 2010. P 48 credit points of level 1000 study.	N/A in 2002
ACCT 3005	IT Assurance and Control	8	A INFO 1000. P ACCT 2003.	1

■ Group B

ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics. P Advisory Prerequisite: MATH 1001 Differential Calculus.	2
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics. C Recommended concurrent units of study: MATH 1001 and 1002 or 1901 and 1902. N May not be counted with PHYS 1002 or 1901.	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. C For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). N May not be counted with PHYS 1004 or 1902.	1,2
COMP 3001	Algorithms	4	p MATH 1004 or 1904 and 8 credit points in Intermediate Mathematics and/or Statistics and/or Econometrics. Q COMP 2002 or 2902 or 2111 or 2811. N May not be counted with COMP 3901.	2
ELEC 3701	Management for Engineers	4		1
MATH 3024	Elementary Cryptography and Protocols	4	p 12 credit points of Intermediate Mathematics. Strongly advise MATH 2008 or 2908.	1
MATH 3925	Public Key Cryptography (Advanced)	4	p 12 credit points from Intermediate or senior mathematics. Strongly recommend MATH 3902.	2
ELEC 4502	Digital Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4604	Engineering Software Requirements	4	p Advisory Prerequisite: COMP 3100 Algorithms, COMP 3205 Product Development Project, ELEC 3601 Digital Systems Design.	2
ELEC 4704	Software Project Management	4	P Advisory Prerequisites: COMP 3100 Algorithms, ELEC 3601 Digital Systems Design.	1
EBUS 5003	E-Commerce Engineering		*Not on offer in 2002.*	
EBUS 5004	Impacts and Challenges of E-Commerce		*Not on offer in 2002.*	

Table 14: Electronic Commerce (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
ELEC 5501	Advanced Communication Networks	4	P	Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4501 Data Communication Networks. *NB: Permission required for enrolment.*	2
ELEC 5504	Cellular Radio Engineering	4	p	Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 5505	Advanced Digital Transmissions	4	P	Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	2
ELEC 5606	Multimedia Systems and Applications	4	P	Advisory Prerequisites: COMP 3100 Software Engineering, ELEC 3303 Digital Signal Processing, and ELEC 4501 Data Communication Systems. *NB: Permission required for enrolment.*	2

Notes

1. The Mathematics, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions (as required by the Faculty of Science) being met.
2. Some of the units of study shown will not be available until after 2002 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.

Table 15: Mechanical Engineering (Space Engineering)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Space 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.				
Core units of study				
■ First Year				
AERO 1600	Workshop Technology	4	**N** MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO 1701	Introduction to Aerospace Engineering	3		1
AERO 1801	Computer Engineering Applications	3	**N** INFO 1000 Information Technology Tools and IS YS 1003 Foundations of Information Technology. *NB: Web page: problemsolvers.aero.usyd.edu.au.*	2
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics. **P** Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1004'	Discrete Mathematics	3	**A** HSC Mathematics Extension 1. **N** May not be counted with MATH 1904.	2, Summer
MECH 1530	Engineering Mechanics	8	**N** CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1820	Introduction to Computing	6	**N** MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
PHYS 1003	Physics 1 (Technological)	6	**A** HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. **C** For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). **N** May not be counted with PHYS 1004 or 1902.	1.2
■ **Second Year**				
AERO 2300	Mechanics of Solids 1	4	**P** 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
AERO 2701	Space Engineering 1	8	**N** AERO 2800 Aeronautical Engineering ComputingAERO 2500 Introductory Flight Mechanics and Performance.	1
MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** May not be counted with MATH 2901.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	**P** MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **N** May not be counted with MATH 2905.	2, Summer
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901. **N** MATH 2952.	2, Summer
MECH 2201	Thermodynamics 1	4	**N** MECH 2200 Thermofluids.	1
MECH 2300	Materials 1	4	**N** CIVL 2101 Properties of Materials.	2
MECH 2400	Mechanical Design 1	6		2
MECH 2500	Engineering Dynamics 1	4	**P** MATH 1001MATH 1002and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
ELEC 2101	Circuit Analysis	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2401	Introductory Electronics	4	**P** Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
■ Third **Year**				
AERO 3250	Aerodynamics 2	4	**P** AERO 2201 Fluid Mechanics 1. **N** MECH 3211 Fluid Mechanics 2.	2
AERO 3401	Aerospace Design	4	**P** MECH 2400 Mechanical Design 1. **N** AERO 3400 Aircraft Design 1.	1
AERO 3500	Flight Mechanics 1	4	**P** AERO 2500 Introductory Flight Mechanics and Performance.	2
AERO 3700	Space Engineering 2	8	**P** AERO 2701 Space Engineering 1.	2
MECH 3201	Thermodynamics 2	4	**P** MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. **N** MECH 3200 Thermal Engineering 1.	1
MECH 3202	Heat Transfer	3	**P** MECH 2201 Thermodynamics 1.	1
MECH 3300	Materials 2	4	**P** MECH 2300 Materials 1 andAERO 2300 Mechanics of Solids 1.	2
MECH 3310	Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 andMATH 2005.	1

Table 15: Mechanical Engineering (Space Engineering) (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
MECH 3500 Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3620 Industrial Management	5		2
ELEC 3401 Electronic Devices and Circuits	4	P Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1
ELEC 3402 Communications Electronics	4	p Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	2
■ **Fourth Year**			
AERO 4201 Propulsion	4	P MECH 3201 Thermodynamics 2.	2
AERO 4303 Aerospace Structures 3	6	P AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. N AERO 4301 Applied Numerical Stress Analysis.	1
AERO 4500 Flight Mechanics 2	6	P AERO 3500 Flight Mechanics 1.	1
AERO 4700 Space Engineering 3	4	P AERO 3700 Space Engineering 2.	1
MECH 4101 Thesis A	0	P 36 credit points of Third Year units of study.	1,2
MECH 4102 Thesis B	12	P MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110 Professional Engineering	4	P 36 credit points of Senior units of study.	1
MECH 4120 Professional Communication	4	P 32 credit points of third year units of study.	2
MECH 4130 Practical Experience	0	P 28 credit points of second year units of study.	1,2

Note
1. MATH 1005 Statistics is an acceptable alternative to MATH 1004.

Resolutions of the Faculty of Engineering relating to Table 15

Candidates for the degree of Bachelor of Engineering in Mechanical (Space Engineering) are required to gain credit for all core units of study set out in Table 15. Additional credit necessary to satisfy Section 9 shall be gained by completing the elective units of study listed in the table below.

Resolutions of the School of Aerospace, Mechanical and Mechatronic Engineering relating to Table 15

Units of study not included in this Table may also be selected subject to the approval of the Head of School of Aerospace, Mechanical and Mechatronic Engineering.

Recommended elective units of study

■ **Mainstream electives**

MECH 4210	Computational Fluid Dynamics	4	P MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.	2
MECH 4220	Environmental Engineering	6	p 24 credit points of third year units of study. N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
MECH 4230	Environmental Acoustics & Noise Control	2	p 24 credit points of third year units of study. N MECH 4220 Environmental Engineering.	1
MECH 4240	Energy and the Environment	4	P 24 credit points of Senior units of study. N MECH 4220 Environmental Engineering.	1
MECH 4250	Air Conditioning and Refrigeration	3	P MECH 3200 Thermal Engineering 1.	1
MECH 4260	Combustion and Fire Safety	3	P MECH 3200 Thermal Engineering 1.	1
MECH 4310	Advanced Engineering Materials	6	P MECH 3300 Materials 2. N MECH 4315 Advanced Aerospace Materials.	2
MECH 4410	Advanced Design and Analysis 1	3	p MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	P MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	2
AERO 4303	Aerospace Structures 3	6	P AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. N AERO 4301 Applied Numerical Stress Analysis.	1
AERO 4250	Aerodynamics 4	3	p AERO 3250 Aerodynamics 2.	2
AERO 4291	Advanced Computational Aerodynamics	3	P AERO 3250 Aerodynamics 2.	2
AERO 4351	Aerospace Structures 4	3	P AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4390	Smart Materials and Structures	3	p AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4490	Advanced Aircraft Design	4	p AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	P AERO 3500 Flight Mechanics 1.	2
ELEC 4502	Digital Communication Systems	4	P Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 5502	Satellite Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

Table 16: Mechatronic Engineering (Space Engineering)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
Candidates for the degree of Bachelor of Engineering in Mechatronic Engineering (Space 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				
■ FirstYear				
AERO 1600	Workshop Technology	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO 1701	Introduction to Aerospace Engineering	3		1
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics. p Advisory Prerequisite: MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1004[1]	Discrete Mathematics	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1904.	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 StaticsMECH 1501 Engineering StaticsMECH 1511 Introductory DynamicsMECH 1510 Kinematics and DynamicsMECH 1500 Mechanical Engineering 1.	2
MECH 1802	C Programming	3	*NB: Web page: www.acfr.usyd.edu.au/teaching/lst-year/mechl802/.*	2
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering 1AMECH 1801 Computational Engineering 1CINFO 1000 Information Technology Tools.DESC9101 Introduction to AutocadDECO 1003 CAD ModellingDESC 9100 Introduction to ArchicadlSYS 1003 Foundations of Information Technology.	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS 1001 or 1002 or 1901 or equivalent. c For Science students: Recommended concurrent units MATH (1003 and 1005) or (1903 and 1905). N May not be counted with PHYS 1004 or 1902.	1.2
■ Second Year				
AERO 2300	Mechanics of Solids 1	4	p 12 credit points of first year Maths (ie, Maths 1001,1002,1003,1005).	1
AERO 2701	Space Engineering 1	8	N AERO 2800 Aeronautical Engineering ComputingAERO 2500 Introductory Flight Mechanics and Performance.	-1
MATH 2001	Vector Calculus and Complex Variables	4	P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). N May not be counted with MATH 2901.	1, Summer
MATH 2005	Fourier Series & Differential Equations	4	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). N May not be counted with MATH 2905.	2, Summer
MECH 2201	Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2400	Mechanical Design 1	6		. -2
MECH 2500	Engineering Dynamics 1	4	P MATH 1001MATH 1002andMECH 1530 Engineering Mechanics or MECH 1510 Kinematics and Dynamics.	2
MECH 2700	Mechatronics 1	6		2
ELEC 2101	Circuit Analysis	4	p Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2401	Introductory Electronics	4	p Advisory Prerequisite: ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2002 Electrical Technology, and ELEC 2003 Electrical and Electronic Engineering A.	2
■ Third Year				
AERO 3400	Aircraft Design 1	3	P MECH 2400 Mechanical Design 1. N AERO 3401 Aerospace Design 1.	1
AERO 3500	Flight Mechanics 1	4	p AERO 2500 Introductory Flight Mechanics and Performance.	2
AERO 3602	Aviation Operation and Management	4		2
AERO 3700	Space Engineering 2	8	p AERO 2701 Space Engineering 1.	2
MECH 3201	Thermodynamics 2	4	P MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. N MECH 3200 Thermal Engineering 1.	1
MECH 3310	Mechanics of Solids 2	4	p AERO 2300 Mechanics of Solids 1 andMATH 2005.	1
MECH 3500	Engineering Dynamics 2	4	p MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3700	Mechatronics 2	5	P MECH 2700 Mechatronics 1.	1
MECH 3800	Systems Control	4	p MATH 2001 and MATH 2005.	2
ELEC 3401	Electronic Devices and Circuits	4	P Advisory Prerequisites: ELEC 2401 Introductory Electronics.	1

Table 16: Mechatronic Engineering (Space Engineering) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Semester
ELEC 3402	Communications Electronics	4	p Advisory Prerequisite: ELEC 3401 Electronic Devices and Circuits.	2
ELEC 3601	Digital Systems Design	4	p Advisory Prerequisite: ELEC 2601 Microcomputer Systems or COMP 2001 Computer Systems.	2
■ Fourth Year				
AERO 4201	Propulsion	4	p MECH 3201 Thermodynamics 2.	2
AERO 4303	Aerospace Structures 3	6	p AERO 3350 Aircraft Structures 2 or AERO 3351 Aerospace Structures 2. N AERO 4301 Applied Numerical Stress Analysis.	1
AERO 4700	Space Engineering 3	4	P AERO 3700 Space Engineering 2.	1
MECH 4101	Thesis A	0	p 36 credit points of Third Year units of study.	1,2
MECH 4102	Thesis B	12	p MECH 4101 Thesis A (the Head of Department may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110	Professional Engineering	4	p 36 credit points of Senior units of study.	1
MECH 4120	Professional Communication	4	P 32 credit points of third year units of study.	2
MECH 4130	Practical Experience	0	p 28 credit points of second year units of study.	1,2
MECH 4710	Microprocessors in Engineered Products	6	p ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits.	1

Note
1. MATH 1005 Statistics is an acceptable alternative to MATH 1004.

Resolutions of the Faculty of Engineering relating to Table 16

Candidates for the degree of Bachelor of Engineering in Mechatronic (Space Engineering) are required to gain credit for all core units of study set out in Table 16. Additional credit necessary to satisfy Section 9 shall be gained by completing the elective units of study listed in the table below.

Resolutions of the School of Aerospace, Mechanical and Mechatronic Engineering relating to Table 16

Units of study not included in this table may also be selected subject to the approval of the Head of School of Aerospace, Mechanical and Mechatronic Engineering.

Recommended elective units of study

■ Mainstream electives

MECH 4410	Advanced Design and Analysis 1	3	P MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	P MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	2
MECH 4701	Modern Estimation and Control	6	p MECH 3800 Systems Control or AERO 3500 Flight Mechanics 1.	1
MECH 4710	Microprocessors in Engineered Products	6	P ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits.	1
MECH 4721	Sensors and Signals A	4	P MECH 3700 Mechatronics 2.	2
MECH 4730	Computers in Real-Time Control and Inst	6	P ELEC 3601 Digital Systems Design andELEC 3401 Electronics Devices & Circuits.	1
AERO 4250	Aerodynamics 4	3	P AERO 3250 Aerodynamics 2.	2
AERO 4291	Advanced Computational Aerodynamics	3	P AERO 3250 Aerodynamics 2.	2
AERO 4351	Aerospace Structures 4	3	p AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4390	Smart Materials and Structures	3	p AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4490	Advanced Aircraft Design	4	P AERO 3450 Aircraft Design 2AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	p AERO 3500 Flight Mechanics 1.	2
ELEC 4502	Digital Communication Systems	4	P Advisory Prerequisites: ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 5502	Satellite Communication Systems	4	p Advisory Prerequisites: ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

4 Regulations

■ Undergraduate degree requirements

Bachelor of Engineering

1. Specialisations

(l)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 than 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 these 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 B achelor of Engineering but who has not re-enrolled foraperiodof 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

(l)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 III.

(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

(l)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 andprizes

(l)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 orBE/BMedSc degrees.

(5) A candidate for an Honours degree who has failed to be placed in any Honours classificationmay 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

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.
2. Candidates qualify for the award of the two degrees of the combined program (a separate testamur being awarded for both the BE and the BA) by completing the following:
   (a) The units of study prescribed for the BE specialisation undertaken (totalling 160-162 credit points, depending on the specialisation). These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.
   (b)BA units of study totalling at least 80 credit points, of which at least 56 must be 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.
2. 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 in Table A, or one major and one minor from subjects listed 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.

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 currentiy 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.
7. Candidates who abandon the combined degree program may elect to complete the BE degree or the BCom degree in accordance with the appropriate Senate Resolutions.
8. The Deans of the Faculties of Engineering and Economics shall jointly exercise authority in any matter concerning this combined degree program not otherwise dealt with in the Senate Resolutions or these joint resolutions.

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.
2. Candidates qualify for the two degrees of the combined program (a separate testamur being awarded for both the BE and the BSc) by completing at least 240 credit points which must include the following:
(a) At least 160 credit points from the units of study prescribed for the BE specialisation undertaken. These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.
(b) At least 80 credit points from units of study listed in Table 1 for the BSc degree other than those in the Science discipline area of Engineering Science, 32 of which must be from 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).
2. 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, BIOL 1003 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.
3. Students who are so qualified may be awarded honours in the BE degree or undertake an honours course in the BMedSc degree.
4. 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 rales 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.

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 then 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 S cience at the end of y our S econd 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 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 re-enrol in the BE degree unit of study, then generally speaking you should apply for re-enrolment by completing an internal University 'General application for enrolment' form by 1 October in the year prior to that in which you wish to re-enrol.

Failure to make satisfactory progress and exclusion

If the Faculty considers that you have failed to make satisfactory progress with your studies, the Faculty may exclude you from re-enrolment in the Faculty of Engineering. This process of excluding students is designed to ensure that the resources available in the Faculty are used to teach those students who make the best use of them. Failure to make satisfactory progress cannot be defined precisely in all cases in advance, but generally you will be considered not to have made satisfactory progress if:

- your weighted average mark (WAM) for the year is poor; and/or
- you do not gain at least half of the credit points for which you are enrolled; and/or
- you fail a major unit of study more than once; and/or
- you had special conditions imposed on your re-enrolment (usually because of lack of satisfactory progress in the previous year of enrolment) and you fail to meet these conditions.

If the Faculty considers that your annual progress has not been satisfactory, it may decide that you should be sent a 'Warning Letter', in which you are advised of this and also of certain conditions that you would need to meet in your next year of enrolment in the Faculty. These conditions would normally specify the number of credit points and particular credit points of study that you would need to pass in the next year of enrolment in the Faculty. Failure to meet such conditions would normally result in you being asked to show 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 re-enrol in the Faculty of Engineering. This means that you are being asked for an explanation for your failure to make satisfactory progress in your studies. When the Faculty considers students' statements purporting to show good cause, it takes account of illness, accident and/or personal problems.

If the Faculty 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 re-admission, the Faculty takes account of the following: the circumstances that led to the student's failure to make satisfactory progress; how these circumstances have changed; and the student's activities since being excluded. The Faculty would normally expect a student to have undertaken relevant tertiary studies successfully during this period.

Awarding of Honours

A graduating student may be awarded Honours for the Bachelor of Engineering degree on the basis of their Graded Weighted Average Mark (or GWAM) as follows. The formula for calculating the GWAM is given below.

Honours 1 (75% < GWAM)
Honours 2.1 (70% < GWAM < 75%)
Honours 2.2 (65% < GWAM < 70%)

At the discretion of a Department or School, Honours 1 and a University Medal may be awarded to a student whose GWAM exceeds 85%.

A Pass degree will be awarded where a student obtains a GWAM below 65%.

Calculation of a GWAM

A student's GWAM is calculated based on the following formula:

$$GWAM = \frac{\sum M \times C \times Y}{\sum C \times Y}$$

where M is the percentage mark obtained for a unit of study, C is the credit point value of the unit of study and Y is the 'nominal year' of the unit of study (see note below). Several points should be noted about this formula for calculating a GWAM:

- In the case of a candidate for a four year BE degree, all units of study will be counted, including any electives taken in excess of the minimum requirements.
- In the case of a candidate for a combined degree, only those units of study taken towards the BE degree will be counted, including any electives taken in excess of the minimum requirements.
- Units of study for which only a Pass/Fail grade is given will not be included in the calculation.
- If a unit of study has been repeated, the mark for each attempt will be included in the calculation.
- The value of Y will be determined from the nominal year as indicated by the unit of study code, not from the year of attendance in which the unit of study is taken. For units of study with codes of level 5 and higher, Y will be taken as equal to 4.

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

Applicants should normally hold a master's degree or a bachelor's degree with first or second class honours of The University of Sydney, or an equivalent qualification from another university or institution.

The degree may be taken on either a full-time or part-time basis.

In the case of full-time candidates, the minimum period of candidature is six semesters (3 years). The maximum period of candidature is normally ten semesters.

Part-time candidature may be approved for applicants who can demonstrate that they are engaged in an occupation or other activity which leaves them substantially free to pursue their candidature for the degree. Normally the minimum period of candidature will be determined on the recommendation of the Faculty but in any case will not be less than six semesters; the maximum period of candidature is normally 14 semesters.

The Faculty may admit some applicants on a probationary basis for a period not exceeding twelve months.

Master of Engineering

Graduates in engineering of The University of Sydney who have had at least three years' experience after graduation may be admitted as candidates for the ME degree. The award is made for a thesis or a design of special merit, and may be looked upon as an external degree reserved by the Faculty for its own graduates.

Master of Engineering (Research)

The Master of Engineering (Research) degree provides candidates with opportunities to develop specialist interests through a program of supervised research (theoretical or applied), shorter than the three years usually required for the PhD degree. Candidature is normally on a full-time basis but may also be undertaken part-time. The ME(Res) degree may be undertaken in the Departments of Aeronautical, Chemical, Electrical 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 prehminary 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 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 School of Electrical and Information Engineering has discontinues its MES coursework program which has been relpaced by the Master of Information Technology. Units of study in all the major specialisations will continue to be available in the MIT.

Mechanical and Mechatronic Engineering

The coursework program is available on both a full- and part-time basis in Mechanical Engineering There is no Masters program in Mechatronic Engineering available at present.

In order to complete the degree requirements in one year, however, a candidate would need to take subjects from those offered by other departments or by another tertiary institution.

Environmental Engineering

The Faculty of Engineering offers a coursework program in Environmental Engineering for the MES degree and DipEnvironEng. While the program is managed by the Department of Chemical Engineering, teaching is by Chemical, Civil and Mechanical Engineering, as well as by other departments in the University.

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
Technology Venture Creation
Telecommunications - DipTelecomm
Computer Systems Enginering
Environmental Engineering - DipEnvironEng
Greenhouse Gas Mitigation

Graduate Certificates are offered on a full fee paying basis. Courses leading to the award of a graduate certificate are available in the following specialist areas:

Integrated Systems
Photonics
Project Management
Signal Processing
Technology Commercialisation
Wireless Communications
Greenhouse Gas Mitigation

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/gse

The brochure *Graduate Programs Engineering 2002* is available from the postgraduate advisor.

6 Other Faculty information

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 significantly affected by duly certified illness or misadventure;
(b) to candidates who have failed an examination but whose overall level of performance in the year's work is deemed sufficient to warrant the concession of a further test.

Supplementary examinations under category (b) are normally granted only to those candidates who are in their first year of attendance.

The award of supplementary examinations is a privilege and not a right.

Illness or misadventure

The Faculty of Engineering recognises that the performance of students may be adversely affected by illness or other misadventure, and makes provision for special consideration of such disabilities when examination results are considered.

Any student who believes that his/her performance has been or may be adversely affected by an occurrence of illness or misadventure may request the Faculty to make special consideration of same. All such requests must include a special consideration application on the form provided by the Faculty, supplied within one week of the occurrence and accompanied by an appropriate medical certificate or other relevant documentary evidence apart from the student's own submission. Such certificates or documentary evidence should state not only the nature of the illness or misadventure but also (where relevant) the opinion of the issuer as to the extent 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 sub-standard performance in assessments which do not reflect a student's true competence in a subject, and such provisions must not act to the disadvantage of other students. The Faculty will only compensate students when there is clear evidence that results have been adversely affected by the disability for which special consideration is requested.

Financial assistance

Special assistance
In certain circumstances assistance is available to students who encounter some unforeseen financial difficulty during their studies. The assistance is usually in the form of bursaries or interest free loans.

Students wishing to apply for financial assistance should make enquiries to either of the following:
Financial Assistance Office, Student Services, (02) 9351 2416.
President of the Students' Representative Council, (02) 9660 5222.

JN Ellis Memorial Fund
The JN 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) 9351 3853.

■ List of staff by departments

Faculty staff

Dean
Professor Judy A Raper, BE PhD *U.N.S. W.* CPEng, FIChemE FTEAust
Executive Assistant to the Dean
Kay Fielding
Pro Dean
Professor Yiu-Wing Mai BSc (Eng) PhD *H.K.,* DEng, FTSE FASME FHKIE FIE Aust
Associate Dean (Postgraduate and Research)
Associate Professor John C Small, BSc(Eng) *Lond.* PhD, MIEAustMASCE
Associate Dean (Undergraduate)
Associate Professor Geoffrey W. Barton, BE PhD
Executive Officer
Eric van Wijk BSc *ANU* DipEd, DipAppEcon *UCan*
Secretary to the Faculty and Finance Officer
Michael Whitley, BA(Hons) *EastAnglia* MCom *U.N.S.W.* ASA CIAFCISFICDDip
Postgraduate Adviser
Josephine Harty, BA *Macq.*

Undergraduate Adviser
Annamaria Brancato
Administration Officer Scholarships and External Relations
Dr Alison Milful BA, PhD *U.N.S.W*
Faculty Librarian
Irene Rossendell BA *Qld,* Dip Lib *UNSW,* ALIA

Advisers to undergraduate students

Aerospace, Mechanical and Mechatronic Engineering
to be advised
Chemical Engineering
Undergraduate Coordinator: A/Prof G Barton
First Year: Dr M Valix
Second Year: Dr V Gomes
Third Year: Dr D McNevin
Fourth Year: Dr 1A Furzer
Civil Engineering
First Year: Associate Professor Robert J Wheen
Second Year: Mr Noel L Ings
Third Year: Dr David W Airey
Fourth Year: Associate Professor Kim JR Rasmussen
Combined degree students: Professor Gregory J Hancock
Electrical and Information Engineering
First Year: Dr Xiheng Hu
Second Year: Dr Swamidoss Sathiakumar
Third Year: Dr Jim Rathmell
Fourth Year: DrYash Shrivastava

Aerospace, Mechanical and Mechatronic Engineering

Head of School
Assaad R. Masri, BE PhD
PN Russell Professor
RogerlTanner.BScfirar. MS *Calif.* PhD *Mane.* FRSFAAFTSE FIEAust MASME MAIChE. Appointed 1975
Lawrence Hargrove Professor
to be advised
Professors
Robert W Bilger, BSc BE *NZ* DPhil *Oxf,* FTSE 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 *HKDEng Syd,* FTSE FASME FHKIE FIE Aust. Appointed 1987
Assaad R Masri, BE PhD
Nhan Phan-Thien, BE PhD, FAA FIEAust. Appointed 1991
Michael V Swain, BSc PhD *UNSW.* Appointed 1997
Associate Professors
Steven W Armfield, BSc *Flinders* PhD
J Dennis Bobyn, BSc MSc *McGill* PhD *Toronto*
Eduardo M Nebot, BS *Bahia Blanco* MS PhD *Colorado State*
Liyong Tong, BSc MEngSc *Dalian* PhD *BUAA,* MIEAust MAIAA
Liangchi Zhang, BSc MEng *Zhejiang* PhD *Peking,* MASME MASPE MJSPE MJSME
Reader
Lin Ye, BS *Harbin* MS PhD *BeijinglAA,* MAIChemE
Senior Lecturers
Douglass J Auld, BSc BE MEngSc PhD
Lynne E Bilston, MSE PhD *Penn* BE
Peter W Gibbens, BE PhD, MAIAA
Andrei Lozzi, BSc *UNSWMEngSc* PhD
PaulJMcHugh,BScBE
David C Rye, BE *Adel* PhD
Karkenahalli Srinivas, ME PhD *IISc*
Kee Choon Wong, BE PhD, MAIAA
Lecturers
David P Boyle, BE, MAIAA
Salah Sukkarieh, BE PhD
Hugh Stone, BSc BE PhD
Adjunct Associate Professor
Robin J Higgs, MBBS *Lond* FRCS *Edin,* FRACS FA OrthA
Simmy Grewal, BSc PhD *UK*
Adjunct Lecturer
Captain Peter L Bates, *BE*

Chemical Engineering

Head of Department
James G Petrie BSc, PhD *Capetown*
Professors
Brian S Haynes, BE PhD *UNSW,* FIChemE FIEAust CPEng. Appointed 1997
Emeritus Professor Rolf GH Prince, AO, BE BSc NZ PhD, FIChemE HonFIEAust FTSE FREng. Appointed 1969
Jose Romagnoli, BE *NdelSurArg* PhD *Minn.* Appointed 1991
Shell Professor of Environmental Engineering
James G Petrie BSc, PhD *Capetown.* Appointed 1997
Associate Professors
Geoffrey W Barton, BE PhD
Timothy AG Langrish, BE *NZ* DPhil *Oxf,* MIChemE
Senior Lecturers
Ian A Furzer, DSc(Eng) PhD *Lond,* MIChemE CEng MAIChemE
Vincent G Gomes, BTech MEng PhD *Montr*
Marjorie Valix, BSc, PhD *UNSW*
Howard See, BSc, BE, MSc *Tokyo,* PhD *Nagoya*
Lecturers
Dennis McNevin, BE *UNSW,* PhD, GradDipEd *UWS*
Honorary Associate Adjunct Professor
David Fletcher BSc, PhD *Exeter*
Honorary Research Associates
G DeLeon, PhD *Belgrade,* MAIMM GSA
Peter B Linkson, BE PhD, FIEChemE FAusIMM FGAA Ceng
Barry W Walsh, BE PhD, MIChemE CEng SPE
Wayne A Davies, BSc PhD, MIEAust

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 CP Eng. Appointed Professor 1990. Appointed Challis Professor 1999
Professors
Ali Ja'afari, BSc ME *Tehr* MSc PhD *Sur.* Appointed Professor 2001
BHP Steel Professor of Steel Structures
Gregory J Hancock, BE BSc PhD, FIEAust. Appointed Professor 1990
Professor of Wind Engineering
Kenny CS Kwok, BE PhD *Monash,* FIEAust FHKIE. Appointed Professor 1999
Adjunct Professor
Robert Herbertson, BSc BE MPhil, DIC FIEAust MIStructE MICE CPEng NPER
Associate Professors
Kim JR Rasmussen, MEngSc *TUDenmark* PhD
Stuart G Reid, BE(Hons) ME *Cant* PhD *McG*
John C Small, BSc *Lond* PhD, FIEAust MASCE
Robert J Wheen, BSc BE MEng Sc, FIEAust MASCE
Adjunct Associate Professor
Ian SF Jones, BE *UNSW PhD Wat.* MIEAust
Honorary Associate Professors
Andrew Abel, Dipl Ing *TU Bud* MSc *McMPhD UNSW,* CEng FIM
Peter Ansourian, BSc BE PhD, FIEAust
Senior Lecturer
David W Airey, BA MPhil PhD *Camb*
Lecturers
Abbas El Zein, *'BE American Uni Lebanon* MSc PhD *Southampton* MS ENPC *Paris,* MIEAust
Noel L Ings, BE, MEngSc *UNSW,* MASCE MIEAust
Tim Wilkinson, BSc BE MA Ph D
Graeme Wood, BEng(Hons) PhD *Edin*
Professional Officers
Nigel P Balaam, BE PhD
David Baxter, BE(Hons), GradlEAust
TimothyS Hull, BE PhD
John P Papangelis, BE PhD MIEAust
Craig M Polley, MSc *Wisconsin*
Emeritus Professors
Harry G Poulos, AM, BE PhD DScEng, FIEAust FASCE FAA
Nicholas S Trahair, BSc BE MEngSc PhD DEng, FIEAust

Honorary Research Associates
Russell Q Bridge, BE (Hons) *UNSWPtiD,* FffiAust
Howard B Harrison, BE PhD, MIEAust
Harold Roper, BSc PhD *Witw* MEngSc, MAIMM
Richard D Watkins, BE *Qld* PhD *Aberd,* MIEAust
Honorary Teaching Associate
Ian G Bowie, MSc *Mane* MASCE, MIEAust

Electrical and Information Engineering

Head of School
Branka S Vucetic, MSc PhD *Belgrade*
Manager, Resources
Paul Beed, BBus *UWS,* ASA
Manager, Academic Support Services
Erica R Ring, MA
Executive Officer, Electrical Engineering Foundation
Stuart Glanfield, MA DipEd
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 (NSW),* FIEAust FIEEE. Appointed 1994
Robert A Minasian, BE PhD *Melb* MSc(Dist) DipMicrowave Eng(Dist) *Lond,* MIEE SMIREE FIEAust
Branka S Vucetic, MSc PhD *Belgrade.* Personal Chair 1999
Hong Yan, BS *Nanking IPTMSE Mich* PhD *Yale.* Personal Chair 1997
Associate Professors
Stephen W Simpson, BSc PhD, FAIP
Anthony D Stokes, BSc BE PhD, FIEAust
Hansen Yee, BSc BE PhD, MIEEE
Senior Lecturers
Richard Coggins, BE BSc PhD, MIEEE
Iain Collings, BE *Melb* PhD *ANU,* MIEEE
Xiheng Hu, DipElecEng *Chongoing IndustUni* MEIecCompEng *China* PhD
Abbas Jamalipour, BSc *Isfahan* MSc *Shaiif* 'PhD *Nagoya,* SMIEEE MURSI, MIEICE, MSITA, MAAEE
Bjorn Landfeldt, PhD *UNSW,* MIEEE
David Levy, BScEng MScEng PhD *Natal,* MIEE
James G RathmeU, BSc BE PhD, SMIREE
Swamidoss Sathiakumar, BSc *American Coll India* BE ME PhD *IISc*
Andre van Schaik, MSc *Twent,* PhD *Swiss Fed IT*
Yash Shrivastava, BTech *IIT Kanpur,* PhD *Iowa,* MIEEE
Graham E Town, BE *NSWITPhD,* MIEEE MIREE
Lecturers
Craig Jin, BSc *Stan* MS *CalTech* PhD
Rafael Calvo, Licenciado in Physics PhD *Universidad Nacional de Rosario*
Professional Officers
William Fong, BE *WAust* MEngSc
Ebrahim Gogani, ME *Tehr Polytechnic* PhD *Brunei*
Ross Hutton, BE *QIT*
Van Dong Pham, BE *South Australia* MEngSc *UNSW*
Michael Rados, BSc BE MEngSc
Robert G Sutton, ME *UNSW*
Senior Research Fellow
Javid Atai, BSc(Hons) *WAust* PhD *ANU*
Research Fellow
Hayoung Yang, BSc MSc PHD *Yonsei*
Honorary Emeritus Professors
WN Christiansen, DSc *Melb,* FInstP FAIP FIEE FIEAust FAA FIREE(Aust)
Hugo K Messerle, MEngSc DSc *Melb* PhD, FTS FIEE FIEAust FIREE FIEEE FAIP
Honorary Professor
SYR Hui, BSc *Birm* PhD *Lond*
Honorary Adjunct Associate Professor
JohnBrydon, BA(Hons) *Camb* MSc LondPhD *UNSW*
Peter M Nickolls, MB BS BSc BE PhD
Honorary Senior Lecturer
Brian Campbell, ME
David F Gosden, ME *UNSW* MBA *AGSM,* MIEAust
Honorary Research Associate
Julie Vonwiller, BA(Hons) PhD *Macq*
Honorary Research Affiliate
JJ 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 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 www.eng.usyd.edu.au/scholarships.

WMNeirous Scholarship
For women enrolling in structural (civil) engineering, valued at $3000 pa for 4 years.

Energy Australia 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.

Other Scholarships are provided by Ford Australia, Transfleld, RTA, ABB, Baulderstone Hornibrook, Resmed and Caltex

The University of Sydney Scholarships and the University of Sydney International Scholarships for engineering are also selected by the Faculty.

Contact: Faculty Scholarships Office
Alison Milful, Administration Officer
Phone: (02) 9351 2834/2131
Fax: (02) 9351 3885
Email: a.milful@eng.usyd.edu.au

■ 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 www.library.usyd.edu.au.

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.

Summer School

Most faculties at the University offer units of study from degree programs during January/February. As the University uses all of its HECS quota in first and second semester, these units are full fee-paying and entirely voluntary. However, Summer School units enable students to accelerate their degree progress, make up for a failed unit or fit in a unit which otherwise would not suit their timetables. New students may also gain a head start by completing requisite subjects before they commence their degrees. Units start on 2nd January and run for up to six weeks (followed by an examination week). Notice of the units available is contained in the various faculty Handbooks and is usually circulated to students with their results notices.

Engineering associations

Sydney University Chemical Engineering Association

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.

Sydney University Engineering Undergraduates' Association

The objects of the Sydney University Engineering Undergraduates' Association (SUEUA) 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.

Sydney University Civil Engineers Society

Sydney University Civil Engineers (SUCE) is the undergraduate social society that operates within the Department of Civil Engineering. It is run by fellow students, aiming to improve the lifestyle and experience of your degree. SUCE runs regular barbecues and pub crawls, and provides free tea and coffee to members in the student common room (room 338 of the Civil Engineering building). You are encouraged to participate.

Membership is $10 for life and entitles you to reduced prices at events, plus free tea and coffee for the following four years.

SUCE also needs committee members from each year group, including first year. If this interests you, email suce_is@hotmail.com or aks at one of the first barbecues of the year.

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 (StudIE 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 affihate 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 WH 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 Darlington extension area across City Road. Since the mid seventies all departments have been accommodated in this area, although a wind tunnel in the Woolley Building is still in use by Aeronautical Engineering.

■ 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.

Phone (02) 9351 6743, fax (02) 9351 7180, email athomas@chem.eng.usyd.edu.au.

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 non-academic 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:

- Networking
- Presenting University Research
- Industry Participation in University Research
- Business Development Facilitation
- Industry Participation in Curriculum Development
- Performance Benchmarking
- Bringing Industry and Students Together
- Encouraging Student and Teaching Excellence
- Entrepreneurship Training
- Sophia Technica Project
- Alumni Relations

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/

7 General University information

See also the Glossary for administrative information relating to particular terms.

Accommodation Service

The Accommodation Service assists students to find off-campus 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 undergraduate admission and can advise prospective local undergraduate students regarding admission requirements. Postgraduate students should contact the appropriate faculty. If you are an Australian citizen or a permanent resident but have qualifications from a non-Australian institution, phone (02) 9351 4118 for more information. For enquiries regarding Special Admissions (including Mature-Age Entry), phone (02) 9351 3615. 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: admissions @ records.usyd.edu.au

Applying for a course

Prospective (intending) students must lodge an application form with the Universities Admissions Centre (UAC) by the last working day of September of the year before enrolment. Note that some faculties, such as Pharmacy, the Sydney Conservatorium of Music and Sydney College of the Arts, have additional application procedures.

Assessment

For matters regarding assessment, refer to the relevant department or school.

Careers information

Provides careers information and advice, and help in finding course-related employment both while you're studying and when you commence your career.

Careers Centre
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

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) 9351 8714
Fax: (02) 9351 8717
Email: ces@stuserv.usyd.edu.au
Web: www.usyd.edu.au/su/cas_emp

Centre for Continuing Education

Bridging courses, study skills courses, essay writing courses, accounting extension courses, university preparation courses, access to university courses, non-award short courses.

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

Centre for English Teaching

The Centre for English Teaching (CET) offers a range of English language courses including Academic English, General & Business English and IELTS preparation. CET programs help international students to reach the required English language levels for entry to degrees at the University. Students have the opportunity to take the CET university direct entry test at the completion of their language programs.

Level 2, Building F, 88 Mallett St
University of Sydney (M02)
NSW 2006 Australia
Phone: (02) 9351 0706
Fax: (02) 9351 0710
Email: info@cet.usyd.edu.au
Web: www.usyd.edu.au/cet

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: childc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/su/cnildcare

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: sydu@mail.coop-bookshop.com.au
Web: www.coop-bookshop.com.au

Counselling Service

The Counselling Service aims to help students fulfil their academic, individual and social goals through professional counselling which is free and confidential. Counselling presents an opportunity to: gain greater self awareness; learn to cope more efficiently with the problem at hand; discuss any work related, social or personal issues that cause concern; explore options with professionally trained staff. In addition, workshops are offered each semester on topics such as stress management, relaxation, exam anxiety, communication skills and others.

Level 7, Education Building, A35
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 2228
Fax: (02) 9351 7055

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: www.usyd.edu.au/su/disability

Enrolment and pre-enrolment

Students entering first year

Details of the enrolment procedures will be sent with the UAC Offer of Enrolment. Enrolment takes place at a specific time and date, depending on your surname and the Faculty in which you are enrolling, but is usually within the last week of January. You must attend the University in person or else nominate, in writing, somebody to act on your behalf. On the enrolment day, you pay the compulsory fees for joining the Student Union, the Students' Representative Council and sporting bodies and nominate your preferred 'up front' or deferred payment for your Higher Contribution Scheme (HECS) liability. You also choose your first-year units of study, so it's important to consult the Handbook before enrolling.

All other students

A pre-enrolment package is sent to all enrolled students in late September, and contains instructions on the procedure for pre-enrolment.

Examinations

The Examinations and Exclusions Office looks after the majority of exam papers, timetables and exclusions. Some faculties, such as the Sydney Conservatorium of Music, make all examination arrangements for the units of study that they offer.

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 4006
Fax: (02) 9351 7330
Email: exams.office@exams.usyd.edu.au

Fees

For information on how to pay, where to pay, and if payments have been received.

Fees Office
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: fao@stuserv.usyd.edu.au
Web: www.usyd.edu.au/su/fin_assist

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 www.usyd.edu.au/arms/foi/.

It is a requirement of the Act that applications be processed and a determination be made generallywithin 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.

Student Centre
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

(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

Student Centre
Ground Floor, Carslaw Building, F07
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 5659, (02) 9351 5062, (02) 9351 2086
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 student support 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: info@io.usyd.edu.au
Web: www.usyd.edu.au/io

International Student Services Unit
Phone: (02) 9351 4749
Fax: (02) 9351 6818
Email: info@issu.usyd.edu.au
Web: www.usyd.edu.au/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/io/studyabroad

Exchange
Phone: (02) 9351 5843
Fax: (02) 9351 2795
Email: exchange@io.usyd.edu.au
Web: www.usyd.edu.au/io/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.

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

Provides self-access course materials in over 140 languages. Beginners and intermediate courses in Modern Spanish, Modern Russian, Modern Welsh, Modern Irish, Modern Portuguese languages and cultures; Diploma Course in Modern Language Teaching.

Level 2, Christopher Brennan Building, A18
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 2371
Fax: (02) 9351 3626
Email: language.enquiries@language.usyd.edu.au
Web :www.arts.usyd. edu. au/Arts/departs/langcent/home. html

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. The Centre's program includes a wide range of workshops on study skills, academic reading and writing, oral communication skills and postgraduate writing and research skills. Other services the Centre provides are an Individual Learning Program (ILP), a special program for international students, Faculty-based workshops, publications of learning resources and library facilities.

Level 7, Education Building, A35
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 3853
Fax: (02) 9351 4865
Email: lc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/su/lc

Library

Students are welcome to use any of the 22 libraries in the 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 www.library.usyd.edu.au 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.

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, G08
Phone: (02) 9351 2231
Fax: (02) 9351 7699
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@Ubrary.usyd.edu.au

Chemistry Library
Chemistry Building, Fl 1
Phone: (02) 9351 3009
Fax: (02) 9351 3329
Email: chemistry@library.usyd.edu.au

Curriculum Resources Library
Old Teachers College, A22
Phone: (02) 9351 6254
Fax: (02) 9351 7766
Email: curriculum@library.usyd.edu.au

Dentistry Library
United Dental Hospital, 2 Chalmers St, Surry Hills, C12
Phone: (02) 9351 8331
Fax: 9212 5149
Email: dentistry@library.usyd.edu.au

Engineering Library
PN 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: mathematics @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
Orange Library
Leeds Parade, Orange
Phone: (02) 6360 5594
Fax: (02) 6360 5637
Email: lib@orange.usyd.edu.au
Physics Library
New Wing, Physics Building, A29
Phone: (02) 9351 2550
Fax: (02) 9351 7767
Email: physics@library.usyd.edu.au
Shaeffer Fine Arts Library
Mills Building, A26
Phone: (02) 9351 2148
Fax: (02) 9351 7624
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
Macquarie St (opposite Bridge St), Sydney, C41
Phone: (02)9351 1316
Email: library@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). It also 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
TTY: (02) 9351 3412
Email: mlc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/su/mlc

Part-time, full-time

Students are normally considered as full-time if they have a HECS weighting of at least 0.375 each semester. Anything under this amount is considered a part-time study load. Note that some faculties have minimum study load requirements for satisfactory progress.

Privacy

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

Ground Floor, Carslaw Building, F07
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 3023 General Enquiries
(02) 9351 4109 Academic Records
(02) 9351 3023 Discontinuation of Enrolment
(02) 9351 5057 Handbooks
(02) 9351 5060 Prizes
Fax: (02) 9351 5081, (02) 9351 5350 Academic Records

Student identity cards

In 1999 the University incorporated a photograph into the student identity card. This means that all students have to provide a colour, passport-sized, head and shoulders photograph when they attend on campus sites to have their student ID card laminated. University student ID cards also function as transport concession cards for eligible students, thus eliminating the need for a separate concession card. The endorsement for concession travel will take the form of a hologram sticker attached to the front of the student ID 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 well being 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. The web site is at www.usyd.edu.au/su/stuserv.

The Sydney Summer School

Most faculties at the University offer units of study from degree programs during January/February. As the University uses all of its HECS quota in first and second semester, these units are full fee-paying and entirely voluntary. However, Summer School units enable students to accelerate their degree progress, make up for a failed unit or fit in a unit which otherwise would not suit their timetables. New students may also gain a head start by completing requisite subjects before they commence their degrees. Units start on 2 January and run for up to six weeks (followed by an examination week). Notice of the units available is contained in the various faculty handbooks and is usually circulated to students with their results notices.

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.

Undergraduate Scholarships

Scholarships Unit, Room 147
Ground Floor, Mackie Building, KOI
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 2717
Fax: (02) 9351 5134
Email: scholarships@careers.usyd.edu.au
Web: www.usyd.edu.au/study/

University Health Service

Provides full general practitioner services and emergency medical care to the University community.

Email: director@unihealth.usyd.edu.au
Web: www.unihealth.usyd.edu.au

University Health Service (Wentworth)
Level 3, Wentworth Building, GO 1
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 3484
Fax: (02) 9351 4110

University Health Service (Holme)
Science Rd Entry, Holme Building, A09
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 4095
Fax: (02) 9351 4338

■ Student organisations

Students'Representative Council

Level 1, Wentworth Building, GO 1
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

Services, facilities and clubs for sport, recreation and fitness.

Noel Martin Sports and Aquatic Centre, G09
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 4960
Fax: (02) 9351 4962
Email: sports_union @ susu.usyd.edu. au

University of Sydney Union

Main provider of catering facilities, retail services, welfare programs, and social and cultural events for the University community on the Camperdown and Darlington campuses, and at many of the University's affiliated campuses.

University of Sydney Union
Box 500, Holme Building, A09
The University of Sydney
NSW 2006 Australia
Phone: (02) 9563 6000 Switchboard/Enquiries
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 facilities, courses and personnel.

The Arena Sports Centre, A30
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 8111
Fax: (02) 9660 0921
Email: secretary@suwsa.usyd.edu.au
Web: www.suwsa.usyd.edu.au

Glossary

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 and policy relating to the admission of students. (For further information, see the University Calendar.)

Academic cycle

The academic cycle is the program of teaching sessions offered over a year. Currently the cycle runs from the enrolment period for Semester 1 through to the completion of the processing of results at the end of Semester 2. (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 transcript: 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 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 (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 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 applications for admission to courses are considered. The main admission period takes place before Semester 1, but there may also be an admission period for mid-year applicants before the beginning of Semester 2 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.

ARTS

Automated Results Transfer System. This system was developed on behalf of ACTAC (Australasian Conference of Tertiary Admissions Centres) to allow the electronic academic record of a student to be accessible, via an admission centre, between tertiary institutions.

Assessment

The process of measuring the performance of students in units of study and courses. The assessment of performance in a unit of study 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

A DETYA classification defining the manner in which a student is undertaking a course - ie, internal, external, mixed or offshore.

Attendance pattern/type

Refers to whether the student is studying part-time or full-time. 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. It is important to note, however, that, for some purposes, to be considered full-time a student may need to be enrolled in at least 0.375 in each half year. 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.

AUSCHECK

AUSCHECK is the software provided by Centrelink to validate data prior to reporting to Centrelink.

AUSTUDY

Replaced by Youth Allowance. (See also *Youth Allowance.)*

Award course

An award course is a formally approved program of study that can lead to an academic award granted by the University. An award course requires the completion of a program of study specified by course rules. (See also *Course rules.)* Award courses are approved by Senate, on the recommendation of the Academic Board. Students normally apply to transfer between Award courses through the UAC. The award course name will appear on testamurs. The University broadly classifies courses as undergraduate, postgraduate coursework or postgraduate research. The award courses offered by the University are:

Higher doctorates
Doctor of philosophy (PhD)
Doctorates by research and advanced coursework
Master's degree by research
Master's degree by coursework
Graduate diploma
Graduate certificate
Bachelor's degree
Advanced diplomas
Diplomas
Certificates

(See also *Bachelor's degree, Course rules, Diploma, Doctorate, Major, Master's degree, Minor, PhD, 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.)*

Barrier

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 (Institute for International Health, Institute of Transport Studies), Camperdown and Darlington (formerly known as 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.

Centre for Continuing Education

The Centre for Continuing Education develops and conducts courses, conferences and study tours for the general public and professional groups. The Centre offers approximately 1,000 courses for approximately 20,000 students each year. Most of these courses are held over one of the four main sessions that are conducted each year, though the Centre is offering an increasing number of ad hoc courses in response to increased competition and changing demands. The Centre operates on a cost recovery/ income generation basis. (See also *Continuing professional education.)*

Centrelink

Centrelink is the agency responsible for providing information and assistance on a range of Commonwealth Government programs including Youth Allowance. (See also *Youth Allowance)*

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.

Comp subs

See *Compulsory subscriptions.*

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 Camperdown/Darlington campus (formerly known as Main Campus), compulsory submissions depend on the level of study.

Undergraduate: the University of Sydney Union, Students' Representative Council (SRC) and the University of Sydney Sports Union or the Sydney University Women's Sports Association.

Postgraduate: the University of Sydney Union and the Sydney University Postgraduate Representative Association (SUPRA).

Student organisations at other campuses include: the Conservatorium Student Association, the Cumberland Student Guild, the Orange Agricultural College Student Association and the Student Association of Sydney College of the Arts.

(See also *Compulsory subscription rates, Compulsory subscription waiver provision, Joining fee, Life membership.)*

Confirmation of Enrolment form

A Confirmation of Enrolment form is issued to students after enrolment showing the course and the units of study they are enrolled in, together with the credit point value of the units of study 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 advisor, the advisor information is also shown.

Continuing professional education

The continuing professional education process provides a number of programs of continuing education courses for professionals as they move through their career. These programs are presently administered by the Centre for Continuing Education and a number of departments and Foundations across the University. This process supports the whole of life learning concept and requires/promotes the maintenance of a long term relationship between the student and the University. It is ■ envisaged that the importance of this mode of education will increase in the future. (See also *Centre for Continuing Education.)*

Convocation

Convocation is the body comprising all graduates of the University.

Core unit of study

A unit of study that is compulsory for the course or subject area. (See also *Unit of study.)*

Corequisite

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

An award course or non-award course undertaken at the University of Sydney. (See also *Award course, Non-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. The term 'suspension of candidature' was previously used to describe research 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 rales 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 rales may be expressed in terms of types of units of study taken, length of study, and credit points accumulated. (See also *Award course.)*

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 units of study 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

The recognition of previous studies successfully completed at this or another recognised (by the University of Sydney) university or tertiary institution as contributing to the requirements for the award of the course in which the applicant requesting such recognition has been admitted.

Where the University agrees to recognise successfully completed previous studies, their contribution to the requirements for the award of the course, in which the applicant has been admitted, will be expressed as specific or non-specific credit.

Credit awarded to a credit applicant - whether specific or non-specific - will be recorded with a mark and grade of 50 pass, unless in individual cases the credit is assessed by the faculty as having a mark and grade greater than 50 pass. This equivalent mark and grade will be used for the purposes of calculating a student's weighted average mark and for the purposes of satisfying prerequisite rules where a level of passing grade is specified.

(See also *Precedents, Specific credit, Non-specific credit, Waiver, Weighted average mark (WAM).)*

Creditpoints

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 unit of study is being undertaken. Students pay compulsory subscriptions to one university only (usually their home university - ie, the university which will award their degree). (See also *Non-award course, Enrolment non-award)*

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 dean's

certificates. In faculties that do, qualified students have 'dean's certificate' noted on their academic record.

Deferment

See Admission (deferment), Leave.

Degree

(See also *Award course, Bachelor's degree.)*

Delivery mode

Indicates the mode of delivery of the instruction for a unit of study - eg, normal (ie, by attending classes at a campus of the University), distance (ie, remotely by correspondence or other distance means - eg, Web delivery). The delivery mode must be recorded for each unit as distinct from the attendance mode of the student - ie, an internal student may take one or more units by distance mode and an external student may attend campus for one or more units.

Department

For the purposes of FlexSIS, a department is the academic unit, which is responsible for teaching and examining a unit of study. It may be called a school, a department, a centre or a unit within the University.

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.

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 units of study 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.

Distance and flexible learning

Distance and flexible learning affords the opportunity to provide higher education to a much wider market - including students from anywhere in the world- at times, locations and modes that suit them.

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 full-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$_1$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 (eg, 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.)*

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. Non-award enrolments are recorded in various categories used for reporting and administrative purposes. (See also *Cross-institutional enrolment, Non-award course.)*

Enrolment status

A student's enrolment status is either 'enrolled' or 'not enrolled'. An enrolment status is hnked 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 the University of Sydney 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.

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 University Calendar. (See also *Senate appeals.)*

Extended semesters

Distance learning students may be allowed more time to complete a module/program if circumstances are beyond the student's control - eg, drought, flood or illness, affect the student's ability to complete the module/program in the specified time.

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 units of study attempted within each course together with the result (but not any unit of study which has the status of withdrawn). It also includes any scholarships or prizes the student has received. Two copies are provided to each student on graduation (one with marks and grades for each unit of study 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 2001 University Calendar, pp.140-141). 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'.

Flexible learning

See *Distance* and *Flexible learning.*

Flexible start date

Full fee-paying distance students should not be restricted to the same enrolment time frames as campus-based or HECS students.

FlexSIS

FlexSIS is the computer-based Flexible Student Information System at the University of Sydney. Electronically FlexSIS holds details of courses and units of study 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 with 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.

HECS

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:

Semester 1:31 March

Semester 2: 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 II, Class III) 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 units of study attempted within each course together with the unit of study 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.)*

Joiningfee

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 units of study 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. Majors may be included on testamurs. (See also *Award course, Minor, 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 unit of study. (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. Minors may be included on testamurs. (See also *Award course, Major, 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.

Mixed mode

See. Attendance mode.

Mode

See. Attendance mode and *Delivery mode.*

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 pre-enrolment and enrolment variations on MyUni. (See also *UsydNet.)*

Non-award course

Non-award courses are courses undertaken by students who are not seeking an award from the University. These may be students enrolled in an award course at another institution or students not seeking an award from any institution. Non-award courses are assigned a course code in the same way as award courses. A separate course code is assigned for each faculty, level (undergraduate or postgraduate) and method (research or coursework) which offers a non-award course. Various categories of non-award enrolment are recorded on FlexSIS for reporting and administrative purposes.(See also *Course, Cross-institutional enrolment, Enrolment non-award.)*

Non-award enrolment

See *Enrolment non-award.*

Non-specific credit

Non-specific credit is awarded when previous studies are deemed to have satisfied defined components of a course other than named units of study. These components include, but are not limited to:

- entire years in courses that progress through the successful completion of a set of prescribed units of study per year
- a set number of credit points within a particular discipline or level (ie, first, second or third year)
- one or more semesters for research courses.

(See also *Credit, Specific credit.)*

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)*

Precedents

Where a credit applicant has credit approved in terms of the granting of specific or non-specific credit on the basis of study previously taken, a precedent is established at system level. Any other credit applicant subsequently seeking credit on the basis of the same pattern of previous study will be eligible to have the item of credit to be immediately approved on the basis of the previously approved precedent. (See also *Credit.)*

Pre-enrolment

Pre-enrolment takes place in October for the following year. Students indicate their choice of unit of study enrolment for the following year. After results are approved, registered students are regarded as enrolled in those units of study 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. Pre-enrolment 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 unit of study 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 op 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.*

Prohibition (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 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

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 units of study. Departments tabulate results for all assessment activities of a unit of study and assign preliminary results for each unit of study. 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 units of study. (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:

HD	High distinction	a mark of 85-100
D	Distinction	a mark of 75-84
CR	Credit	a mark of 65-74
P	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 units of study 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 unit of study.
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 of 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: • 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 • 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 confirming the final result. Except in special cases approved by the Academic Board, this result will be converted to a normal permanent passing or failing grade either: • 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 • 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 valid 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 a session whose dates are determined by the Academic Board. Normally all undergraduate sessions will conform to the semesters approved by the Academic Board. Any offering of an undergraduate unit not conforming to the semester dates must be given special permission by the Academic Board.

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 teaching period that defines the offering of a unit of study. A session cannot be longer than six months. Session offerings are approved by the relevant dean, taking into account all the necessary resources, including teaching space and staffing. 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.*

Specific credit
Specific credit is awarded when previous studies are entirely equivalent to one or more named units of study offered by the University of Sydney that contribute to the course in which the applicant has been admitted. (See also *Credit, Non-specific credit.)*

Sponsorship
Sponsorship is the financial support of a student by a company or government body. Sponsors are frequently invoiced directly.

SRS
SRS is the student record system responsible, prior to FlexSIS, for the processing of student records. The functions of SRS are gradually being incorporated into FlexSIS. (See also *FlexSIS.)*

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 within an award course, which requires the completion of a program of study specified by the course rules for the particular stream, in addition to the core program specified by the course rules for the award course. Students enrolled in award courses that involve streams will have the stream recorded in their enrolment record. Students normally enter streams at the time of admission, although some award courses require students to enrol in streams after the completion of level 1000 units of study. Where permitted to do so by faculty resolution, students may transfer from one stream to another, within an award course, provided they meet criteria approved by the Academic Board on the advice of the faculty concerned. A stream will appear with the award course name on testamurs - eg, B achelor of Engineering in Civil Engineering (Construction **Management). (See also *Award course, Major, 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 9-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 take units of study at the University of Sydney, but not towards an award program. In most cases the units of study taken here are credited towards an award at their home institution. (See also *Exchange student.)*

Subject area

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' and 'Asian Studies'.

Summer School

See *Sydney Summer School.*

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 examinations

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.*

Sydney Summer School

Sydney Summer School is a program of accelerated, intensive study running for approximately 6 weeks during January and February each year. Both undergraduate and postgraduate units are offered. Summer School provides an opportunity for students at Sydney and other universities to catch up on needed units of study, to accelerate completion of a course or to undertake a unit that is outside their award course. All units are full fee-paying and enrolled students are also liable for compulsory subscriptions. Some fee-waiver scholarships are available.

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' means the earliest date at which a research student can submit the thesis. 'Latest date' means 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.

Transfer

See *Course transfer.*

Tuitionfees

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 ranking 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

A unit of study is the smallest stand-alone component of a student's course that is recordable on a student's transcript. Units of study have an integer credit point value, normally in the range 3-24. Each approved unit of study 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 unit of study. Units of study can be grouped by subject and level. (See also *Core unit of study, Course, Major.)*

Unit of study enrolment status

The enrolment status indicates whether the student is still actively attending the unit of study (ie, currently enrolled) or is no longer enrolled (withdrawn or discontinued).

Unit of study group

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, Year 5, and Year 6. 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 master's degrees, whose academic performance is judged outstanding.

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. (See also *MyUni.)*

Variation of enrolment

See *Enrolment variation.*

Vice-Chancellor

The chief executive officer of the University, responsible for its leadership and management. The Vice-Chancellor 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. Unlike credit, 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 unit of study 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.

Youth Allowance

Youth Allowance is payable to a full-time student or trainee aged 16-24 years of age; and enrolled at an approved institution such as a school, college, TAFE or university, and undertaking at least 15 hours a week face-to-face contact. Youth Allowance replaces AUSTUDY.

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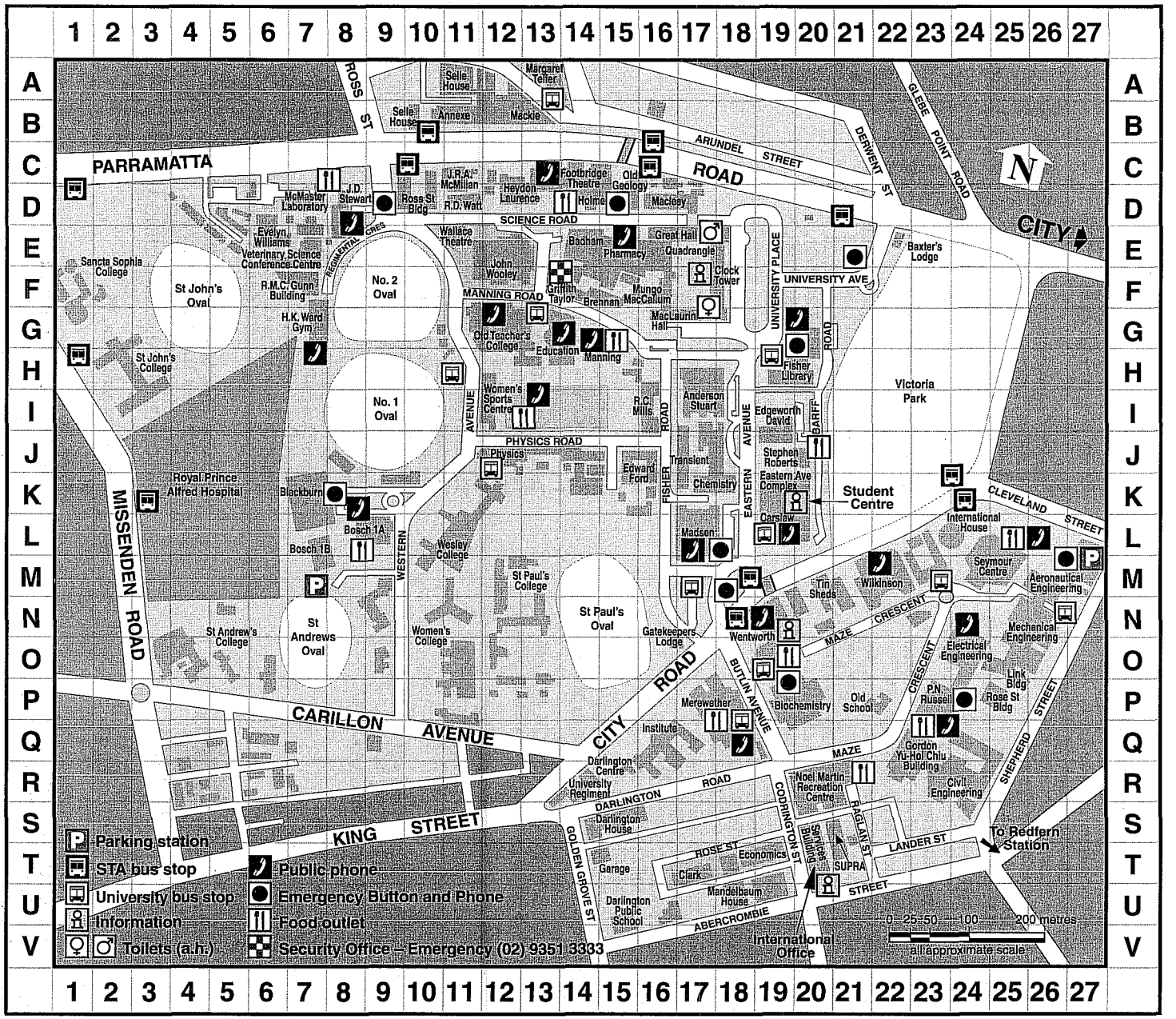
Map of main campus



Chancellor's Committee Shop **17F**
Chaplains'Centre **10G**
Chemical Engineering **23Q**
Chemistry **17K**
Child Care:
Boundary Lane **16U**
Carillon Avenue 9Q
Laurel Tree House (Glebe) **16B**
Union (Darlington) **21S**
Civil Engineering **24R**
Clark Bldg **17T**
Clinical Nursing **Mallett St**
Clinical Ophthalmology & Eye Health **Sydney Eye Hospital**
Clock Tower **17F**
Clinical Trials **Mallett St**
Communication Disorders **Cumberland**
Community & Mental Health Nursing **Cumberland**
Community Health **Cumberland**
Community Medicine **15K**
Computer Sales:
Computer Sales and Service **23U**
Computer Shop **21R**
Computer Science, Basser Dept **17L**
Continuing Education, Centre for **13B**
Coppleson Postgraduate Medical Institute 9K
Copy Centre **21R**
Counselling Service **13G**
Crop Sciences **13F**
Darlington Centre **15R**
Darlington House **14S**
Dentistry Faculty Office & Dental Studies **Surry Hills**
Development Office **16E**
Disability Services **13G**
Eastern Avenue Auditorium & Lecture Theatres **19K**
Econometrics **17P**
Economic History **17P**
Economics Bldg **19T**
Economics, Dept and Faculty Office **17P**
Edgeworth David Bldg **19J**
Education Bldg and Faculty Office **13G**
Educational Development & Evaluation **15K**
Educational Psychology, Literacies & Learning **13G**
Edward Ford Bldg **15K**
Electrical Engineering **240**
Employment Service, Casual **14C**
Engineering Faculty Office **250**
English **12E**
Equal Employment Opportunity Unit **13A**
Evelyn Williams Bldg **6E**
Experimental Medicine **7K**
External Relations Division **16E**
Facilities Planning, Office of **20T**
Family and Community Health in Nursing **Mallett St**
Financial institutions:
Commonwealth Bank **14D**
Credit Union - ATM only **14D**
National Australia Bank **15E, 19N**
Finance, Dept of **16Q**
Financial Management & Reporting **13A**
Financial Services Division **13A**
Financial Systems Development **13A**
Fine Arts (Art History & Theory) **161**
Fisher Library **19G**
Footbridge Theatre **14C**
French Studies **15F**
Garage, University **15T**
Gender Studies **16E**
General Practice **Westmead Hospital**
Geography **16Q**
Geology and Geophysics **19J**
Germanic Studies **15F**
Government and Public Administration **17P**
Great Hall **18E**
Greek, Modern **14F**
Griffith Taylor Bldg **14F**
Gunn, R.M.C. Bldg **7F**
Heydon Laurence Bldg **12D**
Health Information Management **Cumberland**
Health Sciences Faculty Office **Cumberland**
Health Service (Holme Bldg, Wentworth Bldg) **14D, 19N**
History **15F**
History and Philosophy of Science **19L**
Holme Bldg **14D**
Industrial Relations, Dept of **16Q**
Infectious Diseases **7K**
Information Technology Services **19U**
Institute Bldg **16Q**
International Office and International Student Services **20T**
International House **23L**
International Preparation Program **20T**
Italian **161**
Jurisprudence **St James**
Koori Centre **12G**
Law Dept and Faculty Offce **St James**
Learning Assistance Centre **13G**
Life Sciences in Nursing **Mallett St**
Linguistics **17J**
Link Bldg **2SO**
Lost Property **14F**
Mackie Bldg **13B**
MacLaurin Hall **16G**
Macleay Bldg and Museum **16D**
Madsen Bldg **17L**
Mail Room (Internal) **20T**
Main Bldg **17F**
Management Studies **Burren Street**
Mandelbaum House **18U**
Manning House **14H**
Margaret Telfer Bldg **13A**
Marketing, Dept of **16Q**
Mathematics and Statistics **19L**
McMasterBldg **7D**
McMillan, J.R.A., Bldg **11C**
Mechanical and Aeronautical Engineering Bldg **2SN**
Media and Publications **16E**
Mechanical Engineering **2SN**
Media Office **16E**
Medical Radiation Technology **Cumberland**
Medicine, Dept of 7K
Medicine, Faculty of **1SK**
Merewether Bldg **17P**
Microbiology **20P**
Mills, R.C. Bldg **161**
Mungo MacCallum Bldg **16F**
Music, Dept of **24M**
Nicholson Museum **16G**
Nursing Therapeutics **Cumberland**
Obstetrics and Gynaecology **9K**
Occupational Therapy **Cumberland**
Old Geology Bldg **15D**
Old School Bldg **21P**
Old Teachers' College Bldg **12G**
Operations Accounting **13A**
Orange- Rural Management, Faculty **Orange**
Orthoptics Cumberland
Paediatrics and Child Health **New Children's** 1
Pathology **7K**
Personnel Services **13A**
Pharmacology **7L**
Pharmacy **15E**
Philosophy **17G**
Photowise Imaging **20T**
Physics **13J**
Physiology **171**
Physiotherapy **Cumberland**
Planning Support Office **16E**
Post Office **15E**
Printing Services, University **20T**
Professional Studies **13G**
Properties and Investments **13A**
Prospective Students Unit **12B**
Psychological Medicine **4K**
Psychology **14E**
Purchasing **13** A
Publications Unit **16E**
Public Health and Community Medicine **15K**
Quadrangle **17F**
Queen Elizabeth II Research Institute **9K**
Regiment, University **14R**
Religion, School of Studies in **12E**
Research and Scholarships **16E**
Revenue Services **13A**
Risk Management **13A**
Rose Street Bldg **24P**
Ross Street Bldg **10D**
Russell, Peter Nicol, Bldg **23P**
St Andrew's College **50**
St John's College **3H**
St Paul's College **12N**
Sancta Sophia College IF