

# Faculty of Engineering Handbook 2003

# University dates

## University semester and vacation dates 2003

Summer School	
Lectures begin	Monday 6 January
Lectures ends	Friday 7 March
Semester 1	
Lectures begin	Monday 10 March
Easter recess:	
Last day of lectures	Thursday 17 April
Lectures resume	Monday 28 April
Study vacation: 1 week beginning	Monday 16 June
Examinations commence	Monday 23 June
Lectures end	Saturday 5 July
Semester 2	
Lectures begin	Monday 28 July
Mid-semester recess:	
Last day of lectures	Friday 26 September
Lectures resume	Tuesday 7 October
Study vacation: 1 week beginning	Monday 3 November
Examinations commence	Monday 10 November
Lectures end	Saturday 22 November

### Last dates for withdrawal or discontinuation 2003

Semester 1 units of study	
Last day to add a unit	Friday 21 March
Last day for withdrawal	Monday 31 March
Last day to discontinue without failure (DNF)	Friday 2 May
Last day to discontinue (Discontinued - Fail)	Friday 13 June
Semester 2 units of study	
Last day to add a unit	Friday 8 August
Last day for withdrawal	Friday 31 August
Last day to discontinue without failure (DNF)	Friday 12 September
Last day to discontinue (Discontinued - Fail)	Friday 31 October

University semester and vacation dates 2001-2006 are listed in an Acrobat PDF document which can be downloaded from: policy.rms.usyd.edu.au/000004e.pdf.

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### Faculty of Engineering

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# 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 known 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 mamtaining 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. We have now expanded the Advanced Engineering Program to allow our best students to undertake research projects throughout their course.

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 wim 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.

# Message from the SUEUA President

As the president of SUEUA (Sydney University Engineering Undergraduate Association) it is my privilege to enlighten you of all the positive aspects that engineering at Sydney University has to offer. With an excellent reputation for producing engineers of both academic qualities and high leadership skills, Sydney University was my first and only choice for my higher education.

Here I have been lucky enough to further my leadership skills through my considerable involvement with SUEUA along with making many life long friends. Over the past three years it has been easy to see my personal growth in communication, self confidence and leadership, attributes that are highly commended in the professional world of engineering.

Over the past three years I have become involved in SUEUA and have taken the opportunities to network myself into the heart of the engineering community. Within this community balancing both academic studies and social events, the role of SUEUA is to represent the whole of the engineering society.

Essentially SUEUA is a social club, designed for all the strains of engineering students, to organise social events across the academic year helping to bring everyone together. Along with this we are an essential link to the administrative staff and academics who are dedicated to teaching, organisation of seminars and workshops that will increase our knowledge of the industry. This link with the professionals brings together the students with the advancing industry of the engineering world.

Socially, SUEUA is designed to help students during their time at university to expand their horizons and meet new people. At first University is quite a daunting sight with thousands of unknown faces all wandering through the university, however with the inaugural SUEUA 0-Week stand there is a place to go to see a happy face and chat with more experienced students with similar interests. We are always more than happy to help you out with any questions you have, whether they be directions to the bathroom or more importantly your oncoming years in engineering.

Only weeks into the first semester, First Year Camp is an excellent opportunity to meet other members from your faculty, both of the same age and older members who can provide excellent advice on university life. It is a character building weekend away and a chance to establish many new friends who will be there to support you throughout your time in engineering.

With major annual events including Beer'n'Bangers, Harba Crooz, Eggs and Kegs, Triva, and the Ball, there are many opportunities to relax and enjoy yourself during your time at University. Along with this there are numerous relaxing BBQ's, and during the warmer months there is the Slip'n'Slide, a chance to show off your talent at the impressive keg jump. This is an opportunity to train for the upcoming Interfaculty Sports events that are held throughout the year, where engineering has demonstrated their dominance winning the men's shield 65% of the time since the competition began.

Fellow students, do not let your time at university pass you by like another boring chapter of a novel. Let down your hair every now and then, and make sure you enjoy yourself. Try to experience everything that life has to offer, become involved, make new friends through social interactions. The friends that we make today will be our colleagues and business contacts that we work with tomorrow.

Enjoy your time at university, and have a great year. Lee Levsen, President SUEUA 2003



# 1 Guide to the Faculty

# The Faculty of Engineering

Faculty Building, J13 The University of Sydney NSW 2006 Australia Phone: (02) 9351 2534 Fax: (02) 9351 4654 Email: faculty@eng.usyd.edu.au Web: www.eng.usyd.edu.au Dean Professor Judy A Raper, BE PhD CPEng, FlChemE FIEAust Executive Assistant to the Dean Ms Kay Fielding Pro Dean Professor Yiu-Wing Mai, BSc(Eng) PhD H.K., D Eng, FTSE, FASME, FHKIE, FIE Aust Associate Dean (Postgraduate) Associate Professor Liangchi Zhang Associate Dean (Undergraduate) Dr Douglass Auld Associate Dean (Research) Professor John Carter Associate Dean (Teaching and Learning) Mr John Currie Associate Dean (First Year Teaching) Professor Greg Hancock Associate Dean (International) Associate Professor Liyong Tong Executive Officer Mr Eric van Wijk BSc (ANU) DipEd , DipAppEcon (UCan) Secretary to the Faculty and Finance Officer Mr Michael Whitley, BA(Hons) EastAnglia MCom U.N.S. W. ASA CIA FCIS FICD Dip Student Administration Staff Postgraduate Adviser - Ms Josephine Harty, BA Macq. Undergraduate Adviser - Mrs Annamaria Brancato External Relations and Scholarships Dr Alison Milful BA UNSW PhD UNSW Faculty Librarian Irene Rossendell BA (Qld), Dip Lib UNSW, ALIA

# The branches of Engineering

# Aerospace, Mechanical and Mechatronic Engineering

Phone: (02) 9351 2341 Fax: (02) 9351 7060

Email: <u>hod@aeromech.usyd.edu.au</u> Web: <u>www.aeromech.usyd.edu.au</u>

Head of School: Professor Assaad Masri

Administrative Officer: Ann 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 computerautomated manufacturing through the use of robots and automated machine tools. Mechatronics may be concerned with individual machines such as robots, or manufacturing systems automated in their entirety.

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

*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 (AIAA) operates in the Department, which together with the Royal Aeronautical Society, caters to the professional needs of the students. Our student society WINDSOC operates a varied social program.

The first two years of undergraduate study 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**

Phone: (02) 9351 2470 Fax: (02) 9351 2854 Email: <u>hod@chem.eng.usyd.edu.au</u>

Head: Professor James G Petrie

Administrative Manager: Annette Thomas

*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. Three of these introduce students to some important industries in the process field.

*Biochemical Engineering.* For those interested in 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'Ingenieurs de Genie Chimique in Toulouse, see five or six of our final year students completing their degrees at one of these Institutions each year, with similar numbers of their students finishing their courses in Sydney. There is also an exchange program with Iowa State University which allows one or two of our students to spend their third year there. Each of these exchange schemes includes Industrial Experience in the host country. Some financial assistance is available to approved students.

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

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

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

## Civil Engineering and Project Engineering and Management

Phone: (02) 9351 2136

Fax: (02) 9351 3343

Email: office@civil.usyd.edu.au

Head: Associate Professor Robert J. Wheen

Assistant to Head of Department - Undergraduate Matters: Ms Tmne Blair

The tide 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.

Graduates in project 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 multidisciplinary 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 physical sciences with an introduction to structural theory, design, construction, and the properties of materials.

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

In the fourth year, the basic courses of the third year are continued with an additional course which requires the preparation of a thesis. At honours level a more extensive thesis is required. A major segment of final year studies comprises options in structures, fluid mechanics, engineering management, soil mechanics and geomechanics.

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

*Quality Assurance:* For subjects originating in the Department of Civil Engineering, independent Quality Assurance Auditors have been appointed to ensure that high standards are maintained in the teaching of all subjects.

# Electrical, Telecommunications, Software and Computer Engineering

Phone: (02) 9351 3229

Fax: (02) 9351 3847

Email: <u>ug.enquiry@ee.usyd.edu.au</u> Web: www.ee.usyd.edu.au

Head: Professor Branka Vucetic

Manager, Academic Support Services: Erica 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, Software, 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 specialisations offered by the School of Electrical and Information Engineering - Electrical Engineering, Software, Telecommunications, ecommerce and Computer Engineeringare four year programs (for both Pass and Honours). They can, however, be taken as five year double degree programs with Arts, Commerce, Law, Medical Science or Science. Most combinations are possible. Students are also able to participate in

### GUIDE TO THE FACULTY

### The branches of Engineering

exchange programs with universities in Sweden, Hong Kong, the USA and other countries as part of their degree program.

The degree course includes 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 specialisation 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.

Telecommunications Engineering 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 problemsolving computer based projects, and aspects of modern workplace management, are features of the program.

The Computer Engineering specialisation 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. Computer Engineering 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.

Software Engineering has a common first year with Electrical, Telecommunication and Computer Engineering. 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 specialisation 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 mem 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 degree regulations

This chapter contains the regulations governing undergraduate degrees throughout the University and the regulations governing undergraduate degrees offered by the Faculty of Engineering.

# University of Sydney (Coursework) Rule 2000

### Preliminary

### 1. Commencement and purpose of Rule

- (1) This Rule is made by the Senate pursuant to section 37(1) of the University of Sydney Act 1989 for the purposes of the University of Sydney By-law 1999.
- (2) This Rule comes into force on 1 January 2001.
- (3) This Rule governs all coursework award courses in the University. It is to be read in conjunction with the University of Sydney (Amendment Act) Rule 1999 and the Resolutions of the Senate and the faculty resolutions relating to each award course in that faculty.

### Rules relating to coursework award courses

### 1. Definitions

In this Rule:

- *award course* means a formally approved program of study which can lead to an academic award granted by the University.
- *coursework* means an award course not designated as a research award course. While the program of study in a coursework award course may include a component of original, supervised research, other forms of instruction and learning normally will be dominant. All undergraduate award courses are coursework award courses;
- *credit* means advanced standing based on previous attainment in another award course at the University or at another institution. The advanced standing is expressed as credit points granted towards the award course. Credit may be granted as specific credit or non-specific credit. *Specific credit* means the recognition of previously completed studies as directly equivalent to units of study. *Non-specific credit* means a 'block credit' for a specified number of credit points at a particular level. These credit points may be in a particular subject area but are not linked to a specific unit of study;
- *credit points* mean a measure of value indicating the contribution each unit of study provides towards meeting award course completion requirements stated as a total credit point value;
- *dean* means the dean of a faculty or the director or principal of an academic college or the chairperson of a board of studies; *degree* means a degree at the level of bachelor or master for the
- *aegree* means a aegree at the level of bachelor or master for the purpose of this Rule;
- *embedded courses/programs* means award courses in the graduate certificate/graduate diploma/master's degree by coursework sequence which allow unit of study credit points to count in more than one of the awards;
- *faculty* means a faculty, college board, a board of studies or the Australian Graduate School of Management Limited as established in each case by its constitution and in these Rules refers to the faculty or faculties responsible for the award course concerned;
- *major* means a defined program of study, generally comprising specified units of study from later stages of the award course;
- *minor* means 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; nestoraduate award course means on award course leading to the
- *postgraduate award course* means an award course leading to the award of a graduate certificate, graduate diploma, degree of master or a doctorate. Normally, a postgraduate award course requires the prior completion of a relevant undergraduate degree or diploma.

- research award course means an award course in which students undertake and report systematic, creative work in order to increase the stock of knowledge. The research award courses offered by the University are: higher doctorate, Doctor of Philosophy, doctorates by research and advanced coursework, and certain degrees of master designated as research degrees. The systematic, creative component of a research award course must comprise at least 66% of the overall award course requirements;
- *stream* means a defined program of study within an award course, which requires the completion of a program of study specified by the award course rules for the particular stream, in addition to the core program specified by award course rules for the award course.
- student means a person enrolled as a candidate for a course; testamur means a certificate of award provided to a graduate, usually at a graduation ceremony;
- transcript or academic transcript means a printed statement setting out a student's academic record at the University;
- *unit of study* means the smallest stand-alone component of a student's award course that is recordable on a student's transcript. Units of study have an integer credit point value, normally in the range 3-24;
- *undergraduate award course* means an award course leading to the award of an associate diploma, diploma, advanced diploma or degree of bachelor.
- 2. Authorities and responsibilities
- (1) Authorities and responsibilities for the functions set out in this Rule are also defined in the document *Academic Delegations of Authority*. The latter document sets out the mechanisms by which a person who has delegated authority may appoint an agent to perform a particular function.
- (2) The procedures for consideration of, and deadlines for submission of, proposals for new and amended award courses will be determined by the Academic Board.

### Division 1 -Award course requirements, credit points and assessment

### 3. Award course requirements

- To qualify for the award of a degree, diploma or certificate, a student must:
  - (a) complete the award course requirements specified by the Senate for the award of the degree, diploma or certificate concerned;
  - (b) complete any other award course requirements specified by the Academic Board on the recommendation of the faculty and published in the faculty resolutions relating to the award course;

(c) complete any other award course requirements specified by the faculty in accordance with its delegated authority and published in the faculty resolutions relating to the award course; and

(d) satisfy the requirements of all other relevant by-laws, rules and resolutions of the University.

### 4. Units of study and credit points

(1) (a) A unit of study comprises the forms of teaching and learning approved by a faculty. Where the unit of study is being provided specifically for an award course which is the responsibility of another faculty, that faculty must also provide approval.

(b) Any faculty considering the inclusion of a unit of study in the tables of units available for an award course for which it is responsible may review the forms of teaching and learning of that unit, may consult with the approving faculty about aspects of that unit and may specify additional conditions with respect to inclusion of that unit of study.

- (2) A student completes a unit of study if the student:(a) participates in the learning experiences provided for the unit of study;
  - (b) meets all examination, assessment and attendance requirements for the unit of study; and

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(c) passes the required assessments for the unit of study. (3) Each unit of study is assigned a specified number of credit

- points by the faculty responsible for the unit of study.
- (4) The total number of credit points required for completion of an award course will be as specified in the Senate resolutions relating to the award course.
- (5) The total number of credit points required for completion of award courses in an approved combined award course will be specified in the Senate or faculty resolutions relating to the award course.
- (6) A student may, under special circumstances, and in accordance with faculty resolutions, be permitted by the relevant dean to undertake a unit or units of study other than those specified in the faculty resolutions relating to the award course and have that unit or those units of study counted towards fulfilling the requirements of the award course in which the student is enrolled.

### 5. Unit of study assessment

- (1) A student who completes a unit of study will normally be awarded grades of high distinction, distinction, credit or pass, in accordance with policies established by the Academic Board. The grades high distinction, distinction and credit indicate work of a standard higher than that required for a pass.
- (2) A student who completes a unit of study for which only a pass/fail result is available will be recorded as having satisfied requirements.
- (3) In determining the results of a student in any unit of study, the whole of the student's work in the unit of study may be taken into account.
- (4) Examination and assessment in the University are conducted in accordance with the policies and directions of the Academic Board.

### 6. Attendance

- (1) A faculty has authority to specify the attendance requirements for courses or units of study in that faculty. A faculty must take into account any University policies concerning modes of attendance, equity and disabled access.
- (2) A faculty has authority to specify the circumstances under which a student who does not satisfy attendance requirements may be deemed not to have completed a unit of study or an award course.

### **Division 2 - Enrolment**

### 7. Enrolment restrictions

- (1) A student who has completed a unit of study towards the requirements of an award course may not re-enrol in that unit of study, except as permitted by faculty resolution or with the written permission of the dean. A student permitted to reenrol may receive a higher or lower grade, but not additional credit points.
- (2) Except as provided in sub-section (1), a student may not enrol in any unit of study which overlaps substantially in content with a unit that has already been completed or for which credit or exemption has been granted towards the award course requirements.
- (3) A student may not enrol in units of study additional to award course requirements without first obtaining permission from the relevant dean.
- (4) Except as prescribed in faculty resolutions or with the permission of the relevant dean:

(a) a student enrolled in an undergraduate course may not enrol in units of study with a total value of more than 32 credit points in any one semester, or 16 credit points in the summer session; and

(b) a student enrolled in a postgraduate award course may not enrol in units of study with a total value of more than 24 credit points in any one semester, or 12 credit points in the summer session.

# Division 3 - Credit, cross-institutional study and their upper limits

### 8. Credit for previous studies

- (1) Students may be granted credit on the basis of previous studies.
- (2) Notwithstanding any credit granted on the basis of work completed or prior learning in another award course at The University of Sydney or in another institution, in order to qualify for an award a student must:

(a) for undergraduate award courses, complete-a minimum of the equivalent of two full-time semesters of the award course at the University; and

(b) for postgraduate award courses, complete at least fifty percent of the requirements prescribed for the award course at the University.

These requirements may be varied where the work was completed as part of an embedded program at the University or as part of an award course approved by the University in an approved conjoint venture with another institution.

- (3) The credit granted on the basis of work completed at an institution other than a university normally should not exceed one third of the overall award course requirements.
- (4) A faculty has authority to establish embedded academic sequences in closely related graduate certificate, graduate diploma and master's degree award courses. In such embedded sequences, a student may be granted credit for all or some of the units of study completed in one award of the sequence towards any other award in the sequence, irrespective of whether or not the award has been conferred.
- (5) In an award course offered as part of an approved conjoint venture the provisions for the granting of credit are prescribed in the Resolutions of the Senate and the faculty resolutions relating to that award course.

## 9. Cross-institutional study

- (1) The relevant dean may permit a student to complete a unit or units of study at another university or institution and have that unit or those units of study credited to the student's award course.
- (2) The relevant dean has authority to determine any conditions applying to cross-institutional study.

### **Division 4 - Progression**

### 10. Repeating a unit of study

(1) A student who repeats a unit of study shall, unless granted exemption by the relevant dean:

(a) participate in the learning experiences provided for the unit of study; and

(b)meet all examination, assessment and attendance requirements for the unit of study.

(2) A student who presents for re-assessment in any unit of study is not eligible for any prize or scholarship awarded in connection with that unit of study without the permission of the relevant dean.

### 11.Time limits

A student must complete all the requirements for an award course within ten calendar years or any lesser period if specified by Resolution of the Senate or the faculty.

# Division 5 - Discontinuation of enrolment and suspension of candidature

### 12. Discontinuation of enrolment

- A student who wishes to discontinue enrolment in an award course or a unit of study must apply to the relevant dean and will be presumed to have discontinued enrolment from the date of that application, unless evidence is produced showing:

   (a) that the discontinuation occurred at an earlier date; and
   (b) that there was good reason why the application could not be made at the earlier time.
- (2) A student who discontinues enrolment during the first year of enrolment in an award course may not re-enrol in that award course unless:

(a) the relevant dean has granted prior permission to re-enrol; or

(b) the student is reselected for admission to candidature for that course.

- (3)No student may discontinue enrolment in an award course or unit of study after the end of classes in that award course or unit of study, unless he or she produces evidence that:(a) the discontinuation occurred at an earlier date; and(b) there was good reason why the application could not be made at the earlier time.
- (4) A discontinuation of enrolment may be recorded as *Withdrawn (W)* or *Discontinued not to count as failure (DNF)* where that discontinuation occurs within the time-frames specified by the University and published by the faculty, or where the student meets other conditions as specified by the relevant faculty.

### UNDERGRADUATE DEGREE REGULATIONS

### 13. Suspension of candidature

- (1) A student must be enrolled in each semester in which he or she is actively completing the requirements for the award course. A student who wishes to suspend candidature must first obtain approval from the relevant dean.
- (2) The candidature of a student who has not re-enrolled and who has not obtained approval from the dean for suspension will be deemed to have lapsed.
- (3) A student whose candidature has lapsed must apply for readmission in accordance with procedures determined by the relevant faculty.
- (4) A student who enrols after suspending candidature shall complete the requirements for the award course under such conditions as determined by the dean.

### Division 6 - Unsatisfactory progress and exclusion

### 14. Satisfactory progress

A faculty has authority to determine what constitutes satisfactory progress for all students enrolled in award courses in that faculty, in accordance with the policies and directions of the Academic Board.

### 15.Requirement to show good cause

(1) For the purposes of this Rule, good cause means circumstances beyond the reasonable control of a student, which may include serious ill health or misadventure, but does not include demands of employers, pressure of employment or time devoted to non-University activities, unless these are relevant to serious ill health or misadventure. In all cases the onus is on the student to provide the University with satisfactory evidence to establish good cause. The University may take into account relevant aspects of a student's record in other courses or units of study within the University and relevant aspects of academic studies at other institutions provided that the student presents this information to the University.

- (2) The relevant dean may require a student who has not made satisfactory progress to show good cause why he or she should be allowed to re-enrol.
- (3) The dean will permit a student who has shown good cause to re-enrol.

### 16.Exclusion for failure to show good cause

- The dean may, where good cause has not been established:
- (1) exclude the student from the relevant course; or
- (2) permit the student to re-enrol in the relevant award course subject to restrictions on units of study, which may include, but are not restricted to:
  - (a) completion of a unit or units of study within a specified time:

(b) exclusion from a unit or units of study, provided that the dean must first consult the head of the department responsible for the unit or units of study; and

(c) specification of the earliest date upon which a student may re-enrol in a unit or units of study.

### 17. Applying for re-admission after exclusion

- (1) A student who has been excluded from an award course or from a unit or units of study may apply to the relevant dean for readmission to the award course or re-enrolment in the unit or units of study concerned after at least 4 semesters, and that dean may readmit the student to the award course or permit the student to re-enrol in the unit or units of study concerned.
- (2) With the written approval of the relevant dean, a student who has been excluded may be given credit for any work completed elsewhere in the University or in another university during a period of exclusion.

### 18. Appeals against exclusion

- (1)In this Rule a reference to the Appeals Committee is a reference to the Senate Student Appeals Committee (Exclusions and Readmissions).
- (2) (a) (i) A student who has been excluded in accordance with this Rule may appeal to the Appeals Committee.
  (ii) A student who has applied for readmission to an award course or re-enrolment in a unit of study after a period of exclusion, and who is refused readmission or re-enrolment may also apply to the Appeals Committee.
  - may also apply to the Appeals Committee.
    (b) The Appeals Committee shall comprise:

    (i) 3 ex officio members (the Chancellor, the Deputy Chancellor and the Vice-Chancellor and Principal);
    (ii) the Chair and Deputy Chairs of the Academic Board;
    - (iii) 2 student Fellows; and
    - (iv) up to 4 other Fellows.

(c) The Appeals Committee may meet as one or more subcommittees providing that each sub-committee shall include at least 1 member of each of the categories of:

- (i) ex officio member;
- (ii) Chair or Deputy Chair of the Academic Board;
- (iii) student Fellow; and
- (iv) other Fellows.

(d) Three members shall constitute a quorum for a meeting of the Appeals Committee or a sub-committee.

(e) The Appeals Committee and its sub-committees have authority to hear and determine all such appeals and must report its decision to the Senate annually.

(f) The Appeals Committee or a sub-committee may uphold or disallow any appeal and, at its discretion, may determine the earliest date within a maximum of four semesters at which a student who has been excluded shall be permitted to apply to re-enrol.

(g)No appeal shall be determined without granting the student the opportunity to appear in person before the Appeals Committee or sub-committee considering the appeal. A student so appearing may be accompanied by a friend or adviser.

(h)The Appeals Committee or sub-committee may hear the relevant dean but that dean may only be present at those stages at which the student is permitted to be present. Similarly, the dean is entitled to be present when the Committee or sub-committee hears the student.

(i) If, due notice having been given, a student fails to attend a meeting of the Appeals Committee or sub-committee scheduled to consider that student's appeal, the Appeals Committee or sub-committee, at its discretion, may defer consideration of the appeal or may proceed to determine the appeal.

(j) A student who has been excluded in accordance with these resolutions and has lodged a timely appeal against that exclusion may re-enrol pending determination of that appeal if it has not been determined by the commencement of classes in the next appropriate semester.

### **Division 7 - Exceptional circumstances**

# 19. Variation of award course requirements in exceptional circumstances

The relevant dean may vary any requirement for a particular student enrolled in an award course in that faculty where, in the opinion of the dean, exceptional circumstances exist.

# Division 8 - Award of degrees, diplomas and certificates

### 20. Classes of award

- Undergraduate diplomas may be awarded in five grades pass, pass with merit, pass with distinction, pass with high distinction or honours.
- (2) Degrees of bachelor may be awarded in two grades pass or honours.
- (3) Graduate diplomas and graduate certificates may be awarded in one grade only pass.
- in one grade only pass.(4) Degrees of master by coursework may be awarded three grades pass, pass with merit or honours.

### 21.Award of the degree of bachelor with honours

- (1) The award of honours is reserved to indicate special proficiency. The basis on which a student may qualify for the
- award of honours in a particular award course is specified in the faculty resolutions relating to the course.
- (2) Each faculty shall publish the grading systems and criteria for the award of honours in that faculty.
- (3) Classes which may be used for the award of honours are: First Class
  - Second Class/Division 1
  - Second Class/Division 2
  - Third Class.
- (4) With respect to award courses which include an additional honours year:

(a) a student may not graduate with the pass degree while enrolled in the honours year;

(b) on the recommendation of the head of the department concerned, a dean may permit a student who has been awarded the pass degree at a recognised tertiary institution to

enrol in the honours year in that faculty; (c) faculties may prescribe the conditions under which a

student may enrol part-time in the honours year;

### Bachelor of Engineering

(d) a student who fails or discontinues the honours year may not re-enrol in it, except with the approval of the dean.

22. University Medal

An honours bachelor's degree student with an outstanding academic record throughout the award course may be eligible for the award of a University medal, in accordance with Academic Board policy and the requirements of the faculty resolutions relating to the award course concerned.

23.Award of the degree of master with honours or merit The award of honours or pass with merit is reserved to indicate special proficiency or particular pathways to completion. The basis on which a student may qualify for the award of honours or the award with merit in a particular degree is specified in the faculty resolutions relating to that degree.

### 24. Transcripts and testamurs

- (1) A student who has completed an award course or a unit of study at the University will receive an academic transcript upon application and payment of any charges required.
- (2)Testamurs may indicate streamsor majors or both as specified in the relevant faculty resolutions.

### **Division 9 - Transitional provisions**

## 25. Application of this Rule during transition

This Rule applies to all candidates for degrees, diplomas and certificates who commence candidature after 1 January 2001. Candidates who commenced candidature prior to this date may choose to proceed in accordance with the resolutions of the Senate in force at the time they enrolled, except that the faculty may determine specific conditions for any student who has re-enrolled in an award course after a period of suspension.

# Bachelor of Engineering

## Resolutions of the Senate

### [Subject to Senate approval]

These Resolutions must be read in conjunction with the University of Sydney (Coursework) Rule 2000 (as amended), that sets out the requirements for all undergraduate courses, and the relevant Resolutions of the Faculty of Engineering.

- 1. Specialisations
- The BE degree is awarded in the following specialisations:
- (1)School of Aerospace, Mechanical and Mechatronic
  - Engineering -
  - (a) Aeronautical Engineering(b) Aeronautical Engineering (Management)
  - (c) Aeronautical Engineering (Managemen (c) Aeronautical Engineering (Space)
  - (d) Mechanical Engineering
  - (e) Mechanical Engineering (Biomedical)
  - (f) Mechanical Engineering (Management)
  - (f) Mechanical Engineering (Managem (g) Mechanical Engineering (Space)
  - (b) Mechatronic Engineering (5)
  - (i) Mechatronic Engineering (Management)
  - (j) Mechatronic Engineering (Management) (j) Mechatronic Engineering (Space)
- (2) Department of Chemical Engineering -
  - (a) Chemical Engineering
  - (b) Chemical Engineering (Bio-Process)
  - (c) Chemical Engineering (Environmental and Energy)
  - (d) Chemical Engineering (Management)
- (e) Chemical Engineering (Process and Computer Systems)
   (3) Department of Civil Engineering -
  - (a) Civil Engineering
  - (b) Civil Engineering (Construction Management)
  - (c) Civil Engineering (Environmental)
  - (d) Civil Engineering (Geomechanics)
  - (e) Civil Engineering (Structures)
  - (f) Project Engineering and Management (Civil)
- (4) School of Electrical and Information Engineering -
  - (a) Computer Engineering
  - (b) Electrical Engineering
  - (c) Electrical Engineering (Management)
  - (d) Electronic Commerce
  - (e) Software Engineering
  - (f) Telecommunications Engineering
- 2. Combined degree courses
- The BE degree is offered in the following combined degree courses:

- (1)Bachelor of Engineering/Bachelor of Arts
- (2) Bachelor of Engineering/Bachelor of Commerce
- (3) Bachelor of Engineering/Bachelor of Laws
- (4) Bachelor of Engineering/Bachelor of Medical Science
- (5)Bachelor of Engineering/Bachelor of Science
- 3. Requirements for the degree at pass level
- (1) Single degree course
- To qualify for the award of the BE degree at pass level, a student must:

(a) complete successfully units of study giving credit for a total of 192 credit points; and

(b) satisfy the requirements of all other relevant By-laws, Rules and Resolutions of the University.

- (2) Combined degree course
- To qualify for the award of the BE degree at pass level in a combined degree course, a student must complete the requirements published in the Resolutions of the Faculty of Engineering and in the Joint Resolutions of the Faculty of Engineering and the Faculties of Arts, Economics and Business, Law or Science, as the case may be.
- 4. Requirements for the degree with Honours

To qualify for the award of the BE degree with Honours, both in the single degree and the combined degree courses, a student must:

- (1) complete the requirements for the pass degree;
- (2) complete the Honours requirements published in the Resolutions of the Faculty of Engineering relating to the BE degree; and
- (3) satisfy the requirements of all other relevant By-laws, Rules and Resolutions of the University.

# Resolutions of the Faculty of Engineering

### Section 1

These Resolutions must be read in conjunction with the University of Sydney (Coursework) Rule 2000 (as amended), that sets out the requirements for all undergraduate courses, and the Resolutions of the Senate relating to this course. *Definitions* 

- In these Resolutions:
- Committee for Undergraduate Studies means the Committee for Undergraduate Studies of the Faculty of Engineering;
- *credit points* are a measure of value indicating the contribution that each unit of study provides towards meeting the BE degree completion requirements;
- Dean means the Dean of the Faculty of Engineering;
- degree means the degree of Bachelor of Engineering;
- *department-* means the department or school in the Faculty of Engineering in which the student is proceeding (namely: the School of Aerospace, Mechanical and Mechatronic Engineering; the Department of Chemical Engineering; the Department of Civil Engineering; or the School of Electrical and Information Engineering);
- Faculty means the Faculty of Engineering;
- *GWAM* means Grand Weighted Average Mark and is the WAM calculated over all units of study undertaken in a degree course (except those "Discontinued - Not to count as failure" and those with only a "Satisfied Requirements" result), weighted according to credit point value and the year-levels (1,2,3 or 4) of the units of study. The *GWAM* may be expressed as:

# $GWAM = \frac{\sum (mark \times credit \text{ points } \times \text{ year level})}{\sum (mark \times credit \text{ points } \times \text{ year level})}$

### $\sum$ (credit points × year level)

- Specialisation means a defined program of study in the BE degree that requires the completion of the specific requirements prescribed for that subject area and defines what will appear on the testamur;
- *student* means a person enrolled for the degree of Bachelor of Engineering;
- *SWAM* means Semester Weighted Average Mark and is the WAM calculated over all units of study undertaken in a semester (except those 'Discontinued Not to count as failure' and those with only a 'Satisfied Requirements' result), weighted according to credit point value. The *SWAM* may be expressed as:

$$SWAM = \frac{\sum(\text{mark} \times \text{credit points})}{\sum(\text{credit points})}$$

- unit of study or unit- is the smallest stand-alone component of a candidate's course that is recordable on a candidate's transcript;
- University means The University of Sydney.
- WAM means Weighted Average Mark and is the average mark obtained over a nominated set of units of study weighted according to one or more characteristics of the units.
- **Specialisations**
- (1) The degree of Bachelor of Engineering is offered in the following specialisations:
  - (a) in the School of Aerospace, Mechanical and Mechatronic Engineering -
    - (i) Aeronautical Engineering
    - (ii) Aeronautical Engineering (Management)
    - (iii) Aeronautical Engineering (Space)
    - (iv) Mechanical Engineering
    - (v) Mechanical Engineering (Biomedical)
    - (vi) Mechanical Engineering (Management)
    - (vii) Mechanical Engineering (Space)
    - (viii) Mechatronic Engineering
    - (ix) Mechatronic Engineering (Management)
  - (x) Mechatronic Engineering (Space) (b)in the Department of Chemical Engineering -
    - (i) Chemical Engineering
    - (ii) Chemical Engineering (Bio-Process)
    - (iii) Chemical Engineering (Environmental and Energy)
    - (iv) Chemical Engineering (Management)
    - (v) Chemical Engineering (Process and Computer
    - Systems)
  - (c) in the Department of Civil Engineering -
    - (i) Civil Êngineering
    - (ii) Civil Engineering (Construction Management)
    - (iii) Civil Engineering (Environmental)
    - (iv) Civil Engineering (Geomechanics)
    - (v) Civil Engineering (Structures)
  - (vi) Project Engineering and Management (Civil) (d)in the School of Electrical and Information Engineering -
    - (i) Computer Engineering
    - (ii) Electrical Engineering
    - (iii) Electrical Engineering (Management)
    - (iv) Electronic Commerce
    - (v) Software Engineering
  - (vi) Telecommunications Engineering
- (2) (a) (i) Most specialisations are offered as part of a combined course with the degrees of Bachelor of Arts (BA), Bachelor of Commerce (BCom), Bachelor of Laws (LLB), Bachelor of Medical Science (BMedSc) or Bachelor of Science (BSc). (ii) The availability of a specific combination is

  - determined by the relevant department.
  - (b) Resolutions relating to the combined courses are set out in the Joint Resolutions of the Faculty of Engineering and the Faculty of Arts, Economics and Business, Law or Science, as the case may be.
- (3) The testamur for the degree shall specify the specialisation for which the degree is awarded.
- (4) A student who is a candidate for the degree in any specialisation may apply:
  - (a) to the Dean for permission to transfer candidature to any other specialisation for the degree where that specialisation is offered by another Engineering department; or
  - (b) to the head of the relevant department for permission to transfer candidature to any other specialisation for the degree where the two specialisations are offered by the same department.
- *Combined degree courses*
- (1)The BE degree is offered in the following combined degree courses:
  - (a) Bachelor of Engineering/Bachelor of Arts
  - (b)Bachelor of Engineering/Bachelor of Commerce
  - (c) Bachelor of Engineering/Bachelor of Laws
  - (d)Bachelor of Engineering/Bachelor of Medical Science
  - (e) Bachelor of Engineering/Bachelor of Science.
- (2) Not all specialisations are available in each combined degree course.
- 3. Levels of award

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- The degree shall be awarded in one of two grades Pass or Honours.
- 4. Requirements for the degree at pass level
- (1) Single degree course

- Bachelor of Engineering
- To qualify for the award of the degree at pass level, a student must complete units of study that total at least 192 credit points and comprise:
- (a) the core units of study set out in the Specialisation Requirements relating to the specialisation that the student is pursuing: and
- (b) recommended elective units of study, to the credit point value specified in the relevant Specialisation Requirements; and
- (c) such additional free elective units of study as may be necessary to gain credit for a total of not less than 192 credit points.
- (2) Combined degree course
  - To qualify for the award of the BE degree in a combined degree course, a student must complete:
  - (a) the requirements set out in the Specialisation Requirements relating to the BE specialisation that the
  - student is pursuing: and
  - (b) such other requirements as are prescribed in the Joint Faculty Resolutions of the Faculty of Engineering and the Faculty of Arts, Economics and Business, Law or Science, as the case may be.
- Requirements for the degree with Honours
- (1)To qualify for the award of the degree with Honours, both in the single degree and the combined degree courses, a student must: (a) complete the requirements for the pass degree; and
- (b) achieve a level of performance as defined by the GWAM (Grand Weighted Average Mark).
- (2) (a) The GWAM used for Honours assessment includes all attempts at all units of study completed while a student is enrolled at the University (in both single and combined degree courses).
- (b) Units at a level higher than 4 are treated as level 4 units. (3) The various classes of Honours are awarded on the basis of a student's GWAM, as follows:
  - First Class: GWAM > 75
  - Second Class/ Division 1: 70 < GWAM < 75
- Second Class/Division 2: 65 < GWAM < 70 (4) Any student with a GWAM greater than 85 will be considered eligible for the award of a University Medal.
- (5) In exceptional circumstances the head of the relevant department may recommend to the Dean that the above conditions for the award of Honours be varied.
- Units of study
- (1)The programs of units of study for each of the specialisations are set out in the Specialisation Requirements appended to these Resolutions.
- (2) The Specialisation Requirements indicate: (a) the core units of study prescribed, and the recommended electives available, for each specialisation; (b)the credit point values of the units;
  - (c) any assumed knowledge, pre-requisite or co-requisite requirements; and
  - (d) any prohibitions placed on units of study.
- (3) A unit of study shall comprise such lectures, tutorial instruction, assignments and practical work as the Faculty may prescribe.
- (4) In order to complete a unit of study a student shall, except as provided in section 13.(3):
  - (a) attend the lectures and laboratory/tutorial classes;
  - (b) complete satisfactorily any assignments and practical work; and
  - (c) pass any examinations;
- prescribed for that unit. (5) A student may enrol in units of study only in accordance with
- these Resolutions and subject to the constraints of the timetable, unless approval is given by the head of the relevant department.

## Section 2

- 8. Specialisation Requirements
- (1) Glossary
  - For the purposes of these Resolutions:
  - (a) a 'core' unit means a unit of study that must be completed in order to qualify for the award of the degree in the specialisation that the student is pursuing, unless exemption is granted by the head of the relevant department;

### **Bachelor of Engineering**

(b) *'recommended elective'* units mean units of study listed in the various Specialisation Requirements from which students must complete a specific number of credit points as prescribed for the relevant specialisation;

(c) a *'free elective'* unit means a unit of study other than a core or recommended elective unit of study;

(d) *'assumed knowledge'* - means curricular material that is taken to be known by each student who enrols in a unit of study;

(e) a *'pre-requisite'* means a unit of study that must have been completed with a grade of Pass (Concessional) or better before a student may enrol in any unit of study for which that unit of study has been prescribed as a prerequisite;

(f) a *'co-requisite'* means a unit of study in which a student must enrol concurrently with any unit of study for which that unit of study has been prescribed as a co-requisite unless the unit has been completed previously;

(g) **'prohibition'** refers to two or more units of study deemed to be mutually exclusive.

(2) Core and recommended elective units of study

(a) The Dean may permit a student of exceptional merit to undertake a unit or units of study within the Faculty other than those specified in the Specialisation Requirements.

(b) The head of the relevant department may:

(i) prescribe any unit of study as an acceptable alternative to one or more of the units of study set out in the Specialisation Requirements;

(ii) designate as a recommended elective a unit of study not listed in the relevant Specialisation Requirements; (iii) accept other work completed by a student as the equivalent of a co-requisite or pre-requisite for any unit of study offered by that department.

(c) Not all recommended elective units of study set out in the Specialisation Requirements shall necessarily be available each year.

(3) Units of study offered by departments other than Engineering departments

A student who enrols in a unit of study offered by a department other than an Engineering department shall do so in accordance with any rules and requirements prescribed by the department offering that unit of study.

- 9. Enrolment restrictions
- (1)FirstYear

A student in the first year of attendance, who commences candidature in First Semester, shall normally enrol in Level 1 units of study totalling not less than 48 credit points and not more than 54 credit points, with no more than 30 credit points being attempted in either of the first two semesters of enrolment.

(2) Later years

In each year of attendance after the first, a student may enrol in any of the units of study for which there is no pre-requisite or for which the student has completed the pre-requisite(s), provided that:

(a) in the second year of attendance a student may enrol in Level 1 and/or Level 2 units of study only;

(b) a student shall enrol in any core units of study for which he or she was qualified to enrol in the previous year of attendance and for which credit has not yet been gained; and

(c) except as provided in sub-sections (d) and (e) below, a student may not enrol in units of study -  $% \left( \left( {{{\bf{x}}_{i}}} \right) \right) = \left( {{{\bf{x}}_{i}}} \right)$ 

(i) totalling more than 54 credit points for the year or totalling more than 30 credit points in either semester, or (ii) totalling less than 36 credit points for the year, unless the student already has credit for 156 or more credit points.

(d)The director of undergraduate studies in the relevant Engineering department may permit a student who has demonstrated academic merit in the two previous consecutive semesters of enrolment to enrol in up to 60 credit points in one year and/or up to 32 credit points in one semester. (e) In exceptional circumstances, the Chair of the Committee for Undergraduate Studies may permit a student who has demonstrated academic merit in the two previous consecutive semesters of enrolment to enrol in excess of 60 credit points in one year and/or in excess of 32 credit points in one semester.

(3) Students admitted with advanced standing or in Second Semester

The head of the relevant department may vary the requirements of sub-sections (1) and (2) in respect of students who have either been admitted to candidature with advanced standing or who have commenced candidature in Second Semester

(4) Summer Session

(a) The enrolment restrictions set out in sub-sections (1) and(2) do not apply to any units of study that a student may attempt during the Summer Session at Summer School.(b) A student may not enrol in more than 16 credit points during a Summer Session.

- 10. Credit for previous studies
- (1) The head of the relevant department may grant to a student admitted to candidature credit towards the degree for previously completed studies.
- (2) A student who has completed units of study towards a course in another faculty of the University or at another tertiary institution may be granted credit for:
  (a) any of the specific units of study set out in the Specialisation Requirements, up to a maximum of 96 credit points, if that other course has been awarded or conferred or if the credit points accumulated towards that course are being maintained with a view to completion/award of the course; or
  (b) any of the specific units of study set out in the Specialisation Requirements, provided that the student has abandoned credit for such units in the other faculty.
- (3) Subject to the 96 credit point upper limit prescribed in subsection (2)(a), a student who has completed units of study that are not comparable with any of the units of study set out in the Specialisation Requirements may be granted non-specific credit at First, Second, Third and/or Fourth Year level.
- 11. Cross-institutional study
- (1) The head of the relevant department may permit a student to undertake units of study at another tertiary institution, to count towards the degree. Normally such permission will be given only where a comparable unit is not available at the University.
- (2) Where a student completes such approved studies, the head of the department may grant credit for:
  (a) any of the specific units of study set out in the Specialisation Requirements, and/or
  (b) non-specific credit at First, Second, Third and/or Fourth Year level.
- H.Assessment
- (1)Forms of assessment

(a) Students may be tested by written and oral examinations, assignments and practical work, or any combination of these, as the Faculty may determine.

(b) Written information on class requirements and attendance and all aspects of assessment (including criteria for satisfactory and meritorious performance, and the weighting of assessment components), will be made available to students within one week of the commencement of a unit of study.

(2) Results in units of study

(a) A student will be awarded a final grade in each unit of study attempted.

(b)The permanent results used by the Faculty of Engineering are as follows:

Grade	Description	Marks and comments
HD	High Distinction	85-100
D	Distinction	75-84
CR	Credit	65-74
Р	Pass	50-64
R	Satisfied requirements	This is used in Pass/Fail only outcomes.
UCN	Unit of study continuing	Used at the end of a semester for units of study which have been approved to extend into a following semester.
F	Fail	0-49

### UNDERGRADUATE DEGREE REGULATIONS

Grade	Description	Marks and comments
PCON	Pass (Concessional)	A student with a mark in the range 46-49 in an Engineering unit of study may be awarded a PCON. The maximum credit points for which PCONs may be awarded are: 50 < SWAM < 55: PCONs of up to 4 credit points; SWAM > 55: PCONs of up to 8 credit points. The Faculty of Engineering will not normally award a PCON if a student has failed three or more units in that semester.
AF	Absent Fail	
W	Withdrawn	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	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). The 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	This applies from the time DNF ceases to be automatically available up to the cessation of classes for the unit of study.

(c) Various temporary results such as 'INC (Incomplete) may also be used from time to time.

(3) Appeals against academic decisions

Any appeal by a student against an academic decision will be dealt with in accordance with the appropriate Resolutions of the Senate.

13. Progression

(1)Attendance

(a) In order to complete a unit of study, a student must attend the prescribed lectures, tutorials and practical classes.

(b) A student who has been absent from a significant number of classes in any one semester because of accident, illness or misadventure shall report the circumstances to the relevant department(s) on an "Application for Special Consideration" form.

(c) A student who misses more than a fortnight of classes in any one semester may be called upon to show good cause by the relevant head of department why he or she should not be deemed to have failed that unit of study. If the student does not show good cause, he or she may be failed in that unit of study.

### (2) Credit for units of study

A student shall receive credit towards the degree requirements for the credit point value of each unit of study completed in accordance with the relevant Specialisation Requirements, or with special permission in accordance with these Resolutions, except that:

(a) a student may not receive credit for more than one of such units of study that are deemed to be prohibited or mutually exclusive in the Specialisation Requirements;

(b) a student may not receive credit for units of study that the head of department has deemed or regards as being mutually exclusive:

(c) a student may not enrol in and receive additional credit for units of study for which the student has already been granted credit on the basis of previous study completed in another faculty or at another institution.

(3) Repeating a unit of study

(a) A student may not enrol in a unit of study that is offered by an Engineering department and that the student has completed previously with a grade of Pass (Concessional) or better. (b) Where a student re-enrols in an Engineering unit of study, the student shall attend all classes and complete all practical and written work prescribed for that unit, unless exempted from any of these requirements by the unit co-ordinator. (c) A student who has failed and repeats a unit of study shall not be eligible for any prize or scholarship awarded in connection with that unit of study.

(4) Special consideration on the grounds of illness and misadventure

A student who has been prevented by duly certified illness or misadventure from completing all or part of the assessment for a unit of study may be tested at such times and in such a way as the relevant head of department shall determine. This shall not be regarded as a re-examination.

### (5) Time limits

A student must complete all the requirements for the BE degree within eight calendar years, and within ten calendar years where the degree is taken in a combined degree course.

(6) Discontinuation of enrolment Degree course

(a) A student who wishes to discontinue enrolment for the degree must apply to the Dean and will be presumed to have discontinued from the date of that application, unless evidence is produced showing that:

(i) the discontinuation occurred at an earlier date; and (ii) there was good reason why the application could not be made at the earlier time.

(b) A student who discontinues enrolment during the first year of enrolment for the degree may not re-enrol in the degree unless

(i) tie Dean has granted prior permission for re-enrolment; or

(ii) the student is re-selected for admission to candidature. (c) No student may discontinue enrolment for the degree after the end of classes in the particular semester, unless he or she produces evidence that:

(i) the discontinuation occurred at an earlier date; and

(ii) there was good reason why the application could not be made at the earlier time.

Units of study

(d) A student who wishes to discontinue enrolment for a unit of study must apply to the head of the relevant department and will be presumed to have discontinued from the date of that application, unless evidence is produced showing that:

(i) the discontinuation occurred at an earlier date; and (ii) there was good reason why the application could not be made at the earlier time.

(e) No student may discontinue enrolment for a unit of study after the end of classes in the particular semester, unless he or she produces evidence that:

(i) the discontinuation occurred'at an earlier date; and (ii) there was good reason why the application could not be made at the earlier time.

- Discontinuation results
- (f) (i) A discontinuation of enrolment may be recorded as Withdrawn (W) or Discontinued-Not To Count As Failure (DNF) where that discontinuation occurs within the timeframes specified by the University and published by the Faculty

(ii) Except with the express permission of the Dean, any discontinuation occurring after the specified deadline for Discontinued - Not To Count As Failure will be recorded as Discontinued Fail (DF).

(7) Suspension of candidature

(a) Å student must be enrolled in each semester in which he or she is actively completing the requirements for the degree. (b) A student who wishes to suspend candidature must first obtain written approval from the Dean.

(c) A student who enrols after suspending candidature shall complete the requirements for the degree under such conditions as may be determined by the Dean.

(d) The candidature of a student who has not re-enrolled and who has not obtained written approval from the Dean for suspension will be deemed to have lapsed.

(e) A student whose candidature has lapsed must apply for readmission in accordance with procedures determined by the Dean. Any student whose candidature has lapsed and who is permitted to re-enrol shall complete the requirements for the degree under such conditions as may be determined by the Dean.

- (8) Satisfactory progress
  - (a) The Faculty requires students to demonstrate satisfactory progress with their studies.

(b) Satisfactory progress cannot be defined in all cases in advance, but, generally, a student may be deemed not to have

- made satisfactory progress in any semester if the student:
- (i) fails to complete at least half the credit points in which he/she is enrolled, or

(ii) obtains an SWAM (Semester Weighted Average Mark) oflessthan50.

(c) A student who fails to demonstrate satisfactory progress in any semester of enrolment may be sent a warning letter putting the student on notice that subsequent failure to make satisfactory progress may result in being called upon to show good cause why he or she should be allowed to re-enrol in the degree course.

(9) Requirement to show good cause

(a) A student who fails to demonstrate satisfactory progress in any two consecutive calendar years of enrolment will normally be called upon to show good cause why he or she should be allowed to re-enrol in the degree course. (b) Good cause means circumstances beyond the reasonable control of a student, which may include serious ill health or misadventure, but does not include demands of employers, pressure of employment or time devoted to non-University activities, unless these are relevant to serious ill health or misadventure. In all cases the onus is on the student to provide the University with satisfactory evidence to establish good cause. The University may take into account relevant aspects of a student's record in other courses or units of study within the University and relevant aspects of academic studies at other institutions provided that the student presents this information to the University.

(c) The Dean will permit a student who has shown good cause to re-enrol.

(d)(i) Where the Dean permits a student to re-enrol, certain conditions may be imposed.

(ii) These conditions may include, but are not limited to: the specification of a maximum and/or minimum number of credit points to be attempted; and successful completion of one or more specific units of study.

(iii) A student who fails to meet the conditions placed on his or her enrolment may again be called upon to show good cause why he or she should be permitted to re-enrol.

- (10)Exclusion for failure to show good cause(a) Where a student fails to show good cause why he or she should be allowed to re-enrol, the Dean may exclude the
  - student from re-enrolment in the degree. (b) The failure to show good cause may be based on the student either having:
    - (i) submitted an inadequate statement; or
    - (i) sublitted all madequate (ii) no statement at all.
- (1 l)Re-admission after exclusion
  - (a) Re-admission after exclusion is not automatic(b) A student who has been excluded from the degree may apply to the Dean for readmission after at least four semesters.
    (c) Except with the express written approval of the Dean, a student who has been excluded may not be given credit for any work completed elsewhere in the University or in another institution during a period of exclusion.
- (12)Appeals against exclusion
- (a) A student who:

(i) has been excluded in accordance with these Resolutions, or

(ii) has applied for readmission to the degree after a period of exclusion, and who has been refused readmission, may appeal to the Senate Student Appeals Committee

(Exclusions and Readmissions).

(b) Any such appeal should be lodged at the Student Centre. *4.Acad.emic honesty* 

- (1) Pursuant to the Resolutions of the Academic Board relating to Academic Honesty in Coursework, the relevant department(s) may invoke penalties for plagiarism or any other forms of academic dishonesty.
- (2) (a) Plagiarism means knowingly presenting another person's ideas, findings or work as one's own by copying or reproducing them without due acknowledgement of the source.

(b) Other forms of academic dishonesty include, but are not limited to:

(i) forgery of official documents and/or signatures;(ii) the engagement of another person to complete an assessment or examination for a student, whether for payment or otherwise;

(iii) bringing into an examination forbidden material such as textbooks, notes, calculators or computers;

(iv) communication with other candidates during an examination, whether by speaking or some other means;

(v) attempts to read other students' work during an examination;

(vi) writing an examination or test paper, or consulting with another person about the examination or test, outside the confines of the examination room without permission; (vii) fabrication of data; and/or

(viii) recycling (ie, submitting one's own work that has previously counted towards the completion of another unit and been credited towards a university degree, where the examiner has not been informed that the student has already received credit for the work).

(3) Penalties may be invoked through:

(a) the determination of academic results in part of the work, or the final result, for a unit of study, where a result of Fail may be awarded; and/or

(b) disciplinary proceedings under Chapter 8 of the University of Sydney By-laws.

# 15. Variation of course requirements in exceptional circumstances

As provided in the University of Sydney (Coursework) Rule 2000 (as amended), the Dean may vary any of the above requirements for a particular student enrolled for the degree where, in the opinion of the Dean, exceptional circumstances exist.

16. Transitional provisions

The provisions of these Resolutions came into force on 1 January 2003. All students who commenced candidature prior to this date may complete the degree requirements either in accordance with these Resolutions or with those that were in force at the time of their commencement of candidature.

# Combined degrees of BE with Commerce, Science, Arts, Medical Science or Law

# Joint resolutions of the Faculties of Engineering and Arts (BE/BA)

- 1. Candidature for this combined degree program is a minimum of 5 years of full-time study.
- Candidates qualify for the award of the two degrees of the combined program (a separate testamur being awarded for both the BE and the BA) by completing the following:

   (a) The units of study prescribed for the BE specialisation undertaken (totalling 160-162 credit points, depending on the specialisation). These units of study are set out in the tables appended to the Senate Resolutions relating to the BE degree.
   (b)BA units of study totalling at least 80 credit points, of which at least 56 must be Second orThird Year credit points from Part A of the Table of Units of Study for the BA degree, including a major as defined in the resolutions relating to the BA degree.
- 3. Candidates may not enrol in any unit of study which is substantially the same as one they have already passed (or in which they are currently enrolled).
- 4. Candidates will be under the general supervision of the Faculty of Engineering. General supervision covers all areas of policy and procedures affecting candidates, such as combined degree program rules and enrolment procedures. Candidates will be under the supervision of the Faculty of Arts regarding enrolment and progression within the BA component of the combined degree program, as defined in subsection 2(b).
- 5. Candidates may qualify for the award of the BE degree with Honours.
- 6. Candidates who complete the combined degree program may qualify for admission to an honours year in the Faculty of Arts.
- 7. Candidates who abandon the combined degree program may elect to complete the BE degree or BA degree in accordance with the appropriate Senate Resolutions.
- 8. The Deans of the Faculties of Engineering and Arts shall jointly exercise authority in any matter concerning this combined degree program not otherwise dealt with in the Senate Resolutions or these joint resolutions.

# Joint resolutions of the Faculties of Engineering and Economics and Business (BE/BCom)

1. Bachelor of Engineering/Bachelor of Commerce These Resolutions must be read in conjunction with the University of Sydney (Coursework) Rule 2000 (as amended), which sets out the requirements for all undergraduate courses, and the relevant Resolutions of the Senate.

2. Requirements for the Pass BE and BCom degrees

To qualify for the award of the Pass degrees of Bachelor of Engineering and B achelor of Commerce a student must complete successfully units of study that total at least 240 credit points and include:

(1) in the Faculty of Engineering -

the program of units of study set out in the Specialisation Requirements relating to the BE specialisation that the student is pursuing; and

(2) in the Faculty of Economics and Business -

(a) at least 96 credit points in units of study taught by the Faculty of Economics and Business, which cannot be counted towards the award of the Bachelor of Engineering;
(b) six Economics and Business Faculty junior units of study (total 36 credit points) as specified in the Faculty of Economics and Business Handbook relating to the student's year of first enrolment; and
(c) aither an Award course moior (32 credit points) or an

(c) either an Award course major (32 credit points) or an Award course double major (48 credit points), comprising senior units of study as specified in the Faculty of Economics and Business Handbook, from one of the following subject areas:

Accounting;

Business Information Systems;

Commercial Law;

Economics;

Finance;

Industrial Relations and Human Resource Management; Marketing;

Management; or

Management Science.

*3. Requirements for the BE and BCom degrees with Honours* (1)BE with Honours

On completion of the requirements for the combined degrees, a student may qualify for the award of BE degree with Honours in accordance with the requirements set out in the Resolutions of the Faculty of Engineering relating to the BE degree.

(2) BČom with Honours

On completion of the requirements for the combined degrees, a student may be qualified to enrol in Honours in the Bachelor of Commerce. To qualify for the award of the BCom with Honours, a student must complete successfully an additional year of study (the Honours year), as specified in the Faculty of Economics and Business Handbook.

4. Units of study

The units of study, which may be taken for the degrees of Bachelor of Engineering and Bachelor of Commerce, are set out in the Resolutions of the Faculty of Engineering and the Faculty of Economics and Business respectively. The Faculty Resolutions (which are reproduced in the Engineering and Economics and Business Handbooks, as the case may be) specify:

(1) credit point values;

- (2) corequisites/prerequisites/assumed learning/assumed knowledge; and
- (3) any special conditions.

5. Award of the degrees

- (1) A student who completes the requirements for the BE and BCom degrees shall receive at graduation a separate testamur for each of the degrees.
- (2) A student may abandon the combined BE/BCom course and elect to complete either the BE or BCom degree in accordance with the resolutions governing that degree.
- 6. Supervision of the degrees
- (1)Students will be under the general supervision of the Faculty of Engineering for administrative matters.
- (2) Students will be under the supervision of the Faculty of Economics and Business in relation to the BCom component and will be under the supervision of the Faculty of Engineering in relation to the BE component.

The Faculty of Economics and Business and the Faculty of Engineering shall jointly exercise authority in any matter concerning the combined course not otherwise dealt with in these resolutions.

# Joint resolutions of Faculties of the Engineering and Science (BE/BSc)

# Bachelor of Engineering/Bachelor of Science combined degree

- A student may proceed concurrently to the degrees of Bachelor of Science, Bachelor of Science (Advanced) or Bachelor of Science (Advanced Mathematics) and Bachelor of Engineering.
- 2. To qualify for the award of the pass degrees a student shall complete units of study having a total value of at least 240 credit points including:

(a) 80 credit points from Science subject areas,

(b) a major in a Science area, and

(c) 160 credit points from units of study prescribed in the BE Specialisation Requirements for the specialisation that the student is pursuing.

 To qualify for the award of the pass degree in the Advanced or Advanced Mathematics stream of the BSc a student shall: (1)complete at least 56 credit points of Intermediate/Senior Science units of study of which at least 36 shall be completed

at the Advanced level or as TSP units; (2) complete at least 24 credit points of Senior Science units of study at the Advanced level or as TSP units in a single Science subject area; and

(3) maintain in Intermediate and Senior Science units of study an average mark of 65 or greater in each year of enrolment.

- Students who are so qualified may be awarded honours in the BE degree or undertake an honours course in the BSc degree.
- Students may abandon the combined degree course and elect to complete either a BSc or a BE in accordance with the resolutions governing those degrees.
- Students will be under the general supervision of the Faculty of Engineering.

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.

# Bachelor of Engineering/Bachelor of Science double degree

8. A student enrolled for a Bachelor of Engineering degree may be permitted to transfer to the Faculty of Science to complete a BSc degree at the end of Second Year or Third Year in the BE degree if:

(l)except as provided in subsection (2), all units of study attempted in the BE degree have been completed with a grade of Pass or better;

(2) at least 96 credit points from units of study in the BE degree have been completed, of which no more than 12 credit points are from units of study with the grade of Pass (Concessional);

(3) the student is qualified to enrol in a major in a Science area; and

(4) for admission to the Advanced streams, the student satisfies the requirements in Section 23 or 26 of the Resolutions of the Faculty of Science relating to the BSc degree.

9. To qualify for the award of the pass BSc degree a student shall complete units of study to a value of at least 48 credit points including:

(1)40 credit points of Intermediate/Senior units of study in Science subject areas; and

(2) a major in a Science area.

I O.To qualify for the award of the pass degree in the Advanced or Advanced Mathematics stream of the BSc a student shall in addition to the requirements of Sections 8 and 9:

(1)include at least 80 credit points of Intermediate/Senior Science units of study;

(2) include at least 24 credit points of Senior Science units of study at the Advanced level or as TSP units in a single Science subject area; and

(3) maintain in Intermediate and Senior Science units of study an average mark of 65 or greater in each year of enrolment.

II .The requirements of Sections 9 or 10 must be completed in one year of full-time study or two years of part-time study.

- 12. Students who complete at least 40 but less than 48 credit points in the prescribed time limits may in the following year of enrolment in the BE complete the remaining units to satisfy the requirements of the Faculty of Science. Students who complete less than 40 credit points may apply to be readmitted to the degree, subject to Sections 92-95 of the Resolutions of the Faculty of Science relating to the BSc degree.
- 13.Students who are so qualified mayundertake an honours course in the BSc in accordance with Sections 12-20 of the Resolutions of the Faculty of Science relating to the BSc degree.

The Deans of the Faculties of Engineering and Science shall jointly exercise authority in any matter concerning the double degree program not otherwise dealt with in these resolutions.

## Joint resolutions of the Faculties of Engineering and Science (BE/BMedSc)

- 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 CHEM1102 Chemistry IB, BIOL1003 Human Biology and 12 credit points of Mathematics;

(c) 40 credit points of Intermediate core units of study as listed in Table IV of units of study for the BMedSc;

(d) at least 24 credit points of Senior units of study taken from the subject areas of Anatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology, Immunology, Infectious Diseases, Microbiology, Pharmacology and Physiology as listed in Table IV;

(e) a 12 credit point interdisciplinary thesis jointly supervised by departments from Engineering and Science.

- 3. Students who are so qualified may be awarded honours in the BE degree or undertake an honours course in the BMedSc degree.
- Students may abandon the combined degree course and elect to complete either a BMedSc or a BE in accordance with the resolutions governing those degrees.
- 5. Students will be under the general supervision of the Faculty of Engineering.
- 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.

# 3 Bachelor of Engineering specialisation requirements

# School of Aeronautical, Mechanical and Mechatronic Engineering

The School Aeronautical, Mechanical and Mechatronic Engineering offers the following Bachelor of Engineering Degree specialisations:

- Aeronautical
- · Aeronautical Space

### Mechanical Mechanical Space Mechatronic Mechatronic Space Biomedical and combined degrees with Science, Commerce, Arts, Medical Science and Law (not available with the Space degrees).

## Aeronautical Engineering

Unit of	study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
Core	units of study			
<b>B</b> Firs	st 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, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC1002 Computational Science in C. NB: Web page: problemsolvers.aero.usyd.edu.au.	2
AERO 1701	Introduction to Aerospace Engineering	3		1
AERO 1400	Intro to Aircraft Construction & Design	6	NB: Department permission required for enrolment.	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.	l, Summer
1002		2	N May not be counted with MATH 1902 of 1012.	2
MATH 1003	Modelling	3	N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 10051	Statistics	3	A HSC Mathematics. N May not be counted with MATH (1905 or 1015) or ECMT Junior units of studyorSTAT (1021 or 1022).	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Madab, COSC 1002 Computational Science in C.	1
∎ Se	cond Year			
AERO 2201	Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. NB: Web page: www.aeromech.usvd.edu.au/aero/aerodyn.html.	2
AERO 2300	Mechanics of Solids 1	4	P 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
AERO 2500	Intro Flight Mechanics and Performance	4	P 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	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	Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH	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 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
_ T1	ind Voor		· ····· ··· ··························	
■ 1h	ira rear			
AERO 3200	Aerodynamics 1	4	P AEKO 2201 Fluid Mechanics 1.	1

### Aeronautical Engineering (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
AERO 3250	Aerodynamics 2	4	p AERO 2201 Fluid Mechanics 1, MECH 2202 Fluids 1. N MECH 3211 Fluid Mechanics 2.	2
AERO 3301	Aerospace Structures 1	4	P AERO 2300 Mechanics of Solids 1.	1
AERO 34002	Aircraft Design 1	3	P MECH 2400 Mechanical Design 1. N AERO 3401 Aerospace Design 1.	1
AERO 3450^	Aircraft Design 2	3	P MECH 2400 Mechanical Design 1.	2
AERO 3500	Flight Mechanics 1	4	P AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO 3602	Aviation Operation and Management	4		2
MECH 3203	Heat Transfer	4	P AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	1
MECH 3300	Materials 2	4	P MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3310	Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
MECH 3500	Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3800	Systems Control	4	P MATH 2001 and MATH 2005.	2
■ Fo	urth Year			
AERO 4200	Aerodynamics 3	3	P AERO 3250 Aerodynamics 2.	1
AERO 4201	Propulsion	4	P MECH 3201 Thermodynamics 2 or MECH 3203 Heat Transfer.	2
AERO 4305	Aerospace Structures 2	8	P MECH 3310 Mechanics of Solids 2, AERO 3301 Aerospace Structures 1.	1
AERO 4400	Aircraft Design 3	6	P AERO 3450 Aircraft Design 2 and either AERO 3400 Aircraft Design 1 or AERO 3401 Aerospace Design.	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 4951	Thesis Preparation	0	P 36 credit points of Third Year Subjects.	1,2
AERO 4952	Thesis/Design Project	12	P AERO 4951 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

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

4. Students enrolled in BE/BSc can enrol in PHYS 2001, PHYS 2002 or an acceptable alternative to these units of study.

# Resolutions of the Faculty of Engineering relating to the above table: Degree eligibility

### BE(Aeronautical)

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete elective units of study from the table of recommended elective units of study for BE( Aeronautical). A minimum 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 this table, 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 this table, candidates are required to complete recommended units of study given by the Faculty of Economics and Business. A minimum 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 Economics and Business.

### 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.

■ Fi	rstYear			
PHYS 1003	Physics 1 (Technological)	6	<ul> <li>A HSCPhysicsorPHYS(1001orl002orl901orequivalent).MATH(1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful.</li> <li>N May not be counted with PHYS (1004 or 1902).</li> </ul>	1,2
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2

# Aeronautical Engineering (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Se	cond Year			
AERO 2600	Aviation Technology	4		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.	2, Summer
■ Th	ird <b>Year</b>			
AERO 3501	Flying Operations	2	<ul> <li>P AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1.</li> <li>NB: Department permission required for enrolment.</li> </ul>	1
■ Fo	urth Year			
AERO 4250	Aerodynamics 4	3	P AERO 3250 Aerodynamics 2.	2
AERO 4290	Rotary Wing Aircraft	4	P AERO 3250 Aerodynamics 2.	N/A in 2003
AERO 4292	Aeroelasticity	3	P AERO 3250 Aerodynamics 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 2 AERO 3400 Aircraft Design 1.	2
MECH 4210	Computational Fluid Dynamics	4	p MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.	2
MECH 4701	Modern Estimation and Control	6	P MECH 3800 Systems Control.	2

#### Notes

Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
 Approved elective units of study given by departments other than the School of Aerospace, Mechanical and Mechatronic Engineering may be taken as alternatives, subject to the approval of the Head of School.

# Aeronautical Engineering (Space Engineering)

Unit of study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ FirstYear			
AERO Workshop Technology 1600	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO Introductory Space Engineerin 1702	g 5	N AERO 1701 Introduction to Aerospace Engineering.	1
ELEC Foundations of Electronic 1102 Circuits	6	A HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH Differential Calculus 1001	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	l, Summer
MATH Linear Algebra 1002	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	1, Summer
MATH Integral Calculus and 1003 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 Discrete Mathematics	3	A HSC Mathematics Extension 1.	2,
10041 MECH Engineering Mechanics	8	N May not be counted with MATH 1904 or MATH 2011. N CIVI, 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory.	Summer 2
1530	0	Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2
MECH Introductory Digital Systems 1701	3	A HSC Maths Extension 1. N ELEC 1101 Foundations of Computer Systems.	1
MECH Introductory Software 1702 Engineering	4	N MECH 1802 C Programming; COSC 1902 Computational Science in C (Advance); COSC 1002 Computational Science in C.	2
MECH Introduction to Computing	6	N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering	1
1820		1C, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab,	
		COSC 1002 Computational Science in C.	
Second Year  AEPO Mechanics of Solids 1	1	n 0 gradit points of 1st Voer Methometics from MATH 1001 MATH 1002 MATH 1002	1
2300 Weenames of Sonds 1	4	MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1004, MATH 1905 or MATH 1901, MATH 1902, MATH 1904,	1
AERO Space Engineering 1 2702	4	A AERO 1702 Introductory Space Engineering. N AERO 2500 Introductory Flight Mechanics and Performance.	1
ELEC Introductory Electronics 2401	4	<ul> <li>A ELEC 1102 Foundations of Electronic Circuits.</li> <li>N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and</li> </ul>	2
MATH Vector Calculus and Complex	4	Electronic Engineering A. P. MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).	1
2001 Variables	4	N May not be counted with MATH 2901.	Summer
2002	4	N May not be counted with MATH 2902.	Summer
MATH Fourier Series & Differential 2005 Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2005.</li> </ul>	2, Summer
MECH Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH Fluids 1	2	P MATH 1001, MATH 1002, MATH 1003.	2
MECH Materials 1	4	N MECH 2200 Thermotiluids, AERO 2201 Fluid Mechanics 1.           N CIVL 2101 Properties of Materials.	2
2300 MECH Mechanical Design 1	6		2
2400 MECH Engineering Dynamics 1	4	D MATH 1001 MATH 1002 and MECH 1520 Ensinearing Mashanica as MECH 1510	
2500	4	Kinematics & Dynamics or PHYS 1001.	
MECH Space Electronics I 2740	4	N MECH 2701 Mechatronics 2.	1
<ul> <li>Third Year</li> </ul>			
AERO Aerodynamics 2 3250	4	<ul> <li>P AERO 2201 Fluid Mechanics 1, MECH 2202 Fluids 1.</li> <li>N MECH 3211 Fluid Mechanics 2.</li> </ul>	2
AERO Aerospace Structures 1 3301	4	P AERO 2300 Mechanics of Solids 1.	1
AERO Aerospace Design 3401	4	P MECH 2400 Mechanical Design 1. N AERO 3400 Aircraft Design 1.	1
AERO Flight Mechanics 1 3500	4	P AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO Aviation Operation and 3602 Management	4		2
AERO Space Engineering 2 3701	4	P AERO 2701 Space Engineering 1.	2
ELEC Electronic Devices and Circuits	s 4	A ELEC 2401 Introductory Electronics.	1
ELEC Communications Electronics	4	A ELEC 3401 Electronic Devices and Circuits.	2
3402       MECH     Heat Transfer       3203	4	P AERO 2201 Fluid Mechanics lor MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	1

### Aeronautical Engineering (Space Engineering) (continued)

udy	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
Systems Control	4	<b>P</b> MATH 2001 and MATH 2005.	2
rth Year			
Propulsion	4	P MECH 3201 Thermodynamics 2 or MECH 3203 Heat Transfer.	2
Aerospace Structures 2	8	P MECH 3310 Mechanics of Solids 2, AERO 3301 Aerospace Structures 1.	1
Aircraft Design 3	6	<b>P</b> AERO 3450 Aircraft Design 2 and either AERO 3400 Aircraft Design 1 or AERO 3401 Aerospace Design.	1
Flight Mechanics 2A	4	P MECH 3800 Systems Control and AERO 3500 Flight Mechanics 1.	1
Practical Experience	0	P 40 credit points of 3rd yearUOS.	2
Space Engineering 3	4	P AERO 3700 Space Engineering 2.	1
Thesis Preparation	0	P 36 credit points of Third Year Subjects.	1,2
Thesis/Design Project	12	P AERO 4951 Thesis Preparation.	1,2
Seminar	2	P 40 credit points of 3rd Year UOS.	2
	udy Mechanics of Solids 2 Engineering Dynamics 2 Systems Control rth Year Propulsion Aerospace Structures 2 Aircraft Design 3 Flight Mechanics 2A Practical Experience Space Engineering 3 Thesis Preparation Thesis/Design Project Seminar	udyCPMechanics of Solids 24Engineering Dynamics 24Systems Control4 <b>rth Year</b> Propulsion4Aerospace Structures 28Aircraft Design 36Flight Mechanics 2A4Practical Experience0Space Engineering 34Thesis Preparation0Thesis/Design Project12Seminar2	udyCPA: Assumed knowledgeP: PrerequisiteQ: QualifyingC: CorequisiteN: ProhibitionMechanics of Solids 24PAERO 2300 Mechanics of Solids 1 and MATH 2005.Engineering Dynamics 24PMECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).Systems Control4PMATH 2001 and MATH 2005.rth Year

**B** 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

### B BE(AeronauticalEngineering)(Space)

In addition to gaining credit for all the core units of study set out in the above table, candidates are required to complete any additional necessary credit points from the table of recommended elective units of study below. A minimum of 192 credit points is required to be eligible for the award of BE(Aeronautical)(Space).

### B 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. ELEC 3601 is an acceptable alternative for ELEC 3402.

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

B See	cond Year units of study				
AERO 2600	Aviation Technology	4			1
MATH 2052	Numerical Methods	2	С	MATH 2001 or 2901.	2, Summer
B Thi	rd Year units of study				
AERO 3501	Flying Operations	2	Р	AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. NB: Department permission required for enrolment.	1
AERO 3200	Aerodynamics 1	4	Р	AERO 2201 Fluid Mechanics 1.	1
B Fo	urth Year units of study				
AERO 4250	Aerodynamics 4	3	p	AERO 3250 Aerodynamics 2.	2
AERO 4290	Rotary Wing Aircraft	4	Р	AERO 3250 Aerodynamics 2.	N/A in 2003
AERO 4292	Aeroelasticity	3	Р	AERO 3250 Aerodynamics 2.	2
AERO 4390	Smart Materials and Structures	3	Р	AERO 3351 Aerospace Structures 2, AERO 3350 Aircraft Structures 2.	2
AERO 4490	Advanced Aircraft Design	4	Р	AERO 3450 Aircraft Design 2 AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	р	AERO 3500 Flight Mechanics 1.	2
MECH 4701	Modern Estimation and Control	6	Р	MECH 3800 Systems Control.	2
ELEC 4402	Integrated Circuit Design	4	А	ELEC 3401 Electronic Devices and Circuits.	1
ELEC 5502	Satellite Communication Systems	4	А	ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

### **B** 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 majbe taken as alternatives, subject to the approval of the Head of School.

## Mechanical Engineering

### Unit of study

CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition

Session

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 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			
MAIH Differential Calculus	3	A HSC Mathematics Extension 1.	1,
1001 MATH Linear Algebra	3	N May not be counted with MATH 1011 or 1901 or 1906. A HSC Mathematics Extension 1.	Summer
1002	2	N May not be counted with MATH 1902 or 1012.	Summer
MAIH Integral Calculus and 1003 Modelling	3	N May not be counted with MATH 1013 or 1903 or 1907.	Summer <sup>2</sup> ,
MATH Statistics 1005	3	A HSC Mathematics. N May not be counted with MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
MECH Engineering Mechanics 1530	8	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2
MECH Introductory Mechanical 1540 Engineering	5	N AERO 1601 Aerospace Manufacturing, MECH 1500 Mechanical Engineering 1, MECH 1800 Computational Engineering IA.	1
MECH Manufacturing Technology	4	N AERO 1600 Workshop Technology.	1,2
MECH Introduction to Computing 1820	6	N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C.	1
AERO Computer Engineering 1801 Applications	3	N INFO 1000 Information Technology Tools, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C. NB: Web page: problemsolvers.aero.usyd.edu.au.	2
CHEM Chemistry IE	6	p HSC Mathematics and a satisfactory knowledge of Chemistry. N CHEM 1101 CHEM 1102	1
ELEC Introductory Electrical	4	p Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits	2
<ul> <li>Second Year</li> </ul>			
MATH Vector Calculus and Complex 2001 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.	l, Summer
MATH Matrix Applications 20022 <sup>6</sup>	4	p MATH (1002 or 1902) or Distinction in MATH 1012. N May not be counted with MATH 2902	1, Summer
MATH Fourier Series & Differential 2005 Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2005</li> </ul>	2, Summer
MATH Numerical Methods	2	c MATH 2001 or 2901.	2,
MECH Thermodynamics 1	4	N MECH 2200 Thermofluids.	Summer 1
2201 MECH Materials 1	4	N CIVL 2101 Properties of Materials.	2
2300 MECH Mechanical Design 1	6	······································	2
2400			-
2500	4	p MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics of MECH 1510 Kinematics & Dynamics of PHYS 1001.	2
AERO Fluid Mechanics 1 22017	4	<ul> <li>p MATH 1001. MATH 1002, MATH 1003.</li> <li>N MECH 2202 Fluids 1.</li> <li>NB: Web page: www.aeromech.usvd.edu.au/aero/aerodyn.html.</li> </ul>	2
AERO Mechanics of Solids 1 2300	4	p 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004. MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
ELEC Electrical and Electronic 2001 <sup>4</sup> Engineering	6	<ul> <li>P ELEC 1001 Introductory Electrical Engineering.</li> <li>N ELEC 2003 Electrical and Electronic Engineering A, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.</li> </ul>	1
<ul> <li>Third Year</li> </ul>			
MECH Thermodynamics 2 3201	4	<ul> <li>p MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1.</li> <li>N MECH 3200 Thermal Engineering 1.</li> </ul>	1
MECH Heat Transfer 3203^	4	P AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	1
MECH Fluid Mechanics 2 3211=	4	P AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. N AERO 3250 Aerodynamics 2.	2
MECH Materials 2 33005	4	p MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH Mechanics of Solids 2 3310 <sup>s</sup>	4	p AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
MECH Mechanical Design 2A 34002. <sup>6</sup>	4	P MECH 2400 Mechanical Design 1.	1

### Mechanical Engineering (continued)

Unit of s	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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	<ul><li>p MECH 1600 Manufacturing Technology.</li><li>N MECH 3601.</li></ul>	1
MECH 36102. <sup>6</sup>	Team Project	2	P 30 credit points of second year units of study.	2
MECH 36212	Industrial Management	4		2
MECH 3800	Systems Control	4	P MATH 2001 and MATH 2005.	2
∎ Fou	rth Year			
MECH 41018	Thesis A	0	P 36 credit points of Third Year units of study.	1,2
MECH 41028	Thesis B	12	P MECH 4101 Thesis A (the Head of School 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. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	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

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

- These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering and the combined degree BE/BSc, but not for candidates for the combined degrees of BE/BCom, BE/LLB and BE/BA.
- 3. For CHEM 1401, note (2) above also applies. Candidates for the combined degree BE/BSc may take as an alternative to CHEM 1401 other units of study from the Faculties of Science or Health Services, up to 12 credit points and subject to timetabling constraints. Candidates for the combined degree BE/BMedSci should enrol in CHEM 1908 (instead of CHEM 1401) as well as BIOL 1003, CHEM 1909 and PHYS 1003.
- Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in ELEC 2003 Electrical and Electronics Engineering A (4 cp).
   Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 3203 Heat Transfer (4 cp) and should enrol in an additional 12 credit points selected from the following units of study: MECH 3201, MECH 3210, MECH 3300 and MECH 3310.
- 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/BMedSc.
- Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics, MATH 2051 (2cp).
- 8. Candidates for the combined degree BE/BMedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).

### Resolutions of the Faculty of Engineering relating to this table

### BE(Mechanical Engineering)

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 30 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechanical).

### BE(Mechanical Engineering)/BSc

In addition to gaining credit for all the core units of study set out in this table, candidates are required to complete at least 30 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Science.

### BE(Mechanical Engineering) / BA

In addition to gaining credit for all the core units of study set out in this table except those marked as (2), candidates are required to complete at least 27 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Arts.

### BE(Mechanical Engineering)/ BCom

In addition to gaining credit for all the core units of study set out in this table except those marked as (2), candidates are required to complete at least 11 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics and Business.

### BE(Mechanical Engineering) / LLB

In addition to gaining credit for all the core units of study set out in this table except those marked as (2), candidates are required to complete at least 11 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree.

### BE(Mechanical Engineering)/BMedSci

In addition to gaining credit for all the core units of study set out in this table except those marked as (6), candidates are required to complete at least 8 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Science.

# Mechanical Engineering (continued)

Unit of	study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Session		
Acceptable alternative units of study					
			Acceptable alternative.		
<b>CHEM</b> 1401	Chemistry IE	6	СНЕМ 1101.		
<b>MECH</b> 1530	Engineering Mechanics	8	PHYS1001.		
MECH 1320	Introduction to Computing	6	SOFT 1001 is an acceptable alternative to either MECH 1820 or AERO 1801, not both.		
<b>AERO</b> 1801	Computer Engineering Applications	3	SOFT 1001 is an acceptable alternative to either MECH 1820 or AERO 1801, not both.		

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 this table

Note: 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

<b>MECH</b> 4210	Computational Fluid Dynamics	4	p	MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.	2
<b>MECH</b> 4220	Environmental Engineering	6	p N	24 credit points of third year units of study. MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
<b>MECH</b> 4230	Environmental Acoustics & Noise Control	2	p N	24 credit points of third year units of study. MECH 4220 Environmental Engineering.	1
MECH 4240	Energy and the Environment	4	p N	24 credit points of Senior units of study. MECH 4220 Environmental Engineering.	1
MECH 4250	Air Conditioning and Refrigeration	3	p	MECH 3200 Thermal Engineering 1 or (MECH 3201 and one of MECH 3202 or MECH 3203).	1
MECH 4260	Combustion and Fire Safety	3	Р	MECH 3200 Thermal Engineering 1 or MECH 3202 or MECH 3203.	1
<b>MECH</b> 4310	Advanced Engineering Materials	6	P N	MECH 3300 Materials 2. MECH 4315 Advanced Aerospace Materials.	2
<b>MECH</b> 4410	Advanced Design and Analysis 1	3	Р	MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	Р	MECH 3400 Mechanical Design 2A, MECH 3410 Mechanical Design 2B and MECH 4410 Advanced Design and Analysis 2.	2
<b>MECH</b> 4510	Machine Vibration and Monitoring	3	р	MECH 3500 Engineering Dynamics 2.	N/A in 2003
<b>MECH</b> 4605	Industrial Engineering	8	p N	MATH 2001 and MATH 2005 and MECH 3620 Industrial Management. MECH 4610 Industrial and Engineering Management MECH 4620 Industrial Ergonomics MECH 4635 Introduction to Operations Research.	1
<b>MECH</b> 4610	Industrial Engineering and Management	2	p N	MECH 3620 Industrial Management. MECH 4605 Industrial Engineering. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	1
<b>MECH</b> 4620	Industrial Ergonomics	2	N	MECH 4605 Industrial Engineering. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	1
<b>MECH</b> 4635	Introduction to Operations Research	4	p N	MATH 1005 MATH 2001 MATH 2002 MATH 2005. MECH 4600 Industrial Engineering.	1
<b>MECH</b> 4640	Product Life Cycle Design	2	p	MECH 3600 Manufacturing Engineering.	2
<b>MECH</b> 4650	Workplace Industrial Relations in Aust	2	р	36 credit points of senior units of study. NB: Department permission required for enrolment. ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	2
MECH 4701	Modern Estimation and Control	6	р	MECH 3800 Systems Control.	2
<b>MECH</b> 4900	Orthopaedic Engineering	4	Р	MECH 3300 Materials 2 and MECH 3310 Mechanics of Solids 2.	2
<b>MECH</b> 4910	Biomechanics and Biomaterials	4	p	36 credit points of third year units of study.	1
■ Ot	her electives				
ASNS 2601	Asian Studies IA	4			1
ASNS 2602	Asian Studies IB	4	р	ASNS 2601.	2
ASNS 2603	Asian Studies 2A	4	р	ASNS 2602.	1
ASNS 2604	Asian Studies 2B	4	p	ASNS 2603.	2
CIVL 3701	Transportation Engineering and Planning	2			2

# Mechanical Engineering (continued)

Unit of s	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
ELEC 3801	Fundamentals of Biomedical Engineering	4	A 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	<ul> <li>A HSC 2-unit Biology. Students who have not undertaken an HSC biology course are strongly advised to complete a biology bridging course before lectures commence.</li> <li>N May not be counted with BIOL (1901 or 1500).</li> </ul>	1, Summer
CHNG 4504	Environmental Decision Making	4		2
ENGG 4001	Innovation/International Competitiveness	4		1
ENGG 4002	New Business Creation	4	NB: Department permission required for enrolment.	2
IREL 1001	Macro Industrial Relations	6		N/A in 2003

СР

## Mechanical Engineering (Space Engineering)

# Unit of!study

A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition

Session 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 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 H Fir	<b>units of study</b> stYear			
AERO 1600	Workshop Technology	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1
AERO 1702	Introductory Space Engineering	5	N AERO 1701 Introduction to Aerospace Engineering.	1
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, 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 or MATH 2011.	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2
MECH 1701	Introductory Digital Systems	3	A HSC Maths Extension 1. N ELEC 1101 Foundations of Computer Systems.	1
MECH 1702	Introductory Software Engineering	4	N MECH 1802 C Programming; COSC 1902 Computational Science in C (Advance); COSC 1002 Computational Science in C.	2
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C.	1
∎ Se	cond Year			
AERO 2300	Mechanics of Solids 1	4	P 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
AERO 2702	Space Engineering 1	4	A AERO 1702 Introductory Space Engineering. N AERO 2500 Introductory Flight Mechanics and Performance.	1
ELEC 2401	Introductory Electronics	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.	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.	l, Summer
MATH 2002	Matrix Applications	4	P MATH (1002 or 1902) or Distinction in MATH 1012. N May not be counted with MATH 2902.	l, Summer
MATH 2005	Fourier Series &. Differential Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2905.</li> </ul>	2, Summer
MECH 2201	Thermodynamics 1	4	N MECH 2200 Thermofluids.	1
MECH 2202	Fluids 1	2	P MATH 1001, MATH 1002, MATH 1003. N MECH 2200 Thermofluids, AERO 2201 Fluid Mechanics 1.	2
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 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
MECH 2740	Space Electronics 1	4	N MECH2701Mechatronics2.	1
∎ Thi	rd Year			
AERO 3250	Aerodynamics 2	4	P AERO 2201 Fluid Mechanics 1, MECH 2202 Fluids 1. N MECH 3211 Fluid Mechanics 2.	2
AERO 3500	Flight Mechanics 1	4	P AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO 3602	Aviation Operation and Management	4		2
AERO 3701	Space Engineering 2	4	P AERO 2701 Space Engineering 1.	2
ELEC 3401	Electronic Devices and Circuits	4	A ELEC 2401 Introductory Electronics.	1
MECH 3201	Thermodynamics 2	4	<ul> <li>P MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1.</li> <li>N MECH 3200 Thermal Engineering!.</li> </ul>	1
MECH 3203	Heat Transfer	4	P AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	1

### Mechanical Engineering (Space Engineering) (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3300	Materials 2	4	P MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3310	Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
MECH 3400	Mechanical Design 2A	4	P MECH 2400 Mechanical Design 1.	1
MECH 3500	Engineering Dynamics 2	4	P MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3800	Systems Control	4	P MATH 2001 and MATH 2005.	2
■ Fo	urth Year			
AERO 4201	Propulsion	4	P MECH 3201 Thermodynamics 2 or MECH 3203 Heat Transfer.	2
AERO 4305	Aerospace Structures 2	8	P MECH 3310 Mechanics of Solids 2, AERO 3301 Aerospace Structures 1.	1
AERO 4501	Flight Mechanics 2A	4	P MECH 3800 Systems Control and 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 School 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. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	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 this table

### BE(Mechanical Engineering)(Space)

In addition to gaining credit for all the core units of study set out in the above table, candidates are required to complete any additional necessary credit points from the table of recommended elective units of study below. A minimum of 192 credit points is required to be eligible for the award of BE(Mechanical)(Space).

### Resolutions of the School of Aerospace, Mechanical and Mechatronic Engineering relating to this table

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	<ul> <li>P 24 credit points of third year units of study.</li> <li>N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.</li> </ul>	
MECH 4230	Environmental Acoustics & Noise Control	2	P 24 credit points of third year units of study. N MECH 4220 Environmental Engineering.	
MECH 4240	Energy and the Environment	4	<ul> <li>p 24 credit points of Senior units of study.</li> <li>N MECH 4220 Environmental Engineering.</li> </ul>	
MECH 4250	Air Conditioning and Refrigeration	3	p MECH 3200 Thermal Engineering 1 or (MECH 3201 and one of MECH 3202 or MECH 3203).	
MECH 4260	Combustion and Fire Safety	3	P MECH 3200 Thermal Engineering 1 or MECH 3202 or MECH 3203.	
MECH 4310	Advanced Engineering Materials	6	<ul><li>p MECH 3300 Materials 2.</li><li>N MECH 4315 Advanced Aerospace Materials.</li></ul>	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, MECH 3410 Mechanical Design 2B and MECH 4410 Advanced Design and Analysis 2.	2
AERO 4250	Aerodynamics 4	3	P AERO 3250 Aerodynamics 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 2 AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	P AERO 3500 Flight Mechanics 1.	2
ELEC 4402	Integrated Circuit Design	4	A ELEC 3401 Electronic Devices and Circuits.	1
ELEC 5502	Satellite Communication Systems	4	A ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

Session

## Mechatronic Engineering

Unit of study

### CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition

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 shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points. See note (1) relating to core units of study offered by faculties other than Engineering.

Core ■ Fin	e <b>units of study</b>			
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	l, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	l, 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 Junior units of study or STAT (1021 or 1022).	2, Summer
MECH 1530	Engineering Mechanics	S	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 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 IA.	1
MECH 1600	Manufacturing Technology	4	N AERO 1600 Workshop Technology.	1.2
MECH 1701	Introductory Digital Systems	3	A HSC Maths Extension 1. N ELEC 1101 Foundations of Computer Systems.	1
MECH 1702	Introductory Software Engineering	4	N MECH 1802 C Programming; COSC 1902 Computational Science in C (Advance); COSC 1002 Computational Science in C.	2
MECH 1820	Introduction to Computing	6	N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C.	1
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, MATH 1001 Differential Calculus.	2
∎ Se	condYear			
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.	l, 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.	l, 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).	2, Summer
матн	Numerical Methods	2	n May hot be counted with MATH 2903.	2
20522.5 MECH	Thermodynamics 1	4	N MECH 2200 Thermofluids	Summer 1
2201 MECH	Mechanical Design 1	6		2
2400	Engineering Dynamics 1	4	n MATH 1001 MATH 1002 and MECH 1520 Engineering Mechanics or MECH 1510	2
2500	Engineering Dynamics 1	4	Kinematics & Dynamics or PHYS 1001.	1
MECH 2701	Mechatronics 2	8	A MECH 1/01 Introductory Digital Systems. N ELEC 2601 Microcomputer Systems. NB: N B. Web page: www.acfr.wyd.edu.gu/teaching/2nd-year/mech2701	1
AERO 2201 <sup>6</sup>	Fluid Mechanics 1	4	p MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1.	2
AERO 2300	Mechanics of Solids 1	4	P 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
ELEC 2401	Introductory Electronics	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.	2
■ Th	ird Year			
MECH 34002"	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 <sup>3</sup>	Manufacturing Engineering	6	p MECH 1600 Manufacturing Technology. N MECH 3601.	1
MECH 36102"	Team Project	2	p 30 credit points of second year units of study.	2
MECH	Industrial Management	4		2

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### Mechatronic Engineering (continued)

Unit of s	tudy	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3701	Mechatronics 3	6	<ul> <li>A MECH 2701 Mechatronics 2.</li> <li>N MECH 4710 Microprocessors in Engineered Systems and MECH 3700 Mechatronics 2. NB: Web page: www.acfr.usyd.edu.au/teaching/3rd-vr/mech3701.</li> </ul>	1
MECH 3800	Systems Control	4	P MATH 2001 and MATH 2005.	2
ELEC 3202	Power Electronics and Drives	4	A ELEC 2401 Introductory Electronics and (ELEC 2001 Electrical and Electronic Engineering or ELEC 3201 Electrical Energy Systems).	2
ELEC 3401	Electronic Devices and Circuits	4	A ELEC 2401 Introductory Electronics.	1
ELEC 3601	Digital Systems Design	4	A ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatronics 2.	2
■ For	ırth Year			
<b>MECH</b> 4101 <sup>s</sup>	Thesis A	0	P 36 credit points of Third Year units of study.	1,2
MECH 4102 <sup>6</sup>	Thesis B	12	P MECH 4101 Thesis A (the Head of School 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. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	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

For core units offered by faculties 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. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 3601 Manufacturing Systems (2cp) instead of MECH 3600

These units of study are core for candidates for the degree of Bachelor of Engineering in Mechatronic Engineering and the combined degree BE/ 4. BSc, but not for candidates for the combined degrees of BE/BMedSci.

Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics, MATH 2051 (2cp) Candidates for the combined degree BE/BMedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).

6.

# Resolutions of the Faculty of Engineering relating to this table

### **BE(Mechatronic Engineering)**

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 29 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechatronic).

### **BE(Mechatronic Engineering) / BSc**

In addition to gaining credit for all the core units of study set out in this table, candidates are required to complete at least 29 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Science

### BE(Mechatronic Engineering) / BCom

In addition to gaining credit for all the core units of study set out in this table except those marked as (2), candidates are required to complete at least 13 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics and Business

### **BE(Mechatronic Engineering) / LLB**

In addition to gaining credit for all the core units of study set out in this table except those marked as (2). Candidates are required to complete at least 13 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree.

### BE(Mechatronic Engineering)/BA

In addition to gaining credit for all the core units of study set out in this table except those marked as (2). Candidates are required to complete at least 29 credit points of elective units of study. At least 24 of these credit points must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Arts.

### **BE(Mechatronic Engineering) / BMedSci**

In addition to gaining credit for all the core units of study set out in this table except those marked as (4). Candidates are required to complete at least 8 credit points of elective units of study which must be chosen from the following table of mainstream electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Science

## Acceptable alternative units of study

Pursuar	Pursuant to Section 2, the Faculty has prescribed the following; acceptable alternatives to core units of study listed ini this table.			
			Acceptable alternative.	
MECH 1530	Engineering Mechanics	8	PHYS1001.	
MECH 1820	Introduction to Computing	6	SOFT 1001.	

## Mechatronic Engineering (continued)

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

Note: 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

# H 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, MECH 3410 Mechanical Design 2B and MECH 4410 Advanced Design and Analysis 2.	2
MECH 4510	Machine Vibration and Monitoring	3	P MECH 3500 Engineering Dynamics 2.	N/A in 2003
MECH 4640	Product Life Cycle Design	2	P MECH 3600 Manufacturing Engineering.	2
MECH 4650	Workplace Industrial Relations in Aust	2	P 36 credit points of senior units of study. NB: Department permission required for enrolment. ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	2
MECH 4701	Modem Estimation and Control	6	P MECH 3800 Systems Control.	2
MECH 4721	Sensors and Signals A	4	P MECH 3701 Mechatronics 3.	1
MECH 4730	Computers in Real-Time Control and Inst	6	<ul> <li>MECH 3700 Mechatronics 2 or MECH 3701 Mechatronics 3.</li> <li>N ELEC 4602 Real Time Computing.</li> </ul>	1
B Ot	her electives			
ASNS 2601	Asian Studies IA	4		1
ASNS 2602	Asian Studies IB	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 2-unit Biology. Students who have not undertaken an HSC biology course are strongly advised to complete a biology bridging course before lectures commence. 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	A 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: Department permission required for enrolment.	2
CHNG 4504	Environmental Decision Making	4		2
IREL 1001	Macro Industrial Relations	6		N/A in 2003
MECH 4220	Environmental Engineering	6	<ul> <li>P 24 credit points of third year units of study.</li> <li>N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.</li> </ul>	1
MECH 4910	Biomechanics and Biomaterials	4	p 36 credit points of third year units of study.	1

### Mechatronic Engineering (Space Engineering)

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

∎ Fir	■ First Year				
AERO 1600	Workshop Technology	4	N MECH 1600 Manufacturing Technology AERO 1601 Aerospace Manufacture.	1	
AERO 1702	Introductory Space Engineering	5	N AERO 1701 Introduction to Aerospace Engineering.	.1	
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, 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.	l, 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 Extension2or MATH 1001. N May not be counted with MATH 1013 or 1903 or 1907.	2, Summer	
MATH 10041	Discrete Mathematics	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1904 or MATH 2011.	2, Summer	
MECH 1530	Engineering Mechanics	8	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2	
MECH 1701	Introductory Digital Systems	3	A HSC Maths Extension 1. N ELEC 1101 Foundations of Computer Systems	1	
MECH 1702	Introductory Software	4	N MECH 1802 C Programming; COSC 1902 Computational Science in C (Advance); COSC 1002 Computational Science in C	2	
MECH 1820	Introduction to Computing	6	<ul> <li>N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering IC, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C.</li> </ul>	1	
∎ Se	cond Year				
AERO 2201	Fluid Mechanics 1	4	p MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1.	2	
AERO 2300	Mechanics of Solids 1	4	p 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1	
AERO 2702	Space Engineering 1	4	A AERO 1702 Introductory Space Engineering. N AERO 2500 Introductory Flight Mechanics and Performance.	1	
ELEC 2401	Introductory Electronics	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.	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	l, 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).	2, Summer	
MATH	Numerical Methods	2	c MATH 2001 or 2901.	2,	
2052 MECH	Thermodynamics 1	4	N MECH 2200 Thermofluids.	Summer 1	
2201 MECH	Mechanical Design 1	6		2	
2400 MECH	Engineering Dynamics 1	1	n MATH 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510	2	
2500	Maghetropies 2	т 0	Kinematics & Dynamics or PHYS 1001.	1	
MECH 2701	Mechatronics 2	8	N ELEC 2601 Microcomputer Systems. NB: N.B. Web page: <u>www.acfr.usyd.edu.au/teaching/2nd-year/mech2701</u> .	1	
■ Th	ird Year				
AERO 3500	Flight Mechanics 1	4	p AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2	
AERO 3602	Aviation Operation and Management	4		2	
AERO 3701	Space Engineering 2	4	P AERO 2701 Space Engineering 1.	2	
ELEC 3401	Electronic Devices and Circuits	4	A ELEC 2401 Introductory Electronics.	1	
ELEC 3402	Communications Electronics	4	A ELEC 3401 Electronic Devices and Circuits.	2	
ELEC 3601	Digital Systems Design	4	A ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatronics 2.	2	
MECH 3203	Heat Transfer	4	p AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	1	

### Mechatronic Engineering (Space Engineering) (continued)

-				
Unit of s	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3400	Mechanical Design 2A	4	p MECH 2400 Mechanical Design 1.	1
MECH 3500	Engineering Dynamics 2	4	p MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3740	Space Electronics 3	8	<ul> <li>A MECH 2701 Mechatronics 2.</li> <li>N MECH 3701 Mechatronics 3, MECH 4710 Microprocessors in Engineered Systems. NB: Web page: <u>www.acfr.usyd.edu.au/teaching/3rd-yr/mech3701</u>.</li> </ul>	1
MECH 3800	Systems Control	4	p MATH 2001 and MATH 2005.	2
■ Fo	urth Year			
<b>AERO</b> 4700	Space Engineering 3	4	P AERO 3700 Space Engineering 2.	1
AERO 4501	Flight Mechanics 2A	4	p MECH 3800 Systems Control and AERO 3500 Flight Mechanics 1.	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 School 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. NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	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 4701	Modern Estimation and Control	6	p MECH 3800 Systems Control.	2
■ No	ite			

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

## Resolutions of the Faculty of Engineering relating to this table

## BE(Mechatronic Engineering)(Space)

In addition to gaining credit for all the core units of study set out in the above table, candidates are required to complete any additional necessary credit points from the table of recommended elective units of study below. A minimum of 192 credit points is required to be eligible for the award of BE(Mechanical)(Space).

# Resolutions of the School of Aerospace, Mechanical and Mechatronic Engineering relating to this table

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 4110	Professional Engineering	4	p 36 credit points of Senior units of study. NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	1
MECH 4420	Advanced Design and Analysis 2	3	p MECH 3400 Mechanical Design 2A, MECH 3410 Mechanical Design 2B and MECH 4410Advanced Design and Analysis 2.	2
MECH 4721	Sensors and Signals A	4	p MECH 3701 Mechatronics 3.	1
MECH 4730	Computers in Real-Time Control and Inst	6	<ul> <li>MECH 3700 Mechatronics 2 or MECH 3701 Mechatronics 3.</li> <li>N ELEC 4602 Real Time Computing.</li> </ul>	1
AERO 4250	Aerodynamics 4	3	p AERO 3250 Aerodynamics 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 2 AERO 3400 Aircraft Design 1.	2
AERO 4590	Advanced Flight Mechanics	3	P AERO 3500 Flight Mechanics 1.	2
ELEC 4402	Integrated Circuit Design	4	A ELEC 3401 Electronic Devices and Circuits.	1
ELEC 5502	Satellite Communication Systems	4	A ELEC 3502 Random Signals and Communications, ELEC 3503 Introduction to Digital Communications and ELEC 4502 Digital Communication Systems.	2

# Mechanical Engineering (Biomedical)

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

 Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) are required to gain credit for the core units of study set out below. Any additional credit necessary 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. Set note (1) relating to core units of study offered by faculties other than Engineering.

<b>Core</b>	<b>units of study</b> st 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.	l, 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 Junior units of study or STAT (1021 or 1022).	2, Summer
MECH 1530	Engineering Mechanics	8	N CIVL 1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 1500 Mechanical Engineering 1.	2
MECH 1545	Introductory Professional Engineering	3	N AERO 1601 Aerospace Manufacturing MECH 1500 Mechanical Engineering 1.	1
MECH 1820	Introduction to Computing	6	<ul> <li>N MECH 1800 Computational Engineering IA, MECH 1801 Computational Engineering IC, INFO 1000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003</li> <li>Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C.</li> </ul>	1
AERO 1801	Computer Engineering Applications	3	N INFO 1000 Information Technology Tools, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C. NB: Web page: problemsolvers.aero.usyd.edu.au.	2
BIOL 1003	Human Biology	6	<ul> <li>A HSC 2-unit Biology. Students who have not undertaken an HSC biology course are strongly advised to complete a biology bridging course before lectures commence.</li> <li>N May not be counted with BIOL (1903 or 1500) or EDUH1016.</li> </ul>	2, Summer
CHEM 14013	Chemistry IE	6	<ul> <li>P HSC Mathematics and a satisfactory knowledge of Chemistry.</li> <li>N CHEM 1101, CHEM 1102.</li> </ul>	1
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
∎ Se	cond 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).	2, Summer
MATH	Numerical Methods	2	C MATH 2001 or 2901.	2,
2052 MECH	Manufacturing Technology	4	N AERO 1600 Workshop Technology.	1,2
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 1001 MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
MECH 2900	Anatomy and Physiology for Engineers	4	p Biology BIOL 1003 or some previous biology experience. NB: Department permission required for enrolment.	1
AERO 22012	Fluid Mechanics 1	4	P MATH 1001, MATH 1002, MATH 1003. N MECH 2202 Fluids 1. NB: Web page: www.aeromech.usyd.edu.au/aero/aerodyn.html.	2
ELEC 2003	Electrical and Electronic Engineering A	4	<ul> <li>P ELEC 1001 Introductory Electrical Engineering.</li> <li>N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.</li> </ul>	1
■ Th	ird Year			
AERO 2300	Mechanics of Solids 1	4	p 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
MECH 3211	Fluid Mechanics 2	4	p AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. N AERO 3250 Aerodynamics 2.	2
MECH 3300	Materials 2	4	p MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3400*	Mechanical Design 2A	4	p MECH 2400 Mechanical Design 1.	1
#### Mechanical Engineering (Biomedical) (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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. N MECH 3601.	1
MECH 3621	Industrial Management	4		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	A ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A.	1
B Fo	urth Year			
MECH 3310	Mechanics of Solids 2	4	P AERO 2300 Mechanics of Solids 1 and MATH 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 School may allow Thesis A as corequisite in exceptional circumstances).	1,2
MECH 4110	Professional Engineering	4	<ul> <li>P 36 credit points of Senior units of study.</li> <li>NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.</li> </ul>	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

#### Notes

- 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.
- Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp) and should take an additional unit of study in mathematics MATH 2051 (2cp).
- 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 1908 (instead of CHEM 1401) as well as BIOL 1003, CHEM 1909 and PHYS 1003.
- 4. 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/BMedSc.

#### Resolutions of the Faculty of Engineering relating to this table

#### BE(Mechanical Engineering)(Biomedical)

In addition to gaining credit for all the core units of study set out in this table, candidates are required to complete at least 17 credit points of elective units of study. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechanical)(Biomedical).

#### BE(Mechanical Engineering)(Biomedical) / BSc

In addition to gaining credit for all the core units of study set out in this table, candidates are required to complete at least 17 credit points of elective units of study. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Science.

#### Acceptable alternative units of study

Pursuant to Section 2, the Faculty has prescribed the following acceptable alternatives to core units of study listed in this table. Acceptable alternative.

MECH	Engineering Me	echanics	8	PHYS 1001.
MECH 1820	Introduction to	Computing	6 SOF	T 1001 is an acceptable alternative to either MECH 1820 or AERO 1801, notboth.
AERO 1801	Computer Applications	Engineering	3 SOF	T 1001 is an acceptable alternative to either MECH 1820 or AERO 1801, not both.

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 of Aerospace, Mechanical and Mechatronic Engineering.

#### Recommended elective units of study

ENGG	Innovation/International	4

 4001
 Competitiveness

 MECH
 Computational Fluid Dynamics
 4
 P
 MECH 3210 Fluid Mechanics or MECH 3211 Fluid Mechanics 2.
 2

 4210
 2

1

# Mechanical Engineering (Biomedical) (continued)

Unit of s	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 4230	Environmental Acoustics & Noise Control	2	<ul> <li>p 24 credit points of third year units of study.</li> <li>N MECH 4220 Environmental Engineering.</li> </ul>	1
MECH 4240	Energy and the Environment	4	<ul><li>P 24 credit points of Senior units of study.</li><li>N MECH 4220 Environmental Engineering.</li></ul>	1
MECH 4310	Advanced Engineering Materials	6	<ul> <li>P MECH 3300 Materials 2.</li> <li>N MECH 4315 Advanced Aerospace Materials.</li> </ul>	2
MECH 4610	Industrial Engineering and Management	2	<ul> <li>P MECH 3620 Industrial Management.</li> <li>N MECH 4605 Industrial Engineering. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.</li> </ul>	1
MECH 4620	Industrial Ergonomics	2	N MECH 4605 Industrial Engineering. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	1
MECH 4635	Introduction to Operations Research	4	<ul> <li>P MATH 1005 MATH 2001 MATH 2002 MATH 2005.</li> <li>N MECH 4600 Industrial Engineering.</li> </ul>	1
BCHM 2001	Genes and Proteins	8	<ul> <li>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.</li> <li>N May not be counted with AGCH 2001 or BCHM 2101 or 2901.</li> </ul>	N/A in 2003
MICR 2001	Introductory Microbiology	8	<ul> <li>P 6 credit points of Junior Chemistry.</li> <li>Q 6 credit points of Junior Biology.</li> <li>N May not be counted with MICR (2003 or 2901).</li> <li>NB: It is highly recommended that students complete 12 credit points of Junior Biology and MBLG (2001 or 2101 or 2901).</li> </ul>	1

# m Department of Chemical Engineering

The Department of Chemical Engineering offers the following Bachelor of Engineering Degree specialisations:Chemical

- BACHELOR OF ENGINEERING SPECIALISATION REQUIREMENTS
- Chemical Bioprocess
- Chemical Environmental and Energy
- Chemical Computer Aided Process
- Chemical Management •
- and combined degrees with Science, Commerce, Arts, Medical Science and Law. •

# **Chemical Engineering**

Unit of study	СР	A: Assumed knowledge	P: Prerequisite	Q: Qualifying	C: Corequisite	N: Prohibition	Session
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 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			
B Fir	stYear			
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	l, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	l, 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 Junior units of study or STAT (1021 or 1022).	2, Summer
CHEM 1101	Chemistry IA	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, Summer
CHEM 1102	Chemistry IB	6	<ul> <li>Q CHEM 1101 or a Distinction in CHEM 1001 or equivalent.</li> <li>c Recommended concurrent units of study: 6 credit points of Junior Mathematics including MATH (1003 or 1903).</li> <li>N May not be counted with CHEM (1002 or 1902 or 1904 or 1907 or 1908).</li> </ul>	1,2, Summer
CHNG 1001	Chemical Engineering Applications	4		1
CHNG 1101	Chemical Engineering IA	4		1
CHNG 1102	Chemical Engineering IB	4	P CHNG 1101 Chemical Engineering IA.	2
CHNG 1201	Chemical Process Case Studies	4		2
CHNG 1301	Computing for Chemical Engineers IA	4		1
CHNG 1302	Computing for Chemical Engineers IB	4	P Advisory prerequisite: CHNG 1301 Computing for Chemical Engineering IA.	2
∎ Se	cond 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.	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 or 2903 or 2311 or 2312 or 2502).	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 ChemEng Fundamentals	4		1
CHNG 2601	Materials and Corrosion	4		2
■ Thi	rd 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

#### Chemical Engineering (continued)

	8 8 (		<i>'</i>		
Unit of s	study	СР		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
CHNG 3102	Unit Ops (Mass Transfer)	4	Р	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3103	Unit Ops (Particle Mechanics)	4	р	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	2
CHNG 3104	Unit Ops (Fluid Mechanics)	4	Р	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	Р	Advisory prerequisite: CHNG 3105 Thermodynamics 1.	2
CHNG 3107	Reaction Engineering 1	4			2
CHNG 3301	Process Modelling	4	Р	Advisory prerequisite: CHNG 2301 Chemical Engineering Computations.	1
CHNG 3302	Process Control 1	4			2
CHNG 3401	Project Economics	4			2
∎ Fou	rth Year				
CHNG 4001	Practical Experience	0	Р	advisory prerequisite: 28 credit points of 3rd year units.	1
CHNG 4002	Thesis	8	Р	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

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.

- Students doing any of the combined degree options BE/BA, BE/BCom or BE/BSc will be exempt from First Year core units of study CHNG 1302 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 Chemical Engineering

#### Bachelor of Engineering in Chemical Engineering

Candidates for this degree are required to complete all the core units of study (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 (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 forBE(Chem) as shown below.

#### Bachelor of Engineering in Chemical Engineering (Process Systems Engineering)

Candidates for this degree are required to complete all the core units (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 (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 (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 Engineering Business Skills NB: Students MUST register with Young Achievement Australia early in Semester 1.

2003

CHNG 4504	Environmental Decision Making	
ENGG 4001	Innovation/International Competitiveness	
ENGG 4002	New Business Creation	NB: Department permission required for enrolment.
MECH 4650	Workplace Industrial Relations in Aust	P 36 credit points of senior units of study. NB: Department permission required for enrolment

P 36 credit points of senior units of study. NB: Department permission required for enrolment. ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.

# Chemical Engineering (continued)

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

H Combined Degree (Bachelor of Engineering in Chemical Engineering with either a Bachelor of Arts or Bachelor of Science) Candidates in these combined degree options are required to complete all the core units of study 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.

# B Combined Degree (Bachelor of Engineering in Chemical Engineering with a Bachelor of Commerce)

Candidates in this combined degree option are required to complete all the core units of study 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 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.

∎ Se	cond Year		• • • •	
CHNG 2701	Fundamentals of Bioprocess Engineering 1	4	P Advisory prerequisite: CHEM 1101, CHEM 1102.	1
CHNG 2702	Fundamentals of Bioprocess Engineering 2	4	p advisory prerequisite: CHEM 1101, CHEM 1102, CHNG 2701.	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 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905.	1
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
■ Th	ird 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
■ Fo	urth Year			
ENGG 4002	New Business Creation	4	NB: Department permission required for enrolment.	2
WORK 1001	Foundations of Industrial Relations	6	P None. 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	4		N/A in 2003
CHNG 4004	Advances in Chemical Engineering B	4		N/A in 2003
CHNG 4006	Professional Option	2	P advisory prerequisites: Passed at least 144 credit points. NB: Department permission required for enrolment.	1.2
CHNG 4101	Separation Processes	4	P Advisory prerequisites: CHNG 3102.	N/A in 2003
CHNG 4102	Transport Phenomena	4		1,2
CHNG 4103	Advances in Polymer Engineering	4		1,2
CHNG 4104	Reaction Engineering 2	4	P Advisory prerequisite: CHNG 3107 Reaction Engineering 1.	N/A in 2003
CHNG 4105	Advanced Thermodynamics	4	P Advisory prerequisites: CHNG 3105 and CHNG 3106.	N/A in 2003
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. <i>NB: Department permission required for enrolment.</i>	1
CHNG 4301	Advanced Fluid Dynamics Modelling	4		N/A in 2003

# Recommended elective units of study for BE (Chemical)

# Chemical Engineering (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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 1.	N/A in 2003
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	Adv Topics in Environmental Engineering	4	P All four components of unit Operations; CHNG 3106 Thermodynamics 2.	N/A in 2003
CHNG 4504	Environmental Decision Making	4		2
CHNG 4601	Advanced Particle Mechanics	4	P All four components of unit Operations.	N/A in 2003
CHNG 4604	Chemical Modelling of Aqueous Systems	4	P CHNG 3101, CHNG 3102, CHNG 3103, CHNG 3104 and CHNG 3106.	N/A in 2003
CHNG 4605	Mineral Processing	4	P Unit Operations (all four components).	2

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.

Addi	tional 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. NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	1
CHNG 4504	Environmental Decision Making	4		2
MECH 4650	Workplace Industrial Relations in Aust	2	P 36 credit points of senior units of study. NB: Department permission required for enrolment. ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.	2
ENGG 4002	New Business Creation	4	NB: Department permission required for enrolment.	2
Note: 1	ENGG 2003, and ENGG 3002 are	comp	ulsory units of study for the management stream. The remaining 8 credit points required come fro	om the

table above.

# Department of Civil Engineering (including Project Management)

The Department of Civil Engineering offers the following Bachelor of Engineering Degree specialisations:

Civil • Civil Structural BACHELOR OF ENGINEERING SPECIALISATION REQUIREMENTS

- Civil Environmental
- Civil Geotechnical
- Civil Construction Engineering and Management •
- Project Engineering and Management
- and combined degrees with Science, Commerce, Arts, • Medical Science and Law.

# Civil Engineering (except Project Engineering and Management)

Unit of study	СР	A: Assumed knowledge	P: Prerequisite	Q: Qualifying	C: Corequisite	N: Prohibition	Session
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							

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 the degree requirement of not less than 192 credit points shall be gained by completing additional elective units of study, as recommended by the Department (as set out below)

Core	units of study			
■ Firs	st Year			
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1011 or 1901 or 1906.	l, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1. N May not be counted with MATH 1902 or 1012.	l, 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 Junior units of study 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 SOFT 1001 Software Development 1 and SOFT 1002 Software Development 2.	2
ELEC 1001	Introductory Electrical Engineering	4	P Advisory Prerequisite: MATH 1001 Differential Calculus. N ELEC 1102 Foundations of Electronic Circuits.	2
■ Sec	cond 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.	l, Summer
MATH 2005	Fourier Series & Differential Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2905.</li> </ul>	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.	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!	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
<ul> <li>Th</li> </ul>	ird Year			
CIVL 3204	Structural Analysis	6	A CIVL 2201 Structural Mechanics and MATH 2002 Matrix Applications plus MATH 2005 Fourier Series and Differential Equations.	1
CIVL 3227	Steel Structures 1	8	<ul> <li>A CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design.</li> <li>N CIVL 3206 Steel Structures 1, CIVL 3102 Materials Aspects in Design.</li> </ul>	2
CIVL 3225	Concrete Structures: Behaviour		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

### Civil Engineering (except Project Engineering and Management) (continued)

Unit of	study	CP	A: Assumed knowledge P: Prerequisite O: Qualifying C: Corequisite N: Prohibition	Session
CIVL 3226	Concrete Structures: Design	4	<ul> <li>A CIVL 2201 Structural Mechanics and CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design.</li> <li>N CIVL 3205 Concrete Structures 1, CIVL 3224 Concrete Structures: Design.</li> </ul>	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
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
■ Fo	urth Year			
CIVL 4001	Thesis/Design/Project A	0	<ul> <li>P 40 credit points of Senior Subjects.</li> <li>N CIVL 4003 and CIVL 4004.</li> </ul>	1,2
CIVL 4002	Thesis/Design/Project B	5	<ul> <li>P 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001.</li> <li>N CIVL 4003 and CIVL 4004.</li> <li>NB: Department permission required for enrolment in Session 1.</li> </ul>	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	NB: This unit is not available to students in the Civil - Project Engineering Management stream.	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 CIVL 3227 or CIVL 3206 Steel Structures 1.	1

Note

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 the specialisation of the degrees in Civil Engineering (except Project Engineering Management): 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 the above specialisation requirements (160 credit points). They are also required to gain at least 32 credit points from the elective units of study listed below. 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 listed above (160 credit points), except for Bachelor of Commerce where ELEC 1001, CIVL 3207 and CIVL 3005 are not required, therefore only 152 credit points are needed and Bachelor of Laws where ELEC 1001, CIVL 3207, CIVL 3005, MATH 2001, MATH 2005 are not required, therefore only 144 credit points are needed. This total of 160 credit points (or 152 credit points for Bachelor of Commerce or 144 credit points for Bachelor of Laws) 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, Law 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 the relevant department before enrolling.

# Acceptable alternative units of study

The Faculty has prescribed the following acceptable alternatives to core units of study listed in in the above specialisation requirements:

			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 (for BE/BCom degrees only).
MATH 2005	Fourier Series & Differential Equations	4	STAT 2004 (for BE/BCom degrees only).
CIVL 1004	Computational Engineering	4	COMP1001 and COMP1002 or MECH 1800 or MECH 1810 or MECH 1801.
CIVL 1052	Statics	5	MECH1500 or MECH1501.
CIVL 1051	Dynamics	5	MECH1500 or MECH 1501.
ELEC 1001	Introductory Electrical Engineering	4	PHYS1202 or PHYS lOOland PHYS1003 or ELEC 2002.
CIVL 2409	Engineering Geology 2	4	GEOL 2001 and GEOL 2002 and GEOL 2003.

# Civil Engineering (except Project Engineering and Management) (continued)

0		0,000		
Unit of;s	tudy	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
CIVL 4014	Thesis/Design/Project	5	CIVL 4013.	
Reco	mmended elective un	its of	study	
Firs	t Year			
ISYS 1003	Foundations of Information Technology	6	N May not be counted with INFO 1000 or HNFS 1000.	1,2
■ Sec	ond Year			
ASNS 1001	Modern Asian History and Cultures 1	6		1
ASNS 1002	Modern Asian History and Cultures 2	6		2
ARPH 1001	Introduction to Archaeology	6		N/A in 2003
ARPH 1002	Introduction to Australian Archaeology	6		1
DESC 9101	Introduction to Autocad	4	P Preference given to Design Computing and Digital Media students. NB: Department permission required for enrolment.	1,2
DESC 9100	Introduction to Archicad	4	P Preference given to Design Computing and Digital Media students. NB: Department permission required for enrolment.	1,2
■ Fo	urth Year			
WORK 1001	Foundations of Industrial Relations	6	<ul> <li>P None.</li> <li>N IREL1001.</li> <li>NB: This is one of the compulsory units of study for the Industrial Relations/Human</li> </ul>	1
CIVL 4222	Finite Element Methods	5	Resource Management major. A CIVL 3204 Structural Analysis.	1
CHNG 4504	Environmental Decision Making	4		2
MECH 4220	Environmental Engineering	6	<ul> <li>P 24 credit points of third year units of study.</li> <li>N MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.</li> </ul>	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 CIVL 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 Fluids 2.	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.	N/A in 2003
CIVL 3804	Contracts, Formulation and Management	5		2
CIVL 3805	Project Scope, Tune and Cost Management	6		1
CIVL 4808	Project Management & Info Technology	4	A Sufficient knowledge of information technology systems & communica capabilities.	ations $\overline{2}$

# Civil Engineering (except Project Engineering and Management) (continued)

Unit of	study	CP		A: Assumed knowledge	P: Prerequi	iisite Q: Qu	alifying	C: Core	equisite	N: Prof	nibition	Sessio	on
CIVL	Project Planning and	Tendering 4	А	Completion of CIVI	2801 En	ngineering	Constru	ction	1 and	CIVL	3802	Engineering	1
4809				Construction 2 or the e	quivalent kn	nowledge.							
CIVL	Project Quality Risk an	id 6											2
4810	Procurement Mgt												

Notes

1

2.

Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions. For the BE (Civil) degree students must take at least 20 elective credit points of study at Fourth Year level, however 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 CIVL 4002 Thesis by CIVL 4003 and CIVL 4004 Thesis Honours.

4. CIVL 4002 may be completed in the February semester with written approval from the Head of Civil Engineering.

5. Students enrolled in the following specialisations must pick their electives from the following list:

Construction Engineering and Management Stream: CIVL 4807, CIVL 3804, CIVL 3805, CIVL 4808, CIVL 4809, CIVL 4810.

Structural Engineering Stream: CIVL 4221, CIVL 4222, CIVL 4218, CIVL 4219, CIVL 4220

Environmental Stream: CIVL 4406, CIVL 4607, CIVL 4608, CIVL 4609, CHNG 4504, (MECH 4220)

Geotechnical Engineering Stream: CIVL 4222, CIVL 4406, CIVL 4407, GEOL 2004, GEOL 2005

СР

# Project Engineering and Management

### Unit of study

A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition

Session

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 the degree requirement of not less than 192 credit points shall be gained by completing additional elective units of study, as recommended by the Department (as set out below).

Core ■ Firs	units of study t Year				
MATH 1001	Differential Calculus	3	A N	HSC Mathematics Extension 1. May not be counted with MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	A N	HSC Mathematics Extension 1. May not be counted with MATH 1902 or 1012.	l, Summer
MATH 1003	Integral Calculus and Modelling	3	A N	HSC Mathematics Extension 2 or MATH 1001. May not be counted with MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	A N	HSC Mathematics. May not be counted with MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
CIVL 1051	Dynamics	5	A N	HSC Mathematics Extension 1 and HSC Physics. MECH1510.	2
CHEM 1401	Chemistry IE	6	p N	HSC Mathematics and a satisfactory knowledge of Chemistry. 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 N	HSC Mathematics Extension 1. MECH 1500 Mechanical Engineering 1, MECH 1501 Engineering Statics.	1
CIVL 1004	Computational Engineering	4	N	SOFT 1001 Software Develpoment 1 and SOFT 1002 Software Develpoment 2.	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
∎ Se	cond Year				
MATH 2001	Vector Calculus and Complex Variables	4	p N	MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). May not be counted with MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	p N	MATH (1002 or 1902) or Distinction in MATH 1012. May not be counted with MATH 2902.	l, Summer
MATH 2005	Fourier Series & Differential Equations	4	p N	MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). May not be counted with MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	c N	MATH 2001 or 2901, and MATH 2002 or 2902. MATH 2953.	2, Summer
MATH 2052	Numerical Methods	2	c	MATH 2001 or 2901.	2, Summer
GEOL 1501	Engineering Geology 1	6	N	GEOL 1002.	1
CIVL 2204	Introduction to Structural Concepts	4	A N	CIVL 1051 Dynamics and CIVL 1052 Statics. CIVL 2203 Structural Design, CIVL 2101 Properties of Materials.	2
CIVL 2201	Structural Mechanics	6	А	CIVL 1051 Dynamics and CIVL 1052 Statics.	1
CIVL 2004	Engineering Communications 1	2			1
CIVL 2205	Introduction to Structural Design	4	A N	CIVL 1051 Dynamics and CIVL 1052 Statics. CIVL 2201 Structural Mechanics. CIVL 2203 Structural Design, CIVL 2101 Properties of Materials.	2
CIVL 2801	Engineering Construction 1	4			2
WORK 1002	Foundations of Human Resource Management	6	p N	None. IREL 1002. NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.	2
∎ Thi	rd 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 CIVL 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

### Project Engineering and Management (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
CIVL 3803	Project Appraisal	4	N CIVL 4803 Engineering Management.	1
■ Fc	ourth Year			
CIVL 4001	Thesis/Design/Project A	0	<ul><li>P 40 credit points of Senior Subjects.</li><li>N CIVL 4003 and CIVL 4004.</li></ul>	1,2
CIVL 4002	Thesis/Design/Project B	5	<ul> <li>P 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001.</li> <li>N CIVL 4003 and CIVL 4004.</li> <li>NB: Department permission required for enrolment in Session I.</li> </ul>	1,2
CIVL 4008	Practical Experience	0	P 28 credit points of Senior courses.	1
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.	2
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.	1

#### Note

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 specialisation in Project Engineering and Management (Civil): 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 (157 credit points). They are also required to gain at least 35 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 the above specialisation requirements except for ACCT 1003, ACCT 1004 and WORK 1002, which are not required, therefore only 139 credit points are needed. However, a minimum of 13cp 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 the relevant department before enrolling.

### Acceptable aternative units of study

The Faculty has prescribed the following acceptable alternatives to core units of study listed in the above specialisation requirements:

			Acceptable alternative.
CHEM 1401	Chemistry IE	6	CHEM 1101 and CHEM 1102.
GEOL 1501	Engineering Geology 1	6	GEOL 1001 and GEOL 1002.
<b>MATH</b> 2001	Vector Calculus and Complex Variables	4	STAT2002 (For BE/BCom degrees only).
MATH 2005	Fourier Series & Differential Equations	4	STAT2004 (For BE/BCom degrees only).
CIVL 1004	Computational Engineering	4	COMP1001 and COMP1002 or MECH1800 or MECH1810 or MECH1801.
CIVL 1052	Statics	5	MECH1500 or MECH1501.
CIVL 1051	Dynamics	5	MECH 1500 or MECH 1501.
CIVL 4014	Thesis/Design/Project	5	CIVL 4013.

# Recommended elective units of study for the BE Project Engineering and Management (Civil) 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	<ul> <li>A CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design.</li> <li>N CIVL 3206 Steel Structures 1, CIVL 3102 Materials Aspects in Design.</li> </ul>	2
CIVL 3225	Concrete Structures: Behaviour	4	<ul> <li>A CIVL 2201 Structural Mechanics, CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design.</li> <li>N CIVL 3205 Concrete Structures 1, CIVL 3223 Concrete Structures -Behaviour.</li> </ul>	1
CIVL 3226	Concrete Structures: Design	4	<ul> <li>A CIVL 2201 Structural Mechanics and CIVL 2204 Introduction to Structural Concepts and CIVL 2205 Introduction to Structural Design.</li> <li>N CIVL 3205 Concrete Structures 1, CIVL 3224 Concrete Structures: Design.</li> </ul>	2
CIVL 3402	Soil Mechanics B	4	A CIVL 3401 Soil Mechanics A.	2
CIVL 3602	Fluids 2	4	A CIVL 2610 Fluids 1.	2

#### Project Engineering and Management (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
∎ Fo	urth Year			
ECON 1001	Introductory Microeconomics	6	A Mathematics.	l, 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 CIVL 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 Fluids 2.	2
CIVL 4609	Water Resources 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 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. For the BE Project Engineering and Management (Civil) degree, students must take at least 35 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. 2.

3. Honours candidates replace the core unit of study CIVL 4001 and CIVL 4002 thesis by CIVL 4003 and CIVL 4004 Thesis Honours.

4. CIVL 4002 may be completed in Semester 1 with written approval from the Head of Civil Engineering.

# School of Electrical and Information Engineering

The School of Electrical and Information Engineering offers the following Bachelor of Engineering Degree specialisations:

- Computer
- ecommerce
- Electrical
- Software
- Telecommunications
- Management

Unit of study

 and combined degrees with Science, Commerce, Arts, Medical Science and Law.

# Computer Engineering

A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Session

The recommended elective units of study consist of:

• all level 3,4 and 5 ELEC and EBUS units which do not appear in the table of core units (see chapter 4 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.

#### B 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 152 credit points of core units of study;and
- at least 28 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 fulfill the 192 credit point requirement.

#### Bachelor of Engineering in Computer Engineering in a combined degree course

CP

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 152 credit points of core units of study prescribed for the BE in Computer Engineering; and
- at least 8 credit points of recommended electives 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

■ Fir	st Year			
ELEC 1101	Foundations of Computer Systems	6	A HSC Maths extension 1.	l, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, 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.	l, 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 Junior units of study or STAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	<ul><li>A HSC Physics MATH (1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful.</li><li>N May not be counted with PHYS (1002 or 1901).</li></ul>	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901 or equivalent). MATH (1001/1901,1002/ 1902,1003/1903). MATH 1005/1905 would also be useful. 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, Summer
SOFT 1002	Software Development 2	6	<ul><li>O. SOFT (1001 or 1901) or COMP (1001 or 1901).</li><li>N May not be counted with SOFT 1902 or COMP (1002 or 1902).</li></ul>	1,2, Summer
■ Se	cond Year			
ELEC 2101	Circuit Analysis	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	<ul> <li>P 36 credit points.</li> <li>N CHNG 1302 Computing for Chemical Engineers IB, MECH 1820 Introduction to Computing.</li> </ul>	1
ELEC 2301	Signals and Systems	4	<ul> <li>A MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling.</li> <li>N MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).</li> </ul>	2
ELEC 2401	Introductory Electronics	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.	2
ELEC 2601	Microcomputer Systems	4	A ELEC 1101 Foundations of Computer Systems. N MECH 2701 Mechatronics 2.	1

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Computer Engineering, Electronic Commerce, Electrical Engineering, Software Engineering and 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 the tables below pertaining to each specialisation. The recommended elective units of study are as defined for each specialisation.

Candidates for the degree of Bachelor of Engineering in

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

The Mathematics, Physics and Information Technology units of study appearing in the tables 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.

# Computer Engineering (continued)

Unit of	study	CP		A Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MATH 2001	Vector Calculus and Complex Variables	4	p N	MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). May not be counted with MATH 2901.	1, Summer
<b>MATH</b> 2002	Matrix Applications	4	p N	MATH (1002 or 1902) or Distinction in MATH 1012. 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).	2, Summer
DUNC	Dharring OFF	4	N	May not be counted with MATH 2905.	2
2203	Physics 2EE	4			2
SOFT 2001	Concurrent Programming	4	Q N	SOFT (1002 or 1902) or COMP (1002 or 1902). May not be counted with SOFT 2901.	2
SOFT	Software Development	4	Q	SOFT (1002 or 1902) or COMP (1002 or 1902).	1,
2004	Methods 1		Ν	May not be counted with SOFT 2904 or COMP (2004 or 2904).	Summer
■ Th	ird Year				
ELEC 3302	Fundamentals of Feedback Control	4	A N	ELEC 2301 Signals and Systems. MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	A	ELEC 2301 Signals and Systems.	1
ELEC 3401	Electronic Devices and Circuits	4	A	ELEC 2401 Introductory Electronics.	1
ELEC 3403	Switching Devices and Electronics	4	A	ELEC 3401 Electronic Devices and Circuits.	2
ELEC 3502	Random Signals and Communications	4	A	ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	А	ELEC 2301 Signals and Systems.	2
ELEC 3504	Data Communications and the Internet	4	A N	(SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). ELEC 4501 Data Communication Networks.	2
ELEC 3601	Digital Systems Design	4	A	ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatronics 2.	2
ELEC 3603	Introduction to Computing Systems	4	А	ELEC 2601 Microcomputer Systems.	1
NETS 3009	Operating Systems	4	p N	[NETS (2008 or 2908) or ELEC 2601] and [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT(2001 or 2901). May not be counted with NETS 3909 or COMP (3009 or 3909).	2
■ Fo	urth Year				
ELEC 4601	Computer Design	4	A	ELEC 3403 Switching Devices and Electronics, and ELEC 3601 Digital Systems Design.	1
ELEC	Real Time Computing	4	A	ELEC 3601 Digital Systems Design and COMP 3100 Software Engineering.	1
ELEC 4702	Practical Experience	0			1,2
ELEC 4703	Thesis	12	Р	36 credit points from third and fourth year units of study.	2

Note: Candidates in the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

# **Electronic Commerce**

Unit of study СР A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Session The recommended elective units of study are set out in the table of recommended electives below.

### 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 160 credit points of core units of study; and
- at least 20 credit points of recommended elective units of study; and ٠
- other additional elective units of study approved by the Head of School to fulfill 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:

- 148 credit points comprising all of the core units of study except ACCT1003 and ACCT 1004; and
- at least 12 credit points of recommended elective units of study; 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 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	<ul><li>A HSC Mathematics Extension 1.</li><li>N May not be counted with MATH 1011 or 1901 or 1906.</li></ul>	1, Summer
MATH 1002	Linear Algebra	3	<ul><li>A HSC Mathematics Extension 1.</li><li>N May not be counted with MATH 1902 or 1012.</li></ul>	1, Summer
MATH 1003	Integral Calculus and Modelling	3	<ul><li>A HSC Mathematics Extension 2 or MATH 1001.</li><li>N May not be counted with MATH 1013 or 1903 or 1907.</li></ul>	2, Summer
MATH 1005	Statistics	3	<ul> <li>A HSC Mathematics.</li> <li>N May not be counted with MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).</li> </ul>	2, Summer
MKTG 1001	Marketing Principles	6	N MKTG 2001.	1
SOFT 1001	Software Development 1	6	<ul><li>A HSC Mathematics Extension 1.</li><li>N May not be counted with SOFT 1901 or COMP (1001 or 1901).</li></ul>	<b>1,2,</b> Summer
SOFT 1002	Software Development 2	6	<ul> <li>Q SOFT (1001 or 1901) or COMP (1001 or 1901).</li> <li>N May not be counted with SOFT 1902 or COMP (1002 or 1902).</li> </ul>	1,2, Summer
∎ Se	cond Year			
CLAW 2006	Legal Issues for ecommerce	8	P 48 credit points at level 1000.	1,2
ELEC 2102	Engineering Computing	4	<ul> <li>P 36 credit points.</li> <li>N CHNG 1302 Computing for Chemical Engineers IB, MECH 1820 Introduction to Computing.</li> </ul>	1
ELEC 2301	Signals and Systems	4	<ul> <li>MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling.</li> <li>MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).</li> </ul>	2
ELEC 2601	Microcomputer Systems	4	A ELEC 1101 Foundations of Computer Systems. N MECH 2701 Mechatronics 2.	1
INFO 2000	Systems Analysis and Design	4	Q ISYS 1003 or INFO 1000 or INFS 1000 or [COSC (1001 or 1901) and COSC (1002 or 1902)] or SOFT (1001 or 1901) or COMP (1001 or 1901). N May not be counted with INFO 2900.	l, Summer
INFO 2005	Database Management, Introductory	4	Q ISYS 1003 or INFO 1000 or INFS 1000 or [COSC (1001 or 1901) and COSC (1002 or 1902)] or SOFT (1001 or 1901) or COMP (1001 or 1901). N May not be counted with INFO 2905.	2
MATH 2001	Vector Calculus and Complex Variables	4	<ul> <li>P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2901.</li> </ul>	1, Summer
MATH 2002	Matrix Applications	4	<ul> <li>MATH (1002 or 1902) or Distinction in MATH 1012.</li> <li>N May not be counted with MATH 2902.</li> </ul>	1, 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
SOFT 2004	Software Development Methods 1	4	<ul> <li>Q SOFT (1002 or 1902) or COMP (1002 or 1902).</li> <li>N May not be counted with SOFT 2904 or COMP (2004 or 2904).</li> </ul>	1, Summer
Thi	rd Year			
EBUS 3001	Introduction to E-Commerce Systems	4	A COMP 1002 Introductory Computer Science or SOFT 1002 Software Development 2.	1
EBUS 3002	E-Commerce Website Planning	4	A EBUS 3001 Introduction to E-Commerce Systems and (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice).	2
ELEC 3502	Random Signals and Communications	4	A ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	A ELEC 2301 Signals and Systems.	2

# Electronic Commerce (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
ELEC 3504	Data Communications and the Internet	4	<ul> <li>A (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems).</li> <li>N ELEC 4501 Data Communication Networks.</li> </ul>	2
ELEC 3603	Introduction to Computing Systems	4	A ELEC 2601 Microcomputer Systems.	1
INFS 3020	E-Commerce Business Models	8	p OneofINFS1000,ISYS1003andINFO1000.Alsoatleast48creditpoints.	2
NETS 3009	Operating Systems	4	P [NETS (2008 or 2908) or ELEC 2601] and [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT(2001 or 2901). N May not be counted with NETS 3909 or COMP (3009 or 3909).	2
MKTG 3010	Electronic Marketing	8	p MKTG 1001 or MKTG 2001.	2
■ Fo	urth Year			
EBUS 5001	E-Commerce Application Programming	4	A EBUS 3001 Introduction to E-Commerce Systems.	1
EBUS 5002	E-Commerce Systems	4	A EBUS 5001 E-Commerce Application Programming.	2
ELEC 4702	Practical Experience	0		1,2
ELEC 4703	Thesis	12	p 36 credit points from third and fourth year units of study.	2
ELEC 5610	Computer and Network Security	4	<ul> <li>A (ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks) or ELEC 3504 DataCommunications and the Internet.</li> <li>N NETS 3016 Computer and Network Security. NETS 3916 Computer and Network Security (Advance).</li> </ul>	1
Elec	tronic Commerce recon	nme	nded elective units of study	
ACCT 3005	IT Assurance and Control	8	A INFO 1000. P ACCT 2003.	N/A in 2003
ECMT 1011	Econometrics IA Stream 1	6	N MATH 1005, MATH 1905.	N/A in 2003
ECMT 1021	Econometrics IB 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 undertable Econometrics ID before attempting 14.	N/A in 2003
ECON 1001	Introductory Microeconomics	6	A Mathematics.	1, Summer
ECON 1002	Introductory Macroeconomics	6	A Mathematics.	2, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, MATH 1001 Differential Calculus.	2
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics MATH (1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful. 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). MATH (1001/1901,1002/ 1902,1003/1903). MATH 1005/1905 would also be useful. N May not be counted with PHYS (1004 or 1902).	1,2
ELEC 3701	Management for Engineers	4	N Prohibition: ENGG 2003 Introduction to Engineering Management.	1
MATH 3024	Elementary Cryptography and Protocols	4	p 12 credit points of Intermediate Mathematics. Strongly advise MATH 2008 or 2908 or 2918.	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	A ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4604	Engineering Software Requirements	4	A COMP 3100 Software Engineering or SOFT 3104 Software Development Methods 2.	2
ELEC 4704	Software Project Management	4	A (COMP 3100 Software Engineering and COMP 3205 Product Development Project) or (INFO 2000 Systems Analysis and Design and SOFT 2004 Software Development Methods 1)	1
FLEC			Multious 1).	
ELEC 5501	Advanced Communication Networks	4	A NETS 3007 Network Protocols or ELEC 3604 Internet Engineering.	2
ELEC 5501 ELEC 5504	Advanced Communication Networks Cellular Radio Engineering	4	A NETS 3007 Network Protocols or ELEC 3604 Internet Engineering.         A ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	2

# Electrical Engineering

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

The recommended elective units of study consist of:

- all level 3,4 and 5 ELEC and EBUS units which do not appear in the table of core units (see chapter 4 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.

#### 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 fulfill 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, Bachelor of Laws 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 12 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 (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

■ Fi	rstYear			
ELEC 1101	Foundations of Computer Systems	6	A HSC Maths extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, 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 Maynotbecounted with MATH1902 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	<ul> <li>A HSC Mathematics.</li> <li>N May not be counted with MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).</li> </ul>	2, Summer
PHYS 1001	Physics 1 (Regular)	6	<ul> <li>A HSC Physics MATH (1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful.</li> <li>N May not be counted with PHYS (1002 or 1901).</li> </ul>	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901 or equivalent). MATH (1001/1901,1002/ 1902,1003/1903). MATH 1005/1905 would also be useful. 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, Summer
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, Summer
∎ Se	cond Year			
ELEC 2101	Circuit Analysis	4	<ul> <li>A ELEC 1102 Foundations of Electronic Circuits.</li> <li>N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.</li> </ul>	1
ELEC 2102	Engineering Computing	4	<ul> <li>P 36 credit points.</li> <li>N CHNG 1302 Computing for Chemical Engineers IB, MECH1820 Introduction to Computing.</li> </ul>	1
ELEC 2301	Signals and Systems	4	<ul> <li>A MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling.</li> <li>N MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).</li> </ul>	2
ELEC 2401	Introductory Electronics	4	<ul> <li>A ELEC 1102 Foundations of Electronic Circuits.</li> <li>N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.</li> </ul>	2
ELEC 2601	Microcomputer Systems	4	A ELEC 1101 Foundations of Computer Systems. N MECH 2701 Mechatronics 2.	1
MATH 2001	Vector Calculus and Complex Variables	4	<ul> <li>P MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2901.</li> </ul>	1, Summer
MATH 2002	Matrix Applications	4	<ul><li>P MATH (1002 or 1902) or Distinction in MATH 1012.</li><li>N May not be counted with MATH 2902.</li></ul>	l, Summer
MATH 2005	Fourier Series & Differential Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2905.</li> </ul>	2, Summer
PHYS 2203	Physics 2EE	4		2

# Electrical Engineering (continued)

Unit of	study	СР	A: Assumed knowledge, P: Prerequisite, O: Qualifying, C: Corequisite, N: Prohibition	Session
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).	Summer 1,
B Thi	rd Year			
ELEC 3102	Engineering Electromagnetics	4	A PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	1
ELEC 3201	Electrical Energy Systems	4	A ELEC 2101 Circuit Analysis.	1
ELEC 3302	Fundamentals of Feedback Control	4	A ELEC 2301 Signals and Systems. N MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	A ELEC 2301 Signals and Systems.	1
ELEC 3401	Electronic Devices and Circuits	4	A ELEC 2401 Introductory Electronics.	1
ELEC 3502	Random Signals and Communications	4	A ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	A ELEC 2301 Signals and Systems.	2
ELEC 3601	Digital Systems Design	4	A ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatronics 2.	2
H Fo	urth Year			
ELEC 4702	Practical Experience	0		1,2
ELEC 4703	Thesis	12	p 36 credit points from third and fourth year units of study.	2
H No	te			
Candid	ates in the BE/BMedSc combined	l degro	ee course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.	
Addi	tional units of study for	Ele	ctrical 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
ELEC 4701	Project Management	4	A ENGG 2003 Introduction to Engineering Management or ELEC 3701 Management for Engineers.	2
CHNG 4403	Engineering Business Skills	4	NB: Students MUST register with Young Achievement Australia early in Semester 1.	N/A in 2003
CHNG 4504	Environmental Decision Making	4		2
MECH 4650	Workplace Industrial Relations in Aust	2	<ul> <li>p 36 credit points of senior units of study.</li> <li>NB: Department permission required for enrolment. ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.</li> </ul>	2
ENGG 4002	New Business Creation	4	NB: Department 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.

# Software Engineering

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

The recommended elective units of study consist of:

- all level 3,4 and 5 ELEC and EBUS units which do not appear in the table of core units (see chapter 4 for a list of all ELEC and EBUS units of study); and
- · all level 3 and 4 COMP, INFO, ISYS, MULT, NETS and SOFT 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.

### 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 160 credit points of core units of study; and
- at least 20 credit points of recommended elective units of study, of which at least 8 credit points must be at the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfill 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 160 credit points of core units of study; 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

∎ Fin	rst 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 2 units, 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	<ul> <li>A HSC Mathematics.</li> <li>N May not be counted with MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).</li> </ul>	2, Summer
PHYS 1001	Physics 1 (Regular)	6	<ul> <li>A HSC Physics MATH (1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful.</li> <li>N May not be counted with PHYS (1002 or 1901).</li> </ul>	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901 or equivalent). MATH (1001/1901,1002/ 1902,1003/1903). MATH 1005/1905 would also be useful. 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, Summer
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, Summer
■ Se	cond Year			
ELEC 2102	Engineering Computing	4	<ul> <li>P 36 credit points.</li> <li>N CHNG 1302 Computing for Chemical Engineers IB, MECH1820 Introduction to Computing.</li> </ul>	1
ELEC 2301	Signals and Systems	4	<ul> <li>A MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling.</li> <li>N MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).</li> </ul>	2
ELEC 2401	Introductory Electronics	4	<ul> <li>A ELEC 1102 Foundations of Electronic Circuits.</li> <li>N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.</li> </ul>	2
ELEC 2601	Microcomputer Systems	4	A ELEC 1101 Foundations of Computer Systems. N MECH 2701 Mechatronics 2.	1
INFO 2000	Systems Analysis and Design	4	<ul> <li>Q ISYS 1003 or INFO 1000 or EMFS 1000 or [COSC (1001 or 1901) and COSC (1002 or 1902)] or SOFT (1001 or 1901) or COMP (1001 or 1901).</li> <li>N May not be counted with INFO 2900.</li> </ul>	l, Summer
INFO 2005	Database Management, Introductory	4	<ul> <li>Q ISYS 1003 or INFO 1000 or INFS 1000 or [COSC (1001 or 1901) and COSC (1002 or 1902)] or SOFT (1001 or 1901) or COMP (1001 or 1901).</li> <li>N May not be counted with INFO 2905.</li> </ul>	2
MATH 2002	Matrix Applications	4	<ul><li>P MATH (1002 or 1902) or Distinction in MATH 1012.</li><li>N May not be counted with MATH 2902.</li></ul>	l, Summer
MATH 2005	Fourier Series & Differential Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2905.</li> </ul>	2, Summer
MATH 2011	Topics in Discrete Mathematics	4	<ul> <li>A HSC Mathematics Extension 1.</li> <li>P 6 credit points of Junior Mathematics.</li> <li>N May not be counted with MATH (1004 or 1904).</li> </ul>	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	<ul> <li>Q SOFT (1002 or 1902) or COMP (1002 or 1902).</li> <li>N May not be counted with SOFT 2904 or COMP (2004 or 2904).</li> </ul>	1, Summer

# Software Engineering (continued)

Unit of	study	СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Th	ird Year			
ELEC 3302	Fundamentals of Feedback Control	4	A ELEC 2301 Signals and Systems.     MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	A ELEC 2301 Signals and Systems.	1
ELEC 3502	Random Signals and Communications	4	A ELEC 2301 Signals and Systems.	1
ELEC 3504	Data Communications and the Internet	4	<ul> <li>A (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems).</li> <li>N ELEC 4501 Data Communication Networks.</li> </ul>	2
ELEC 3603	Introduction to Computing Systems	4	A ELEC 2601 Microcomputer Systems.	1
NETS 3009	Operating Systems	4	<ul> <li>P [NETS (2008 or 2908) or ELEC 2601] and [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT(2001 or 2901).</li> <li>N May not be counted with NETS 3909 or COMP (3009 or 3909).</li> </ul>	2
NETS 3017	Network Programming and Distributed Apps	4	<ul> <li>P [[NETS (2008 or 2908) and NETS (2009 or 2909)] or ELEC 2601] and [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901).</li> <li>N May not be counted with NETS 3917 or ELEC 3604.</li> </ul>	2
SOFT- SI 01	Object-Oriented Software Design	4	<ul> <li>P SOFT (2001 or 2901) and INFO (2000 or 2900) and INFO (2005 or 2905) and [SOFT (2004 or 2904) or COMP (2004 or 2904)].</li> <li>N May not be counted with SOFT 3801 or COMP (3008 or 3908).</li> </ul>	1
son- si 03	Software Validation and Verification	4	<ul> <li>P [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901) and MATH (1005 or 1905).</li> <li>N May not be counted with SOFT 3803</li> </ul>	2
son- si 04	Software Development Methods 2	4	P         [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901).           N         May not be counted with SOFT 3804 or COMP (3100 or 3800).	1
∎ Fo	urth Year			
ELEC 4602	Real Tune Computing	4	A ELEC 3601 Digital Systems Design and COMP 3100 Software Engineering.	1
ELEC 4604	Engineering Software Requirements	4	A COMP 3100 Software Engineering or SOFT 3104 Software Development Methods 2.	2
ELEC 4702	Practical Experience	0		1,2
ELEC 4704	Software Project Management	4	A (COMP 3100 Software Engineering and COMP 3205 Product Development Project) or (INFO 2000 Systems Analysis and Design and SOFT 2004 Software Development Methods 1).	1
ELEC 4703	Thesis	12	<b>P</b> 36 credit points from third and fourth year units of study.	2
ELEC 5610	Computer and Network Security	4	<ul> <li>A (ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks) or ELEC 3504 DataCommunications and the Internet.</li> <li>N NETS 3016 Computer and Network Security. NETS 3916 Computer and Network Security (Advance).</li> </ul>	1
B No	ate			

Candidates in the BE/BMedSc combined degree i:ourse shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

### Telecommunications Engineering

# Unit of study CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Session The recommended elective units of study consist of:

• all level 3,4 and 5 ELEC and EBUS units which do not appear in the table of core units (see chapter 4 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.

#### 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 24 credit points must be at trie 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfill the 192 credit point requirement.

#### B 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; 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.

# Core units of study

∎ Fir	rst Year			
ELEC 1101	Foundations of Computer Systems	6	A HSC Maths extension 1.	l, Summer
ELEC 1102	Foundations of Electronic Circuits	6	A HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1. N May not be counted with MATH 101 lor 1901 or 1906.	l, 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 Junior units of study orSTAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	<ul> <li>A HSC Physics MATH (1001/1901,1002/1902,1003/1903). MATH 1005/1905 would also be useful.</li> <li>N May not be counted with PHYS (1002 or 1901).</li> </ul>	1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901 or equivalent). MATH (1001/1901,1002/ 1902,1003/1903). MATH 1005/1905 would also be useful. 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, Summer
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, Summer
■ Se	cond Year	-		
ELEC 2101	Circuit Analysis	4	A ELEC 1102 Foundations of Electronic Circuits. N ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	<ul> <li>p 36 credit points.</li> <li>N CHNG 1302 Computing for Chemical Engineers IB, MECH 1820 Introduction to Computing.</li> </ul>	1
ELEC 2301	Signals and Systems	4	<ul> <li>A MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling.</li> <li>N MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).</li> </ul>	2
ELEC 2401	Introductory Electronics	4	<ul> <li>A ELEC 1102 Foundations of Electronic Circuits.</li> <li>N ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A.</li> </ul>	2
ELEC 2601	Microcomputer Systems	4	A ELEC 1101 Foundations of Computer Systems. N MECH 2701 Mechatronics 2.	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.	l, Summer
MATH 2002	Matrix Applications	4	<ul><li>P MATH (1002 or 1902) or Distinction in MATH 1012.</li><li>N May not be counted with MATH 2902.</li></ul>	l, Summer
MATH 2005	Fourier Series & Differential Equations	4	<ul> <li>P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907).</li> <li>N May not be counted with MATH 2905.</li> </ul>	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, Summer
■ Thi	ird Year			
ELEC 3102	Engineering Electromagnetics	4	A PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	1

# Telecommunications Engineering (continued)

Unit of study		СР	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
ELEC 3302	Fundamentals of Feedback Control	4	A ELEC 2301 Signals and Systems. N MECH 3800 Systems Control and CHNG 3302 Process Control.	2
ELEC 3303	Digital Signal Processing	4	A ELEC 2301 Signals and Systems.	1
ELEC 3401	Electronic Devices and Circuits	4	A ELEC 2401 Introductory Electronics.	1
ELEC 3402	Communications Electronics	4	A ELEC 3401 Electronic Devices and Circuits.	2
ELEC 3502	Random Signals and Communications	4	A ELEC 2301 Signals and Systems.	1
ELEC 3503	Introduction to Digital Communications	4	A ELEC 2301 Signals and Systems.	2
ELEC 3504	Data Communications and the Internet	4	<ul> <li>A (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems).</li> <li>N ELEC 4501 Data Communication Networks.</li> </ul>	2
ELEC 3601	Digital Systems Design	4	A ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatronics 2.	2
∎ Fo	urth Year			
ELEC 4502	Digital Communication Systems	4	A ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 4702	Practical Experience	0		1,2
ELEC 4703	Thesis	12	P 36 credit points from third and fourth year units of study.	2
∎ No	te			

Candidates in the BE/BMedSc combined degree course shall replace ELEC 4703 Thesis with ELEC 4705 Interdisciplinary Thesis.

# Faculty-wide electives and Advanced Engineering

# Faculty-wide elective subjects and Advanced Engineering

Unit of study CP A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition Session 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 engmeering. Any additional credit 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 1,2 and 3 of their engineering course.

These units of study are elective units of study available in any discipline of Engmeering.

ENGG 1001	Interdisciplinary Project	12	p UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. 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: Department permission required for enrolment	1
ENGG 1002	Introduction to Engineering Leadership	2	na. Deparanent permission regarea for en oanent.	2
ENGG 2002	Advanced Engineering Project	2	<ul> <li>p Only students who have been named on the Dean's list at the end of Year 1 will be eligible.</li> <li>NB: Department permission required for enrolment.</li> </ul>	2
ENGG 2003	Introduction to Engineering Management	4	N ELEC 3701, MECH 3620.	2
ENGG 2004	Engineering Studies B	4	NB: Department permission required for enrolment. Permisson required for enrolment.	1,2, Summer
ENGG 2006	Advances in Engineering Leadership	2	P ENGG 1002.	2
ENGG 2008	Engineering Studies A	2	NB: Department permission required for enrolment. Permission required for enrolment.	1,2, Summer
ENGG 3001	Technology Education	2	<ul> <li>p Only students who have been named on the Dean's list at the end of Year 2 will be eligible.</li> <li>NB: Department permission required for enrolment.</li> </ul>	2
ENGG 3002	Industrial and Engineering Management	4	p ENGG 2003. N MECH 4610.	1
ENGG 4002	New Business Creation	4	NB: Department permission required for enrolment.	2
ENGG 4003	Commercial Engineering Practice	4	NB: Department permission required for enrolment.	2
ENGG 4004 <sup>1</sup>	Advanced Engineering Design Project	12	<ul> <li>P Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group.</li> <li>NB: Department permission required for enrolment.</li> </ul>	2
1. This CIV	unit of study may be taken as an /L 4002, OVL 4003, CIVL 4004	electiv	e or as a replacement for one of the following units of study: CHNG 4201, CHNG 4202, CIV C 4703, MECH 4110, MECH 4610, MECH 4620, MECH 4650.	L 4001,

# 4 Undergraduate units of study

# Aeronautical Engineering

AERO1 4 0 0IntrotoAircraftConstruction&Design 6 credit points. Session: 2. Classes: 1 lec/week per semester. 1 x 3hr practical/workshop session/week per semester. Assessment: In-course involvement, practical assignments and quizzes.

*NB: Department permission required for enrolment.* 

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.

#### AERO1 6 0 0Workshop Technology

4 credit points. Session: 1. Classes: (one 3hr lab)/wk. Prohibition: MECH 1600 Manufacturing Technology AERO 1601 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 (BSP Professional, 1988)

#### AERO1 7 0 1 Introduction to Aerospace Engineering ' 3 credit points. Session: 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 modern vehicles, their uses and limitations. Modern developments in aerospace. Future trends, mass transport vehicles, aerospace planes, orbital vehicles. The limitations of the aerospace environment. Reference books

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

Stinton The Anatomy of the Aeroplane (Collins, 1985)

Brandt et. al., Introduction to Aeronautics: A Design Perspective (AIAA Education Series, 1997)

AERO 1702 Introductory Space Engineering 5 credit points. Session: 1. Classes: 2 lectures and one 2 hour tutorial per week. Prohibition: AERO 1701 Introduction to Aerospace Engineering. Assessment: Assignments, quizzes and evaluation of work undertaken during the semester

First year core unit of study for the degrees in Mechanical

(Space), Mechatronic (Space) and Aeronautical

(Space) Engineering.

Objectives

This course will provide students with an introduction into Space Engineering through the process of an

overview of Space systems, their development, construction and implementation. Real life examples will be

provided.

Syllabus Summary

Glossary of terms for aerospace vehicles and their

components. Brief introduction to aerodynamics,

astronautics, aircraft and spacecraft performance, mechanics of flight, aerospace structures, materials and

propulsion systems. The operating characteristics of modern vehicles, their uses and limitations. Modern

developments in aerospace. Future trends, mass transport vehicles, aerospace planes, orbital vehicles. The

limitations of the aerospace environment. Orbital Mechanics and trajectory transitions. Development and

implementation of satellite communication systems. Space stations and interplanetary rovers.

Expected outcomes

To develop an understanding of the role of aerospace engineers within industry along with the overlying

fundamentals of aerospace vehicle design, analysis

performance, operation, orbital mechanics, interplanetary systems and satellite communication. Students will develop

skills in working in groups, communication and presentation of information, solving engineering based problems

AERO1 8 0 1 Computer Engineering Applications 3 credit points. Session: 2. Classes: (1 lec, one 2hr lab)/wk. Prohibition: INFO 1000 Information Technology Tools, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC1002 Computational Science in C. 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. Session: 2. Classes: (three lec, one 1 hr lab/tut)/wk. Prerequisite: MATH 1001, MATH 1002, MATH 1003. Prohibition: MECH 2202 Fluids 1. Assessment: assignments, practical work, 2hr examination.

NB: Webpage: www.aeromech.usyd.edu.au/aero/aerodyn.html **Objectives**/ Outcomes

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

Properties of fluids and gases; measurement and prediction of gas properties and behaviour; temperature, density, pressure viscosity, speed of sound. Perfect gas laws. Definition of Newtonian fluid, non-Newtonian fluid, continuum and rarefied flows. Fluid behaviour, governing equations, controlling nondimensional parameters, Reynolds number, Mach number, Froude number, Weber number, Knudsen number.

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

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

Introduction to viscosity and compressibility effects. 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. Session: 1. Classes: (2 lec, one 2hr tut/lab)/wk. Prerequisite: 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905. Assessment: 2hr exam (70%) and course assignments (30%). Syllabus Summary

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

# Textbooks

Mechanics of Materials, 4th Ed. 2000, by R.C.Hibbeler, Prentice Hall International, Inc., ISBN:0-13-016467^t, 848pp

AERO 2500 Intro Flight Mechanics and Performance 4 credit points. Session: 1. Classes: (3 lec, one 1 hr tut/lab)/wk Prerequisite: 9 credit points of 1st Year Mathematics from MATH 1001, MATH 1002, MATH 1003, MATH 1004, MATH 1005 or MATH 1901, MATH 1902, MATH 1903, MATH 1904, MATH 1905. 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 Summary

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

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

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

Reference books

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

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

Etkin Dynamics of Atmospheric Flight (Wiley, 1972) Roskam Airplane Flight Dynamics and Automatic Flight Controls (RoskamÁ&EC, 1979)

Nelson Flight Stability and Automatic Control (McGraw-Hill, 1989) AERO 2600 Aviation Technology 4 credit points. Session: 1. Classes: One 3hr Lecture/Tut/Lab/

Demonstration session per week. Assessment: 2hr examination (50%)

plus Assignments (50%) Recommended Elective unit

Objectives and 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 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.

Aeronautical material and hardware standards. Civil aviation regulations and airworthiness directives.

Standards. Aircraft weight and balance control. In-service structural integrity checking. Flight vehicle

Maintenance requirements. Flight Management Systems. GPS Navigation techniques.

Reference Books

CASA Civil Aviation Orders, parts 100 to 103. Cutler Understanding Aircraft Structures (PSP professional, 1988) AERO 2702 Space Engineering 1

4 credit points. Session: 1. Classes: Three 1 hour lectures and one 1 hour tutorial per week. Assumed knowledge: AERO 1702 Introductory Space Engineering. Prohibition: AERO 2500 Introductory Flight Mechanics and Performance. Assessment: Assignments and Exam. Second year core unit of study for the degrees of Bachelor of Engineering in Mechanical (Space), Mechatronic (Space) and Aeronautical (Space) Engineering.

Syllabus Summary

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.

#### 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.

#### AERO 3200 Aerodynamics 1

4 credit points. Session: 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. Session: 2. Classes: (2 lec, one 1 hr tut,)/wk one 3 hr lab. Prerequisite: AERO 2201 Fluid Mechanics 1, MECH 2202 Fluids 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. Svllabus Summarv

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,

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979) Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Liepmann and Roshko Elements of Gas Dynamics (Wiley 1957) Schlichting Boundary Layer Theory (McGraw Hill, 1960)

AERO 3301 Aerospace Structures 1

4 credit points. Session: 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.

Svllabus Summarv

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 land 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 3400 Aircraft Design 1

3 credit points. Session: 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. Svllabus Summarv

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. Session: 1. Classes: 1 lec, one 3hr tut 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. Session: 2. Classes: (1 lec, one 3hrtut)/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. Svllabus Summarv

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. Session: 2. Classes: (3 lec, one 1 hr tut/lab)/wk. Prerequisite: AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702. 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. Session: 1. Classes: Part-week course held midsemester vacation. Prerequisite: AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. NB: Department permission required for enrolment. 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 3602 Aviation Operation and Management

4 credit points. Session: 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.

Svllabus Summarv

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 3701 Space Engineering 2

4 credit points. Session: 2. Classes: (2 lec, one 2hr workshop)/wk. Prerequisite: AERO 2701 Space Engineering 1. Assessment: Assignments.

Objectives/ Outcomes:

Students will gain skills in solving problems encountered in Space Engineering. An appreciation of the

complexity of space vehicle design and component integration will be gained. Methods of project management

to ensure quality control and. the achievement of objectives will be shown to have paramount importance.

Syllabus Summary:

Advanced spacecraft design; subsystems; propellant budgets, attitude control, thermal view factor calculations,

nuclear generation of power, surface tension propellant tanks, sensor and actuator requirements. Spacecraft

operation and control.

Human space-flight; design & operational implications. Space vehicle testing; theory and practice; acoustic,

vibration, thermal, vacuum testing. Quality assurance and product assurance.

Advanced orbital mechanics; interplanetary trajectories Molniya type orbits; Gravity assist and atmospheric braking modes of trajectory change.

Textbooks To be advised.

#### AERO 4200 Aerodynamics 3

3 credit points. Session: 1. Classes: (2 lec, one 1hrtut/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

McCormickAerodynamics,,Aeronautics and Flight Mechanics (Wiley, 1979)

Pankhurst and Holder Wind Tunnel Technique (Wiley)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979) Abbott and Von DoenhoffTheory of Wing Sections (Dover 1959) Houghton and Brock Aerodynamics for Engineering Students (Edward Amold)

Anderson Fundamentals of Aerodynamics (McGraw-Hill, 1986) Thompson Compressible Fluid Dynamics (McGraw-Hill)

#### AERO 4201 Propulsion

4 credit points. Session: 2. Classes: (3 lec, one 1 hr tut/lab)/wk. Prerequisite: MECH 3201 Thermodynamics 2 or MECH 3203 Heat Transfer. Assessment: Assignments/lab reports.

**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, gasturbine engines to rockets.

Syllabus Summarv

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 furbine 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,

Glauett 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. Session: 2. Classes: (2 lec, one 1hrtut/lab)/wk. Prerequisite: AERO 3250 Aerodynamics 2. Assessment: Assignments/ lab reports.

**Objectives/Outcomes** 

To develop an understanding of modern applications of aerodynamic theory. Students will gain skills in problem solving using state of the art methods for air and fluid flows.

Syllabus Summary

Unsteady supersonic one-dimensional flow. Hypersonic flow; real gas effects.

Introduction to the use of CFD for transonic flow.

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

Reference books

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979) Anderson Fundamentals of Aerodynamics (McGraw-Hill, 1986) Thompson Compressible Fluid Dynamics (McGraw-Hill)

John Gas Dynamics (Allyn and Bacon, 1984)

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

AERO 4292 Aeroelasticity

3 credit points. Session: 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 DoenhoffTheory of Wing Sections. (Dover, 1959)

Bertin and Smith Aerodynamics for Engineers (Prentice Hall, 1979) Fung An Introduction to Theory of Elasticity (Dover, 1969)

# AERO 4305 Aerospace Structures 2

8 credit points. Session: 1. Classes: (4 lec, 2.5 hr tut/lab)/wk. Prerequisite: MECH 3310 Mechanics of Solids 2, AERO 3301 Aerospace Structures 1. Assessment: 2 hr exam, assignments, lab reports.

Obj ecti ves/Outcomes:

- To develop an understanding of modern numerical and analytical techniques for evaluating
- stresses, strains, deformations and strength of typical aerospace structures. Student will gain
- skills in problem solving using state of the art numerical and analytical methods in aerospace
  - structural analysis.
  - Syllabus Summary:

Finite element method for analysis of structural problems: finite element formulations for continuum mechanics

- triangular and the iso-parametric element families for 2D elastic analysis, finite element analysis for plates and
- shells, finite element analysis for structural dynamics including free vibration analysis, modal response analysis,
- and transient response analysis, finite element analysis for axisymmetric shells and pressure vessels, finite
- element analysis for buckling of thin-walled structures, finite element modelling strategy Introduction to advanced theoretical analysis of aerospace
- structures: theories of plates and shells, buckling of plates and shells, structural dynamics, structural fatigue,
- mechanics of composite materials, and structural
- optimisation Textbooks
- ? T.H.G. Megson, Aircraft Structures for Engineering Students, 2nd Edition, Edward Arnold, Amember of
- the Hodder Headline Group, London Sydney Auckland, 1990 ? T.R. Chandrupatla and A.D. Belegundu, Introduction to Finite

- Price Charle participation and Price Decignition, introduction of Pinite Elements in Engineering, 2nd Edition,
  Prentice Hall, 1997.
  R. D. Cook, D. S. Malkus and M. E. Plesha, Concepts and Applications of Finite Element Analysis, 3rd
  Edition, John Wiley & Sons, 1989
- S.P. Timoshenko & J.N. Goodier, Theory of Elasticity, McGraw-Hill Book Company, 1985
   S.P. Timoshenko & JM Gere, Theory of Elastic Stability, McGraw Hill,
- 1961
- S.P. Timoshenko & S. Woinowsky-Krieger, Theory of Plates and Shells, 2nd Edition, McGraw-Hill, 1959
  I.M. Daniel & O. Ishai, Engineering Mechanics of Composite Materials, Oxford University Press, 1994
  D. J. Inman, Engineering Vibration, Prentice Hall, 1996

AERO 4390 Smart Materials and Structures

3 credit points. Session: 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 modern smart materials and structures technologies. Students will gain an appreciation of the advanced technology components: sensors, actuators, and central process unit, in the implementation of Smart Structures System. Syllabus Summary

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

#### AERO 4400 Aircraft Design 3

6 credit points. Session: 1. Classes: (1 lec, one 3hr design class)/wk. Prerequisite: AERO 3450 Aircraft Design 2 and either AERO 3400 Aircraft Design 1 or AERO 3401 Aerospace Design. 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 (RoskamA&EC)

AERO 4490 Advanced Aircraft Design

4 credit points. Session: 2. Classes: (one 3hr design class)/wk. Prerequisite: AERO 3450 Aircraft Design 2 AERO 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.

Svllabus Summarv

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 (RoskamA&EC)

AERO 4500 Flight Mechanics 2

#### 6 credit points. Session: 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 Agriptane Flight Dynamics and Automatic Flight Controls (RoskamA&EC, 1979) D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4501 Flight Mechanics 2A

4 credit points. Session: 1. Classes: (3 lectures and 1 tut)/week. Prerequisite: MECH 3800 Systems Control and AERO 3500 Flight

Mechanics 1. Assessment: Assignments and Exam.

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

#### UNDERGRADUATE UNITS OF STUDY

freedom. 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 (RoskamÁ&EC, 1979)

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

#### AERO 4590 Advanced Flight Mechanics

3 credit points. Session: 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 modem 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 Modern (McGraw-Hill, 1995)

#### AERO 4600 Practical Experience

No credit points. Session: 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. Session: 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 Mechatro 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.

NB: Department permission required for enrolment. 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 Aeronautical Engineering

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. Session: 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 4907 InterdiciplinaryThesis A 2 credit points. Session: 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. Session: 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: 40 credit points of 3rd Year UOS. Assessment: Satisfactory performance in the seminar as assessed by the participants and staff.

4th Year Core unit

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

#### Chemical Engineering

it is not obligatory, the subject for the seminar is normally closely related to the 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 topic 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.

#### AERO 4951 Thesis Preparation

No credit points. Session: 1, 2. Classes: None. Prerequisite: 36 credit points of Third Year Subjects. Assessment: A Thesis Plan and Literature Review is to be submitted for assessment.

Fourth Year core course for the degree in Aeronautical

Engineering and Aeronautical

(Space) Engineering.

Objectives/ Outcomes:

To develop an understanding of the practise of Aerospace 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 4952 Thesis.

#### AERO 4952 Thesis/Design Project

12 credit points. Session: 1,2. Classes: None. Prerequisite: AERO 4951 Thesis Preparation. Assessment: A bound thesis document is to be submitted for assessment.

Fourth year core course for the degree in Aeronautical

Engineering and Aeronautical (Space) Engineering.

Objectives/ Outcomes:

To develop an understanding of the practice of Aerospace 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. Session: 1. Classes: 2 lec/wk plus prac classes. Prohibition: AERO 4301 Applied Numerical Stress Analysis 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)

# Chemical Engineering

CHNG 1001 Chemical Engineering Applications 4 credit points. Session: 1. Classes: One (2 hr) lectureAutorial per week plus one (3 hr) laboratory or plant visit per week for one semester. Assessment: Laboratory reports (30%), industrial visits (10%), lecture reports (15%), final examination (45%).

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

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

Laboratory

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

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

- (a) What is chemical engineering? A survey of the nature of chemical engineering, of the nature of the Australian process industries, and of the main professional activities of chemical engineers. Lectures are given by invited speakers from government, industry and academia. Visits to works in the Sydney region are undertaken with tutorial exercises based on these visits.
- (b) Chemical engineering applications laboratory. An appreciation of (i) the methods and materials of construction of items of process equipment, (ii) the role of this equipment in building up an entire chemical processing plant, (iii) its operation and maintenance and (iv) safety requirements and procedures. Students will dismantle, reassemble and operate items of process equipment. They will present written answers to questions, supplemented by'drawings of process flowsheets, diagrams of dismantled equipment, and discussions of heat and mass balances and of process parameter values.

#### CHNG 1006 **Professional Communication for** Engineers

2 credit points. Session: 1. Classes: 2 hours of lectures/tutorials per week for 1 semester. Corequisite: CHNG 1201 Chemical Process Case Studies. Assessment: Tutorials and assignments (pass/fail course): participation (attendance and contribution) 10%; individual written exercises 4 x 10%; individual written assignment 50%. NB: Department permission required for enrolment. Aim: To improve students' written communication for academic and professional purposes.

Objective: To develop skills in the construction, cohesion, style and grammar of key written genres such as short answer responses and reports; to develop critical and analytical approaches to processing information; to support written assessment tasks within the discipline.

Description: This course will address the need for engineers to have well developed written communication skills. The course will develop strategies for selecting, analysing and reporting information in the discipline. Specifically, it will draw on the content of Chemical Process Case Studies (CHNG 1201) and support the written assignments of this unit. There will be a focus on improving the structure, academic style and grammatical correctness of students' writing.

Outcome: At the end of this unit of study students should be able to demonstrate improved skills in: writing appropriately for audience, purpose and situation; understanding basic sentence and paragraph structure; critically evaluating information; logical reasoning in writing.

#### CHNG 1101 Chemical Engineering 1A

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

#### **Objectives/Outcomes**

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

# Syllabus

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

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

# CHNG 1102 Chemical Engineering 1B

4 credit points. **Session: 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. **Session: 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. **Session: 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 Engineers 1B 4 credit points. Session: 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 -100% tutorial performance.

pass/fail basis -100% tutorial performance. Objectives/outcomes: to develop a basic understanding of the Matlab computing environment and its use in solving chemical engineering problems.

Syllabus summary:

Review of linear algebra

- Introduction to Matlab
- Matlab functions
- Interpolation and curve fitting

Applications (of the above) to chemical engineering problems *Textbooks* 

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

#### CHNG 2101 Chemical Engineering 2A

4 credit points. **Session:** 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. Session: 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 lighthearted 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. Session: 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. Session: 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. Session: 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. Session: 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. Session: 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. **Session:** 1. **Classes:** one lecture per week and two tutorial/project/lab sessions per week for one semester. **Prerequisite:** Advisory prerequisite: CHEM 1101, CHEM 1102. **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. Stryer 4th edition, WH Freeman and Co. NY

CHNG 2702 Fundamentals of Bioprocess

#### Engineering 2

4 credit points. **Session: 2. Classes:** one lecture and two tutorial/project/ labs per week for one semester. **Prerequisite:** advisory prerequisite: CHEM 1101, CHEM 1102, CHNG 2701. **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. Session: 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. Session: 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.

NB: Department permission required for enrolment.

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. Session: 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. *NB: Department permission required for enrolment.* 

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. Session: 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 heattransfer 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. Session: 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.

#### CHNG3103 Unit Ops (Particle Mechanics) 4 credit points. Session: 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. Session: 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 non-receipting fluid 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. Session: 1. Classes: Two (1 hr) 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.

#### Chemical Engineering

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 3parameter 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.

### CHNG3106 Thermodynamics 2

4 credit points. **Session: 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. **Session:** 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. **Session: 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. **Session**: 2. **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. Closedloop characteristic equation. Stability analysis. Controller design. Process reaction curve method. Use of MATLAB.

### CHNG 3303 Flowsheeting and Optimisation

4 credit points. Session: 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. **Session:** 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. Session: 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. Session: 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. Session: 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. Session: 1,2. Classes: There are no formal classes for this course. Prerequisite: advisory prerequisites: Passed at least 144 credit points. Assessment: See Syllabus description.

NB: Department permission required for enrolment.

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.

report, as a seminar, or both. CHNG 4041 Exchange Program 4A 24 credit points. Session: 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.

NB: Department permission required for enrolment. 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. Session: 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.

NB: Department permission required for enrolment.

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. Session: NA in 2003. 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. Session: 1, 2. Classes: Three hours of lectures/tutorials per week for one semester. Assessment: Tutorial assignments; final examination.

Objectives/Outcomes - To develop an understanding of the physical mechanisms governing momentum, energy and mass transfer, and the application of these concepts to engineering calculations. Students will develop skills in: model formulation
#### Chemical Engineering

and solving 3 dimensional transport problems using vector/ tensor analysis and differential equations. Syllabus Summary Introduction to transport phenomena. Vector and tensor analysis. Momentum transfer: basic mechanisms; complex fluids (eg, particulate suspensions, polymers, liquid crystals, electro- and magneto-rheological fluids); relationship between microstructure and flow behaviour; constitutive modelling; viscoelasticity; memory effects; non-shearing flow geometries. Analysis of mechanisms governing mass & energy transfer: boundary layers; diffusion; laminar and turbulent flow.

#### CHNG 4103 Advances in Polymer Engineering 4 credit points. Session: 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.

Svllabus 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. Session: 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. Session: 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.

#### UNDERGRADUATE UNITS OF STUDY

#### 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. Session: 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. NB: Department permission required for 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. Svllabus

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. Session: 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. Session: 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. Session: 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. **Session: 1. Classes:** Three hours of lectures, class exercises and tutorials 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. Session: NA in 2003. Classes: Three hours per week of group work with a (nominated) company for one semester, plus 3 onehour 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 midway through 1st semester, then work till the end of 2nd semester.

#### CHNG 4501 Biochemical Engineering

8 credit points. Session: 2. Classes: 2 x 2 hr / week Lectures, 4 x 12 hr / semester Laboratories, 6 x 1 hr Tutorials. **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.
- 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. **Session: 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. **Session:** 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: devicing strategies to schiave extraction process objectives

- 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. Hydrometailurgical processing of low-grade ores and electrowinning.

## Civil Engineering

#### CIVL1001 **Civil Engineering 1**

4 credit points. Session: 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. Session: 2. Classes: 1 lecture and one 2 hour computer laboratory session/week. Prohibition: SOFT 1001 Software Development 1 and SOFT 1002 Software Development 2. 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. Litdefield Mastering Matlab Prentice-Hall 1996.

D.M. Etter Engineering Problem Solving with Matlab 2nd Ed., 1997
 F.S. Hill MacMillan Computer Graphics 1990
 V.B. Anand Computer Graphics and Geometric Modelling for Engineering John Wiley & Sons, 1993

#### CIVL 1051 **Dvnamics**

5 credit points. Session: 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. Session: 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. Session: 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. Session: 1. Classes: lec: 39hrs, tut: 26hrs. Assumed knowledge: CIVL 1051 Dynamics and CIVL 1052 Statics. Assessment: Tutorial submissions, laboratory reports, quizzes and end of semester examination.

Second year core unit of study for the degree in Civil

Engineering and Project Engineering and Management (Civil). Objective

The primary objective is to understand internal actions (forces and moments) in structures (deformable objects) under loads in three key areas:

- how structures resist external loads by internal actions.
- the distribution of internal actions within structures, and

- the deformations, stresses and strains associated with the internal actions. Outcomes
- At the end of this course, students should be able to:
- Understand the basic methods of load transfer in structures tension, compression, bending, shear and torsion (internal actions)
- Apply the equations of equilibrium to determine the distribution of internal actions in a simple structure by drawing BMDs, SFDs, AFDs, and TMDs,
- Understand the significance and methods of calculation of the geometric properties of structural sections (I, Z, S, J etc),
- Understand the effect of internal forces and deformations of bodies through the concept and calculation of strains and stresses
- Appreciate the behaviour of structures by analysing structures without numerical calculations,
- Display a knowledge of basic material properties, combined stresses and failure criteria, and
- Demonstrate their hands-on experience of the behaviour of structural members via experiments and the ability to prepare written reports on those experiments. Emphasis in the assessment scheme will be placed on

understanding structural behaviour and solving problems, rather than remembering formulae or performing complex calculations.

The course seeks to utilise and improve the generic skills of students, in areas such as problem solving, neat and logical setting out of solutions, report writing, and team work.

Syllabus summary: Introduction; Equilibrium; Internal Actions: BMDs, SFDs, AFDs, and TMDs; 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

CIVI 2204 Introduction to Structural Concepts 4 credit points. Session: 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 Pronibition: 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. Session: 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.

Textbook

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

SAA AS4100 - Steel Structures Code SAA AS3600 - Concrete Structures Code, and SAA AS 1720.1 - Timber Structures Code, and

SAA AS 1170 - 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. Session: 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).

CIVL 2610 Fluids 1

6 credit points. Session: 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. How 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 (Wilev)

Vennard and Street Elementary Fluid Mechanics (Wiley). Nakayaraa 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. Session: 2. Classes: 26hrs lec & 26hrs tut. Assessment: Regular coursework as well as tests as generally advised at the commencement of the course.

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, Excavation Handbook

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

CIVI 3005 **Engineering Communications 2** 

2 credit points. Session: 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. -

Materials Aspects in Design CIVI 3102

4 credit points. Session: 2. Classes: lec 40hrs, lab: 12hrs. Assumed knowledge: CIVL 2101 Properties of Materials. Prohibition: CIVL 3225, CIVL 3226, CIVL 3227. Assessment: One 3hr exam covering the whole syllabus

NB: Department permission required for enrolment.

This course will not be offered after 2001. Students who failed this course in 2001 should see the Department of CivilEngineering as to proceedures for re-enrolling.

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

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

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

#### UNDERGRADUATE UNITS OF STUDY

#### Textbooks

Materials Science and Engineering an Introduction

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

Campbell-Allen and Roper Concrete Structures: Materials Maintenance and Repair (Longman Scientific and Technical) - preferred text. Soroka Portland Cement Paste and Concrete (Macmillan Australia, 1979)

Akroyd Concrete - Its Properties and Manufacture (Pergamon) and/or

Troxell Composition and Properties of Concrete 2nd edn (McGraw Hill). U.S. Bureau of Reclamation Concrete Manual

Czemin Cement Chemistry and Physics for Civil Engineers (Lockwood). Relevant SAA Specifications.

CIVL 3204 Structural Analysis

6 credit points. Session: 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, MJ Clarke Structural Analysis 2, (Univ of Svdnev)

Reference Books

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

Timoshenko and Young, Theory of Structures (McGraw Hill)

#### CIVI 3206 Steel Structures 1

6 credit points. Session: 2. Classes: 39hrs lec, 39hrs tut/lab/drawing office. Assumed knowledge: CIVL 2201 Structural Mechanics. Prohibition: CIVL 3227. Assessment: One 3 hr exam at the end of the semester plus assessment of design and problem based assignments. NB: Department permission required for enrolment. This unit of study has been superceeded by CIVL 3227. It is available for enrolment for certain students only with Head of Department Approval.

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

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

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

(AISC) Economical Structural Steelwork.

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

BHP, Hot Rolled and Structural Products Handbook.

Standards Australia Specifications - current editions AS 1170 Parts land 2 Loading Code, and

AS4100 Steel Structures Code; or

ASHB2.2 Structural Engineering Standards.

Reference books

AISC, Design Capacity Tables for Structural Steel.

Trahair and Bradford, Behaviour and Design of Steel Structures to

AS4100 (3rd Edn, É & FN Spon, 1998).

#### UNDERGRADUATE UNITS OF STUDY

CIVL 3207 **Risk and Reliability Analysis** 2 credit points. Session: 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 3tir 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 3224 Concrete Structures: Design

3 credit points. Session: 2. Classes: Lectures 24 hrs: tut/lab/drawing office 18 hrs. Assumed knowledge: CIVL 2201 Structural Mechanics and CIVL 2203 Structural Design. Prohibition: CIVL 3205 Concrete Structures 1, CIVL 3226. Assessment: One 3 hour exam plus design project and mid-semester test.

*NB: Department permission required for enrolment.* This unit of study has been superceeded by CIVL 3226. It is available for enrolment for certain students only with Head of Department Approval.

Syllabus Summary: The reinforced concrete truss analogy (shear/torsion/and detailing implications). Introduction to behaviour or reinforced concrete slabs. Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings. Material aspects of cement and concrete.

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

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

Textbooks

Warner et al, Concrete Structures (Longman 1998)

Standards Australia Specifications - current editions: AS1170 Loading Code - Parts 1,2 & 4

AS3600 Concrete Structures Code

ASHB2.2 Structural Engineering Standards

Reference Books Concrete Design Handbook, Cement and Concrete Association of Australia

Reinforcement Detailing Handbook, Concrete Institute of Australia.

CIVL 3225 Concrete Structures: Behaviour 4 credit points. A/Prof. S. G. Reid. Session: 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 a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis of reinforced concrete behaviour (including an understanding of capabilities and limitations).

Expected 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/timedependence), 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

Concrete Structures: Design CIVL 3226

4 credit points. A/Prof. S. G. Reid. Session: 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:

AS1170LoadingCode-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

B credit points. Session: 2. Classes: Lectures: 39 hrs; tut/lab/drawing office: 39hrs, lab 8hrs. 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, midsemester 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

The primary objectives are:

- to provide fundamental understanding of behaviour and design of steel members, connections and structures,
- to provide a fundamental knowledge on the material aspects of steel and other metals, and to relate the properties of metals to the design of structures, and

CIVL 3227 Steel Structures 1 to reinforce and complement the content of related units of study.

Emphasis will be placed on understanding structural behaviour and solving problems rather than remembering formulae.

Outcomes

It is anticipated that at the end of this unit of study students should

- Be familiar with the behaviour of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions
- Have a working knowledge of AS 4100, and be competent in designing a simple structure to AS 4100.
- Have some confidence that they could understand most design specifications.
- Ĥave knowledge of the material aspects of steel manufacture, and material associated failures/issues in structural steel design

The unit of study seeks to utilise and improve the following generic skills of students: problem solving, neat and logical setting out of solutions, report writing, team work, and interpretation and understanding of technical drawings and specifications.

In addition, students will experience the behaviour of structural members and materials at first hand through a set of laboratory experiments.

Syllabus Summary: The behaviour of steel members and structures - manufacturing technology of metals, fracture, fatigue, 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 lengms 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.J. 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 AS1170 Parts 0,1 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. Session: 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. Session: 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. Session: 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. Blinker, P. Wolf Elementary Surveying (Harper Collins Publishers)

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

#### CIVL 3602 Fluids 2

4 credit points. Session: 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. Session: 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).

Wiley, 1997). (Wiley, 1997). ICAO Airport Planning Manual. Rural Road Design (Austroads 1989). Pavement Design (Austroads 1992).

CIVL 3802 Engineering Construction 2 4 credit points. Session: 1. Classes: 26hrs lec & 26hrs tut. Assumed knowledge: Completion of CIVL 2801 Engineering Construction 1 or equivalent knowledge. Assessment: Assignments and tests 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. Session: 1. Prohibition: CIVL 4803 Engineering Management. Assessment: Tests and coursework including a final examination as advised at the commencement of the course.

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. Session: 2. Assessment: Class tests and coursework, and a 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 finalisation, 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, Contacts 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, MrTed Tooher. **Session:** 1. **Assessment:** Tests and assignments completed and submitted by students in stages. Details will be advised at the commencement of the course.

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

Course objectives:

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

Expected outcomes:

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

#### **Civil Engineering**

#### Syllabus summary:

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

Textbooks

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

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

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

CIVL 4001 Thesis/Design/Project A

No credit points. Session: 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. Session: 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

NB: Department permission required for enrolment in Session 1. 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. Session: 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: CIVI4001 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

NB: Department permission required for enrolment. Objectives/Outcomes: This unit of study provides and opportunity for students to conduct original investigation and research work 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 successfully for the award of Honours in the civil stream of Bachelor of Engineering.

CIVI 4004 Honours Thesis/Design/Project B 10 credit points. Session: 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: CIVI 4001 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

NB: Department permission required for enrolment.

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.

#### CIVI 4008 Practical Experience

No credit points. Session: 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)

CIVI 4016 Professional Practice- Civil Engineering 5 credit points. Session: 2. Classes: 26hrs lec, 26hrs tut. Assessment: Project test and assignment work. No final examination.

NB: This unit is not available to students in the Civil - Project Engineering Management stream

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

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 ofSydney)

CIVL 4218 **Concrete Structures 2** 

5 credit points. Session: 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

AS 1170 Parts 1 and 2 Loading Code, and

AS3600 Concrete Structures Code, or

AS HB2.2 Structural Engineering Standards.

Reference books

Lin and Burns Design of Prestressed Concrete Structures (Wiley). Park and Gamble Reinforced Concrete Slabs (Wiley).

Other books as indicated in classes

Structural Dynamics CIVL 4219

#### 5 credit points. Session: 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. (Alien & Unwin, 1983).

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

'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. Session: 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. Session: 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. Session: 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, axi-symmetric problems, 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. Session: 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. Session: 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.

#### Civil Engineering

Objectives: To develop an understanding of: current methods used in the investigation and design of foundations on soils and rocks; the limitations of these methods.

Outcomes: Students should gain an understanding of: the 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. Session: 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-frequencyduration 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 (LE. 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. Session: 2. Classes: 26hrs lec, 26hrs tut. Assumed knowledge: Material covered in Fluids 2. 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

Shore Protection Manual Vol. 1 and 2, Dept of the Army, Coastal Engineering Research Centre, US Army Corps of Engineers, 1984. Computer Applications in Hydraulic Engineering (Haestad Press).

#### CIVL 4609 Water Resources Engineering

5 credit points. Session: 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 reuse; 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. Session: 1. Classes: 26hrs lec, 26hrs tut. Prohibition: CIVL 3803 Project Appraisal. Assessment: Class tests, coursework and final examination will be conducted. Details will be advised at the commencement of the course.

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. Session: 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 the examiners' evaluation of the quality and thoroughness of work done 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 M Chaaya. Session: Assumed knowledge: Sufficient knowledge of information technology systems & communications capabilities. Assessment: Coursework and tests including a final examination. 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. Session: 1. Assumed knowledge: Completion of CIVL 2801 Engineering Construction 1 and CIVL 3802 Engineering Construction 2 or the equivalent knowledge. Assessment: A class test and an assignment, using an integrated system. Details will be advised at the commencement of the course.

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

Course objectives:

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

#### Expected Outcomes

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

#### Svllabus 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

#### Reference books

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

Barrie and Paulson. Professional Construction Management.

Project Quality Risk and Procurement Mat CIVI 4810 6 credit points. Coordinator Prof. A. jaafari. Session: 2. Assessment: based on both coursework and tests, including a final examination, 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 affiancing. 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. Session: 1. Classes: 13hrs lec & 39hrs of 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 - Uich Structure Dal

AS1511 - High Strength Structural Bolting Code

MAI Steel Structures

Austroads Bridge Design Specification

AS1720 - Timber Engineering Code (Purchase of separate codes is recommended)

#### CIVL 5252 Plates and Shells

6 credit points. Session: 2.

NB: Department permission required for enrolment.

#### Electrical Engineering

For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5257 Concrete Structures: Prestressed 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5258 Advanced Structural Steel Design 6 credit points. Session: 1.

For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5259 Advanced Structural Steel Analysis 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5351 Environmental Geotechnics

6 credit points. Session: 1. For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5353 Environmental Oceanography & Meteorology

4 credit points. Session: 1. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5450 Analysis and Design of Pile Foundations 6 credit points. Session: 1.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5454 Rock Engineering

6 credit points. Session: 2. For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5456 **Earth and Rockfill Dams** 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5654 Ocean Mixing

4 credit points. Session: 2. For more information see the Faculty of Engineering Postgraduate Handbook.

# CIVL 5850 **Project Planning and Optimisation** 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

## CIVL 5851 Civil Engineering Project

6 credit points. Session: 1, 2, Summer. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5852 Project

12 credit points. Session: 1,2, Summer. For more information see the Faculty of Engineering Postgraduate Handbook.

## CIVL 5853 Seminar

2 credit points. Session: 1, 2. For more information see the Faculty of Engineering Postgraduate Handbook.

## Electrical Engineering

## ELEC 1001 Introductory Electrical Engineering

4 credit points. Session: 2. Classes: Two 1 hr lectures per week and nine 3hr lab/tut. Prerequisite: Advisory Prerequisite: MATH 1001 Differential Calculus. Prohibition: ELEC 1102 Foundations of Electronic Circuits. Assessment: Lab reports, assignments and a 2hr exam at end of semester.

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

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. Seriesparallel 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. Session: 1, Summer. Classes: Two 1 h lectures, one 2hr lab and one 2hr tut per week. Assumed knowledge: HSC Maths extension 1. Assessment: Laboratory and tutorial work, a laboratory exam and a 3-hr exam at the end of semester.

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

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. Session: 2. Classes: Two 1hr lectures, one 2hr lab, one 2hrtut per week. Assumed knowledge: HSC Physics 2 units, MATH 1001 Differential Calculus. Assessment: Laboratory and tutorial work, a laboratory test and an exam at the end of semester. Core unit of study for Computer, Electrical, Mechatronic, Software and Telecommunications Engineering.

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. Session: 1. Classes: Three 1 hr lectures and a 3hr lab/tut per week. 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, assignments and a 2hr exam at end of semester. Core unit of study for Mechanical Engineering.

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. Induction motors. Equivalent circuits. Slip-torque characteristics. 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. 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.

Microprocessorfundamentals: 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. Session: 1. Classes: 3 1hr lectures 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 Systems. Assessment: Lab reports, assignments and a 2hr exam at end of semester.

Core unit of study for Mechanical Engineering (Biomedical). Three phase electric power systems. Star and delta connections. Balanced and unbalanced loads. Magnetic fields. Solenoids and toroids. Magnetic circuit calculations. AC

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. Session: 1. Classes: Two 1 hr lectures and a 2hr tut per week. Assumed knowledge: ELEC 1102 Foundations of Electronic Circuits. Prohibition: ELEC 2001 Electrical and Electronic Engineering 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.

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. Session: 1. Classes: One 1 hr lecture and a 3hr lab per week. Prerequisite: 36 credit points. Prohibition: CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing. Assessment: Lab work, through semester examinations and a 2hr exam at end of semester.

Core unit of study for Electrical, Computer, Software and Telecommunications Engineering and Electronic Commerce. Basic features of Matlab. The Matlab desktop. Interactive use with the command window. Performing arithmetic, using

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 numerical 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. 4 credit points. Session: 2. Classes: Two 1 hr lectures and 2hrs lab/tut per week. Assumed knowledge: MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. 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, Electronic Commerce, Software and Telecommunications Engineering.

Continuous-time and discrete-time signals: classification and properties. Basic properties of systems: linearity, timeinvariance, causality, stability. Linear time-invariant (LTI) systems: the convolution sum and convolution integral, characterisation by differential and difference equations, impulse response, singularity functions. Fourier series for continuoustime 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. Session: 2. Classes: Two 1 hr lectures per week, and a 1 hr tut and a 3hr lab every two weeks. Assumed knowledge: ELEC 1102 Foundations of Electronic Circuits. Prohibition: ELEC 2001 Electrical and Electronic Engineering, and ELEC 2003 Electrical and Electronic Engineering A. Assessment: Lab, quizzes and a 2hr exam at end of semester.

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

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. Session: 1. Classes: Two 1 hr lectures per week and six 3hr labs. Assumed knowledge: ELEC 1101 Foundations of Computer Systems. Prohibition: MECH 2701 Mechatronics 2. Assessment: Lab, quizzes and a 2hr exam at end of semester. Core unit of study for Computer, Electrical, Electronic

Commerce, Software and Telecommunications Engineering.

Computer architecture and assembly language programming. Microprocessor and microcontroller systems, memory and IO interfacing, interrupts and interrupt handling. System design, implementation and debugging.

#### ELEC 3101 Circuit Theory and Design

4 credit points. Session: 2. Classes: Two lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2101 Circuit Analysis, and ELEC 2301 Signals and Systems. Assessment: Assignments, labs and a 2hr exam at the end of semester.

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

The aim of this unit of study 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. Session: 1. Classes: Two 1 hr lectures per week, one 2hr tutorial every second week. Assumed knowledge: PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering). Assessment: Questions in lectures/ tutorials, a mid-semester quiz, 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.

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, propagation in waveguides, waveguide components, radiation patterns of antennas and simple antenna arrays.

## ELEC 3103 Electrical Engineering Design

4 credit points. Session: 2. Classes: One 1 hr lec and a 2hr lab per week. Assumed knowledge: ELEC 2101 Circuit Analysis, ELEC 2301 Signals and Systems, ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems. Assessment: Lab, assignments and a 2hr exam at end of semester.

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

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. Session: 1. **Classes**: Two 1 hr lectures and one 2hr lab/tut per week. **Assumed knowledge**: ELEC 2101 Circuit Analysis. **Assessment:** Tutorials, one 1 hr mid-semester exam, one 2hr exam at end of semester.

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

A broad view of 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.

More detailed study of techniques of systems modelling and analysis including three phase systems, transformers and per unit systems, rotating machines, transmission lines and the control of real and reactive power.

#### ELEC 3202 Power Electronics and Drives

4 credit points. Session: 2. Classes: Two 1 hr lectures and an average of 2hr lab/tut per week. Assumed knowledge: ELEC 2401 Introductory Electronics and (ELEC 2001 Electrical and Electronic Engineering or ELEC 3201 Electrical Energy Systems). Assessment: Lab reports, a mid semester exam and a 2hr exam at end of semester. Core unit of study for Mechatronic Engineering. Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems. Prohibition: MECH 3800 Systems Control and CHNG 3302 Process Control. Assessment: Lab, a mid semester exam and a 2hr exam at end of semester.

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

History and review of control. Modelling of physical processes; state variables and differential equations. Dynamic response; review of Laplace transform, transfer functions and block diagrams, poles and zeros. Design specifications in the time domain. Basic feedback principles; effect of feedback on sensitivity and disturbance rejection, steady state accuracy and stability; the Routh criterion; proportional, integral and derivative control. Design using the root locus; rules for sketching root locus; lead and lag compensators; analogue and digital implementation of controllers. Frequency response design methods; the Nyquist stability criterion; design specifications in the frequency domain, gain and phase margins; compensator design. An introduction to state space for single input singleoutput systems; eigenvalues, zeroes and transfer functions; introduction to state variable feedback and design of estimators.

#### ELEC 3303 Digital Signal Processing

4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems. Assessment: Lab reports, assignments and a 2hr exam at end of semester.

Core unit of study for Computer, Software, Electrical and Telecommunications Engmeering.

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. **Session: 1. Classes:** Two 1 hr lectures per week, a 3hr lab and a 1 hr tut every two weeks. **Assumed knowledge:** ELEC 2401 Introductory Electronics. **Assessment:** Lab work, quizzes and a 2hr exam at end of semester.

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

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. Session: 2. Classes: Two 1hr lectures and up to 2hr lab/ tut per week. Assumed knowledge: ELEC 3401 Electronic Devices and Circuits. Assessment: Practical work and a 2hr exam at end of semester. Core unit of study for Telecommuncations Engineering. Recommended elective unit of study for Computer, Electrical and Software Engineering.

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

ELEC 3403 Switching Devices and Electronics 4 credit points. Session: 2. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

Solid state physics, PN and metal-semi junctions, semiconductor devices, digital devices (TIL, 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 optoisolators, 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. Session: 1. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems. Assessment: Assignments, lab marks and an exam at end of semester. Core unit of study for Computer, Software, Electrical and Telecommunications Engineering.

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/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.

#### UNDERGRADUATE UNITS OF STUDY

ELEC 3503 Introduction to Digital Communications 4 credit points. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems. Assessment: Assignment, 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.

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 3504 Data Communications and the Internet 4 credit points. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). Prohibition: ELEC 4501 Data Communication Networks. Assessment: Assignments, lab works, mid-semester quiz, and a 2hr exam at the end of semester.

Core unit of study for Computer, Software and

Telecommunications Engineering. Recommended elective unit of study for Electrical Engineering.

Networking principles; Network protocols - The 7-layer ISO / OSI and TCP/IP reference models; Application protocols and socket programming; Reliable and unreliable transport layer design and implementations; Multiplexing - FDM, TDM, STDM, CDM; Network topologies; Circuit and packet switching techniques; Introductory queuing and traffic theory for circuit switched and packet switched networks; Local area network architectures; Network layer, routing and IP protocols; Link layer and medium access protocols; Physical, data link, and network layer implementations in LANs and public data networks; Concepts of broadband, metropolitan and wide area networks; Network technologies; Introduction to frame relay and asynchronous transfer mode (ATM); Multimedia and real-time communications networks; Comprehensive broadband networks for user access; Network performance evaluations; Related technologies and standards.

#### ELEC 3601 Digital Systems Design

4 credit points. Session: 2. Classes: A1 hr lecture per week and nine 3hr lab sessions. Assumed knowledge: ELEC 2601 Microcomputer Systems, or COMP 2001 Computer Systems, or NETS 2008 Computer Systems Organisation, or NETS 2908 Computer Systems Organisation (adv) or MECH 2701 Mechatonics 2. Assessment: Lab, quizzes and a 2hr exam at end of semester.

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

Structure of digital systems, programmable logic, state machine design, datapath functions, computer arithmetic, computer design, pipe-lines, specification languages.

#### ELEC 3603 Introduction to Computing Systems 4 credit points. Session: 1. Classes: Two hours of lectures/tutorials and a 2hr lab per week. Assumed knowledge: ELEC 2601 Microcomputer Systems. Assessment: Assignments, lab work and a 2hr exam at the end of semester.

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

Introduction to Computer Architecture and Technology. Performance, its role, measurement and evaluation. Instruction set architectures and instruction set design. Processor implementations, Enhancing performance with pipelines and superscalar CPUs. The memory hierarchy. Interfacing and peripherals. Parallel and distributed processing. Introduction to networks and protocols. Elements of computer security. Some case studies of selected processors and systems.

#### ELEC 3701 Management for Engineers

4 credit points. Session: 1. Classes: Two 1 hr lectures and a 1 hr tut per week. Prohibition: Prohibition: ENGG 2003 Introduction to Engineering Management. 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.

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. Session: 1. Classes: One 2hr lecture and up to 2hr lab/tut per week. Assumed knowledge: ELEC 2401 Introductory Electronics or ELEC 2001 Electrical and Electronic Engineering or ELEC 2003 Electrical and Electronic Engineering A. Assessment: Lab reports, one 2hr exam at end of semester.

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

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, electiomyogram, 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. Session: 1. Classes: Two 1 hr lectures and a 1 hr tut per week. Assumed knowledge: ELEC 3201 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.

A range of topics will be presented related to electrical systems analysis. The topics covered may vary somewhat from year to year.Possible topics include the following. Analysis of power systems under normal operating conditions (the power flow problem). Symmetric components and unbalanced system operation. Transmission line transients. Faults and protection. Advanced modelling of synchronous generators. Automatic generation control. An introduction to transient stability, voltage and long-term stability, dynamic stability. The electrical energy market.

#### ELEC 4301 Computer Control System Design 4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 3302 Fundamentals of Feedback Control. Assessment: Assignments, a mid semester quiz and a 2hr exam at end of semester.

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

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. Session: 2. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems, and ELEC 4303 Digital Signal Processing. Assessment: Assignments and a 2hr exam at end of semester.

*NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. Session: 1. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

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. Session: 1. Classes: Two 1 hr lectures and an average of 2-1/2 hr lab/tut per week. Assumed knowledge: ELEC 2301 Signals and Systems, ELEC 3302 Fundamentals of Feedback Control, and ELEC 3401 Electronic Devices and Circuits. Prohibition: ELEC 4401 Electronic Design. Assessment: Assignments, quizzes, lab work and a 2hr exam at end of semester.

*NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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 4502 Digital Communication Systems 4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

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 multichannel systems, performance criteria and systems analysis. Satellite communications systems. Cellular mobile radio systems.

#### ELEC 4503 Error Control Coding

4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

Error control coding principles, linear algebra, linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, bursterror correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording, convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission, multidimensional codes, turbo codes.

ELEC 4504 Wireless Networks

4 credit points. Session: 2. Classes: Two 1 hr lectures and a 1 hr tut per week. Assessment: Assignments, one 2hr exam at end of semester.

Recommended elective unit of study for BE students in Computer, Electrical, Software and Telecommunications Engineering. Recommended elective unit of study for BIT and BCST students in Networks and Systems.

This unit will introduce the key ideas in modern wireless telecommunications networks. The main focus will be on capacity, radio resource management and mobility management issues for second and third generation wireless networks.

Background: Radio channel characteristics. Overview of digital modulation schemes. Multiple access schemes: FDMA, TDMA, CDMA. This short module is intended to introduce basic physical layer communications concepts to those students who do not have a communications engineering background.

Principles of mobile communications: Frequency reuse, spectral efficiency, handover, interaction with the fixed network. Microcells and macrocells.

Medium access control: Near-far effect and the hidden terminal problem. Wireless MAC schemes: Aloha and s-Aloha, carrier sense multiple access, reservation-based MAC schemes, polling, spread-aloha multiple access.

GSM: System architecture, radio resource management, mobility management, connection management.

Third generation systems: WCDMA and cdma 2000

Wireless LANs: IEEE802.11, Hiperlan, Bluetooth. Convergence: GSM evolution to data services via GPRS and EDGE. Issues with TCP over wireless. Mobility management in MobilelP. WAP.

#### ELEC 4601 Computer Design

4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr iab/tut per week. Assumed knowledge: ELEC 3403 Switching Devices and Electronics, and ELEC 3601 Digital Systems Design. Prohibition: MECH 4730 Computers in Real time Instrumentation and Control. 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.

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. Session: 1. Classes: Ttwo 1h lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

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. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: COMP 3100 Software Engineering or SOFT 3104 Software Development Methods 2. 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 Electronic Commerce. The objective of this course is for students to become aware of

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. Session: 2. Classes: Two 1hr lectures and one 2hr tutorial/workshop per week. Assumed knowledge: ENGG 2003 Introduction to Engineering Management or ELEC 3701 Management for Engineers. Assessment: Assignments, in-course involvement, and a 2hr exam at end of semester.

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

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. Session: 1, 2. Classes: Not applicable. Assessment: Submission of a written report.

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

Students are required to obtain industrial experience of 12 weeks duration. This experience is normally gained at the end of third year before entering fourth year. Work 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 School of Electrical and Information Engineering and the Careers and Appointments Service, will assist as much as possible. The student is required to inform the School of any work arrangements made and to obtain approval of these arrangements.

Assessment in this course is by the submission, normally within the first two weeks of semester 1 of the following year, of a written report of about 2500 words on the industrial experience undertaken. The report is to describe 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 prior to submission by a responsible officer of the company.

#### ELEC 4703 Thesis

12 credit points. Session: 2. Classes: There are no formal classes. The bulk of the work will be carried out during semester 2 with some preparatory work in semester 1. Prerequisite: 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. 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. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: (COMP 3100 Software Engineering and COMP 3205 Product Development Project) or (INFO 2000 Systems Analysis and Design and SOFT 2004 Software Development Methods 1). 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 Communications Engineering and Electronic Commence

Telecommunications Engineering and Electronic Commerce. The objective of this unit of study 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. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 3801 Fundamentals of Biomedical Engineering. Assessment: Assignments, lab and a 2hr exam at end of semester.

*NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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 Advanced Power Systems and Markets 4 credit points. Session: 2. Classes: Two 1 hr lectures and a 2hr tut/ project per week. Assumed knowledge: ELEC 3201 Electrical Energy Systems, and ELEC 4201 Electrical Power Systems. Assessment: Assignments and a 2hr exam at end of semester. *NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering

Software and Telecommunications Engineering. 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 Advanced Systems and Control

4 credit points. Session: 2. Classes: Two 1 hr lectures and a 2 hr tut/ project per week. Assumed knowledge: ELEC 3302 Fundamentals of Feedback Control, and ELEC 4301 Computer Control System Design. Assessment: Assignments, labs and a 2hr exam at the end of semester. *NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. Session: 2. Classes: two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: NETS 3007 Network Protocols or ELEC 3604 Internet Engineering. Assessment: Project report and presentation and a 2hr exam at end of semester. Recommended elective unit of study for Computer, Electrical,

Software and Telecommunications Engineering. This unit of study serves as an introduction to network

research. The unit relies on a solid understanding of the TCP/IP protocol suite and properties of data networks' physical layers. The unit introduces some of the currently most debated research topics in networking and presents an overview of different technical solutions. The students are expected to critically evaluate these solutions in their context and produce an objective analysis of advantages/disadvantages of the different research proposals. Areas covered will be IP mobility management, quality of service in IP networks, ad hoc networks, naming and presence systems and peer-to-peer networks.

ELEC 5502 Satellite Communication Systems 4 credit points. Session: 2. Classes: Two 1hr lectures and a 1hr tut per week. Assumed knowledge: 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.

#### **Electrical Engineering**

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

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. Session: 1. Classes: Two 1 hr lectures and a 1 hr tut per week. Assumed knowledge: ELEC 3402 Communications Electronics, 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.

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. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: 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.

Antenna basics: analysis of simple antennas, uniform linear antenna arrays, planar array, base-station antennas, mobile antennas. Mobile radio channel: multipath fading, diversity, lognormal 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, cdma 2000 layering structure.

#### ELEC 5506 Optical Networks

4 credit points. Session: 2. Classes: Two 1 hr lectures and a 1 hr lab/tut per week. Assumed knowledge: 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.

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. Session: 1. Classes: Two 1 hr lectures and a 1 hr lab/tut per week. Assumed knowledge: ELEC 2101 Circuit Analysis, and ELEC 3401 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.

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. **Session:** 2. **Classes:** Two 1 hr lectures and a 1 hr lab/tut per week. **Assumed knowledge:** 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.

This unit of study covers the theory and practice of modern antenna design, relevant to applications in telecommunications, radar and imaging systems from metre to millimetre wavelengths.

The first part of the unit describes the theory of radiation from elementary current sources, wires and arrays and introduces antenna terminology and characteristics such as radiation patterns, directivity, polarization and gain. The properties of receiving and transmitting antennas in a communications link are also described.

The second part of the unit describes three significant areas in antenna practice:

- 1. Numerical analysis of wire antennas an introduction to the computer aided design of wire antennas and arrays.
- 2. Aperture antennas an introduction to horn and reflector antennas and their applications.
- 3. Microstrip antennas an introduction to modern printed circuit antennas and arrays and their applications.

ELEC 5601 Advanced Real Time Computing 4 credit points. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 4602 Real Time Computing. Assessment: Assignments and a 2hr exam at end of semester. *NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. **Session: 2. Classes:** Assignments and a 2hr exam at end of semester.

*NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. Session: 2. Classes: two 1 hr lectures and a 1 hr lab/tut per week. Assessment: Assignments and a 2hr exam at end of semester.

*NB: Department permission required for enrolment.* Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

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. Session: 1. Classes: two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: NETS 3007 Network Protocols or ELEC 3504 Data Communications and Internet. Prohibition: ELEC 3604 Internet Engineering. Assessment: an assignment, a mid semester exam and a 2hr exam at end of semester.

NB: Department permission required for enrolment. Permission required for enrolment

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

This unit of study covers the design and implementation of interactive networked multimedia processing and communication applications. The course will build on previous knowledge of the TCP/IP protocol stack and the principles of packet and circuit switched data networks and enhances this knowledge significantly in selected areas related to multimedia delivery over IP based networks. Video and audio coding principles will be covered and associated protocols and standards studied. Furthermore, standards, tools and methods for media broadcasting and video/audio/voice over IP conferencing will be covered. Finally, the unit will introduce multimedia delivery in the emerging mobile Internet and provide an appreciation of the potentials and difficulties with wireless networks.

ELEC 5610 **Computer and Network Security** 4 credit points. Session: 1. Classes: Two 1 hr lectures and a 2hr lab/tut per week. Assumed knowledge: (ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks) or ELEC 3504 DataCommunications and the Internet. Prohibition: NETS 3016 Computer and Network Security. NETS 3916 Computer and Network

Security (Advance). Assessment: Assignments, lab marks and an exam at end of semester Core unit of study for Electronic Commerce and Software

Engineering.

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

This unit examines the basic cryptographic building blocks of security, working through to their applications in authentication, key exchange, secret and public key encryption, digital signatures, protocols and systems. It then considers these applications in the real world, analysing practical cryptosystems, the assumptions with which they were designed, their limitations, failure modes, and ultimately why most end up broken

ELEC 5611 Advanced Computer Engineering

4 credit points. Session: 2. Classes: Two 1hr lectures and a 2hr lab/tut per week. Assumed knowledge: ELEC 4601 Computer Design. Assessment: Lab and a 2hr exam at the end of semester. NB: Department permission required for enrolment. Recommended elective unit of study for Computer, Electrical, Telecommunications and Software Engineering.

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 1530 Engineering Mechanics

8 credit points. Session: 2. Classes: lectures, problem solving workshop and tutorial. Prohibition: CIVL1052 Statics MECH 1501 Engineering Statics MECH 1511 Introductory Dynamics MECH 1510 Kinematics and Dynamics MECH 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

Merian and Kraige Engineering Mechanics, Volume I.Statistics (4th Edition) Volume 2, Dynamics (4th Edition)

MECH 1540 Introductory Mechanical Engineering 5 credit points. Session: 1. Classes: Professional Engineering: 3 x 1 hr lecture-tute per week Mechatronics Design: 2 hr lecture-tute per week. Prohibition: AERO 1 6 0 1 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. Session: 1. Classes: 3 x 1 hr lecture-tute per week Prohibition: AERO 1601 Aerospace Manufacturing MECH 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

#### MECH1600 Manufacturing Technology

4 credit points. Session: 1,2. 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, deburring and finishing operations.
- (c) Welding Various welding processes, distortions, flame cutting, resistance welding. Practical work in gas welding and arc welding.
- (d) Heat treatment, blacksmithing and forging Definition and importance of heat treatment, and the process of forging, normalising hardening, case hardening.
- (e) Founding Materials used in the foundry, moulding and core making, the casting process.

Safety requirements: All students are required to comply with the safety regulations. Students who fail to do this will not be permitted to enter the workshops. In particular, approved industrial footwear must be worn, and long hair must be

protected by a hair net. Safety glasses must be worn at all times. Objectives

To develop an understanding of a range of machining and manufacturing processes required to make mechanical components

Expected outcomes

Students should develop skills in machining and manufacturing methods through practical experience Textbooks

Library Classification: 671.

#### MECH 1701 Introductory Digital Systems

3 credit points. Session: 1. Classes: (1 lecture and one 2hr tut)/week. Assumed knowledge: HSC Maths Extension 1. Prohibition: ELEC 1101 Foundations of Computer Systems. Assessment: Performance in practical assignments, plus exam.

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

Objectives

To provide an introduction to the analysis and design of digital logic circuits.

Svllabus Summarv

Number systems and codes; Logic gates and Boolean algebra, universal (nand) logic gates; Digital arithmetic: operations and circuits, Two's complement addition and

subtraction, overflow; Combinational logic circuits;

Flip-flops and related devices; Counters and registers, shift register applications; Design of synchronous,

sequential circuits, designs of synchronous, cascadable counters (BCD and binary). Integrated circuit logic

families and interfacing; practical issues including, fan out, pull-up/down, open-collector outputs, grounds,

power supplies and decoupling; timing issues, race conditions. Tri-state signals and buses; MSI logic circuits,

applications of multiplexers, demultiplexers, decoders, magnitude comparators; Introduction to programmable

logic devices.

The unit of study will include a practical component where students design and implement logic circuits.

Purchase of a basic laboratory kit as described in classes will be required.

Expected Outcomes

Students will be able to

? analyse and synthesise basic digital logic expressions, in natural binary, hexadecimal, two's

complement and BCD encodings;

? simplify compound digital logic expressions:

? analyse, design and implement combinational and sequential logic circuits;

? analyse and implement interfaces between major logic families:

? analyse and synthesise logic circuits on the basis of real device I/O and timing characteristics, as

expressed in component data sheets;

? breadboard and debug simple digital circuits.

Textbooks

Wakerly, Introduction to Digital Design, 3ed., Prentice-Hall, 2000. Library Classification: 621.3819,621.39

MECH 1702 Introductory Software Engineering 4 credit points. Session: 2. Classes: (2 hr lectures and one 2hr lab/tut)/ week. Prohibition: MECH 1802 C Programming; COSC 1902 Computational Science in C (Advance); COSC 1002 Computational Science in C. Assessment: One 2 hr exam and assignments. First year core unit of study for the degree of B achelor of Engineering in Mechatronic Engineering

Objectives

To provide a foundation for the study of systems and embedded programming for the degree in Mechatronic

Engineering.

Svllabus Summarv

This unit of study provides an introduction to software design, implementation, documentation, debugging and

testing in the context of procedural and object-oriented languages.

Object-oriented vs. procedural analysis and design; problem definition; diagramming; design for testing, code

instrumentation:

Preprocessor, tokens, storage classes and types. Arithmetic, relational and bit manipulation operators. Constructs

for control flow: if, switch, for, do and while. Arrays. Pointers and character strings. Functions and parameter

passing. Derived storage classes, structures, unions and bit fields. File I/O.

Incremental development model; file and code structure; best practice in programming.

Expected Outcomes

Students will develop skills in the design, coding,

documentation, debugging, testing of computer programs. Textbooks

Deitel & Deitel, C How to Program, 3ed, Prentice-Hall, 2001.

Reference Books

Kernighan & Ritchie The C Programming Language 2nd ed (Prentice Hall, 1988)

McConnell Code Complete (Microsoft Press, 1994)

Library Reference: 001.6424152, 005.1 222

#### MECH 1820 Introduction to Computing

6 credit points. Session: 1. Classes: Lecture and computer labs. Prohibition: MECH 1800 Computational Engineering 1A, MECH 1801 Computational Engineering 1C, INF01000 Information Technology Tools, DESC 9101 Introduction to Autocad, DECO 1003 CAD Modelling, DESC 9100 Introduction to Archicad, ISYS 1003 Foundations of Information Technology, COSC 1001 Computational Science in Matlab, COSC 1002 Computational Science in C. Assessment: In class basic skills test, assignments, exam

First year core unit of study for Mechanical, Mechatronics, and Aeronautical Engineering.

Svllabus Summary

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

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

CAD (2 Cr): Elements of solid modelling systems; basic spatial concepts. The manufacture and assembly of machine components. Kinematics interaction and modelling, with examples taken from machinery.

Objectives

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

Expected outcomes

Students will develop skills in:

basics of computer programming

- programming with Matlab
- problem-solving with Matlab
- understanding spatial concepts in design
- solving engineering mechanics problems with a solid modelling package

Textbooks

SolidWorks Course Notes, from Wentworth Copy Centre

The Student Edition of Madab (Prentice Hall, 1995)

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

#### MECH 2201 Thermodynamics 1

4 credit points. Session: 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. Session: 2. Classes: 1 lecture/wk and labs and tuts. Prerequisite: MATH 1001, MATH 1002, MATH 1003. Prohibition: MECH 2200Thermofluids, 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. **Session:** 2. **Classes:** 2 lectures and 1 hrtut/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 Introducition to

Microstrucitures, 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. Session: 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. Session: 2. Classes: Two lec/wk, three 3 hr lab sessions and ten 2 hr tutorials. Prerequisite: MAIH 1001 MAIH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS1001. 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 2701 Mechatronics 2

8 credit points. Session: 1. Classes: (3 lectures and one 3hr lab/tut)/ week. Assumed knowledge: MECH 1701 Introductory Digital Systems. Prohibition: ELEC 2601 Microcomputer Systems. Assessment: Exam and assignments.

NB: N.B. Web page: www.acfr.usyd.edu.au/teaching/2nd-year/ mech2701

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

Objectives

This unit of study is intended to teach the fundamental principals of microcontroller system design. This

involves a thorough understanding of the interaction between hardware and software at the assembly language

level, and of interfacing to external devices. The course will focus each year on a particular microcontroller

which is widely used in industry.

The aim of the unit is to introduce students to microprocessor and microcomputer systems, emphasizing

assembly language programming and building on the digital logic foundations from first year.

Svllabus Summarv

Introduction to microprocessors, stored-program computer architecture, instruction codes and addressing modes,

- instruction execution cycle; Memory devices. Computer architecture and assembly language programming.
- Microprocessor and microcontroller systems, memory and IO interfacing, interrupts and interrupt handling.
- Serial and parallel communications. System design, documentation, implementation, debugging and testing.

Expected Outcomes

Students will have a thorough knowledge of the interaction between microprocessor hardware and software at

the assembly language level. They will be able to implement a microcontroller-based system involving both

hardware and software design.

- Textbooks Spasov, Microcontroller Technology: The 68HC11,4 ed., Prentice-Hall, 2001.
- Horowitz & Hill, The Art of Electronics, 2ed., Cambridge University Press, 1989.

Library Reference: 004.16557,621.381 110

#### MECH 2740 Space Electronics 1

4 credit points. Session: 1. Classes: Two lectures and one 1 hr tut per week. Prohibition: MECH 2701 Mechatronics 2. Assessment: One 2 hr exam plus assignment work. Satisfactory performance in both exam and assignment work is required.

Second year core unit of study for the degrees of Bachelor of Engineering in Mechanical (Space), Mechatronic

(Space) and Aeronautical (Space) Engineering. Objectives

This unit of study has two main objectives:

- 1. To teach the fundamental principals of microcontroller system design. This involves a thorough understanding of the interaction between hardware and
- software at the assembly language level, and of interfacing to external devices.
- 2. To extend this knowledge into the domain of electronics and
- computers implemented within the space industry. This will provide the opportunity to understand the
- differences in philosophy and architecture between those electronics implemented within space and
- those commonly found in everyday life. Syllabus Summary

Introduction to microprocessors, stored-program computer architecture, instruction codes and addressing modes,

instruction execution cycle; Memory devices. Computer architecture and assembly language programming.

Microprocessor and microcontroller systems, memory and IO interfacing, interrupts and interrupt handling.

Serial and parallel communications. Overview of system design, documentation, testing and certification.

Electronics for space missions: architectures and redundancy philosophies. Manufacture and coding of

electronic hardware for space certification.

Expected Outcomes

Students will have a thorough knowledge of the interaction between microprocessor hardware and software at

the assembly language level. They will be able to implement a microcontroller-based system involving both

hardware and software design. They will also see how this is extended into the space domain, and how the space

industry undertakes the development, manufacture and implementation of space electronics.

Textbooks

Spasov, Microcontroller Technology: The 68HC11,4 ed., Prentice-Hall, 2001

Library Reference: 004.16557,621.381 110

MECH 2900 Anatomy and Physiology for Engineers 4 credit points. Session: 1. Classes: 3 hrs/wk, including lectures and laboratory sessions. Prerequisite: Biology BIOL 1003 or some previous biology experience. Assessment: Exam plus assignments and laboratory reports.

NB: Department permission required for enrolment. 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. Session: 1. Classes: (2 lec and 1 x 1 hr tut)/week and laboratory work. Prerequisite: MECH 2200 Thermofiuids 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

#### MECH 3203 Heat Transfer

4 credit points. Session: 1. Classes: 1 lecture, 1 tut/wk. Prerequisite: AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1. Assessment: One 2 hr exam and assignments. Third year core unit of study for the degree in Mechanical Engineering, Mechanical(Space),

Aeronautical Engineering, Aeronautical(Space),

Mechatronics (Space).

Objectives

To teach the fundamentals of heat transfer in solids, fluids and for

radiative heat transfer over a wide range of situations. Svllabus summarv

Conduction: thermal circuits, plane, cylindrical, conduction equation, use of fins, Heat exchangers, LMTD and NTU methods, Numerical

Methods, finite difference equations. Unsteady Conduction, lumped capacity, Bi, Fo, Heissler charts,

- dimensional analysis. Convection: forced and natural,
- analytical solutions, Nu, Pr, Ra, Gr, boiling. Radiation: spectrum, blackbody, emissivity, absorptivity,
- transmissivity, intensity, Stefan-Boltzmann, Kirchhoff Laws, band emission and absorption, gray body,

selective surfaces, radiative exchange between surfaces, environmental radiation.

Expected outcomes:

Ability to solve a wide range of heat transfer problems using the many techniques applied to

conduction, convection and radiative heat transfer situations. Textbook

Incropera and De Witt Fundamentals of Heat and Mass Transfer (Wiley) Library Classification: 536.2

#### MECH 3211 Fluid Mechanics 2

4 credit points. Session: 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,

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979) Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Liepmann and Roshko Elements of Gas Dynamics (Wiley 1957) Schlichting Boundary Layer Theory (McGraw Hill, 1960)

#### MECH 3300 Materials 2

4 credit points. Session: 2. Classes: 2 lec/wk plus 1 tut/wk. Prerequisite: MECH 2300 Materials 1 and AERO 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.

Svllabus summarv

Short-term and long-term mechanical properties, introductory fracture and fatigue mechanics, dislocations, polymers and polymer composite materials, ceramics and glasses, structureproperty relationships, selection of materials in mechanical design.

Objectives

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

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

Expected outcomes

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

Textbooks

Lecture notes

Reference Books

Ashby & Jones Engineering Materials 1 (Butterworth Heinemann) Ashby & Jones Engineering Materials 2 (Butterworth Heinemann)

Higgins Properties of Engineering Materials (Edward Arnold) Gallister, Jr.Materials Science and Engineering-An Introduction (John Wiley & Sons)

Bolton Engineering Materials Technology (Butterworth Heinemann) Ashby Materials Selection in Mechanical Design (Pergamon Press) Library Classification: 620-624,666-679

MECH 3310 Mechanics of Solids 2

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

Third year core unit of study for the degrees in Aeronautical Engineering, Biomedical Engineering, Mechanical Engineering and Space Engineering.

Syllabus Summary

Stress and strain, linear elasticity, primary modelling and solution methods and skills for the stress and deformation analysis of engineering problems, Airy stress function method, stress concentration, introduction to the finite element method, case studies.

Objectives

To understand how to evaluate the behaviour of solid materials subjected to stress and deformation.

Expected outcomes

Students will gain the ability to analyse engineering problems in terms of strength, stress and deformation in relation to the design, fabrication and maintenance of machine and structure components

Textbook

Zhang, Solid Mechanics for Engineers (Palgrave, 2001)

Reference books

Chandrupatla and Belegundu, Introduction to Finite Elements in Engineering (Prentice Hall, 1991)

Courtney, Mechanical Behaviour of Materials (McGraw-Hill Publishing Company, 1990)

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

MECH 3400 Mechanical Design 2A

4 credit points. Session: 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 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 Integrated Approach (Prentice Hall), or J.Shigley et al Mechanical Engineering Design (McGraw-Hill) Reference Books

Orlov Fundamentals of Machine Design Vol I to V (M.I.R. Moscow) Library classification: 621.815,001.6443

MECH 3410 Mechanical Design 2B

4 credit points. Session: 2. Classes: 2 lectures & one 1 hr drawing office session/wk. Prerequisite: MECH 2400 Mechanical Design 1. Assessment: Assignments and guizzes.

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

#### Mechanical Engineering

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),

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. Session: 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

Svllabus Summarv

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. Session: 1. Classes: lec: 3hrs/wk; plus an average of 2hrs/wkfortut, lab and industrial visits. Prerequisite: MECH 1600 Manufacturing Technology. Prohibition: MECH 3601. 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. Session: 1. Classes: 2 hrs/wk lec; plus industrial visits. Prerequisite: MECH 1600 Manufacturing Technology. Prohibition: MECH 3600 Manufacturing Engineering. Assessment: One 1 hr exam plus labs and industrial visits.

Third year core unit of study for the degrees BE/BCom (MX), BE/LLB (MX) and BE/BA (MX).

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:

Tto understand some fundamental manufacturing systems. Expected outcomes:

Students will understand the principles, merits and

disadvantages of some commonly used manufacturing

techniques.

Textbooks

Lecture notes Reference books

S. Kalpakiran, 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. Session: 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 3621 Industrial Management

4 credit points. Session: 2.

Third year core unit of study for the degree in Mechanical, Mechatronic, Aeronautical,

Mechanical (Biomedical), Mechanical (Space), Aeronautical (Space) and Mechatronic

(Space) Engineering

Syllabus summary:

Microeconomics, the Australian business environment, the role of the 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 3630 International Exchange Program 3A 12 credit points. Session: 1,2. Prerequisite: Completion of all first and second year core units of study and at least 96 credit points toward the degree. Endorsement by Head of School of Aerospace, Mechanical &

#### UNDERGRADUATE UNITS OF STUDY

Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School. Assessment: Individual approved subjects at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated

NB: Department permission required for enrolment.

Objectives

The objective of this exchange program is to give students an opportunity to study in a different cultural

environment. Students will gain an understanding of the differences in techniques applied in aeronautical,

mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree

disciplines of the School. The course work completed at the exchange university is to be equivalent to one

semester at the University of Sydney. The specific units of study must be approved by the Heads of

School/Department at both institutions.

MECH 3631 International Exchange Program 3B 12 credit points. Session: 1, 2. Prerequisite: Completion of all first and second year core units of study and at least 96 credit points toward the degree. Endorsement by Head of School of Aerospace, Mechanical & Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School. Assessment: Individual approved subjects at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated. NB: Department permission required for enrolment.

Objectives

The objective of this exchange program is to give students an opportunity to study in a different cultural

environment. Students will gain an understanding of the differences in techniques applied in aeronautical,

mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree

disciplines of the School. The course work completed at the exchange university is to be equivalent to one

semester at the University of Sydney. The specific units of study must be approved by the Heads of

School/Department at both institutions.

#### MECH 3701 Mechatronics 3

tut)/week. Assumed knowledge: MECH 2701 Mechatronics 2. Prohibition: MECH 4710 Microprocessors in Engineered Systems and MECH 3700 Mechatronics 2. Assessment: Project and assignment work, plus one 2 hr exam. Satisfactory performance in both project/ assignment work and exam is required.

NB: Web page: www.acfr.usyd.edu.au/teaching/3rd-yr/mech3701 Third year core unit of study for the degree of Bachelor of Engineering in Mechatronic Engineering

Objectives

To provide experience, confidence and 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 provide

experience of working in a project team to prototype a realistic product to meet a specification.

Syllabus Summary

Single processor systems, multiple and distributed processing systems, special purpose architectures (DSPs etc)

and their application. Standard interfacing of sensor and actuation systems; ADC/DAC, SSI, parallel, CAN bus

etc

Specific requirements for microprocessor-based products. Problem definition and system design. Tools for

design, development and testing of prototype systems. The unit of study will include a project, where groups of

students design, develop and commission a microprocessorbased product.

Expected outcomes

The student will understand microprocessor system organization, and the organization of multiple and

distributed processor systems, special purpose architectures (DSPs etc) and their application.

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

An extensive reference list will be distributed

Library Classification: 629.398,629.895,621.3815,621.38195, 001 6425 005 1

Peatman, Embedded Design with the PIC18F452 Microcontroller, Prentice Hall

MECH 3740 Space Electronics 3

8 credit points. Session: 1. Classes: (one 2hr lecture, one 1 hr lecture and one 3hr lab/tut)/week. Assumed knowledge: MECH 2701 Mechatronics 2. Prohibition: MECH 3701 Mechatronics 3, MECH 4710 Microprocessors in Engineered Systems. Assessment: Project and assignment work, plus one 2 hr exam. Satisfactory performance in both

NB: Webpage: www.acfr.usyd.edu.au/teaching/3rd-yr/mech3701 Third year core unit of study for the degree of Bachelor of Engineering in Mechatronic (Space) Engineering

Objectives

To provide experience, confidence and 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 provide

experience of working in a project team to prototype a realistic product to meet a specification.

Syllabus Summary

Single processor systems, multiple and distributed processing systems, special purpose architectures (DSPs etc) and their application. Standard interfacing of sensor and

actuation systems; ADC/DAC, SSI, parallel, CAN bus

etc. Specific requirements for microprocessor-based products.

Problem definition and system design. Tools for design, development and testing of prototype systems. The

unit of study will include a project, where groups of

students design, develop and commission a microprocessor-based product. System integration of electronics in a

space environment. Coding principles and advanced architectures and communication protocols.

Expected outcomes

The student will understand microprocessor system organization, and the organization of multiple and

distributed processor systems, special purpose architectures (DSPs etc) and their application. 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 for space engineering applications. Textbooks

An extensive reference list will be distributed

Library Classification: 629.398,629.895,621.3815,621.38195, 001.6425,005.1

MECH 3800 Systems Control

4 credit points. Session: 2. Classes: 2 lec and 1 tut/week plus laboratory sessions. Prerequisite: MATH 2001 and MATH 2005. Assessment: One 11/2 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 Matlab 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. Session: 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. Session: 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. Session: 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 1st semester. Each prospective Fourth year student is then required to consult with prospective supervisors to apply for atopic

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. Session: 1, 2. Prerequisite: MECH 4101 Thesis A (the Head of School 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. Session: 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. Session: 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 (Mechanical or Mechatronic Engineering) /Bachelor of Medical Science. The Charles Rolling Prize may be awarded for the best graduation thesis.

Objectives: To involve students in a research or major design project and give them the opportunity to conduct systematic investigations.

Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution.

Expected outcomes: Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

Syllabus summary: In this unit of study, each candidate works towards and writes an undergraduate thesis, at least one copy of which should be submitted in completed form before a date to be announced. Thesis B is the second part of Thesis A and Thesis B and requires the student to continue from the progress attained in Thesis A.

In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his or her practical work and the general layout of the thesis itself.

Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc., properly displayed. One copy should be submitted, hard-bound for the departmental library, on or before the due date. The penalty rate for late submissions will be advertised. Students are responsible for supplying their own thesis production materials.

The Charles Rolling Prize may be awarded for the best graduation thesis.

MECH 4105 International Exchange Program 24 credit points. Session: 1,2. Prerequisite: Completion of all first, second and at least 24 third year core units of study. Approval by Head of School of Aerospace, Mechanical and Mechatronic Engineering. Assessment: Individual units of study at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated. NB: Department permission required for enrolment.

Objectives

To give students an opportunity to study in a different cultural environment for a semester. Students will gain an understanding of the

differences in techniques applied in aeronautical, mechanical, mechatronics, space or biomedical engineering overseas. Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree

disciplines of the School. The course work completed at the exchange university is to be equivalent to one

semester at the University of Sydney. The specific units of study must be approved by the Heads of

School/Department at both institutions. A recommended subject is Thesis and students are encouraged to

undertake work experience in overseas industry. For details of overseas institutions participating in this

exchange program, contact the Head of of the School of Aerospace, Mechanical and Mechatronic Engineering.

## MECH 4110 Professional Engineering

4 credit points. Session: 1. Classes: Lectures/consultations/student presentations - 4hr/week for one semester. Prerequisite: 36 credit points of Senior units of study. Assessment: Student assignments and presentations.

*NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.* 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. Session: 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. Session: 1,2. Classes: 12 weeks of practical work experience. Prerequisite: 28 credit points of second year units of study. Assessment: A writtlen 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. Session: 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

#### Mechanical Engineering

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. Session: 1. Classes: 6 hrs/wk. 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: Classwork, Assignments, one 1.5hrexam and one 2hr exam

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,

Preliminary reading can be made on the web at <u>www.ieagreen.org.uk</u>. 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. Session: 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. Session: 1. Classes: 3hrs per week. Prerequisite: 24 credit points of Senior units of study. Prohibition: MECH 4220 Environmental Engineering. Assessment: Assignments, classwork and one 2hr exam.

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. Session: 1. Classes: 1.5hr lecture and 1 hr tut/wk. Prerequisite: MECH 3200 Thermal Engineering 1 or (MECH 3201 and one of MECH 3202 or MECH 3203). 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. Session: 1. Classes: 1.5hr lecture and 1 hr tut/wk. Prerequisite: MECH 3200 Thermal Engineering 1 or MECH 3202 or MECH 3203. 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. Session: 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 structureproperty 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, 19.93)

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,

Davidge, Mechanical Behaviour of Ceramics (C.U.P., 1979) Eckold, Design and Manufacture of Composite Structures (McGraw-Hill, 1994)

Gibson, Principles of Composite Material Mechanics (McGraw-Hill, 1994)

Richerson, Modem Ceramic Engineering (M. Dekker, 1982) Harris, Engineering Composite Materials (Institute of Metals, 1986) Jones, Engineering Materials 3 - Materials Failure Analysis (Pergamon, 1993)

Richerson, Modern Ceramic Engineering (M Dekker, 1982) MECH 4315 Advanced Aerospace Materials 6 credit points. Session: 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 structureproperty 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 (Ellis Horwood, 1985) Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff,

1982 Chawala, Composite Materials (Springer-Verlag, 1987)

Crawford, Plastic Engineering (second edition, Maxwell-Macmillan, 1987)

Davidge, Mechanical Behaviour of Ceramics (C.U.P., 1979) Eckold, Design and Manufacture of Composite Structures (McGraw-Hill, 1994)

Gibson, Principles of Composite Materials Mechanics (McGraw-Hill, 1994)

Harris, Engineering Composite Materials (Institute of Metals, 1986) Jones, Engineering Materials 3 - Materials Failure Analysis (Pergamon, 1993)

Richerson, Modern Ceramic Engineering (M Dekker, 1982)

MECH 4410 Advanced Design and Analysis 1

3 credit points. Session: 1. Classes: 2 hrs/wk. Prerequisite: MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B. Assessment: Assessment is based on three assignments (each 25%)

and one exam (25%, closed book), as well as attendance, participation and evidenced effort during classes (including class tasks) in the drawing office as well as the PC345 laboratory Fourth year elective unit of study.

Objectives:

To develop a fuller understanding of and familiarity with the practical design processes expected in industry, including application of analysis techniques (in particular the Finite Element Method) and knowledge obtained from other courses studied.

Expected outcomes:

Students should be able to undertake with a measure of confidence basic design and related analysis tasks likely to be encountered in early industrial employment, and should have an understanding of the many aspects associated with them. Strong competence and understanding of the application of the Finite Element Method in stress and vibration analysis for the design task will be expected and necessary.

Syllabus summary:

The course introduces the student to the practical aspects of mechanical design in the industrial environment, with particular emphasis on the complete design of typical mainstream machinery such as fans, ore grinding mills and vibrating screens among others. Other topics include a revision of main machinery components (shafts, couplings, baseplates etc); torsional vibration; design for fatigue loadings; quality management; ndt; strain gauging methods for design confirmation. The course includes considerable application of the finite element method in stress and vibration analysis as applicable to the mechanical design analysis task, with specific use of the STRAND7 FE code in the department PC345 laboratory.

Textbooks

Lecture notes

References

Norton 'Machine Design - an integrated approach'. Bleier 'Fan Handbook' Wills 'Mineral Processing Technology' Adams and Askenazi 'Building Better Products with Finite Element Analysis

Maddox 'Fatigue Strength of Welded Structures'

Regular reference will be made to other publications, journals, relevant conference proceedings, 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. Session: 2. Classes: 2 hrs/wk. Prerequisite: MECH 3400 Mechanical Design 2A, MECH 3410 Mechanical Design 2B and MECH 4410 Advanced Design and Analysis 2. Assessment: Assessment is based on three assignments (each-25%) and one exam (25%, closed book), as well as attendance, participation and evidenced effort during classes (including class tasks) in the drawing office as well as the PC345 laboratory. Fourth year elective unit of study.

Objectives:

To develop a fuller understanding of and familiarity with the nominated elements of the practical design process expected in industry, 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 design and analysis tasks likely to be encountered in early industrial employment, and should have an understanding of the many aspects associated with them. Strong competence and understanding of the application of the Finite Element Method in stress and vibration analysis for the design task will be expected and necessary.

Syllabus summary:

The course is independent of Mech 4410 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, stainless steel and selected composites; design fundamentals of stacker reclaimers and shiploaders; lifting tackle; special purpose machinery design; wind and earthquake loading analysis; structural dynamics; design rectification techniques; design audits. The course includes considerable application of the finite element method in stress and vibration analysis as applicable to the mechanical design analysis task, with specific use of the STRAND7 FE code in the department PC345 laboratory. Textbooks

Lecture notes

References

Norton 'Machine Design - an integrated approach'.

#### Mechanical Engineering

Regular reference will be made to other publications, journals, relevant conference proceedings, trade information as well as Australian and International Standards and Codes of Practice, societies and organisations

MECH 4605 Industrial Engineering

8 credit points. Session: 1. Classes: 7 lec/wk plus associated tut and lab work and industrial visits. Prerequisite: MATH 2001 and MATH 2005 and MECH 3620 Industrial Management. Prohibition: MECH 4610 Industrial and Engineering Management MECH 4620 Industrial Ergonomics MECH 4635 Introduction to Operations Research. 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. Session: 1. Classes: 2hrs lec and tut/wk plus industrial visits. Prerequisite: MECH 3620 Industrial Management. Prohibition: MECH 4605 Industrial Engineering. Assessment: Assignments. NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004. 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. ENGG 4004 is an acceptrable alternative up to a total
- substitution not exceeding the credit point value of ENGG 4004. Textbooks

Samson D., Management for Engineering (Longmans)

Reference books

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, Fitzxoy, Shaw, Australian Marketing Management (Prentice-Hall) Macnamara, Australian Marketing and Promotion Handbook (Australian Business Library)

- Business Library)

Case Studies in Australian Strategic Management

MECH 4620 Industrial Ergonomics 2 credit points. Session: 1. Classes: 2hrs/wk. Prohibition: MECH 4605 Industrial Engineering. Assessment: Assignments and exam.

NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004. 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<sup>1</sup> 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. Session: 1. Classes: 3 hrs/wk. Prerequisite: MATH 1005 MATH 2001 MATH 2002 MATH 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

Taha, Operations Research - An introduction (Prentice Hall, 1997) Lewis, Introduction to Reliability Engineering (Wiley, 1987 or 1994)

#### MECH 4640 Product Life Cycle Design

2 credit points. Session: 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 in Aust

2 credit points. Session: 2. Classes: Session of 2 consecutive days. Prerequisite: 36 credit points of senior units of study. Assessment: Assessment will be based on the level of participation in small group work, the larger group and a role play. This will require a high level of verbal communication skills and an ability to contribute to complex discussions. Punctuality will also be considered.

NB: Department permission required for enrolment. ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004. 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. Session: 2. Classes: 3 lectures and one 3hr lab/tut per week. Prerequisite: MECH 3800 Systems Control. Assessment: Assignments.

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: Modern 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.

The course will be broken up into two parts. The first part runs for 2 lectures per week and deals with the fundamental theories and their applications. The second part is for one lecture per week and looks at applymg this theory into the various streams of land vehicles, flight platforms and space vehicles. 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 4721 Sensors and Signals A

4 credit points. Session: 1. Classes: 3 hours of lectures per week, 1 hour of Lab/Tutorial per week. Prerequisite: MECH 3701 Mechatronics 3. Assessment: Assignments (50%), Tutorials (20%), and a 2hr open book exam (30%).

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. Session: 1. Classes: (one 2hr lecture and one 3hr lab/ tut)/week. Prerequisite: MECH 3700 Mechatronics 2 or MECH 3701 Mechatronics 3. Prohibition: ELEC 4602 Real Time Computing. Assessment: Project and assignment work, plus one 2 hr exam. Satisfactory performance in both project/assignment work and exam is required.

Fourth year elective unit of study for the degree of Bachelor of Engineering in Mechatronic Engineering

Syllabus Summary:

Review of sensing, analogue and digital electronics, and overview of the IBM PC architecture. Programming for interactive control using both assembly language and high level languages. Timers and asynchronous tasks; data communication. Data structures for real-time programming. Multitasking and real time operating systems. Use of multi-tasking, message passing and multi-threading in environments such as NT and/or Unix. Object-oriented programming in C++. 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, real-time operating systems and 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 real-time multitasking systems with graphical user interfaces. *Textbook* 

Auslander DM & Tham CH, Real Time Software for Control, Prentice Hall, 1990.

Library Classification: 629.8102,629.8955133.

MECH 4900 Orthopaedic Engineering

4 credit points. Session: 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 hearing, 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 musculoskeletal system and to the fundamentals of biomedical engineering as applied to orthopaedic devices used for the replacement and repair of the diseased or damaged skeleton.

Expected outcomes

Students will become acquainted with 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 andjoints.

#### MECH 4910 Biomechanics and Biomaterials

4 credit points. Session: 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

## ENGG 1001 Interdisciplinary Project

12 credit points. Session: 1. Prerequisite: UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. 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. *NB: Department permission required for enrolment.* 

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. Session: 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. Session: 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. NB: Department permission required for enrolment.

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. Session: 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 Engineering Studies B

4 credit points. Session: 1, 2, Summer. NB: Department permission required for enrolment. Pennisson required for enrolment Special project specified for individual requirement

## ENGG 2005 Engineering Studies C

6 credit points. Session: 1,2, Summer. NB: Department permission required for enrolment. Permission required for enrolment

ENGG 2006 Advances in Engineering Leadership 2 credit points. Session: 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 Engineering Studies D

8 credit points. Session: 1, 2, Summer.

NB: Department permission required for enrolment. Permission required for enrolment

## ENGG 2008 Engineering Studies A

2 credit points. Session: 1, 2, Summer.

NB: Department permission required for enrolment. Permission required for enrolment

## ENGG 3001 Technology Education

2 credit points. Session: 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.

NB: Department permission required for enrolment.

Syllabus: Students will work in a group 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 3002 Industrial and Engineering Management 4 credit points. Session: 1. Classes: 2 (1 hr) lectures and 1 (1 hr) tutorial per week one semester. Prerequisite: ENGG 2003. Prohibition: MECH 4610. Assessment: Project assignments plus a final 2 hr examination. Year 3 core unit of study for the Management streamwithin the degrees in Aeronautical, Chemical, Electrical, Mechanical and Mechatronics Engineering.

Syllabus: Project mangement; industrial relations and human resource management; technology and innovation management; organisational design; management and change; leadership;

environmental and susatinability issues.

Objectives: to develop in students a substantial understanding and capability in major facets of industrial and engineering management.

ENGG 4001 Innovation/International Competitiveness 4 credit points. **Session:** 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. Session: 2. Assessment: In-course involvement (attendance and discussion); product development assignment; business case study assignment; examination.

NB: Department permission required for enrolment. 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. Session: 2. Classes: 2 hours per week. Assessment: Assignments and a 2hr exam at end of semester. NB: Department permission required for enrolment.

Approved as a recommended elective unit of study for Electrical, Computer, Telecommunications and Software Engineering.

- 1. The commercial working environment.
- Managing and being managed. 2
- 3. Workplace, workforce and commercial ethics.
- 4. What the Marketing Department wants.
- 5. What the Production Department wants.
- 6. Communication: language and form.
- Conflict resolution and working relationships. 7.
- Time management. 8
- Report writing and documentation. 9
- 10.Project planning and resource management.

11.Intellectual property: inventions, patents and copyright.

ENGG 4004 Advanced Engineering Design Project

12 credit points. Session: 2. Classes: Literature Survey, project formulation and detailed design of a major integrated facility to be carried out in interdisciplinary groups in Semester 2. Prerequisite: Only students out in interdisciplinary groups in seriester 2. Frerequisite. Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group. Assessment: Assessment will be on the basis of a written report and oral presentations. Satisfactory tutorial performance and group participation is also required. This unit of study can be taken as an electing for all programmed deermas. an elective for all engineering degrees.

NB: Department permission required for enrolment.

Objectives/Outcomes: To develop an understanding of the practice of engineering, utilising a diverse range of skills to solve complex problems. Students will gain skills in design, analysis and management by undertaking a significant research project in a multi-disciplinary team comprising students from across the faculty. Each student will be required to work in a team to produce an integrated design in greater detail than is possible in ordinary classes and to write a significant design report presenting the results of the process. The ability to work in a team of engineers from different disciplines will be assessed as part of this design project which will be centred around a major industrial facility.

Syllabus: Introduction to the design process. Design philosophy. Use of computer packages in design. Design optimisation. Detailed equipment design and costing. Hazard assessment. Environmental Impact Assessment. Project Financial Analysis.

#### ENGG 5601 Greenhouse Gas Mitigation 6 credit points. Session: 2.

## Other faculties

#### CHEM 1401 Chemistry 1E

6 credit points. Session: 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).

#### GEOL 1501 Engineering Geology 1

6 credit points. Session: 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 mineral s 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. Session: 2, Summer. Classes: (1 lec & 1 tut)/wk. Corequisite: MATH 2001 or 2901, and MATH 2002 or 2902. 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

Swanson, IAV. Linear Programming, Basic Theory and Applications. McGraw-Hill, 1987.
 Tana, HA. Operations Research: An Introduction. 5th edn, Mucmillan.

1992 Thic, 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. Session: 2, Summer. Classes: (1 lec & 1 computer tut)/ wk). Corequisite: MATH 2001 or 2901.

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 discussion quadrature. Numerical solution of ordinary differential equations - Runge-Kutta methods: stability and stillness. Textbooks

Course notes: Numerical Methods. D.J. Galloway and C. Macaskill. 2(X)3, available from Kopyslop

PHYS1202 Physics 1E 6 credit points. Session: NA in 2003.

PHYS1203 Physics 1EE 4 credit points. Session: N/A in 2003.

PHYS2203 Physics 2EE 4 credit points. Session: 2.

# 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 DavidLipscombeHollway, 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 Keny Rowe Nicholas Snowden Trahair Kenneth J. Waldron Keith Kingsford Watson

## Doctor of Philosophy

The degree of Doctor of Ph i I osophy 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 4year Bachelor of Engineering degree from The University of Sydney with first or second class honours in the same branch of engineering as that in which the ME(Res) degree is to be undertaken, or an equivalent qualification from another university or tertiary institution. In exceptional circumstances a graduate in engineering with a pass degree or a graduate with an honours degree in a different branch of engineering or from another Faculty may be admitted to candidature but such an applicant may be required to undergo a preliminary examination.

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

The minimum period of candidature is one year full-time and two years part-time and the maximum period of candidature is two years full-time and three years part-time. If a candidate is required to undertake a preliminary examination then the candidature commences after the completion of the preliminary examination.

Special attention is drawn to the need for applicants to provide concise details of their proposed research program including aims and methodology and evidence of their ability to carry out intensive research and advanced study. Candidates who enrol for this degree with the object of later transferring to candidature for the PhD degree should select a research project that is suitable for this purpose.

Applicants admitted to candidature for the ME(Res) degree arc 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 lake subjects from another Faculty at this University or from
#### Master of Project Management

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 MRS 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 replaced its MES with the Master of Information Technology (MIT) offered by the Faculty of Science. The School still offers graduate diplomas and graduate certificates in telecommunications, computer systems, wireless

communications, signal processing, intergrated systems and photonics.

Telecommunications and computer systems engineering units of study are offered as streams in the MIT and are taught by the School of Electrical and Information Engineering.

#### Mechanical and Mechatronic Engineering

The coursework program is available on both a full- and parttime basis in Mechanical Engineering There is no Master's 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.

The new Master's of Automation in Field Robotics is now available.

#### **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 eight course modules (48 credit points), of which three (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 Master 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
- Telecommunications DipTelecomm
- Computer Systems Engineering
- Environmental Engineering DipEnvironEng
- Greenhouse Gas Mitigation
- Automation in Field Robotics

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, Jl 3

The University of Sydney NSW 2006 Phone: (02) 9351 7084

Fax: (02) 9351 7082

Email: j.harly@eng.usyd.edu.au

Web: www.eng.usyd.edu.au/gse

The brochure *Graduate Programs Engineering 2003* is available from the postgraduate advisor.

# Postgraduate units of study

# Aeronautical Engineering units of study

# AERO 5301 Applied Finite Element Analysis

6 credit points. Session: 1. Classes: 2 lec/wk plus prac classes. Prohibition: AERO 4301 Applied Numerical Stress Analysis 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)

# Chemical Engineering

#### CHNG 5401. Process Plant Risk Management 8 credit points. Session: 1.

Topics include: Inevitability of risk, types of hazard to people, the environment and property. Risk criteria or targets. Systematic hazard identification. Dimensions of risk. Quantification of consequences and frequency of hazardous incidents. Assessment of risk, risk contours. Role of the human factor. Inherent safely, and risk reduction by engineering and management approaches. Community interaction. Case studies.

#### CHNG 5503 Environmental Decision Making 8 credit points. Session: 2. Assessment: Major project, 2 minor projects, assignments.

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

# Civil Engineering

#### CIVL 5252 Plates and Shells

6 credit points. Session: 2.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5257 **Concrete Structures: Prestressed** 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5258 **Advanced Structural Steel Design** 6 credit points. Session: 1.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5259 **Advanced Structural Steel Analysis** 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5351 **Environmental Geotechnics** 6 credit points. Session: 1.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5353 Environmental Oceanography & Meteorology

4 credit points. Session: 1. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5450 Analysis and Design of Pile Foundations 6 credit points. Session: 1.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5454 **Rock Engineering**

6 credit points. Session: 2. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5456 Earth and Rockfill Dams

6 credit points. Session: 2. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5654 **Ocean Mixing**

4 credit points. Session: 2. For more information see the Faculty of Engineering

Postgraduate Handbook.

#### CIVI 5850 **Project Planning and Optimisation** 6 credit points. Session: 2.

For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5851 **Civil Engineering Project**

6 credit points. Session: 1,2, Summer. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5852 Project

12 credit points. Session: 1, 2, Summer. For more information see the Faculty of Engineering Postgraduate Handbook.

#### CIVL 5853 Seminar

2 credit points. Session: 1,2.

For more information see the Faculty of Engineering Postgraduate Handbook.

# Electrical Engineering

Contact the School of Electrical and Information Engineering.

# Mechanical Engineering

#### MECH 5202 Computational Fluid Dynamics 4 credit points. Session: 2. Assessment: Tut work, projects and one 2hr

exam. Objectives: To provide the skills necessary to use a state-of-the-

art computational fluid dynamics package. Expected outcomes: Students are required to obtain solutions for a number of standard flows and one complex flow in computer laboratory sessions which are carried out on a

commercial CFD package. Syllabus: The governing equations are classified according to mathematical character. Finite difference and finite volume methods, accuracy and stability for the advection equation, diffusion equation and advection/diffusion equation are covered. Direct and iterative solution techniques for the resulting algebraic equations are considered. Solution of the full Navier-Stokes equations, including the pressure/continuity coupling is described. The k-epsilon turbulence model is derived and applied to standard flows.

### MECH 5250 Air Conditioning and Refrigeration

3 credit points. Session: 1. Classes: 1.5hr lecture and 1 hr tut/wk. Prohibition: MECH 4250 Air Conditioning and Refrigeration. Assessment: Assignments, project and one 2hr exam. 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 5260 **Combustion and Fire Safety** 3 credit points. **Session:** 1. **Classes:** 1.5hr lecture and 1 hr tut/wk. **Prohibition:** MECH 4260 Combustion and Fire Safety. **Assessment:** Assignments, project and one 2 hr exam.

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 5310 Advanced Engineering Materials 6 credit points. Session: 2. Classes: 3 lec/wk plus 3 tut & lab/wk. Prohibition: MECH 4310 Advanced Materials. Assessment: One 2 hr exam, one project report, assignments and lab reports as specified at the commencement of the semester.

Syllabus summary: Postyield fracture mechanics, embritflement, creep rupture, damage tolerance, structure integrity and reliability, thin film science and technology, advanced polymer matrix composites, toughening mechanisms, processing and manufacturing, superalloys, advanced joining methods.

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

#### Postgraduate units of study

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

Ashby, 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 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 5410 Advanced Design and Analysis 1 3 credit points. Session: 1. Classes: 2 hrs/wk. Prohibition: MECH 4410 Advanced Design 1. Assessment: Assessment is based on three assignments (each 25%) and one exam (25%, closed book), as well as attendance, participation and evidenced effort during classes (including class tasks) in the drawing office as well as the PC345 laboratory. Fourth year elective unit of study.

Objectives:

To develop a fuller understanding of and familiarity with the practical design processes expected in industry, including application of analysis techniques (in particular the Finite Element Method) and knowledge obtained from other courses studied.

Expected outcomes:

Students should be able to undertake with a measure of confidence basic design and related analysis tasks likely to be encountered in early industrial employment, and should have an understanding of the many aspects associated with them. Strong competence and understanding of the application of the Finite Element Method in stress and vibration analysis for the design task will be expected and necessary.

Syllabus summary:

The course introduces the student to the practical aspects of mechanical design in the industrial environment, with particular emphasis on the complete design of typical mainstream machinery such as fans, ore grinding mills and vibrating screens among others. Other topics include a revision of main machinery components (shafts, couplings, baseplates etc); torsional vibration; design for fatigue loadings; quality management; ndt; strain gauging methods for design confirmation. The course includes considerable application of the finite element method in stress and vibration analysis as applicable to the mechanical design analysis task, with specific use of the STRAND7 FE code in the department PC345 laboratory.

## Textbooks

Lecture notes

References

Norton 'Machine Design - an integrated approach'.

Bleier 'Fan Handbook'

Wills 'Mineral Processing Technology'

Adams and Askenazi 'Building Better Products with Finite Element Analysis'

Maddox 'Fatigue Strength of Welded Structures'

Regular reference will be made to other publications, journals, relevant conference proceedings, trade information as well as Australian and International Standards and Codes of Practice, societies and organisations.

#### MECH 5420 Advanced Design and Analysis 2

3 credit points. Session: 2. Classes: 2 hrs/wk. Prohibition: MECH 4420 Advanced Design and Analysis 2. Assessment: Assessment is based on three assignments (each 25%) and one exam (25%, closed book), as well as attendance, participation and evidenced effort during classes (including class tasks) in the drawing office as well as the PC345 laboratory.

Fourth year elective unit of study.

Objectives:

To develop a fuller understanding of and familiarity with the nominated elements of the practical design process expected in industry, 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 design and analysis tasks likely to be encountered in early industrial employment, and should have an understanding of the many aspects associated with them. Strong competence and understanding of the application of the Finite Element Method in stress and vibration analysis for the design task will be expected and necessary.

Syllabus summary:

The course is independent of Mech 4410 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, stainless steel and selected composites; design fundamentals of stacker reclaimers and shiploaders; lifting tackle; special purpose machinery design; wind and earthquake loading analysis; structural dynamics; design rectification techniques; design audits. The course includes considerable application of the finite element method in stress and vibration analysis as applicable to the mechanical design analysis task, with specific use of the STRAND7 FE code in the department PC345 laboratory. Textbooks

Lecture notes

References

Norton 'Machine Design - an integrated approach'.

'Design Guide for structural hollow sections in mechanical applications' CIDECT

Regular reference will be made to other publications, journals, relevant conference proceedings, trade information as well as Australian and International Standards and Codes of Practice, societies and organisations.

#### MECH 5624 Energy and the Environment

4 credit points. Session: 1. Classes: (3 hr lec/tut)/wk. Prohibition: MECH 4220 Environmental Engineering MECH 4240 Energy and the Environment. Assessment: Group assignment submissions, as indicated at the commencement of the course, oral examination. Objective: To develop an understanding of the economic and environmental constraints on the selection and design of energy systems.

Expected outcomes: Students will have learnt how to make economic assessment of energy system alternatives and to mitigate and evaluate their environmental impact.

Syllabus summary: Economic analysis of energy systems. Urban air pollution, ozone hole and greenhouse problems, waste disposal, water pollution. Montreal protocol, Rio and Kyoto Accords, C02 capture and sequestration and other emerging control technologies.

#### MECH 5640 Product Life Cycle Design

2 credit points. Session: 2. Classes: 2 hrs/wk. Prohibition: MECH 4640 Product Life Cycle Design. Assessment: Course tasks during Semester. 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 5701 Computers in Real Time Control and Inst 6 credit points. Session: 1. Classes: (one 2hr lecture and one 3hr lab/ tut)/week. Prohibition: MECH 4730 Computers in Real-Time Control and Inst MECH 4710 Microprocessors in Engineered Products.

Assessment: Project and assignment work, plus one 2 hr exam. Satisfactory performance in both project/assignment work and exam is required.

Fourth year elective unit of study for the degree of Bachelor of Engineering in Mechatronic Engineering

Syllabus Summary:

Review of sensing, analogue and digital electronics, and overview of the IBM PC architecture. Programming for interactive control using both assembly language and high level languages. Timers and asynchronous tasks; data communication. Data structures for real-time programming. Multitasking and real time operating systems. Use of multi-tasking, message passing and multi-threading in environments such as NT and/or Unix. Object-oriented programming in C++. 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, real-time operating systems and 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 real-time multitasking systems with graphical user interfaces. *Textbook* 

*Lexidook* Auglandar DM & Tl

Auslander DM & Tham CH, Real Time Software for Control, Prentice Hall, 1990.

Library Classification: 629.8102,629.8955133.

MECH 5720 Sensors and Signals

6 credit points. Session: 1. Classes: 3 hours of lectures per week, 1 hour of LabAutorial per week. Prohibition: MECH 4720 Sensors and Signals. Assessment: Assignments (50%), Tutorials (20%), and a 2hr open book exam (30%).

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 5900 Thesis, Semester 1, Full Time

12 credit points. Session: 1. Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution. *NB: Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should* 

be submitted, hard-bound for the university library. Students are responsible for supplying their own thesis production materials. Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

Objectives:

To involve students in a research or major design project and give them the opportunity to conduct systematic investigations. Expected outcomes:

Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

#### MECH 5901 Thesis, Semester 2, Full Time

12 credit points. Session: 2. Assessment: On the basis of the submitted thesis and the report by the supervisor of the student's contribution. *NB: Theses should be typewritten onA4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-bound for the university library. Students are responsible for supplying their own thesis production materials.* Syllabus:

Each prospective student is required to consult with prospective supervisors to apply for a topic. In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

Objectives:

To involve students in a research or major design project and give them the opportunity to conduct systematic investigations.

Expected outcomes:

Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

#### MECH 5904 Seminar, Semester 1

2 credit points. Session: 1. Classes: Some instructional sessions will be arranged to provide basic techniques for preparation and presentation of technical material to an audience by audio-visual means. Assessment: Satisfactory performance in a seminar as assessed by the participants. Syllabus summary:

Each student, usually in consultation with his or her

supervisor, prepares a abstract of the seminar for distribution one week in advance of the seminar. Although it is not obligatory, the subject for the seminar is normally closely related to the student's thesis project (MECH 5900); thus it tends to deal in depth with some relatively narrow technical field. At the seminar (where the participants comprise departmental staff, postgraduate students and visitors), oral presentation of the thesis is followed by critical discussion under formal chairmanship.

Objectives:

To improve student competence and confidence in developing and presenting a formal technical presentation.

Expected outcomes:

The ability to structure and deliver a competent and informative technical presentation.

#### MECH 5905 Seminar, Semester 2

2 credit points. Session: 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. Assessment: Satisfactory performance in a seminar as assessed by the participants. Syllabus summary:

Each student, usually in consultation with his or her

supervisor, prepares a abstract of the seminar for distribution one week in advance of the seminar. Although it is not obligatory, the subject for the seminar is normally closely related to the student's thesis project (MECH 5900); thus it tends to deal in depth with some relatively narrow technical field. At the seminar (where the participants comprise departmental staff, postgraduate students and visitors), oral presentation of the thesis is followed by critical discussion under formal chairmanship.

Objectives:

To improve student competence and confidence in developing and presenting a formal technical presentation.

Expected outcomes:

#### Postgraduate units of study

The ability to structure and deliver a competent and informative technical presentation.

#### MECH 5910 Biomaterials and Biomechanics

4 credit points. Session: 1. Classes: 4 hrs of lecture/tut/lab per week. Prohibition: MECH 4910 Biomaterials and Biomechanics. Assessment: continual assessment semester and end of semester exam. 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

areas of current research in both the biomaterials and biomechanics fields, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems.

Reference books

J.B. Park and R.S. Lakes Biomaterials An Introduction (Plenum Press, 1992)

J. Black Orthopaedic biomaterials in research and practice (Churchill Livingstone, 1988)
 Y.-C. Fung Biomechanics of Living Tissues (Springer-Verlag)

#### MECH 5912 Environmental Acoustics & Noise Control 3 credit points. Session: 1. Prohibition: MECH 4230 Environmental Acoustics and Noise Control. Assessment: One 1.5hrexam. Syllabus summary:

Basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations. Computational methods in acoustics.

Objective:

To acquaint students with the methods engineers use to assess and deal with the environmental noise due to industry and other human activities.

Expected outcomes:

Students will appreciate the social, economic, and legislative aspects of environmental noise. They will be able to make the calculations and measurements necessary to estimate sound levels and noise in machinery, buildings and the outside environment and to make recommendations as to how best to reduce them.

Reference books

Bies and Hansen Engineering Noise Control (Allen & Unwin, 1988) Hassall and Zaveri Acoustic Noise Measurement (Bruel & Kjaer, 1988)

MECH 5920 **Orthopaedic Engineering** 4 credit points. Session: 2. Classes: 4hrs of tut/lab classes/wk. Prohibition: MECH 4900 Orthopaedic Engineering. Assessment: one 2hr exam and through semester assignments.

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.

# Project Engineering

#### PMGT 5867 Project Management Fundamentals 1 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5868 Project Management Fundamentals 2 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5869 Project Management Fundamentals 3 6 credit points. Session: 2.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

# PMGT 5870 **IT for Project Management** 6 credit points. Session: 2.

*NB: Department permission required for enrolment:* For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5871 Project Process Planning and Control 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5872 Project Human Resources Man & Leadership

#### 6 credit points. Session: 2.

NB: Department permission required for enrolment.-

#### PMGT 5873 Project Economics and Finance 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5874 Project and Contract Management 6 credit points. Session: 2.

*NB: Department permission required for enrolment.* For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5875 Project Management of IT Systems 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5876 Strategic Project Management 6 credit points. Session: 2.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5877 Project-Oriented Organisations 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5878 Project Stakeholders Impact Evaluations 6 credit points. Session: 2.

NB: Department permission required for enrolment.

### POSTGRADUATE STUDY

For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5879 Project Portfolio & Program Management 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5880 Project Delivery Systems 6 credit points. Session: 1.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5881 Advanced Risk and Uncertainty Management

6 credit points. Session: 2.

*NB: Department permission required for enrolment.* For more information see the Faculty of Engineering Postgraduate Handbook.

#### PMGT 5882 Project Formulation & Multidiscipline PI 12 credit points. Session: 2.

*NB: Department permission required for enrolment.* For more information see the Faculty of Engineering Postgraduate Handbook.

# PMGT 5883 Thesis/Project 1

6 credit points. Session: 1,2. NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

**PMGT 5884** Thesis/Project 2 6 credit points. Session: 1. Prerequisite: PMGT 5883. NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook:

#### PMGT 5885 Event Project Management 6 credit points. Session: 2.

NB: Department permission required for enrolment. For more information see the Faculty of Engineering Postgraduate Handbook.

# Interdisciplinary

ENGG 5601 Greenhouse Gas Mitigation 6 credit points. Session: 2.

# 6 Other Faculty information

# The Faculty

#### Faculty adviser

You are most welcome to discuss with the undergraduate or postgraduate advisers any questions about your studies, difficulties in maintaining your studies for financial or personal reasons, or any other questions or problems that may arise. As difficulties can usually be handled more easily in the early stages, you should seek help without delay. Discussions are held in strict confidence - simply come to the Faculty Office, in Room 226, Engineering Faculty Building and make an appointment. Special enrolment instructions

These are the special requirements for Engineering students. To complete your enrolment in Engineering you proceed to

the PNR Enrolment Centre in the Drawing Office, where you collect your enrolment form,

- complete a registration form,
- consult an adviser about your plan of courses and
- record your courses on the computer and receive your timetable

#### Examinations

#### Freedom of Information Act

Examination scripts, or copies of same, are available for viewing or collection from Departmental Offices for three months after final examinations each year, after which they will be shredded. Enquiries

All examination result enquiries must be made with your Department. The Engineering Faculty Office is not equipped to handle examination enquiries. Supplementary examinations

- A supplementary examination may be granted by the Faculty:
- (a) to candidates whose performance in an examination has been 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 substandard performance in assessments which do not reflect a student's true competence in a subject, and such provisions must not act to the disadvantage of other students. The Faculty will

only compensate students when there is clear evidence that results have been adversely affected by the disability for which special consideration is requested.

#### Financial assistance

#### Special assistance

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

Students wishing to apply for financial assistance should make enquiries from either of the following:

Financial Assistance Office, Student Services,

(02)93512416.

President of the Students' Representative Council, (02)96605222.

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 LWSWCPEng, FIChemE **FIEAust** 

Executive Assistant to the Dean

Kay Fielding

Pro Dean

Professor Yiu-Wing Mai, BSc(Eng) PhD HK DEng, FTSE FASMEFHKIE FIEAust

Associate Dean (Postgraduate)

Associate Professor Liangchi Zhang

Associate Dean (Undergraduate)

Dr Douglass Auld

Associate Dean (Research)

Professor John Carter

Associate Dean (Teaching and Learning)

Mr John Currie

Associate Dean (First Year Teaching)

Professor Greg Hancock

#### OTHER FACULTY INFORMATION

Associate Dean (International) Associate Professor Liyong Tong Executive Officer Eric van Wijk, BSc ANU DipEd DipAppEcon UCan Secretary to the Faculty and Finance Officer Michael Whitley, BA(Hons) EastAnglia MCom UNSW ASA CIAFCISFICDDip Postgraduate Adviser Josephine Harty, BA Macq Undergraduate Adviser Annamaria Brancato Administration Officer Scholarships and External Relations Dr Alison Milful BA, PhD UNSW

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: A/Prof G Barton Third Year: A/Prof T Langrish FourthYear:DrHSee 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 RMasri, BE PhD PN Russell Professor Roger I Tanner, BSc Brist MS Calif PhD Mane, FRS FAA FTSE FIEAust FASME. Appointed 1975 Lawrence Hargrove Professor to be advised Professors Robert W Bilger, BSc BE NZ DPhil Oxf FTSE FJEAust. Appointed 1976 Hugh F Durrant-Whyte, BSc(Eng) Lond MSE PhD Penn. Appointed 1995 John H Kent, BE MEngSc PhD FIEAust. Appointed 2001 Yiu-Wing Mai, BSc (Eng) PhD DScfflsTDEng Syd FAA FTSE FASME FHKJE FIE Aust. Appointed 1987 Assaad R Masri, BE PhD Eduardo M Nebot, BS *BahiaBlanca* MS PhD *ColoradoState* Michael V Swain, BSc PhD *UNSW*. Appointed 1997 Lin Ye, BS *Harbin* MS PhD *BUAA* Liangchi Zhang, BSc MEng Zhejiang PhD Peking MASME MASPE MJSPE MJSME Associate Professors Steven W Armfield, BSc Flinders PhD Liyong Tong, BSc MEngSc Dalian PhD BUAA, FIEAust MAIAA Reader vacant Senior Lecturers Douglass J Auld, BSc BE MEngSc PhD Peter W Gibbens, BE PhD Ncle(NSW), MAIAA Andrei Lozzi, BSc UNSWMEngSc PhD Paul J McHugh, BSc BE David C Rye, BE Adel PhD Karkenahalli Srinivas, BE *Bangalore* ME PhD *IISc* Kee Choon Wong, BE PhD, MAIAA

Lecturers

Steven Scheding, BE PhD

Hugh Stone, BSc BE PhD

Salah Sukkarieh, BE PhD Adjunct Associate Professor Simmy Grewal, BSc Coventry PhD Liv Adjunct Senior Lecturer Rob Widders, BE MEngSc UNSW Adjunct Lecturer Captain Peter LBates, 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 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 Vincent G Gomes, BTech MEng PhD Montr Marjorie Valix, BSc PhD UNSW Howard See, BSc BE MSc Tokyo PhD Nagoya Adjunct Associate Professors David Fletcher, BSc PhD Exeter Donald A White, BE Liverpool Honorary Research Associates Peter B Linkson, BE PhD, FIEChemE FAusIMM FGAA CEng 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 CPEng. 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 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 MEngSc, FIEAust MASCE Adjunct Associate Professor Ian SF Jones, BE UNSW PhD Wat. MIEAust Emeritus Professors Harry G Poulos, AM, BE PhD DScEng, FIEAust FASCE FAA Nicholas S Trahair, BSc BE MEngSc PhD DEng, FIEAust Honorary Associate Professors Andrew Abel, Dipllng TUBud MSc McMPhD UNSW, CEng FTM Peter Ansourian, BSc BE PhD Honorary Associate Professor YK Cheung, OBE, BSc PhD DSc DE, FEng CEng FICE FIStructE FIEAust FHKIE(Hon) Senior Lecturer David W Airey, BA MPhil PhD Camb Lecturers Abbas El Zein, BE AmericanUniLebanon MSc PhD Southampton MS ENPCParis, MIEAust Noel L Ings, BE MEngSc UNSW, MASCE MIEAust Li Liu, BE NUTD MBA ATT MTax Syd PhD AGSM Tim Wilkinson, BSc BE MA PhD Graeme Wood, BEng(Hons) PhD Edin Professional Officers Nigel P Balaam, BE PhD Timothy S Hull, BE PhD

#### Scholarships and prizes

John P Papangelis, BE PhD, MIEAust Honorary Research Associates Russell Q Bridge, BE(Hons) UNSW PhD, FIEAust Howard B Harrison, BE PhD, MIEAust Harold Roper, BSc PhD Witw MEngSc, MATMM Richard D Wafkins, BE Qld PhD Aberd, MIEAust Honorary Teaching Associate Ian G Bowie, MSc Mane, MASCE MIEAust

# Electrical and Information Engineering

Head of School Branka Vucetic, MSc PhD Belgrade Manager, Resources Paul Beed, BBus UWS, CPA 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, BA DipEd Macq Rita Wong Ping Zhang, BA Fudan PNRussell Professor Trevor William Cole, BE WAust PhD Camb, FIEAust. Appointed 1980 Professors David Hill, BE BSc Old PhD N'cle(NSW), FIEAust FIEEE Appointed 1994 Robert A Minasian, BE PhD *Melb* MSc *Lond*, FIEEE FIEAust CPEng. Personal Chair 2002 Branka Vucetic, MSc PhD *Belgrade*, FIEEE. Personal Chair 1999 Hong Yan, BS Nanking IPTMSE Mich PhD Yale. Personal Chair 1997 Associate Professors Abbas Jamalipour, BSc Isfahan MSc Sharif PhD Nagoya, SMIEEE MURSIMIEICE MSITA MAAEE Stephen W Simpson, BSc PhD, FAIP Anthony D Stokes, BSc BE PhD, FIEAust Hansen Yee, BSc BE PhD, MIEEE Senior Lecturers Javid Atai, BSc(Hons) WAust PhD ANU Richard Coggins, BE BSc PhD, MIEEE Iain CoUings, BE *Melb* PhD *ANU*, MIEEE Xiheng Hu, DipElecEng ChongoingIndustUni MElecCompEng China PhD Bjorn Landfeldt, PhD UNSW, MIEEE David Levy, BScEng MScEng PhD Natal, MIEE James G Rathmell, BSc BE PhD, SMIREE Swamidoss Sathiakumar, BSc AmericanCollIndia BE ME PhD IISc Andre van Schaik, MSc Twent PhD SwissFedIT Yash Shrivastava, BTech *HTKanpurPhD Iowa*, MIEEE Lecturers Craig Jin, BSc Stan MS CalTech PhD Rafael Calvo, Licenciado in Physics PhD Universidad Nacional de Rosario Guoqiang Mao, BE HubeiPolyUni ME SoutheastChina PhD EdithCowan, MIEEE Professional Officers William Fong, BE WAust MEngSc Ebrahim Gogani, ME TehrPolytechnic PhD Brunei Ross Hutton, BE QU Van Dong Pham, BE SouthAust MEngSc PhD UNSW Michael Rados, BSc BE MEngSc Robert G Sutton, ME UNSW Research Fellow Hayoung Yang, BSc MSc PHD Yonsei Honorary appointments 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 Adjunct Associate Professor John Brydon, BA(Hons) Camb MSc Lond PhD UNSW Peter M Nickolls, MB BS BSc BE PhD Senior Lecturer Brian Campbell, ME David F Gosden, ME UNSW MBA AGSM, MIEAust 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 of 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** (TEPS, ordinary and combined degrees, \$1000 pa + \$3500 for 10 weeks paid work experience).

The scholarships Web site is at <u>www.eng.usyd.edu.au/</u> scholarships.

# WMNeirous Scholarship

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

#### EnergyAustralia Scholarship in Engineering

For school leavers undertaking a standard electrical engineering program, with a complete year in industry, valued at \$44,500 for 5 years.

Other Scholarships are provided by Ford Australia, Transfield, 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: <u>a.milful@eng.usyd.edu.au</u>

#### The Major Industrial Project Placement Scheme for undergraduates

#### **Chemical Engineering**

The objective of this program, 'MIPPS', is to provide opportunities for top students (First Class Honours potential), to spend 6 months in industry undertaking high-level investigative projects during their final year of studies. No subjects are taken in the first semester of the final year. Topics otherwise missed in process design simulation, risk management and hazard analysis, and project management are covered by case studies, which can often be based on available company in-house courses or technical activities.

Students work full time in industry, from mid January to early July, at the sponsor's premises, so that this really is an industrial experience, rather than a part-time position for a full-time

#### OTHER FACULTY INFORMATION

student. It is insisted that the project must be the company's, and that it is always under the company's final control. The sponsor appoints the project supervisor, who must have the authority to make and enact project decisions. Although not an essential requirement, projects which tap into the research and applications expertise within the Department are preferred. Companies nominate two to four projects, so as to allow the Department to comment on the nature and extent of support which it can provide as detailed below. Final project selection and specification involves quite some discussion, and is then finalised by mutual agreement.

A key feature of the scheme is that the Department participates extensively through sharing supervisory responsibilities, by appointing an academic as associate supervisor. The associate supervisor supports the students in their first significant investigative task (finding resources, handling information, setting directions,...); supports the projects by contributing to the direction and methodology; and monitoring project progress.

Students are invited to apply and are selected based on academic and personal qualities demonstrated during the first three years of their studies. Company representatives are invited to participate in the overall selection procedure. Companies do not select students, but where feasible, the Department tries to match students to sponsors and projects, based on students' preferences and on the knowledge gained by the Department.

The MIPPS stipend for the present is \$11,000, tax free to the student. Total cost to the sponsor is currently \$17,000-19,000, depending on the extent of other support by the sponsor to the Department, such as Foundation membership.

*Projects and Sponsors:* projects previously carried out include:

- · Transient modelling of heat recovery steam generators
- Modelling of interest rates in the Australian financial markets
- Upgrade of industrial oxygen plants
- Lubricating oil brightstock investigation
- Conditions for increased oil refinery alkylate production
  Monitoring and controlling changing raw drinking water quality
- Low cost carbon sources for sewage denitrification
- Optimisation of trade waste treatment plant operation
- Advanced data processing, reconciliation, modelling and optimization for a paper mill (2 projects)

• Integrated process plants water consumption minimisation. The sponsors for 2002 were Alstom Power; ANZ Investment Bank; BOC; Caltex; Shell Refining; Sydney Water; Unilever/ Streets; VisyPaper; and WMC.

# Student facilities and societies

#### Notice boards

Faculty notice boards, one for First year courses and one for Second year courses, located outside the Student Enquiry Office, second level, Faculty Building. Each of the Engineering departments has a notice board for Third and Fourth year students.

Notice boards are also in the various Science departments, and information concerning the courses given by those departments will be posted on these boards.

Details of class lists, timetable variations, examination times and other information relating to courses of study will be posted on the relevant notice boards. Students are expected to inspect the notice boards at frequent intervals.

Notices referring to cadetships, scholarships, vacation employment and career opportunities and other matters of this nature are also displayed on the notice boards in and around the Student Enquiry Office, 2nd level, Engineering Faculty Building.

#### The Engineering Library

The Engineering Library is part of the University of Sydney Library and supports the Engineering Faculty. It is located on the ground floor of the PNR Building. The Library has a large collection of Engineering serials (many of which are available electronically), research material such as books, conferences and microfiche collections and multiple copies of Undergraduate Engineering material. The library's catalogue, databases, internet resource guides and electronic collections are available via the Web at <u>www.library.usyd.edu.au</u>.

The library offers electronic database classes and personal assistance with research needs. The librarians are involved in an

extensive Information skills program within the Faculty undertaking classes for all Engineering courses during the semester.

Books may be borrowed by undergraduate students for two weeks with renewals available if the item is not placed on hold for another borrower. Postgraduates and academics are entitled to a two month loan period with renewals available if the item is not required by another borrower. Journals are not borrowable but photocopying facilities are available for print journals and many journals are available in electronic format. Printing facilities are available in the library and remote access is available via the internet. High demand material is also put into a Reserve collection for two hour loan during the day and overnight loan.

The Engineering Library opens from 8.30 am to 7 pm on Monday and Thursday and 8.30 am to 6 pm Tuesday, Wednesday and Friday during semester. Vacation hours are 9 am to 5 pm Monday to Friday.

#### 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.

# Engineering associations

#### SUCEA

The Sydney University Chemical Engineering Association (SUCEA) is a body representing the graduates of the Department of Chemical Engineering. Established in the 1950s, it is one of the oldest alumni associations at the University of Sydney. With 1326 members living in over 20 countries around the world, it is also one of the largest.

SUCEA holds a number of social events and a technical symposium each year with the aim of maintaining strong contact between the Department and its graduates (some of whom are well into their sixties). So, via SUCEA, you will still be part of the 'Chem Eng' family even after you graduate.

#### SUEUA

The objects of SUEUA, the Sydney University Engineering Undergraduates' Association, are:

- (a) to perform such actions and to organise such functions as the committee may deem necessary and desirable in the interests of the Faculty of Engineering, University of Sydney, and the students thereof:
- (b) to act as an intermediary body between the teaching staff on the one hand and the members of the Association on the other;
- (c) to organise Engineering teams for inter-faculty sport. The office of the SUEUA is on the ground floor of the PNR

Building close to the Faculty library. In this office the association conducts a bookshop where many items of stationery, and some textbooks and codes of practice, are available at competitive prices.

The SUEUA normally holds an election for the president and other office bearers in March each year and all financial members of the association are eligible to vote. The president becomes a member of the Faculty by virtue of this office. The by-laws of the University provide for the undergraduates in Engineering to elect two others of their number to be members of Faculty and an election for this purpose is conducted in October each year. All Engineering undergraduates, including those enrolled in the Faculty of Science as candidates for the double degree, are eligible to vote.

#### Institution of Engineers, Australia

The professional body for Engineering in Australia is the Institution of Engineers, Australia, whose first objective is to 'promote the science and practice of engineering in all its branches'.

The institution functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession - eg, civil, electrical, mechanical, chemical and transportation to name a few.

Any student of an approved School of Engineering can join the Institution as a student member (StudlE Aust).

As a student member you will receive the fortnightly magazine *Engineers Australia*, containing articles of general engineering interest and advising you of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, and so on.

Student members may freely use the comprehensive library and reference facilities maintained by the Institution - a handy place to obtain a hard-to-get book or periodical.

Within most divisions is a Graduates and Students Section, known as GAS, and all graduates of, or students at, approved engineering schools are eligible for membership.

The Graduates and Students Sections organise film nights, site tours and other activities of general interest. The Malcolm Stanley Speakers' Competition for public speaking is held each year, usually in September, and prizes are awarded for the best speeches.

For membership information and application forms enquire at the Faculty Office or at the Sydney Division Office: 118 Alfred Street, Milsons Point 2061 (PO Box 138) Phone (02) 9929 8544.

#### The Institution of Chemical Engineers

An alternative organisation for Chemical Engineering students is the Institution of Chemical Engineers. The Institution welcomes and values student members, offering special rates for technical meetings, together with Institution literature and guides to gaining employment. For further information contact the General Office in Chemical Engineering.

# The Association of Professional Engineers, Scientists and Managers, Australia

APESMA is a professional organisation that represents the industrial interests of its members. Its major focus is on providing advice and assistance on employment-related matters, including individual representation and improving salaries and conditions for professional engineers, scientists and managers. The Association also provides members with legal, financial and insurance services and runs an extensive management education program.

APESMA has some 19,000 members in all areas of public and private sectors in Australia. In addition, 6500 university students in engineering and science-related disciplines are student members.

The Association invites students to become affiliate members for no charge while they are studying. This membership gives students access to information and advice on industrial experience, salary rates for graduates and contracts of employment. Student members receive *The Student Update*, a publication designed specifically for students, three times a year. This gives students some practical insight into aspects of the workplace to which they may not have given much thought, in particular the employment issues that affect them as professional engineers.

For more information and student membership application forms, contact Felicity Ryan, Membership Liaison Officer, phone (02) 9264 9500.

# A short history of the Faculty

# A hundred and seventeen years of engineering education

In 1983 the Faculty of Engineering celebrated one hundred years of engineering education at the University of Sydney.

At the beginning of March 1883 the first classes in engineering were held in the Main Building. Engineering then formed part of the newly created Faculty of Science (1882). The classes were attended at the opening by three matriculated students who were candidates for the engineering certificate and by seven non-matriculated students.

The lecturer in engineering was Mr W.H. Warren, who had been appointed in December 1882 following a decision by the University Senate to carry out significant revisions to the teaching of the University. These revisions, which provided for the establishment of Schools of Medicine, Science and. Engineering, were unable to be implemented in 1881 for lack of staff, accommodation, and facilities.

In 1883, when the new engineering curriculum was introduced, the Senate reported that 'great inconvenience [had]

been felt during the year, both by the lecturers and the students, through the deficiency in accommodation for lecturing purpose ... the room occupied by the Lecturer in Engineering [was] much too small to contain the apparatus required for the illustration of his lectures...'. A temporary structure was erected at the rear of the Main Building, and in 1885 classes moved to a fairly commodious low white building with a verandah facing Parramatta Road, on a site now partly occupied by the Holme Building.

In 1909 the new building for the P.N. Russell School of Engineering was sufficiently completed early in the year for the work of the school to be conducted within its walls. This building - an outcome of the extraordinary benefaction of Peter Nicol Russell - was formally opened by the Governor on 20 September 1909 at the same time as he opened the new Fisher Library building (now MacLaurin Hall). During the course of the next few decades extensions were made to the PNR Building until, with the expansion in student numbers in the 1950s and early 1960s, new facilities were constructed in the Darlington extension area across City Road. Since the mid-seventies all departments have been accommodated in this area, although a wind tunnel in the Woolley Building is still in use by Aeronautical Engineering.

# Foundations

#### Chemical Engineering Foundation

The Foundation was created in 1981 as a means of fostering closer ties between the Department and Industry. Foundation activities include:

- regular meetings with guest lectures, research round-ups and open forum discussions
- career days to introduce Foundation members interested in graduate recruitment to students in the department
- facilitating access to areas of specialist expertise in the department
- providing input and advice regarding the composition and teaching of undergraduate courses
- continuing education courses.

Current company members of the Foundation include Alstom Power, BOC Gases, Shell Refining, Dupont, Visy Pulp & Paper, Alstom Power, Caltex, Honeywell Ltd, Sugar Australia and Sydney Water. These corporate representatives are joined by a strong body of individual members, many of whom work as independent consultants in the field of Chemical Engineering. The Foundation Web site can be found at

www.chem.eng.usyd.edu.au/cef. Phone (02) 9351 2455, fax (02) 9351 2854, email

espinner@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 nonacademic and is a conduit between academic staff, parents and industry. In addition, the Foundation supports department activities and is an integral part of the department's function.

The Foundation is the arm of the civil engineering industry within the University receives all it's funding from the industry. The Foundation has gained a reputation for holding unusual fund raising activities being widely supported by industry.

This funding is used to foster education and research and to ensure the department is fully equipped to engage in such civil engineering research and development. Many civil engineering consultants, contractors and architects use the department's research capabilities before any major works are commenced.

The Foundation also promotes Lectures, Seminars, Short Courses, Masters' programs and technical notes to ensure the Australian civil engineering industry is kept at the fore front of world practice.

Management of the Foundation is through a council of civil engineering industry representatives and department staff who meet regularly to monitor the progress of the department and its students.

The Foundation can be contacted through the Executive Officer:

Phone (02) 9351 2127, fax (02) 9351 6284, email foundation@civil.usyd.edu.au.

#### Electrical Engineering Foundation Electrical and Information Engineering Foundation

The mission of the Electrical and Information Engineering Foundation is to build a successful partnership between the School of Electrical and Information Engineering, industry and the profession which facihtates, 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:

- government/university relations bringing industry and students together industry participation in University teaching industry participation in University research encouraging student and teacher excellence
- Sophia Technica Project
- Alumni relations

President: Mr Michael Dureau. Director: Professor Robert Minasian Executive Officer: Mr Stuart Glanfield Phone: (02)9351 7171 Fax: (02) 9351 7172 Email: <u>eief@ee.usyd.edu.au</u> Web: <u>www.ee.usyd.edu.au/foundation</u>

# 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 Email: <u>accomm@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/accom</u> Admissions Office

The Admissions Office (see address below) 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 Orecords.usyd.edu.au

Applying for a course

# Local applicants for undergraduate courses and programs of study

Citizens and permanent residents of Australia and citizens of New Zealand are considered local applicants for the purpose of admission and enrolment. If you are in this group and you wish to apply for admission into an undergraduate course, you would generally apply through the Universities Admissions Centre (UAC) by the last working day of September of the year before enrolment. Go to <u>www.uac.edu.au</u> for more information.

Note that some faculties, such as Pharmacy, the Sydney Conservatorium of Music and Sydney College of the Arts, have additional application procedures.

# Local applicants for postgraduate courses and programs of study

Citizens and permanent residents of Australia and citizens of New Zealand are considered local applicants for the purpose of admission and enrolment. Application is direct to the faculty (not to the department, Student Centre or the Admissions Office) which offers the course in which you are interested. Application forms for postgraduate coursework, postgraduate research and the Master's qualifying or preliminary program, or for non-award postgraduate study can be found at <u>www.usyd.edu.au/su/</u> studentcentre/applications/applications.html.

Please note that not all faculties use these application forms for admission into their courses. Some faculties prefer to use their own specially tailored application forms rather than the standard ones. Please contact the relevant faculty.

# International applicants for all course types (undergraduate and postgraduate)

All applicants other than Australian citizens, Australian permanent residents and citizens of New Zealand are considered to be international applicants. In the vast majority of cases applicants apply for admission through the University's International Office. All of the information international applicants need, as well as downloadable application forms, is available from the International Office's section of the University's Web site, <u>www.usyd.edu.au/io</u>.

#### 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: <u>info@careers.usyd.edu.au</u> Web: <u>www.careers.usyd.edu.au</u> 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: <u>ces@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/cas\_emp</u>

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, K01 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: <u>info@cet.usyd.edu.au</u> Web: <u>www.usyd.edu.au/cet</u>

#### Child care

Contact the Child Care Coordinator for information about children's services for students and staff of the University who are parents. Child Care Coordinator Level 7, Education Building, A35 Phone: (02) 9351 5667 Fax: (02) 9351 7055 Email: <u>childc@stuserv.usyd.edu.au</u>

Web: www.usyd.edu.au/childcare

### The Co-op Bookshop

As well as providing textbooks for all courses, the Co-op stocks a wide range of supplementary material including recommended readings, course notes, study aids, reference titles, general fiction, non fiction, academic and professional titles. Co-op members receive up to 15 per cent discount and the shop stocks software at up to 70 per cent of for students and academics.

The Co-op is located in the Sydney University Sports and Aquatic Centre. Phone: (02) 9351 3705 or (02) 9351 2807 Fax: (02) 9660 5256 Email: <u>sydu@mail.coop-bookshop.com.au</u> Web: <u>www.coop-bookshop.com.au</u>

#### **Counselling Service**

The Counselling Service aims to help students fulfil their academic, individual and social goals through professional counselling which is free and confidential. 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: <u>counsell@mail.usyd.edu.au</u> Web: <u>www.usyd.edu.au/counsel</u>

#### **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 7040 Fax: (02) 9351 3320 TTY: (02) 9351 3412 Email: <u>disserv@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/disability</u>

#### 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 preenrolment.

#### Examinations

The Examinations and Exclusions Office (see address below) 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: <u>exams.office@exams.usyd.edu.au</u>

#### 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 Email: <u>fao@stuserv.usyd.edu.au</u> Web: www.usyd.edu.au/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;
- enables a member of the public to obtain access to documents held by the University;
- enables 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.
  (Note that a 'member of the public' includes staff and students

of the University)

It is a requirement of the Act that applications be processed and a determination be made within a specified time period, generally 21 days. Determinations are made by the University's Registrar.

While application may be made for access to access University documents, some may not be released in accordance with particular exemptions provided by the Act. There are review and appeal mechanisms which apply when access has been refused.

The University is required to report to the public on its FOI activities on a regular basis. The two reports produced 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 the University's policy documents and provides information regarding how to make application for access to University documents.

Further information, and copies of the current reports may be found at <u>www.usyd.edu.au/arms/foi</u>.

#### **Graduations Office**

The Graduations Office is responsible for organising graduation ceremonies and informing students of their graduation arrangements.

Student Centre

Carslaw Building, F07 The University of Sydney NSW 2006 Australia Phone: (02) 9351 3199, (02) 9351 4009, Protocol (02) 9351 4612

Finite: (02) 9351 5199, (02) 9351 4009, FiniteCol (02) 9351 401. 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 <u>www.usyd.edu.au/</u> 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

#### Information Technology Services (ITS)

Information Technology Services oversees the University's computing infrastructure. Students can contact ITS either through the ITS Helpdesk (<u>helpdesk.usyd.edu.au</u>), located in the University Computer Centre (Building H08), or through the University Access Labs (<u>www.usyd.edu.au/su/is/labs/</u>). The access labs on main campus are located in:

- Fisher Library (Level 2)
- Carslaw (Room 201)
- Education (Room 232)
- The Link Building (Room 222)
- Pharmacy (Room 510)

Other labs are available at the Law, Orange, Westmead and Cumberland campuses.

The labs allow students free access to computers, including office and desktop publishing software and storage, at-cost Internet access, printing facilities and the opportunity to host their own Web site.

Each student is supplied with an account, called a 'Unikey' or 'extra' account, which allows access to a number of services including:

Free email (www-mail.usyd.edu.au);

- Access to the Internet both from home and from the access labs (<u>helpdesk.usyd.edu.au/services.html</u>);
- Online course material (groucho.ucc.usyd.edu.au:9000/ webct/public/home.pl);
- Student facilities via the intranet (<u>www.intranet.usyd.edu.au</u>), including exam results and seating, student timetables and bulletin boards; and
- Free courses in Microsoft Word and Excel, Photoshop, Internet use and html.

#### **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 orientation and assistance with finding accommodation for new arrivals and psychological counselling and welfare advice for international students and their families. The Study Abroad and Exchange unit assists both domestic and international students who wish to enrol for Study Abroad or Exchange programs.

#### International Student Centre

Services Building, G12 The University of Sydney NSW 2006 Australia Phone: (02) 9351 4079 Fax: (02) 9351 4013 Email: <u>info@io.usyd.edu.au</u> Web: <u>www.usyd.edu.au/io</u>

#### International Student Services Unit

Phone: (02) 93514749 Fax: (02) 9351 6818 Email: <u>info@issu.usyd.edu.au</u> Web: <u>www.usyd.edu.au/issu</u>

#### Study Abroad and Exchange Unit

Study Abroad Phone: (02)9351 3699 Fax: (02) 9351 2795 Email: <u>studyabroad@io.usyd.edu.au</u> Web: <u>www.usyd.edu.au/io/studyabroad</u> *Exchange* Phone: (02) 9351 3699 Fax: (02) 9351 2795 Email: <u>exchange@io.usyd.edu.au</u> Web: <u>www.usyd.edu.au/io/exchange</u>

#### Intranet

The University is continually increasing the amount of information and services it provides through the Web. This can be seen in the University's intranet, called USYDnet. Here, students and staff can find information on everything, from University policies, through to courses and units of study. As well as delivering this information, USYDnet provides interactive services such as a calendar of events, where students and staff can enter events and publish them on the Web, access to a single point of email, the ability to search for housing and casual jobs, and other student/staff specific information.

MyUni is the personalised section of USYDnet. All staff and students are provided with access to MyUni through a login name and password. MyUni enables them to receive delivery of personal information such as exam results, enrolment variations and seat numbers. MyUni is a portal from which students and staff can complete tasks that were previously only able to be done in person, offline.

#### 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. Beginner 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, Al 8 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 helps students to develop the generic learning and communication skills which are necessary for university study and beyond. The Centre is committed to helping students 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 are an Individual Learning Program, a special program for international students, faculty-based workshops, computer-based learning resources, publications of learning resources and library facilities. Level 7, Education Building, A3 5 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/lc

# GENERAL UNIVERSITY INFORMATION

#### Library

Students are welcome to use any of the 20 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 Web page, <u>www.library.usyd.edu.au</u>, as well as in the printed Library Guide, available at any library. Consult the Library staff for assistance.

The libraries listed below are located on the Camperdown/ Darlington campus unless otherwise specified.

Architecture Library Wilkinson Building, G04 Phone: (02) 9351 2775 Fax: (02) 9351 4782 Email: architecture@library.usyd.edu.au Badham Library Badham Building, Al6 Phone: (02) 9351 2728 Fax: (02) 9351 3852 Email: <u>badham@library.usyd.edu.au</u> 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: <u>burkittford@library.usyd.edu.au</u> Camden Library University Farms, Werombi Rd, Camden, C15 Phone: (02) 9351 1627 Fax: (02) 4655 6719 Email: camden@library.usyd.edu.au Chemistry Library From December 2002, merged with the Geosciences Library in the Madsen Building Curriculum Resources Library Relocated to Fisher Library, Floor 1 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: 92125149 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 4328 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: library@fhs.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 Musk 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@Ubrary.usyd.edu.au Orange Library Leeds Parade, Orange Phone: (02) 6360 5593 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 Schaeffer 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 Fax: (02) 9351 1372 Email: <u>Ubrary@conmusic.usyd.edu.au</u>

#### Mathematics Learning Centre

The Mathematics Learning Centre assists students to develop the mathematical knowledge, skills and confidence that are needed for studying mathematics or statistics at university. The Centre runs bridging courses in mathematics at the beginning of the academic year (fees apply). The Centre also provides on-going support during the year through individual assistance and small group tutorials to eligible students.

Level 4, Carslaw Building, F07 The University of Sydney NSW 2006 AustraUa Phone: (02) 9351 4061 Fax: (02) 9351 5797 Email: <u>rnlc@stuserv.usyd.edu.au</u> Web: <u>www.usyd.edu.au/mlc</u>

#### Part-time, full-time

#### Undergraduate students

Undergraduate students are normaUy 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.

#### Postgraduate students (coursework)

Whether a postgraduate coursework student is part-time or fuUtime is determined solely by credit-point load for all coursework programs. A students is classed as enrolled full-time in a semester if he/she is enrolled in units of study which total at least 18 credit points. Anything under this amount is considered a

#### Student organisations

part-time study load. Please note that classes for some coursework programs are held in the evenings (generally 6-9 pm).

#### Postgraduate students (research)

Full-time candidates for research degrees do not keep to the normal semester schedule but work continuously throughout the year except for a period of four weeks' recreation leave. There is no strict definition of what constitutes full-time candidature but, generally speaking, if you have employment or other commitments that would prevent you from devoting at least the equivalent of a 35-hour working week to your candidature (including attendance at the University for lectures, seminars, practical work and consultation with your supervisor as may be required) you should enrol as a part-time candidate. If in doubt you should consult your faculty or supervisor.

#### International students

International students who are resident in Australia are normally required under the terms of their entry visa to undertake full-time candidature only.

#### Privacy

The University is subject to the NSW Privacy and Personal Information Protection Act 1998 (the Act). Central to the Act are the twelve Information Protection Principles (IPPs) which regulate the collection, management, use and disclosure of personal information. The University has developed a Privacy Management Plan which includes the University Privacy Policy. The Privacy Management Plan sets out the IPPs and how they apply to functions and activities carried out by the University. Both the Plan and the new University Privacy Policy were endorsed by the Vice-Chancellor on 28 June 2000.

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 Anne Picot: (02) 9351 7262 Email: foi@mail.usyd.edu.au

#### Scholarships for undergraduates

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/scholarships.shtml

# **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

The student tidentity card functions as a library borrowing card, a transport concession card, when suitably endorsed, and a general identity card for a range of purposes within the Univesity. The card must be carried at all times on the grounds of the University and must be shown on demand. Students are required to provide a passport-sized colour photograph incorporating head nd shoulders only for lamination to this card. Free lamination is provided at a range of sites throughout the University during the January/February enrolment/pre-enrolment period. Cards which are not laminated or do not include a photograph will not be accepted. New identity cards are required for each year of a student enrolment.

#### **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, Counselling Service, Disability Services, Financial Assistance Office, Learning Centre, Mathematics Learning Centre. The Web site is at www.usvd.edu.au/stuserv

#### The Svdnev Summer School

Most faculties at the University offer units of study from undergraduate degree programs during January/February. There are also some units of study available from postgraduate coursework programs from some faculties. As the University uses all of its HECS quota in first and second semester, these units are full fee-paying for both local and international students and enrolment is 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 6 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, on the summer school Web site (www.summer.usyd.edu.au) 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.

#### **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, G01 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, G01 The University of Sydney NSW 2006 Australia Phone: (02) 9660 5222 Editors, Honi Soit/Legal Aid (02) 9660 4756 Second-hand Bookshop (02) 9351 0691 Mallett St (02) 93511291 Pitt St - Conservatorium Fax: (02)96604260 Email: postmaster@src.usyd.edu.au Sydney University Postgraduate Representative Association (SUPRA)

SUPRA is an organization which provides services to and represents the interests of postgraduate students.

All postgraduate students at the University of Sydney are members of SUPRA

Raglan Street Building, G10

University of Sydney

NSW 2006 Australia

Phone: (02) 9351 3715, Freecall 1800 249 950

Fax: 02 9351 6400

Email: supra@mail.usyd.edu.au

Web: www.usyd.edu.au/supra/

## GENERAL UNIVERSITY INFORMATION

### 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: <u>sports union@susu.usyd.edu.au</u> 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: <u>email@usu.usyd.edu.au</u> Web: <u>www.usu.usyd.edu.au</u> Women's Sports Association Provides for students, predominantiy 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: <u>secretary@suwsa.usyd.edu.au</u> Web: <u>www.suwsa.usyd.edu.au</u>

# 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*.)

#### 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 midyear 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 DEST 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 121

#### GLOSSARY

proportion being undertaken by the student of the normal fulltime 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 umt 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 DEST 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 alphanumeric 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 per cent or more of the overall course requirements.

#### Course rules

Course rules govern the allowable enrolment of a student in a course; eg, a candidate may not enrol in units of study having a total value of more than 32 credit points per semester. Course rules also govern the requirements for the award of the course; eg, a candidate must have completed a minimum of 144 credit points. Course rules may be expressed in terms of types of units of study taken, length of study, and credit points accumulated. (See also *Award course.*)

# Course suspension

See Course leave. Course transfer

#### Course transje

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 DEST 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 nonspecific - 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** 

#### Delivery moue

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.

#### DEST

The Department of Education, Science and Training is the Commonwealth Government department responsible for higher education. The University is required to provide DEST with information about its students several times a year. The Government uses this information in its funding deliberations.

Differential HECS See Higher Education Contribution Scheme (HECS). Diploma

#### Dipioma

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* DEST 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.

#### ĔFTYR

The effective full-time enrolment year (EFTYR) is a calculation of how long, in terms of equivalence to full-time years of enrolment, a student has been enrolled in a course. If a student has always been full-time, the calculation is straightforward (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 linked to an enrolment status reason or category.

#### Enrolment status reason/category

Not enrolled status reasons/categories include: withdrawn, totally discontinued, cancelled, on leave (suspended), transferred, lapsed, terminated, qualified and conferred.

#### **Enrolment** variation

Students may vary their enrolment at the beginning of each semester. Each faculty determines its deadlines for variations, but HECS liability depends on the HECS census date. (See also *HECS.)* 

# Enrolment year

See EFTYR, Stage.

#### Examination

See Examination paper code, Examination period,

# Supplementary exams.

# Examination paper code

A code that identifies each individual examination paper. Used to help organise examinations.

# Examination period

The examination period is the time set each semester for the conduct of formal examinations.

#### Exchange student

An exchange student is either a student of 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 DEST. The following dates apply:

Semester 1:31 March

Semester 2: 31 August.

#### **HECS** code

A code used by DEST to identify the HECS status of a student (eg, 10 deferred, 11 upfront).

Higher doctorates

# See Award course.

### Higher Education Contribution Scheme (HECS)

All students, except international students, local fee-paying students and holders of certain scholarships are obliged to contribute towards the cost of their education under the Higher Education Contribution Scheme (HECS). HECS liability depends on the load being taken.

Current students, except possibly those who began their studies prior to 1997, have a HECS rate charged for each unit of study in their degree program which depends on the 'discipline group' it is in, and the 'band' to which the Government has assigned it. Theses are all determined annually by the Government.

#### Honorary degrees

A degree honoris causa (translated from the Latin as 'for the purpose of honouring') is an honorary award, which is conferred on a person whom the University wishes to honour.

A degree ad eundem gradum (translated as 'at the same level') is awarded to a member of the academic staff who is not a graduate of the University in recognition of outstanding service to the University. The award of an honorary degree is noted on the person's academic record.

#### Honours

Some degrees may be completed 'with Honours'. This may involve either the completion of a separate Honours year or additional work in the later years of the course or meritorious achievement over all years of the course. Honours are awarded in a class (Class 1, Class n, Class HI) and sometimes there are two divisions within Class n.

#### 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.

#### GLOSSARY

#### 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.)

#### Joining fee

Students enrolling for the first time pay, in addition, a joining fee for the University of Sydney Union or equivalent student organisation.

(See also *Compulsory subscription*.)

Leave

See Course leave.

#### Life membership

Under some circumstances (eg, after five full-time years of enrolments and contributions) students may be granted life membership of various organisations, which means they are exempt from paying yearly fees.

(See also Compulsory subscription.)

#### Load

Load for an individual student is the sum of the weights of all the 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 direcdy 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, Crossinstitutional 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.)

Non-standard Teaching Period

A non-standard teaching period is when a unit of study is delivered in a teaching session of less than a standard semester (6 months). Summer School units of study, which are delivered and assessed in intensive mode during January of each year, are an example of non-standard teaching periods. (See also *Semester*, *Session.*)

#### **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.

#### PELS

See Postgraduate Education Loans Scheme

#### 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

### Postgraduate Education Loans Scheme (PELS)

The Postgraduate Education Loans Scheme (PELS) is an interest-free loans facility for eligible students who are enrolled in fee-paying, postgraduate non-research courses. It is similar to the deferred payment arrangements available under the Higher Education Contribution Scheme (HECS).

#### 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. Prerequisites can be mandatory (compulsory) or advisory. (See also Assumed knowledge, Corequisite, Waiver, Qualifier.)

#### Prizes

Prizes are awarded by the University, a faculty or a department for outstanding academic achievement. Full details can be found in the University Calendar.

#### **Probationary candidature**

A probationary candidate is a student who is enrolled in a postgraduate course on probation for a period of time up to one year. The head of department is required to consider the candidate's progress during the period of probation and make a recommendation for normal candidature or otherwise to the faculty.

#### Progression

See Course progression.

#### Prohibited combinations of units of study

When two or more units of study contain a sufficient overlap of content, enrolment in any one such unit prohibits 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**

### **Oualification**

A qualification is an academic attainment recognised by the University. Qualifier

A mandatory (compulsory) pre-requisite unit of study which must have a grade of Pass or better. (See also Assumed knowledge, Corequisite, Prerequisite, Waiver.)

#### 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.)

#### **Research Training Scheme (RTS)**

The RTS provides Commonwealth-funded higher degree by research (HDR) students with an 'entitlement' to a HECS exemption for the duration of an accredited HDR course, up to a maximum period of four years' full-time equivalent study for a Doctorate by research and two years' full-time equivalent study for a Masters by research.

#### **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:

0 D	1 (	
HD HD	High distinction	a mark of 85-100
D	Distinction	a mark of 75-84
CR	Credit	a mark of 65-74
Р	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: (a) by the dean at the review of examination results conducted pursuant to section 2 (4) of the Academic Board policy 'Examinations and Assessment Procedures'; or (b) automatically to the indicated mark and grade by the third week of the immediately subsequent academic session. Deans are authorised to approve the extension of a MINC grade for individual students having a valid reason for their incomplete status.
INC	Incomplete	This result is used when examiners have grounds (such as illness or misadventure) for seeking further information or for considering additional work from the student before 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: (a) by the dean at the review of examination results conducted pursuant to section 2 (4) of the Academic Board policy 'Examinations and Assessment Procedures'; or (b) automatically to an AF grade by the third week of the immediately subsequent academic session. Deans are authorised to approve the extension of a MINC grade for individual students having a 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).

### RTS

See Research Training Scheme.

#### **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 half-yearly teaching 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 (non-standard teaching period) must be given special permission by the Academic Board. (See also Session, Non-Standard Teaching Period?)

# 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 any period of time during which a unit of study is taught. A session differs from a semester in that it need not be a six-month teaching period, but it cannot be longer than six months. Each session maps to either Semester 1 or 2 for DEST reporting purposes. Session offerings are approved by the 128

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. (See also Semester, Non-Standard Teaching Period.) 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.

#### GLOSSARY

#### 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, Bachelor 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

#### Syuncy Summer Schoo

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 feepaying 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.)* 

### GLOSSARY

### 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 MvUni.)

#### 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 coursespecific: 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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- L7 Art Workshop
- G3 Badham Building
- H3 Bank Building
- Baxter's Lodge L2
- L8
- Biochemistry and Microbiology Building
- Blackburn Building E6
- E7 Bosch Building IA
- E7 Bosch Building IB
- Bruce Williams Pavilion E6
- Carslaw Building L6
- Chaplaincy F4
- M8 Chemical Engineering Building
- Chemistry Building J5
- Christopher Brennan Building H3
- Civil Engineering Building N8
- N9 Civil Engineering Workshop
- K10 Clark Building
- J9 Darlington Centre
- Darlington House ЛО
- Darlington Road Terraces K9
- K5
- Eastern Avenue Auditorium & Lecture Theatre Complex
- L9 Economics and Business Building
- Edgeworth David Building K4
- Education Building G4
- G4 Education Building Annexe
- H5 Edward Ford Building
- Electrical Engineering Building N7
- Engineering Link Building N7
- Evelyn Williams Building C3
- Fisher Library K3
- Fisher Library Stack K4
- Gatekeeper's Lodge C3
- Gatekeeper's Lodge (City Road) J7
- M8 Gordon Yu-Hoi Chui Building
- J2 Great Hall
- G3 Griffith Taylor Building
- HK Ward Gymnasium D4
- Heydon-Laurence Building F2
- G2 Holme Building
- K8 Institute Building
- N5 International House
- JRA McMillan Building F2
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- F3 John Woollev Building
- Fl Mackie Building
- MacLaurin Hall H3
- Macleav Building H2 Margaret Telfer Building
- Gl J6 Madsen Building
- Manning House H4
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- D3 McMaster Annexe

- McMaster Building Mechanical Engineering Building Medical Foundation Building Merewether Building Mungo MacCallum Building Old Geology Building Old School Building Old Teachers'College Pharmacy Building Physics Annexe Physics Building PNR Building Queen Elizabeth II Research Institute RC Mills Building RD Watt Building RMC Gunn Building Raglan Street Building Rose Street Building Ross Street Building Science Road Cottage Selle House M10 Services Building Seymour Centre K10 Shepherd Centre Shepherd Street Carpark Stephen Roberts Theatre Storie Dixson Wing The Arena Sports Centre The Quadrangle Transient Building L10 University Computing Centre University Garage University Sports & Aquatic Centre Veterinary Science Conference Centre Victor Coppleson Building Wallace Theatre Wentworth Building Western Avenue Carpark WH Maze Building Wilkinson Building Academic Colleges (offices) H5 Health Sciences Humanities and Social Sciences Sciences and Technology **Childcare Centres** K11 Boundary Lane
- Carillon Avenue F9
- H1 Laurel Tree House
- N9 Union

D3

06

A2

K8

H3

H2

M7

F4

H3

H6

G5

N8

E6

H5

F2

D4

M9

N7

E2

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EL

N6

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L5

K9

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J3

J5

ЛО

M9

D3

E6

F3

K7

E7

M6

M6

F4

N8

#### **Colleges & Residential Accommodation** Darlington House

- ЛО
- Darlington Road Terraces K9
- N5 International House
- K10 Mandelbaum House
- A4 Sancta Sophia College

- C8 St Andrew's College B5 St John's College St Michael's College L6 G7 St Paul's College El Selle House
- D10 Sydney University Village
- Wesley College F7
- G8 Women's College

#### Computer Access Centres (ITS)

- L6 Carslaw
- G4 Education
- K3 Fisher
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#### Cultural Venues

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- H2 Macleav Museum
- H3 Nicholson Museum
- N6 Sevmour Centre
- Sir Hermann Black Gallery K7
- Tin Sheds Gallery L6
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- Faculties (offices)
- E2 Agriculture
- Architecture L6
- H3 Arts
- 18 Economics & Business
- G4 Education
- N7 Engineering
- H5 Medicine
- G3 Pharmacv
- K6 Science
- D3 Veterinary Science

#### Libraries

- Architecture L6
- G3 Badham
- K8 Biochemistry
- H5 Burkitt-Ford

K3 Fisher

Chemistry

Engineering

Geosciences

Mathematics

H5 Schaeffer Fine Arts

Bank Building

Australia Post Office

Darlington Centre

Holme Building

H4 Manning House

Medical

H3 Pharmacv

H6 Physics

Curriculum Resources

J5

F4

M7

K4

K6

D7

N6 Music

Retail

H3

H3

J9

G2