The University of Sydney

Faculty of Engineering Handbook 2004

University dates

University semester and vacation dates 2004

Summer School	
Lectures begin	Monday 5 January
Lectures end	Friday 20 February
Semester 1	
Lectures begin	Monday 8 March
AVCC Common Week/non-teaching Easter Period	Friday 9 April to Friday 16 April
Last day of lectures	Friday 11 June
Study vacation: 1 week beginning	Monday 14 June to Friday 18 June
Examination period	Monday 21 June to Saturday 3 July
Semester ends	Saturday 3 July
AVCC Common week/non-teaching period	Monday 5 July to Friday 9 July
Semester 2	
Lectures begin	Monday 26 July
AVCC Common Week/non-teaching period	Monday 27 September to Friday 1 October
Last day of lectures	Friday 29 October
Study vacation	Monday 1 November to Friday 5 November
Examination period	Monday 8 November to Saturday 20 November
Semester ends	Saturday 20 November

Last dates for withdrawal or discontinuation 2004

Semester 1 units of study.	
Last day to add a unit	Friday 19 March
Last day for withdrawal	Wednesday 31 March
Last day to discontinue without failure (DNF)	Friday 30 April
Last day to discontinue (Discontinued – Fail)	Friday 11 June
Semester 2 units of study.	
Last day to add a unit	Friday 6 August
Last day for withdrawal	Tuesday 31 August
Last day to discontinue without failure (DNF)	Friday 17 September
Last day to discontinue (Discontinued – Fail)	Friday 29 October
Withdrawal from intensive units of study offered at any time.	
Last day to withdraw from an intensive unit with a duration of less than six weeks.	Close of business on the first teaching day.
Last day to withdraw from an intensive unit with a duration of six weeks or more but less than that of a standard semester.	Close of business on the fourteenth day after teaching has commenced.

University semester and vacation dates 2004–2006 are listed on the University Web site at www.usyd.edu.au/fstudent/undergrad/apply/scm/dates.shtml.

The University of Sydney
NSW 2006
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Contents

Message from the Dean

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

The Faculty of Engineering, also 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 maintaining academic excellence, producing innovative and exciting research, and mentoring our undergraduate and postgraduate students in order that they become Australia's future industrial leaders. Our industry links are stronger than ever and our record with respect to graduate recruitment remains unsurpassed. Over recent years, moreover, our unique Advanced Engineering program has meant the exposure of our high achieving students to ground-breaking design projects and entrepreneurial skills. We have now expanded the Advanced Engineering Program to allow our best students to undertake research projects throughout their course. In 2004, we are introducing the Flexible First Year program. This new program will allow students who are unsure which specialization they wish to follow to make an informed choice at the end of first year

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

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. . For this purpose, we are enhancing our courses to provide more professional development to make you aware of the way engineers work and interact with people around them, and to improve your communication skills. Surveys of our graduates and employers of our graduates have informed us that improved communication is essential for engineers in a modern working environment. 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. We would encourage youto 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). We congratulate you for choosing the University of Sydney as your place of study. We are certain your time here will be a rewarding one

Professor Gregory Hancock
Acting Dean, Faculty of Engineering

Letter from the SUEUA President

As the president of SUEUA (Sydney University Engineering Undergraduate Association) it is my privilege to inform 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 four 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 four 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 faculty.

At first University is quite a daunting sight with thousands of unknown faces all wandering through the university, however with the SUEUA O-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 cafe 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 Fist Year Camp, 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 BBQs, and during the warmer months 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 in all aspects of sporting prowess winning the majority of the competitions since its inception over 60 years.

Essentially SUEUA is a social club, designed for all the strains of engineering students, not only to organise social events across the academic year but also to cement the solidarity of the entire faculty. Along with this we are an essential link to the administrative staff and academics who are dedicated to facilitating our education, 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.

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 and make new friends through social interactions. The friends that we make today will be our colleagues and business contacts that we work with tomorrow.

SUEUA is here to make sure you enjoy your time at university, and still graduate with flying colours. And always remember a wise man once said work to live, don't live to work.

Andrew Adorini
President SUEUA 2004

1 Guide to the Faculty

The Faculty of Engineering

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Professor Gregory J. Hancock, B.E., B.Sc., Ph.D, D.Eng, F.I.E.Aust. BHP Steel Professor of Steel Structures

Executive Assistant to the Dean
Ms Kay Fielding

Pro Dean
Professor Yiu-Wing Mai, BSc(*Eng*) PhD *H.K.,* D Eng, FTSE, FASME, FHKIE, Federation Fellow, FIE*Aust*

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Associate Dean (Research)
Professor John P. Carter, B.E., Ph.D., M.A.S.C.E., F.I.E.Aust., C.P. Eng.

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Administrative Assistant – Vacant

External Relations and Scholarships
Ms Myra Koureas MEd, BEd

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The branches of Engineering

Aerospace, Mechanical and Mechatronic Enginering

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Head of School: Professor Lin Ye
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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 specialisations in biomedical and space engineering. There are also five-year combined degree programs with Science, Commerce, Arts, Medical Science and a six-year combined degree program with Law.

Aeronautical Engineering is the study of the mathematics, physics, computer science, material science and design philosophy underlying 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. 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. Mechanical Engineers 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.

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

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

Space Engineering is the study of the design, testing and implementation of engineering components in one of the most demanding of environments – space. Students have the opportunity to complete the Space stream with the Aeronautical, Mechanical or Mechatronic engineering programs.

In all programs described above he 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 the 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.

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

Chemical Engineering

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Head: Professor James G Petrie
Administrative Manager: Ms Katharyn 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.

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

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.

Environmental Engineering. These courses are for those students interested in environmental issues relevant to Australia, and sustainability.

Polymer Engineering. For those interested in gaining familiarity with polymer manufacturing, processing and application industries.

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 a number of our final year students completing their degrees at one of these Institutions each year, with similar numbers of their students finishing their courses in Sydney. There is also an exchange program with Iowa State University which allows one or two of our students to spend their third year there. Each of these exchange schemes includes Industrial Experience in the host country. Some financial assistance is available to approved students.

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

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

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

Civil Engineering and Project Engineering and Management

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Head: Associate Professor Robert J. Wheen
Assistant to Head of Department – Undergraduate Matters: Ms Cynthia Papangelis

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

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

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. 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, Computer, E-Commerce, Software and Telecommunications Engineering

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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, e-Commerce, Computer, Software and Telecommunications 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, e-Commerce, Computer, Software and Telecommunications Engineering – are four year programs (for both Pass and Honours). They can, however, be taken as five year combined degree programs with Arts, Commerce, Medical Science or Science or as a six-year combined degree program with Law. Most combinations are possible, but only the BE/BCom combined degree course is available in e-Commerce. There is also a way to gain a BE and BSc in five years by commencing the four-year BE degree in First Year. This is the "double degree" program whereby two years are completed in the Faculty of Engineering, one year in the Faculty of Science (majoring in Maths, Physics or Computer Science) and then two more years in Engineering.

Students are also able to participate in exchange programs with universities in Sweden, Hong Kong, the USA and other countries as part of their degree program.

The BE 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-month practical training in industry at the end of third year.

Students in Electrical, Computer, Software and Telecommunications Engineering have a "common first year" where they enrol in the same units of study; e-Commerce students have a slightly different First 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 to take a broad selection in several areas.

The Computer Engineering specialisation has a greater emphasis on computer hardware and software, and in the third and fourth years it specialises 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 an emphasis on the science and technology of computer software. There is a strong focus on embedded systems. A feature of the program is that students can start specialising in the second year by selecting software engineering electives in software, electronics and circuits, with application in CAD software, commerce and biology. Specialisations are available in software engineering databases, signal processing, information systems, telecommunication software systems, CAD, operating systems and compilers, real time systems and high performance computing.

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 problem-solving computer based projects, and aspects of modern workplace management, are features of the program.

The e-Commerce 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 them to become leaders and innovators in the emerging information technology and electronic business industries.

Electrical, Computer, Software, Telecommunications and e-Commerce 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 (as amended)

Preliminary

Rules relating to Coursework Award Courses

■ University of Sydney (Coursework) Rule 2000 (as amended)

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 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;

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

(1) 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 the standards required by the University for academic honesty;

(c) meets all examination, assessment and attendance requirements for the unit of study; and

(d) 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 re-enrol 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

(1) 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.

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 re-admission 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.
(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 sub-committees 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

(1) 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.

(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;
(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 streams or 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

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 (Space)
(d) Mechanical Engineering
(e) Mechanical Engineering (Biomedical)
(f) Mechanical Engineering (Management)
(g) Mechanical Engineering (Space)
(h) Mechatronic Engineering
(i) 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
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:

$$GWAM = \frac{mark \times creditpoints \times yearlevel}{creditpoints \times yearlevel}$$

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:

$$SWAM = \frac{mark \times creditpoints}{creditpoints}$$

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.

1. 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 Engineering
  - (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.

2. 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. Flexible First Year Program

(1) Students entering first year who wish to choose any of the degree specialisations, otherthan those offered by the School of Electrical and Information engineering may choose to undertake the flexible first year program. Students are not required to make a final choice of specialisation until the end of 1st year except for those choosing Chemical Engineering who will need to choose after the first semester.

(2) Those students who have met the requirements for first year entry (UAI cut-off) into a particular degree specialisation will be guaranteed a place in second year in that specialisation even though they choose the flexible first year program.

(3) Students attaining high average marks in the flexible first year program will be eligible to apply for second year entry into higher UAI cut-off specialisations.

(4) Students gaining entry to any of the combined degree courses may also choose to undertake the flexible first year program. The above conditions (sub-sections 1, 2 &3) for entry into a second year specialist stream will also apply for combined degree students.

4. Levels of award

The degree shall be awarded in one of two grades – Pass or Honours.

5. Requirements for the degree at pass level

(1) Single degree course

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.

6. 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 or equal to 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.

7. Units of study

(1) The programs of units of study for each of the specialisations and the flexible first year program 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, prerequisite or corequisite 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;
- (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 'prerequisite' 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 'corequisite' 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 corequisite 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 corequisite or prerequisite 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) First Year

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 prerequisite or for which the student has completed the prerequisite(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) a student may not enrol in units of study:
  - (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 or is granted special permission in accordance with sub-sections (d) or (e).
- (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 sub-section (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.

12. 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
P	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
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 coordinator.

(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) the 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 time-frames 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) A 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 re-admission 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) of less than 50.
- (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
  - (ii) no statement at all.

(11) 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.

14. Academic 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 2004. 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.

17. Minimum and maximum completion times

The minimum time for completion of the BE degree shall be two years and the maximum shall be eight years.

Combined Degrees of Bachelor of Engineering with Bachelor of Commerce, Science, Arts, Medical Science or Law.

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

1. Bachelor of Engineering/Bachelor of Arts

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 BA awards

(1) Candidature for this combined degree program is a minimum of 5 years of full-timestudy.
(2) Candidates qualify for the two awards from the combined degree 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. These units of study are set out in the tables appended to the Resolutions relating to the BE degree.
(b) BA units of study totaling at least 80 credit points, of which at least 56 must beSecond or Third 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.
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).
3. Requirements for the BE and BA awards with Honours
(1) BE with Honours
On completion of the requirements for the combined degrees, a student may qualify for the award of BE with Honours in accordance with the requirements set out in the Resolutions of the Faculty of Engineering relating to the BE degree.
(2) BA with Honours
On completion of the requirements for the combined degrees, a student may be qualified to enrol in Honours in the Bachelor of Arts. To qualify for the award of the BA with Honours, a student must complete successfully an additional year of study (the Honours year), as specified in the Faculty of Arts Handbook.
4. Units of study
The units of study, which may be taken for the combined Bachelor of Engineering and Bachelor of Arts program, are set out in the Resolutions of the Faculty of Engineering and the Faculty of Arts respectively. The Faculty Resolutions specify:
(1) credit point values;
(2) corequisites/prerequisites/assumed learning/assumed knowledge; and
(3) any special conditions.
5. Supervision of the degrees
(1) Students will be under the general supervision of the Faculty of Engineering for enrolment and administrative matters.
(2) Students will be under the supervision of the Faculty of Arts in relation to progression and elligibility of award of the BA component and will be under the supervision of the Faculty of Engineering in relation to the BE component.
(3) The Deans of the Faculty of Arts and the Faculty of Engineering shall jointly exercise authority in any matter concerning the combined course not otherwise dealt with in these resolutions.
6. Transfer Arrangements
A student may abandon the combined BE/BA course and elect to complete either the BE or BA degree in accordance with the resolutions governing that degree.

Joint Resolutions with 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 Bachelor 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) 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) BCom 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.
(3) 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 with the Faculties of Engineering and Science (BE/BSc)

Bachelor of Engineering Bachelor of Science combined degree

1 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:
(1) 96 credit points of units from Science subject areas,
(2) a major in a Science area, and
(3) units of study as prescribed in the BE Specialisation Requirements for the specialisation that the student is pursuing.
3. To qualify for the award of the pass degree in the Advanced or Advanced Mathematics stream of the BSc a student shall:
(1) include 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) 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.
5. 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. 4.Students who are so qualified may be awarded honours in the BE degree or undertake an honours course in the BSc degree.
6. 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:
(1) 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.
10. 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.
11. 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)

1. A student may proceed concurrently to the award of Bachelor of Medical Science and Bachelor of Engineering (in any specialisation except Civil Engineering or Electronic Commerce).
2. To qualify for the award of the pass degrees, a student shall complete units of study totaling at least 240 credit points including:
   (a) units of study as prescribed in the BE Specialisation Requirements for the specialisation that the student is pursuing., including an interdisciplinary thesis (see note 2(e) below);
   (b) at least 24 credit points from Junior Science units of study (which may be commonwith those of 2(a)), but including CHEM 1102 Chemistry 1B, BIOL 1003 HumanBiology and 12 credit points of Mathematics;
   (c) 40 credit points of Intermediate core units of study as listed in Table IV of units ofstudy for the BMedSc;
   (d) at least 24 credit points of Senior units of study taken from the subject areas ofAnatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology,Immunology, Infectious Diseases, Microbiology, Pharmacology and Physiology aslisted in Table IV;
   (e) a 12 credit point interdisciplinary thesis jointly supervised by departments fromEngineering and Science.
3. Students who are so qualified may be awarded honours in the BE degree or undertake anhonours course in the BMedSc degree.
4. Students may abandon the combined degree course and elect to complete either a BMedSc or a BE in accordance with the resolutions governing those degrees.
5. Students will be under the general supervision of the Faculty of Engineering.
6. The Deans of the Faculties of Engineering and Science shall jointly exercise authority in any matter concerning the combined degrees not otherwise dealt with in these resolutions.

Joint Resolutions of the Faculties of Engineering and Law (BE/LLB)

1.A student may proceed concurrently to the degrees of Bachelor of Laws and Bachelor of Engineering
2. To qualify for the award of the pass degrees a student shall complete a minimum of 288 credit points including:
   Units of study as prescribed in the BE Specialisation Requirements for the specialisation that the student is pursuing.
   144 credit points of units of study as prescribed by the Faculty of Law under a combined Law program.
3. Candidates in a Combined BE/LLB program may credit Legal Institutions, Law, Lawyers and Justice, Contracts, Criminal
   Law, Legal Research, Legal Writing, Federal Constitutional Law and Torts both to the Bachelor of Laws and the Engineering component of the Combined Engineering/Law program.
4. Candidates in a Combined Engineering/Law program must complete the law units of study in the following annual sequence:

Year	Law units of study	credit points
Combined BE/LLB 1	Legal Institutions	6
	Torts	6
	Legal Research	0
Combined BE/LLB 2	Contracts	8
	Criminal Law	8
Combined BE/LLB 3	Federal Constitutional Law	10
	Law, Lawyers and Justice	10+
Combined BE/LLB 4	Completion of BE degree component	

On completion of the requirements for the degree of Bachelor of Engineering, then (except as provided in Resolution 19 of the Law Faculty Resolutions):

Year	Units of study	credit points
Combined BE/LLB 5	Administrative Law	8
	Corporate Law	8
	Equity	8
	International Law	8
	Litigation	8
	Real Property	8
Combined BE/LLB 6	Optional units of study as specified in Resolution 11 of the Law Faculty resolutions	

5. Except with the permission of the Dean or an Associate Dean, candidates in a Combined BE/LLB program must successfully complete Legal Institutions before enrolling in any other Bachelor of Law units of study.
6. Candidates in a Combined BE/LLB program are under the general supervision of the Engineering Faculty in which they are enrolled until the end of the semester in which they

complete the requirements of the Engineering degree. After that, they will be under the general supervision of the Faculty of Law.

3 Bachelor of Engineering specialisation requirements

Faculty of Engineering : Flexible First Year

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
Students wishing to proceed to the degree of Bachelor of Engineering or combined degrees with Science, Arts, Commerce, Law or Medical Science, in specialisations other than those given by the School of Electrical and Information Engineering may choose to enrol in the following Flexible First year program. For details on elligibility for entry to this program and second year specialisation entry requirements consult the previous section on resolutions pertaining to Flexible First Year.			
■ First Year			
ENGG 1800 Introduction to Engineering Disciplines	6	*NB: Department permission required for enrolment. Flexible first year core unit of study.*	1
ENGG 1801 Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802 Engineering Mechanics	6		2
ENGG 1803 Professional Engineering 1	6		1, 2
MATH 1001 Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005 Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
CHEM 1001 Fundamentals of Chemistry 1A	6	**A** There is no assumed knowledge of chemistry for this unit of study, but students who have not undertaken an HSC chemistry course are strongly advised to complete a chemistry bridging course before lectures commence. **N** May not be counted with CHEM 1101 or 1901 or 1903 or 1905 or 1906 or 1909.	1
■ Elective unit of study			
In addition, a 6 credit Junior Level unit of study must be choosen to complete the 2nd Semester enrolment. This is a free choice elective unit subject only to enrolment restrictions imposed by Faculties on some specific Junior Level units.			

Notes:

1. Students wishing to proceed to the degree of Bachelor of Engineering in Chemical Engineering should complete the first semester of this program and enrol in their chosen specialisation in semester 2.
2. It is strongly advised that before choosing the 2nd semester elective, students consult the requirements for the specialisation that they plan to enter as an appropriate choice of elective will help with core progression and prerequisite requirements for some areas.
3. Students who have not taken HSC Chemistry may enrol in CHEM 1001 Chemistry 1 Fundamentals.

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				
First Year (see note 5)				
AERO 1560	Introduction to Aerospace Engineering	6	**N** MECH 1560 Introduction to Mechanical Engineering, MECH 1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. *NB: Unit of study Web Page: www.aeromech.usyd.edu.au/AERO1560.*	1
AMME 1060	Engineering Applications	6	*NB: Unit of study Web site: problemsolvers.aeromech.usyd.edu.au/.*	2
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005[1]	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
Second Year				
AERO 2201	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
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** 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** MATH 2905.	2, Summer
MECH 2201[4]	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[4]	Engineering Dynamics 1	4	**P** MATH 1001, MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
Third Year				
AERO 3200	Aerodynamics 1	4	**P** AERO 2201 Fluid Mechanics 1.	1
AERO 3250	Aerodynamics 2	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **N** MECH 3211 Fluid Mechanics 2.	1
AERO 3301	Aerospace Structures 1	4	**P** AERO 2300 Mechanics of Solids 1.	1
AERO 3400[2]	Aircraft Design 1	3	**P** AERO 2300 Mechanics of Solids 1 and MECH 2400 Mechanical Design 1. **N** AERO 3401 Aerospace Design 1.	1
AERO 3450[2]	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[3]	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.	2
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

Aeronautical Engineering (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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
■ Fourth Year			
AERO 4200 Aerodynamics 3	3	**P** AERO 3250 Aerodynamics 2.	1
AERO 4201 Propulsion	4	**P** 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 4501 Flight Mechanics 2A	4	**P** MECH 3800 Systems Control and AERO 3500 Flight Mechanics 1.	1
AERO 4600 Practical Experience	0	**P** 40 credit points of 3rd year UOS.	1, 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 4920[3] Seminar	2	**P** 40 credit points of 3rd Year UOS.	2

■ Notes

1.MATH 1004 Discrete Mathematics is an acceptable alternative to MATH 1005

2.Students enrolled in BE/BCom enrol in AERO 3401 Aerospace Design as an alternative to AERO 3400 & AERO 3450.

3.Students enrolled in BE/BCom are exempt from these units

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

5.Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.

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 a particular year of their degree must enrol in the appropriate Aerospace International Exchange Program units of study as an alternative to a semester's standard units.

Recommended Elective units of study

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ First Year			
AERO 1400 Intro to Aircraft Construction & Design	6	*NB: Department permission required for enrolment. Enrolment subject to number of places available.*	2
ELEC 1102 Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
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** PHYS (1004 or 1902).	1, 2
■ Second Year			
AERO 2600 Aviation Technology	4		1
MATH 2002 Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** MATH 2902.	1, Summer
MATH 2052 Numerical Methods	2	**C** MATH 2001 or 2901.	2
■ Third Year			
AERO 3501 Flying Operations	2	**P** AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. *NB: Department permission required for enrolment.*	1

Aeronautical Engineering (continued)

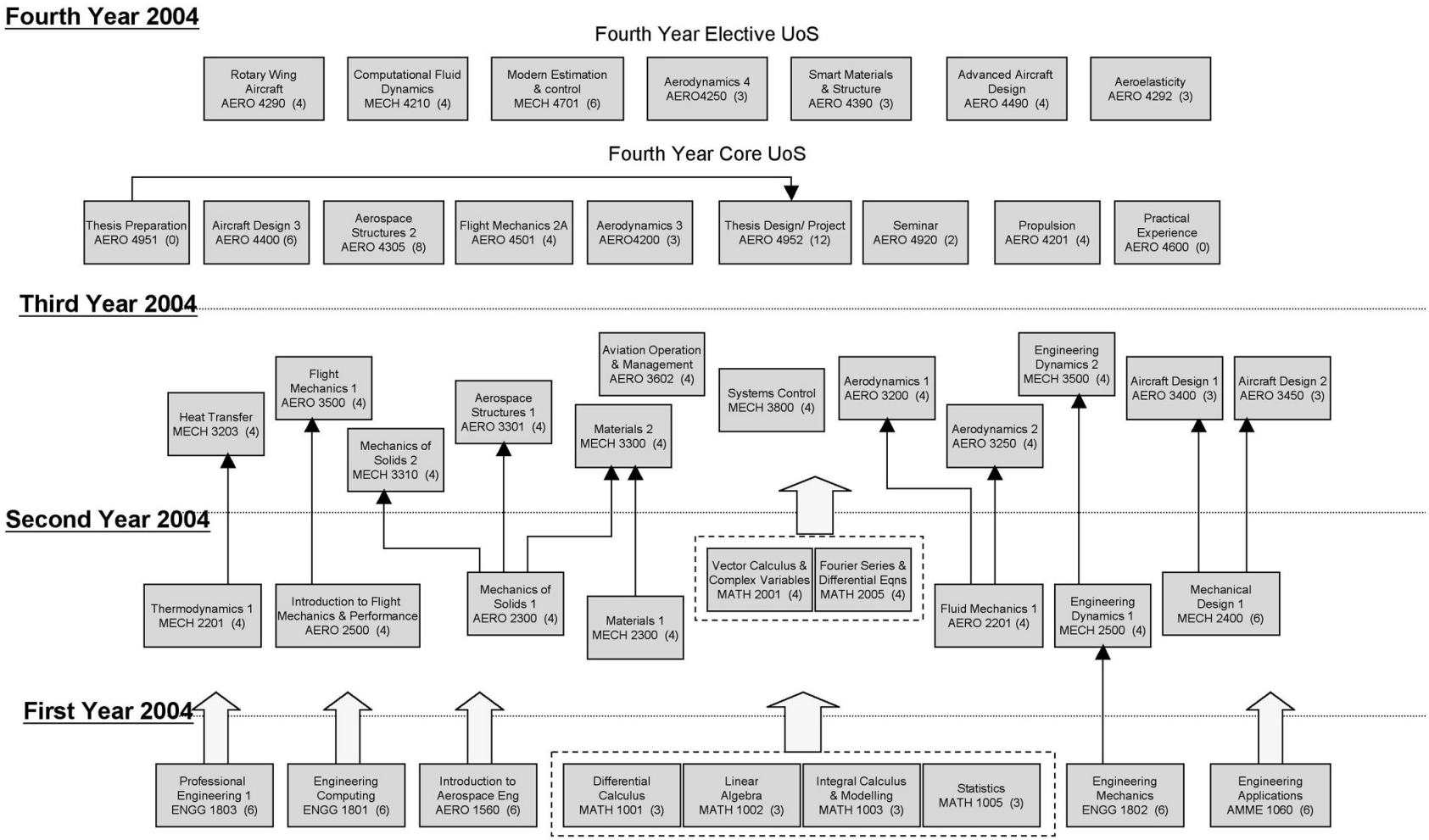
Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Fourth Year			
AERO 4250 Aerodynamics 4	3	**P** AERO 3250 Aerodynamics 2.	2
AERO 4290 Rotary Wing Aircraft	4	**P** AERO 3250 Aerodynamics 2.	1
AERO 4292 Aeroelasticity	3	**P** AERO 3250 Aerodynamics 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 or MECH 3211 or AERO 3250.	1
MECH 4701 Modern Estimation and Control	6	**P** MECH 3800 Systems Control.	2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.
2. 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 (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Aeronautical Eng Curriculum for 2005_



Aeronautical Engineering (Space Engineering)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
Core units of study				
■ **First Year (see note 2)**				
AERO 1560	Introduction to Aerospace Engineering	6	**N** MECH 1560 Introduction to Mechanical Engineering, MECH 1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. *NB: Unit of study Web Page: www.aeromech.usyd.edu.au/AERO1560.*	1
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005[1]	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
■ **Second 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 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 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** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	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
■ **Third Year**				
AERO 3250	Aerodynamics 2	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **N** MECH 3211 Fluid Mechanics 2.	1
AERO 3301	Aerospace Structures 1	4	**P** AERO 2300 Mechanics of Solids 1.	1
AERO 3401	Aerospace Design	4	**P** AERO 2300 Mechanics of Solids 1 and MECH 2400 Mechanical Design 1. **N** AERO 3400 Aircraft Design 1.	1
AERO 3500	Flight Mechanics 1	4	**P** AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO 3700	Space Engineering 2	8	**P** AERO 2701 Space Engineering 1 or AERO 2702 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
MECH 3203	Heat Transfer	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 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

Aeronautical Engineering (Space Engineering) (continued)

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Fourth Year			
AERO 4201 Propulsion	4	**P** 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 4501 Flight Mechanics 2A	4	**P** MECH 3800 Systems Control and AERO 3500 Flight Mechanics 1.	1
AERO 4600 Practical Experience	0	**P** 40 credit points of 3rd year UOS.	1, 2
AERO 4700 Space Engineering 3	4	**P** AERO 3700 Space Engineering 2.	1
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 4920 Seminar	2	**P** 40 credit points of 3rd Year UOS.	2

Notes

1.MATH 1004 Discrete Mathematics is an acceptable alternative to MATH 1005

2.Students enrolled in Flexible First year will choose from the Flexible First year table in place of these specific units.

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

■ BE(Aeronautical 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(Aeronautical)(Space).

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 a particular year of their degree must enrol in the appropriate Aerospace International Exchange Program units of study as an alternative to a semester's standard units.

Recommended Elective units of study

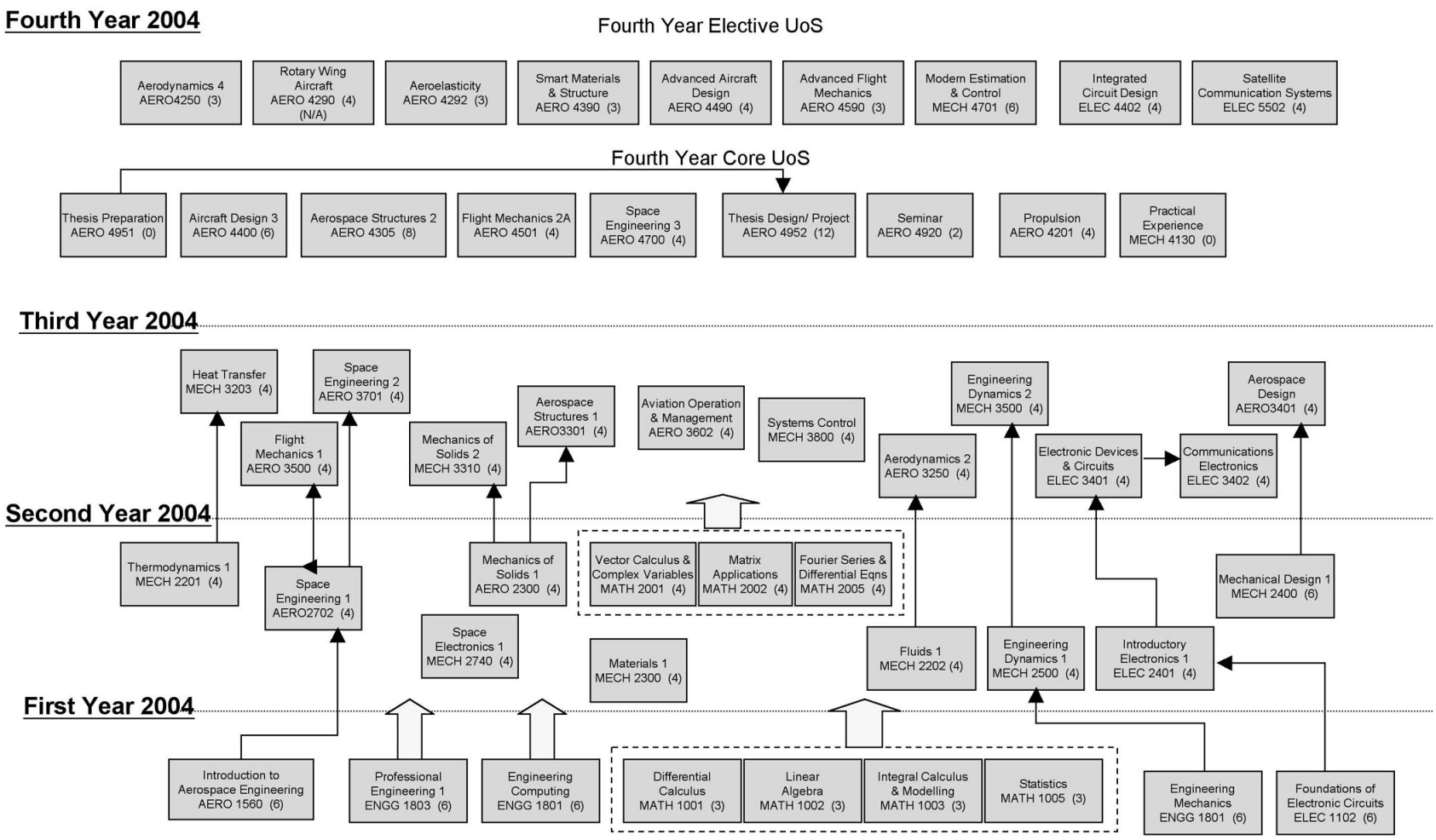
Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ First Year			
MECH 1760 Mechatronics 1	6	**A** HSC Maths Extension 1. **N** ELEC 1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC 1902 Computational Science in C (Advance), COSC 1002 Computational Science in C.	2
■ Second Year			
AERO 2600 Aviation Technology	4		1
MATH 2052 Numerical Methods	2	**C** MATH 2001 or 2901.	2
■ Third Year			
AERO 3501 Flying Operations	2	**P** AERO 2500 Introductory Flight Mechanics and Performance; AERO 2201 Fluid Mechanics 1. *NB: Department permission required for enrolment.*	1
AERO 3200 Aerodynamics 1	4	**P** AERO 2201 Fluid Mechanics 1.	1
■ Fourth Year			
AERO 4250 Aerodynamics 4	3	**P** AERO 3250 Aerodynamics 2.	2
AERO 4290 Rotary Wing Aircraft	4	**P** AERO 3250 Aerodynamics 2.	1
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
AERO 4590 Advanced Flight Mechanics	3	**P** AERO 3500 Flight Mechanics 1.	2
MECH 4701 Modern Estimation and Control	6	**P** MECH 3800 Systems Control.	2

Notes

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

Aeronautical Engineering (Space Engineering) (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Aeronautical Eng (Space Eng) Curriculum for 2005_



Mechanical Engineering

Unit of study	CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
Core units of study			
■ **First Year (see note 9)**			
MECH 1560 Introduction to Mechanical Engineering	6	**N** AERO 1560 Introduction to Mechanical Engineering, MECH 1751 Introductiory Mechatronic Engineering, MECH 1600 Manufacturing Technology.	1
AMME 1060 Engineering Applications	6	*NB: Unit of study Web site: problemsolvers.aeromech.usyd.edu.au/.*	2
ENGG 1801 Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802 Engineering Mechanics	6		2
ENGG 1803 Professional Engineering 1	6		1, 2
MATH 1001 Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002 Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003 Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005[1] Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
CHEM 1101[3] Chemistry 1A	6	**A** HSC Chemistry and Mathematics. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **N** May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909).	1, 2, Summer
■ **Second Year**			
MATH 2001 Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002[2,6] Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
MATH 2052 Numerical Methods	2	**C** MATH 2001 or 2901.	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
AERO 2201[7] 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
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 2001[4] Electrical and Electronic Engineering	6	**P** ELEC 1001 Introductory Electrical Engineering. **N** ELEC 2003 Electrical and Electronic Engineering A, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.	1
■ **Third Year**			
MECH 3201 Thermodynamics 2	4	**P** MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. **N** MECH 3200 Thermal Engineering 1.	1
MECH 3203[5] Heat Transfer	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	2
MECH 3211[5] Fluid Mechanics 2	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **N** AERO 3250 Aerodynamics 2.	1
MECH 3300[5] Materials 2	4	**P** MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3310[5] Mechanics of Solids 2	4	**P** AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
MECH 3400[2,6] Mechanical Design 2A	4	**P** MECH 2400 Mechanical Design 1.	1
MECH 3410 Mechanical Design 2B	4	**P** MECH 2400 Mechanical Design 1.	2
MECH 3500 Engineering Dynamics 2	4	**P** MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3600 Manufacturing Engineering	6	**P** MECH 1600 Manufacturing Technology. **N** MECH 3601.	1
MECH 3610[2,6] Team Project	2	**P** 30 credit points of second year units of study.	2
MECH 3621[2] Industrial Management	4	**N** ENGG 2003.	2

Mechanical Engineering (continued)

Unit of study	CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3800 Systems Control	4	**P**	MATH 2001 and MATH 2005.	2
■ Fourth Year				
MECH 4101[8] Thesis A	0	**P**	36 credit points of Third Year units of study.	1, 2
MECH 4102[8] Thesis B	12	**P**	MECH 4101 Thesis A (the Head of 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. MATH 1004 is an acceptable alternative to MATH 1005.
2. These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering and the combined degree BE/BSc, but not for candidates for the combined degrees of BE/BCom, BE/LLB and BE/BA.
3. For CHEM 1101, note (2) above also applies. Candidates for the combined degree BE/BSc may take as an alternative to CHEM 1101 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 1101) as well as BIOL 1003, CHEM 1909 and PHYS 1003.
4. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in ELEC 2003 Electrical and Electronics Engineering A (4 cp).
5. Candidates for the combined degrees BE/BCom, BE/LLB and BE/BA should enrol in MECH 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.
6. These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering and the combined degree BE/BSc, but not for candidates for the combined degrees of BE/BMedSc.
7. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp).
8. Candidates for the combined degree BE/BMedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).
9. Students enrolled in Flexible First Yearprogram will choose from the Flexible First year table in place of these specific units.

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.

Acceptable alternative units of study

Unit of study		*Acceptable Alternative.*
ENGG 1802 Engineering Mechanics	6	*PHYS 1001.*
ENGG 1801 Engineering Computing	6	*SOFT 1001.*

Mechanical 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

■ Mainstream electives

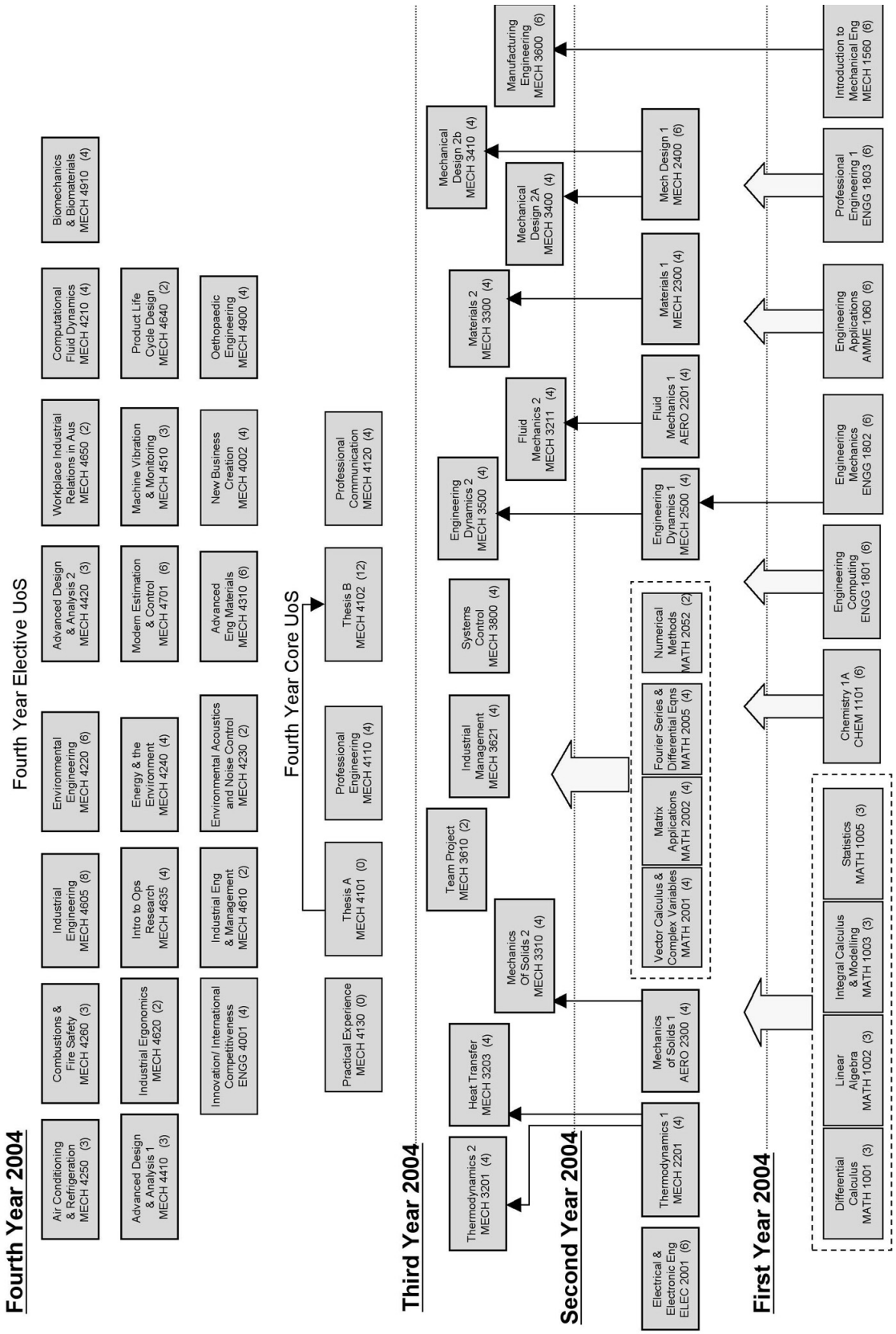
MECH 4210	Computational Fluid Dynamics	4	**P** MECH 3210 or MECH 3211 or AERO 3250.	1
MECH 4220	Environmental Engineering	6	**P** 24 credit points of third year units of study. **N** MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
MECH 4230	Environmental Acoustics & Noise Control	2	**P** 24 credit points of third year units of study. **N** MECH 4220 Environmental Engineering.	1
MECH 4240	Energy and the Environment	4	**P** 24 credit points of Senior units of study. **N** MECH 4220 Environmental Engineering.	1
MECH 4250	Air Conditioning and Refrigeration	3	**P** MECH 3200 Thermal Engineering 1 or (MECH 3201 and one of MECH 3202 or MECH 3203).	2
MECH 4310	Advanced Engineering Materials	6	**P** MECH 3300 Materials 2. **N** MECH 4315 Advanced Aerospace Materials.	2
MECH 4410	Advanced Design and Analysis 1	3	**P** MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 3400	Mechanical Design 2A	4	**P** MECH 2400 Mechanical Design 1.	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 4605	Industrial Engineering	8	**P** MATH 2001 and MATH 2005 and one of MECH 3620, MECH 3621, ENGG 2003. **N** MECH 4610 Industrial and Engineering Management, MECH 4620 Industrial Ergonomics, MECH 4635 Introduction to Operations Research.	1
MECH 4610	Industrial Engineering and Management	2	**P** One of MECH 3620, MECH 3621, ENGG 2003. **N** MECH 4605 Industrial Engineering. *NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.*	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	**P** MATH 1005, MATH 2001, MATH 2002, MATH 2005. **N** MECH 4605 Industrial Engineering.	1
MECH 4640	Product Life Cycle Design	2	**P** MECH 3600 or MECH 3620 or MECH 3621 or ENGG 2003.	2
MECH 4650	Workplace Industrial Relations in Aust	2	**P** 36 credit points of senior units of study. *NB: Department permission required for enrolment. 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	**P** MECH 3800 Systems Control.	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

■ Other electives

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	**A** No previous knowledge required. Students who have not taken HSC biology are recommended to take the Biology Bridging Course. **N** BIOL (1101 or 1901 or 1500).	1, Summer
CHNG 4504	Environmental Decision Making	4	*NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.*	2
ENGG 4001	Innovation/International Competitiveness	4		1
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

Mechanical Engineering Course Map (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Mechanical Eng Curriculum for 2005_



Mechanical 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 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 units of study

■ First Year (see note 2)

AERO 1560	Introduction to Aerospace Engineering	6	**N** MECH 1560 Introduction to Mechanical Engineering, MECH 1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. *NB: Unit of study Web Page: www.aeromech.usyd.edu.au/AERO1560.*	1
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
MECH 1760	Mechatronics 1	6	**A** HSC Maths Extension 1. **N** ELEC 1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC 1902 Computational Science in C (Advance), COSC 1002 Computational Science in C.	2

■ Second 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 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 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** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	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

■ Third Year

AERO 3250	Aerodynamics 2	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **N** MECH 3211 Fluid Mechanics 2.	1
AERO 3500	Flight Mechanics 1	4	**P** AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO 3700	Space Engineering 2	8	**P** AERO 2701 Space Engineering 1 or AERO 2702 Space Engineering 1.	2
ELEC 3401	Electronic Devices and Circuits	4	**A** ELEC 2401 Introductory Electronics.	1
MECH 3201	Thermodynamics 2	4	**P** MECH 2200 Thermofluids or MECH 2201 Thermodynamics 1. **N** MECH 3200 Thermal Engineering 1.	1
MECH 3203	Heat Transfer	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1 or MECH 2201 Thermodynamics 1.	2
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

Mechanical Engineering (Space Engineering) (continued)

Unit of study		CP		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 3800	Systems Control	4	**P**	MATH 2001 and MATH 2005.	2
■ **Fourth Year**					
AERO 4201	Propulsion	4	**P**	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 1004 is an acceptable alternative to MATH 1005.

2.Students enrolled in Flexible First Yearprogram will choose from the Flexible First year table in place of these specific units.

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.

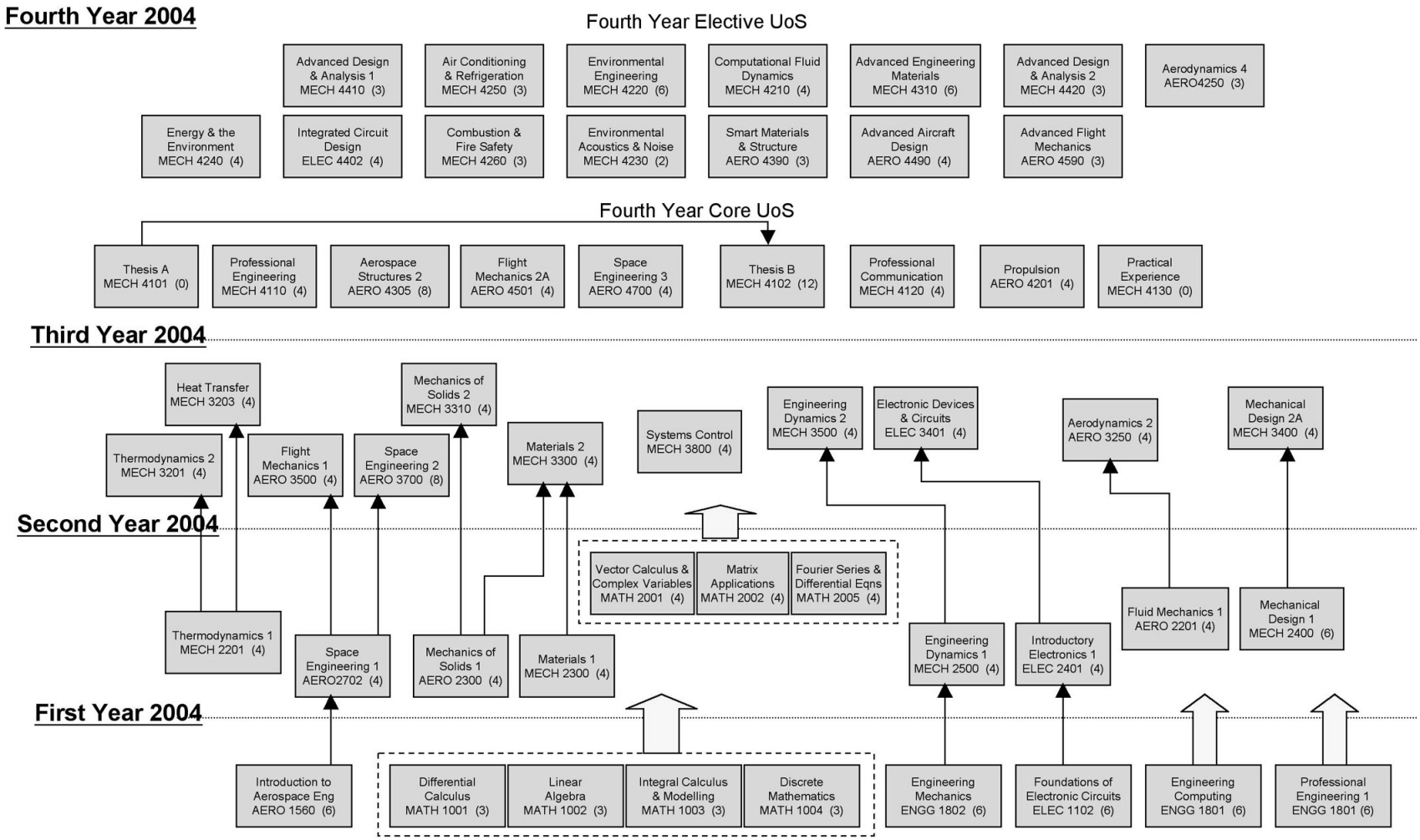
Recommended elective units of study

■ **Mainstream electives**

AERO 2600	Aviation Technology	4			1
MECH 4210	Computational Fluid Dynamics	4	**P**	MECH 3210 or MECH 3211 or AERO 3250.	1
MECH 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
MECH 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).	2
MECH 4310	Advanced Engineering Materials	6	**P** **N**	MECH 3300 Materials 2. MECH 4315 Advanced Aerospace Materials.	2
MECH 4410	Advanced Design and Analysis 1	3	**P**	MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4420	Advanced Design and Analysis 2	3	**P**	MECH 3400 Mechanical Design 2A, 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

Mechanical Engineering (Space Engineering) (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Mechanical Eng (Space Eng) Curriculum for 2005_



Mechatronic Engineering

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 units of study

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ First Year (see note 7)				
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1004	Discrete Mathematics	3	**A** HSC Mathematics Extension 1. **N** MATH 1904 or MATH 2011.	2, Summer
MECH 1751	Introduction to Mechatronics Engineering	6	**N** AERO 1560 Intro to Aerospace Engineering, MECH 1560 Intro Mechanical Engineering, MECH 1600 Manufacturing Technology.	1
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MECH 1760	Mechatronics 1	6	**A** HSC Maths Extension 1. **N** ELEC 1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC 1902 Computational Science in C (Advance), COSC 1002 Computational Science in C.	2
■ Second Year				
MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002[2,5]	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
MATH 2052[2,5]	Numerical Methods	2	**C** MATH 2001 or 2901.	2
MECH 2201	Thermodynamics 1	4	**N** MECH 2200 Thermofluids.	1
MECH 2400	Mechanical Design 1	6		2
MECH 2500	Engineering Dynamics 1	4	**P** MATH 1001, MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
MECH 2701	Mechatronics 2	8	**P** MECH 1701 Introductory Digital Systems and MECH 1702 Introductory Software Engineering. **N** ELEC 2601 Microcomputer Systems. *NB: Website: www.acfr.usyd.edu.au/teaching/2nd-year/mech2701-Mx2.*	1
AERO 2201[5]	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
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
■ Third Year				
MECH 3400[2,4]	Mechanical Design 2A	4	**P** MECH 2400 Mechanical Design 1.	1
MECH 3410[2]	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[3]	Manufacturing Engineering	6	**P** MECH 1600 Manufacturing Technology. **N** MECH 3601.	1
MECH 3610[2,4]	Team Project	2	**P** 30 credit points of second year units of study.	2
MECH 3621[2]	Industrial Management	4	**N** ENGG 2003.	2
MECH 3701	Mechatronics 3	6	**A** MECH 2701 Mechatronics 2. **N** MECH 4710 Microprocessors in Engineered Systems and MECH 3700 Mechatronics 2. *NB: Website: www.acfr.usyd.edu.au/teaching/3rd-year/mech3701-Mx3.*	1

Mechatronic Engineering (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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
■ **Fourth Year**					
MECH 4101[6]	Thesis A	0	**P**	36 credit points of Third Year units of study.	1, 2
MECH 4102[6]	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 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.
4. 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/BMedSci.
5. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp).
6. Candidates for the combined degree BE/BMedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).
7. Students enrolled in Flexible First Year Program will choose from the Flexible First year table in place of these specific units.

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 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(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 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(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

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

	Units of study		*Acceptable alternative.*
ENGG 1802	Engineering Mechanics	6	*PHYS 1001.*
ENGG 1801	Engineering 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

■ Mainstream electives

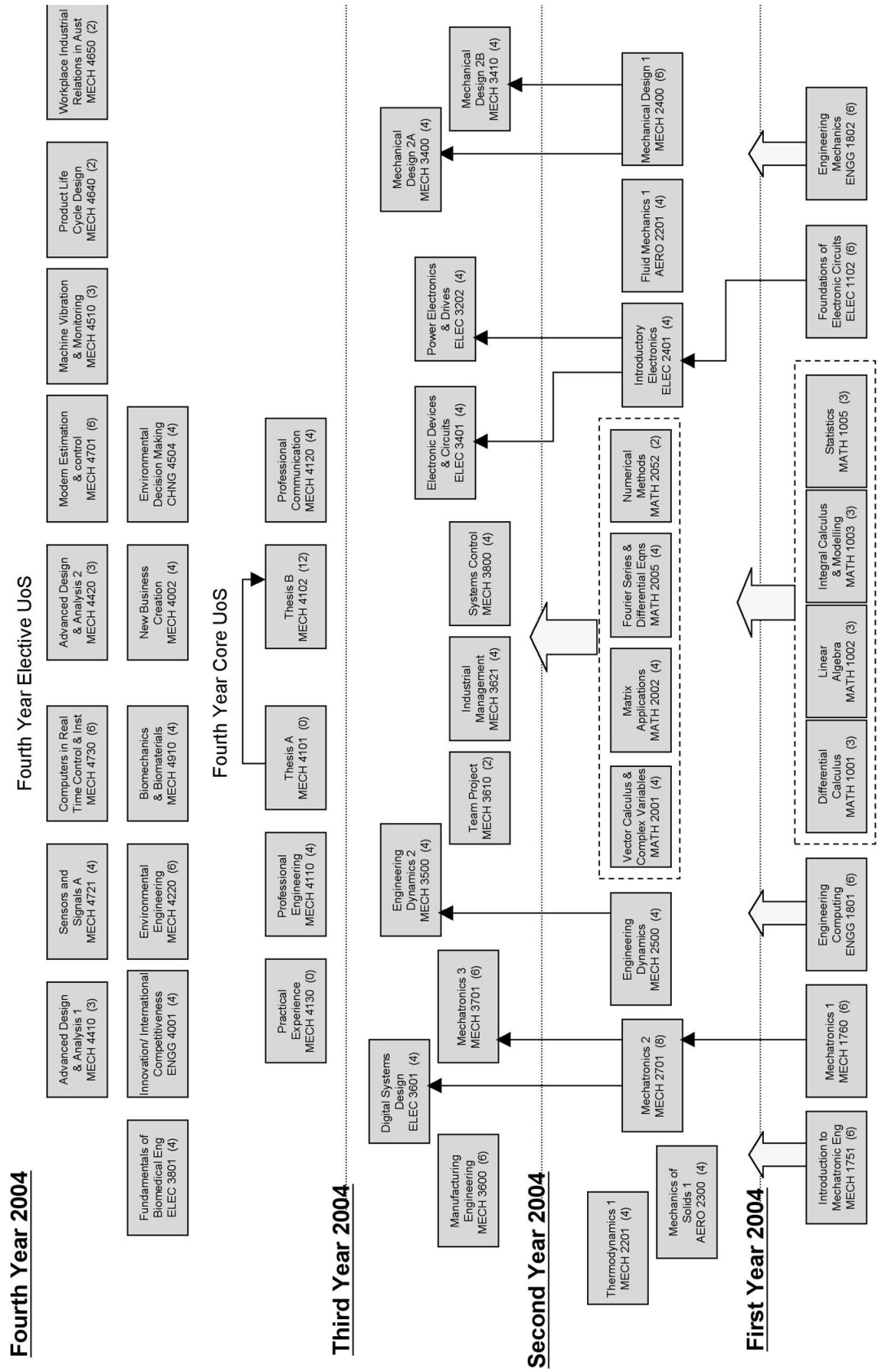
MECH 4410	Advanced Design and Analysis 1	3	**P** MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.		1
MECH 4420	Advanced Design and Analysis 2	3	**P** MECH 3400 Mechanical Design 2A, MECH 3410 Mechanical Design 2B and MECH 4410 Advanced Design and Analysis 2.		2
MECH 4640	Product Life Cycle Design	2	**P** MECH 3600 or MECH 3620 or MECH 3621 or ENGG 2003.		2
MECH 4650	Workplace Industrial Relations in Aust	2	**P** 36 credit points of senior units of study. *NB: Department permission required for enrolment. 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	**P** MECH 3800 Systems Control.		2
MECH 4721	Sensors and Signals A	4	**P** MECH 3700 or MECH 3701.		1
MECH 4730	Computers in Real-Time Control and Inst	6	**P** MECH 3700 Mechatronics 2 or MECH 3701 Mechatronics 3. **N** ELEC 4602 Real Time Computing.		1

■ Other electives

BIOL 1001	Concepts in Biology	6	**A** No previous knowledge required. Students who have not taken HSC biology are recommended to take the Biology Bridging Course. **N** BIOL (1101 or 1901 or 1500).		1, Summer
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
CHNG 4504	Environmental Decision Making	4	*NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.*		2
ENGG 4001	Innovation/International Competitiveness	4			1
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
MECH 4220	Environmental Engineering	6	**P** 24 credit points of third year units of study. **N** MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.		1
MECH 4910	Biomechanics and Biomaterials	4	**P** 36 credit points of third year units of study.		1

Mechatronic Engineering (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Mechatronic Eng Curriculum for 2005_



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				
■ First Year (see note 2)				
AERO 1560	Introduction to Aerospace Engineering	6	**N** MECH 1560 Introduction to Mechanical Engineering, MECH 1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. *NB: Unit of study Web Page: www.aeromech.usyd.edu.au/AERO1560.*	1
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1004	Discrete Mathematics	3	**A** HSC Mathematics Extension 1. **N** MATH 1904 or MATH 2011.	2, Summer
MECH 1760	Mechatronics 1	6	**A** HSC Maths Extension 1. **N** ELEC 1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC 1902 Computational Science in C (Advance), COSC 1002 Computational Science in C.	2
■ Second Year				
AERO 2201	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
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** 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** MATH 2905.	2, Summer
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901.	2
MECH 2201	Thermodynamics 1	4	**N** MECH 2200 Thermofluids.	1
MECH 2400	Mechanical Design 1	6		2
MECH 2500	Engineering Dynamics 1	4	**P** MATH 1001, MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001.	2
MECH 2701	Mechatronics 2	8	**P** MECH 1701 Introductory Digital Systems and MECH 1702 Introductory Software Engineering. **N** ELEC 2601 Microcomputer Systems. *NB: Website: www.acfr.usyd.edu.au/teaching/2nd-year/mech2701-Mx2.*	1
■ Third Year				
AERO 3500	Flight Mechanics 1	4	**P** AERO 2500 or AERO 2700 or AERO 2701 or AERO 2702.	2
AERO 3700	Space Engineering 2	8	**P** AERO 2701 Space Engineering 1 or AERO 2702 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.	2
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

Mechatronic Engineering (Space Engineering) (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3740	Space Electronics 3	8	**A** **N**	MECH 2701 Mechatronics 2. MECH 3701 Mechatronics 3, MECH 4710 Microprocessors in Engineered Systems. *NB: Web page: www.acfr.usyd.edu.au/teaching/3rd-yr/mech3701.*	1
MECH 3800	Systems Control	4	**P**	MATH 2001 and MATH 2005.	2
■ **Fourth Year**					
AERO 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 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
MECH 4701	Modern Estimation and Control	6	**P**	MECH 3800 Systems Control.	2

Note.

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

■ **2.Students enrolled in Flexible First Year program will choose from the Flexible First year table in place of these specific units.**

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.

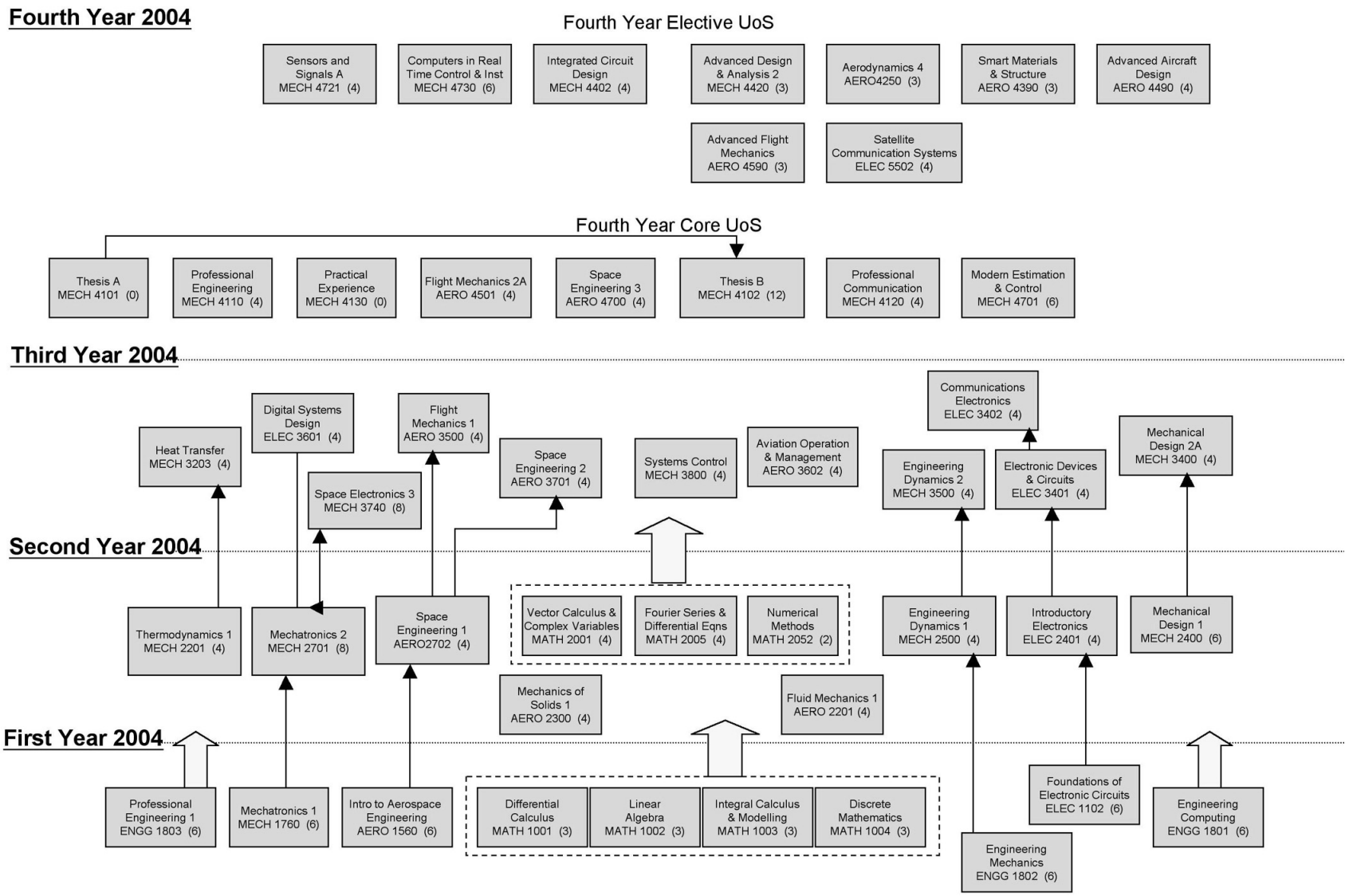
Recommended elective units of study

■ **Mainstream electives**

MECH 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 4410	Advanced Design and Analysis 1	3	**P**	MECH 3400 Mechanical Design 2A and MECH 3410 Mechanical Design 2B.	1
MECH 4721	Sensors and Signals A	4	**P**	MECH 3700 or MECH 3701.	1
MECH 4730	Computers in Real-Time Control and Inst	6	**P** **N**	MECH 3700 Mechatronics 2 or MECH 3701 Mechatronics 3. ELEC 4602 Real Time Computing.	1
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

Mechatronic Engineering (Space Engineering) (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Mechatronic Eng (Space Eng) Curriculum for 2005_



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. See note (1) relating to core units of study offered by faculties other than Engineering.

Core units of study

■ First Year (see note 8)

MECH 1560	Introduction to Mechanical Engineering	6	**N** AERO 1560 Introduction to Mechanical Engineering, MECH 1751 Introductiory Mechatronic Engineering, MECH 1600 Manufacturing Technology.	1
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005[1]	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
CHEM 1101[3]	Chemistry 1A	6	**A** HSC Chemistry and Mathematics. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **N** May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909).	1, 2, Summer
BIOL 1003	Human 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** BIOL (1903 or 1500) or EDUH 1016.	2, Summer

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
MATH 2052[2,5]	Numerical Methods	2	**C** MATH 2001 or 2901.	2
MECH 1600	Manufacturing Technology	4	**N** AERO 1600 Workshop Technology. *NB: Department permission required for enrolment. Enrolment subject to number of places available.*	1
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 2201[6]	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	**P** ELEC 1001 Introductory Electrical Engineering. **N** ELEC 2001 Electrical and Electronic Engineering, and ELEC 2101 Circuit Analysis, and ELEC 2401 Introductory Electronics, and ELEC 2601 Microcomputer Systems.	1

■ Third 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[4]	Fluid Mechanics 2	4	**P** AERO 2201 Fluid Mechanics 1 or MECH 2202 Fluids 1. **N** AERO 3250 Aerodynamics 2.	1
MECH 3300[4]	Materials 2	4	**P** MECH 2300 Materials 1 and AERO 2300 Mechanics of Solids 1.	2
MECH 3400[2,5]	Mechanical Design 2A	4	**P** MECH 2400 Mechanical Design 1.	1
MECH 3410	Mechanical Design 2B	4	**P** MECH 2400 Mechanical Design 1.	2
MECH 3500	Engineering Dynamics 2	4	**P** MECH 2500 Engineering Dynamics 1 and (MATH 2001 & MATH 2005).	1
MECH 3600	Manufacturing Engineering	6	**P** MECH 1600 Manufacturing Technology. **N** MECH 3601.	1

Mechanical Engineering (Biomedical) (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
MECH 3621[2]	Industrial Management	4	**N**	ENGG 2003.	2
MECH 3800	Systems Control	4	**P**	MATH 2001 and MATH 2005.	2
MECH 3910[2,5]	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
■ **Fourth Year**					
MECH 3310[4]	Mechanics of Solids 2	4	**P**	AERO 2300 Mechanics of Solids 1 and MATH 2005.	1
MECH 4101[7]	Thesis A	0	**P**	36 credit points of Third Year units of study.	1, 2
MECH 4102[7]	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
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.
2. These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) and the combined degree BE/BSc,but not for candidates for the combined degrees of BE/BCom.
3. Candidates for the combined degree BE/BSc may take as an alternative to CHEM 1101 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 1101) as well as CHEM 1909 and PHYS 1003.
4. Candidates for the combined degrees BE/BCom should enrol in 8 credit points selected from the following units of study: MECH 3211, MECH 3300 and MECH 3310.
5. These units of study are core for candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) and the combined degree BE/BSc, but not for candidates for the combined degrees of BE/BMedSci.
6. Candidates for the combined degree BE/BSc should enrol in MECH 2202 (2cp) instead of AERO 2201 (4cp).
7. Candidates for the combined degree BE/BMedSci should enrol in MECH 4103 and MECH 4104 (instead of MECH 4101 and MECH 4102).
8. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.

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 elective units of study. At least 10 credit points of these electives must be chosen from Biomedical units of study (not necessarily in Engineering), or from the Mechanical Engineering Mainstream 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 elective units of study. At least 10 credit points of these electives must be chosen from Biomedical units of study (not necessarily in Engineering), or from the Mechanical Engineering Mainstream 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.

■ BE(Mechanical Engineering)(Biomedical) / BCom

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)(Biomedical) / BmedSci

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.

	Unit of study		*Acceptable alternative.*
ENGG 1802	Engineering Mechanics	6	*PHYS 1001.*
ENGG 1801	Engineering Computing	6	*SOFT 1001.*

Mechanical Engineering (Biomedical) (continued)

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

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

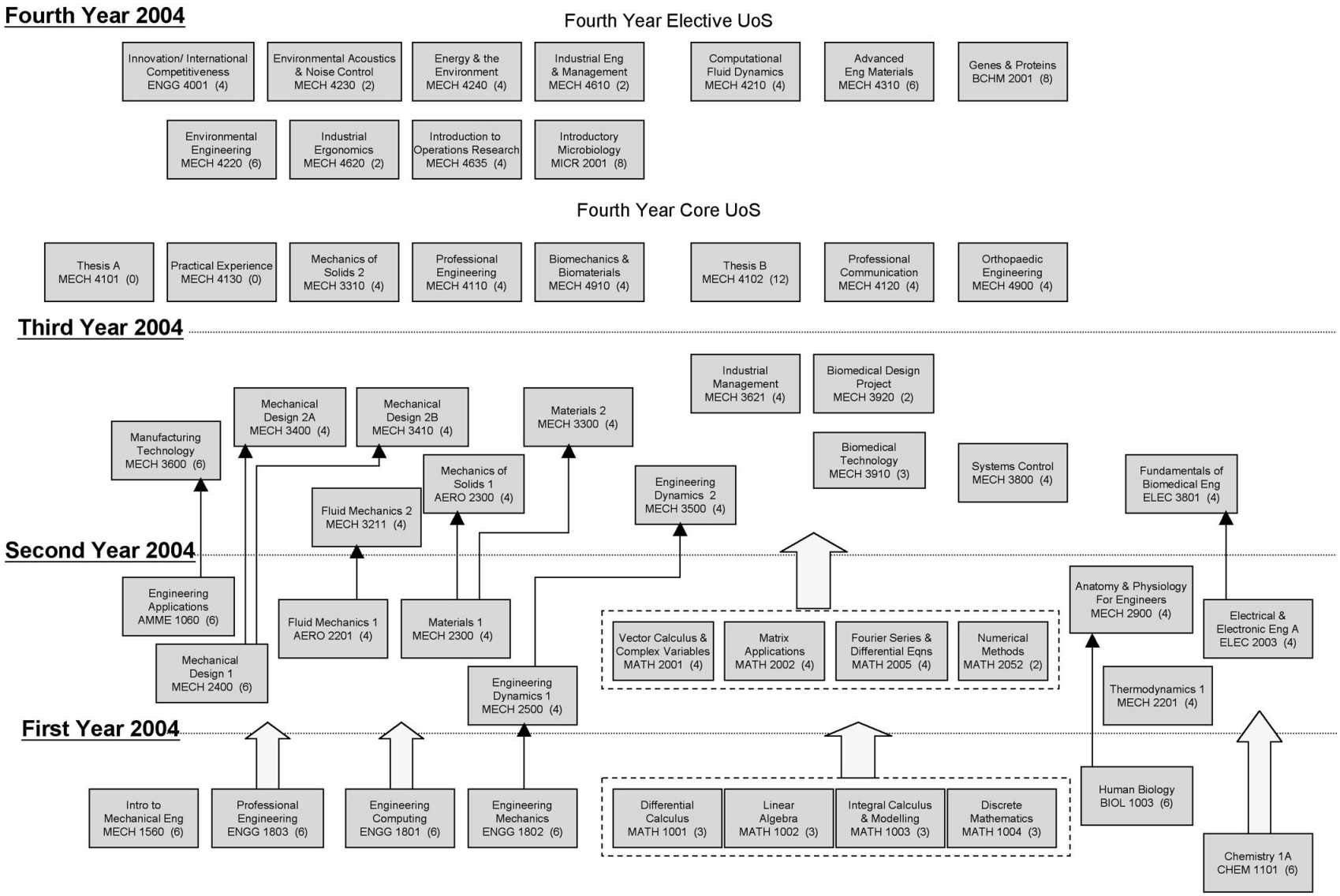
Units of study not included in this table may also be selected subject to the approval of the Head of School of Aerospace, Mechanical and Mechatronic Engineering.

Recommended elective units of study

ENGG 4001	Innovation/International Competitiveness	4		1
MECH 4210	Computational Fluid Dynamics	4	**P** MECH 3210 or MECH 3211 or AERO 3250.	1
MECH 4230	Environmental Acoustics & Noise Control	2	**P** 24 credit points of third year units of study. **N** MECH 4220 Environmental Engineering.	1
MECH 4240	Energy and the Environment	4	**P** 24 credit points of Senior units of study. **N** MECH 4220 Environmental Engineering.	1
MECH 4310	Advanced Engineering Materials	6	**P** MECH 3300 Materials 2. **N** MECH 4315 Advanced Aerospace Materials.	2
MECH 4610	Industrial Engineering and Management	2	**P** One of MECH 3620, MECH 3621, ENGG 2003. **N** MECH 4605 Industrial Engineering. *NB: ENGG 4004 is an acceptable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.*	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	**P** MATH 1005, MATH 2001, MATH 2002, MATH 2005. **N** MECH 4605 Industrial Engineering.	1
BCHM 2001	Genes and Proteins	8	**Q** 6 credit points of Junior Chemistry which must include one of CHEM 1101, 1102, 1901, 1902, 1903, 1904 or, with the permission of the Head of Department, exceptional performance in CHEM 1001 or 1002. **N** May not be counted with AGCH 2001 or BCHM 2101 or 2901.	N/A in 2004
MICR 2001	Introductory Microbiology	8	**P** 6 credit points of Junior Chemistry. **Q** 6 credit points of Junior Biology. **N** MICR (2003 or 2901). *NB: It is highly recommended that students complete 12 credit points of Junior Biology and MBLG (2001 or 2101 or 2901).*	1

Mechanical Engineering (Biomedical) (Core UoS and 4th Year Electives)

Please note that significant revisions will occur in Mechanical Eng (Biomedical) Curriculum for 2005_



■ Department of Chemical Engineering

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

- Chemical
- Chemical Bioprocess
- Chemical Environmental and Energy
- Chemical Process and Computer Systems
- and combined degrees with Science, Commerce, Arts, Medical Science and Law.

Chemical 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 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 – Chemical Engineering

■ First Year

MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
CHEM 1101	Chemistry 1A	6	**A** HSC Chemistry and Mathematics. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **N** May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909).	1, 2, Summer
CHEM 1102	Chemistry 1B	6	**Q** CHEM 1101 or a Distinction in CHEM 1001 or 1901 or equivalent. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics including MATH (1003 or 1903). **N** CHEM (1002 or 1902 or 1904 or 1907 or 1908).	1, 2, Summer
CHNG 1103	Material & Energy Transformations Intro	6	**A** Aims: students should develop generic attributes in the following areas: Knowledge skills: develop a body of knowledge in the fields of material and energy balances; be able to apply theory to practice in familiar and unfamiliar situation; be able to identify, access, organise and communicate knoweldge gains. Thinking skills: be able to exercise critical judgement; be an independent thinker; adopt a problem solving approach. Personal skills: be able to work productively with others. Practical skills: test hypotheses experimentally; apply technical skills; use flowsheeting computational tools to analyse elementary problems. **P** Field trips to industrial sites will help put into context course material. These trips will highlight selected processes carried out in today's chemical and process industries, with particular emphasis on the material and energy transformations. The economic and environmental aspects of these processes will also be introduced and examined. **N** Objectives: students should: develop an understanding of and competence in the formulation and solution of material and energy balance problems in engineering; develop competence in using basic flowsheet analysis and appropriate computational tools; improve their group work and problem solving skills; gain an ability to extract a simplified version of a problem from a complex situation.	2
ENGG 1800	Introduction to Engineering Disciplines	6	*NB: Department permission required for enrolment. Flexible first year core unit of study.*	1
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1803	Professional Engineering 1	6		1, 2

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	**C** MATH 2001 or 2901, and MATH 2002 or 2902. **N** MATH 2953.	2
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901.	2
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 Chem Eng Fundamentals	4		1
CHNG 2601	Materials and Corrosion	4		2

Chemical Engineering (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Third Year					
CHNG 3001	Chemical Engineering Laboratory	4	**P**	Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3101	Unit Ops (Heat Transfer)	4	**P**	Advisory prerequisite: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	2
CHNG 3102	Unit Ops (Mass Transfer)	4	**P**	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3103	Unit Ops (Particle Mechanics)	4	**P**	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	2
CHNG 3104	Unit Ops (Fluid Mechanics)	4	**P**	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3105	Thermodynamics 1	4	**P**	advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B.	1
CHNG 3106	Thermodynamics 2	4	**P**	Advisory prerequisite: CHNG 3105 Thermodynamics 1.	2
CHNG 3107	Reaction Engineering 1	4			2
CHNG 3301	Process Modelling	4	**P**	Advisory prerequisite: CHNG 2301 Chemical Engineering Computations.	1
CHNG 3302	Process Control 1	4			1
CHNG 3401	Project Economics	4			2
■ Fourth Year					
CHNG 4001	Practical Experience	0	**P**	advisory prerequisite: 28 credit points of 3rd year units.	1
CHNG 4002	Thesis	8	**P**	Advisory prerequisite: Students should have completed (or be enrolled in) all other 4th Year core units.	1
CHNG 4201	Chemical Engineering Design 1	4			1
CHNG 4202	Chemical Engineering Design 2	8			2
CHNG 4401	Project Engineering	4			1
CHNG 4402	Process Plant Risk Management	4			1

Notes:

1. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge and/or prerequisite requirements will be as prescribed by that Faculty.
2. Students doing any of the combined degree options BE/BA, BE/BCom or BE/BSc will be exempt from a First Year core unit of study.
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 in Table 2 (total 164 credit points). They are also required to complete CHNG 2701, CHNG 2702, MICR 2007, MICR 2008 and CHNG 4501, as well as gaining at least 4 credit points from the Fourth Year electives listed in the table of Recommended Elective units of study for BE (Chem) as shown below.

■ Bachelor of Engineering in Chemical Engineering (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 4403	Engineering Business Skills	4
CHNG 4504	Environmental Decision Making	4
ENGG 4001	Innovation/International Competitiveness	4
ENGG 4002	New Business Creation	4
MECH 4630	to Operations Research (4 credit points	
MECH 4650	Workplace Industrial Relations in Aust	2

Chemical Engineering (continued)

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

■ 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.

■ 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.

Recommended Elective units of study for BE (Chemical)

■ Second 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: Department permission required for enrolment. 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: Department permission required for enrolment. 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, MECH 3621.	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.	N/A in 2004

■ Third Year

MICR 2007	Microbiology for Engineers A	4		1
MICR 2008	Microbiology for Engineers B	4		2
CHNG 3303	Flowsheeting and Optimisation	4	*NB: Department permission required for enrolment. 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: Department permission required for enrolment.*	1
ENGG 3002	Industrial and Engineering Management	4	**P** ENGG 2003. **N** MECH 4610.	1

■ Fourth 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 2004
CHNG 4004	Advances in Chemical Engineering B	4		N/A in 2004
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 2004
CHNG 4102	Transport Phenomena	4	*NB: Department permission required for enrolment.*	1, 2
CHNG 4103	Advances in Polymer Engineering	4	*NB: Department permission required for enrolment.*	1, 2
CHNG 4104	Reaction Engineering 2	4	**P** Advisory prerequisite: CHNG 3107 Reaction Engineering 1.	N/A in 2004
CHNG 4105	Advanced Thermodynamics	4	**P** Advisory prerequisites: CHNG 3105 and CHNG 3106.	N/A in 2004
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. **Q** WAM greater than credit average. *NB: Department permission required for enrolment.*	1

Chemical Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
CHNG 4301	Advanced Fluid Dynamics Modelling	4		N/A in 2004
CHNG 4304	Process Control 2	4	**P** CHNG 3302 Process Control 1.	1
CHNG 4305	Process Systems Engineering	4	**A** CHNG 3302 Process Control 1; CHNG 4304 Process Control 2. **N** CHNG 4303 Optimisation Techniques.	2
CHNG 4403	Engineering Business Skills	4	*NB: Department permission required for enrolment. Students MUST register with Young Achievement Australia early in Semester 1.*	1
CHNG 4501	Biochemical Engineering	8	**P** CHNG 2701 & CHNG 2702 Fundamentals of Bioprocess Engineering 1 & 2; MICR 2007 Microbiology for Engineers A; MICR 2008 Microbiology for Engineers B.	2
CHNG 4502	Adv Topics in Environmental Engineering	4	**P** All four components of unit Operations; CHNG 3106 Thermodynamics 2.	N/A in 2004
CHNG 4504	Environmental Decision Making	4	*NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.*	2
CHNG 4601	Advanced Particle Mechanics	4	**P** All four components of unit Operations.	N/A in 2004
CHNG 4604	Chemical Modelling of Aqueous Systems	4	**P** CHNG 3101, CHNG 3102, CHNG 3103, CHNG 3104 and CHNG 3106. *NB: Department permission required for enrolment.*	1
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.

Additional units of study for students interested in Management

■ Core unit of study

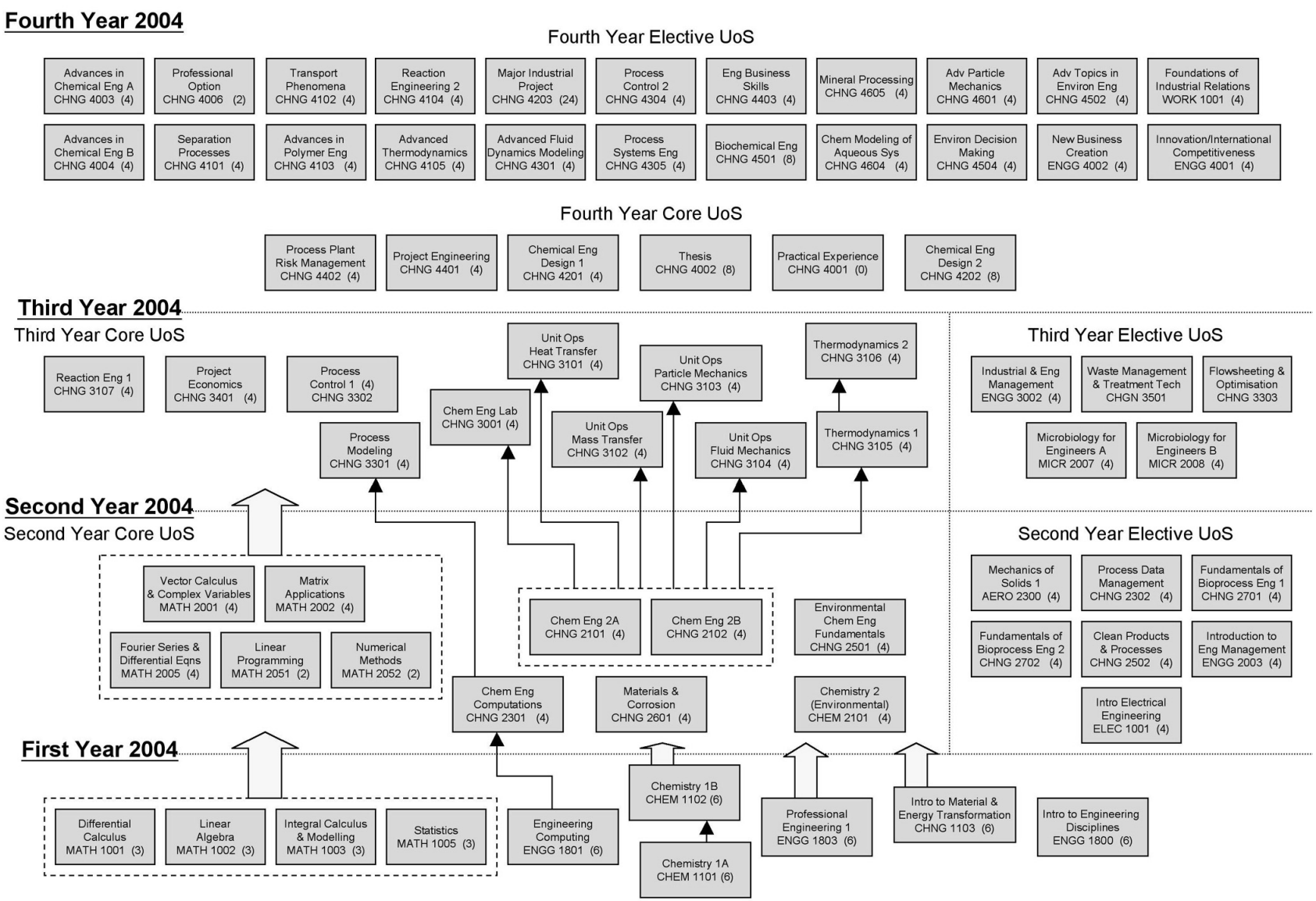
ENGG 2003	Introduction to Engineering Management	4	**N** ELEC 3701, MECH 3620, MECH 3621.	2
ENGG 3002	Industrial and Engineering Management	4	**P** ENGG 2003. **N** MECH 4610.	1
ENGG 4001	Innovation/International Competitiveness	4		1
MECH 4110	Professional Engineering	4	**P** 36 credit points of Senior units of study. *NB: ENGG 4004 is an acceptrable alternative up to a total substitution not exceeding the credit point value of ENGG 4004.*	1
CHNG 4403	Engineering Business Skills	4	*NB: Department permission required for enrolment. Students MUST register with Young Achievement Australia early in Semester 1.*	1
CHNG 4504	Environmental Decision Making	4	*NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.*	2
MECH 4650	Workplace Industrial Relations in Aust	2	**P** 36 credit points of senior units of study. *NB: Department permission required for enrolment. 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: ENGG 2003, and ENGG 3002 are compulsory units of study for the management stream. The remaining 8 credit points required come from the Table above.

Note: 4th year Chemical Engineering electives are offered subject to enrolment numbers.

Chemical Engineering Course Map (Core UoS)

Please note that significant revisions will occur in Chemical Eng Curriculum for 2005_



■ Department of Civil Engineering (including Project Management)

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

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

Specialisation Requirements : Civil Engineering (except Project Engineering and Management)

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 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

■ First Year

MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
GEOL 1501	Engineering Geology 1	6	**N** GEOL 1002.	2
ENGG 1800	Introduction to Engineering Disciplines	6	*NB: Department permission required for enrolment. Flexible first year core unit of study.*	1
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
CHEM 1101	Chemistry 1A	6	**A** HSC Chemistry and Mathematics. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **N** May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909).	1, 2, Summer

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** 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** MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	**C** MATH 2001 or 2901, and MATH 2002 or 2902. **N** MATH 2953.	2
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901.	2
CIVL 2201	Structural Mechanics	6	**A** CIVL 1051 Dynamics and CIVL 1052 Statics.	1
CIVL 2110	Materials	6	**A** CHEM 1001, ENGG 1802.	1
CIVL 2230	Intro to Structural Concepts and Design	6	**A** ENGG 1802 Engineering Mechanics, CIVL 2110 Materials CIVL 2201 Structural Mechanics.	2
CIVL 2410	Soil Mechanics	6	**A** CIVL 2201 Structural Mechanics.	1, 2
CIVL 2611	Fluid Mechanics	6	**A** Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005.	2
CIVL 2810	Engineering Construction and Surveying	6	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1

■ Third Year

CIVL 3205	Concrete Structures 1	6	**A** CIVL 2110 Materials, CIVL 2201 Structural Mechanicsm CIVL 2230 Introduction to Civil Engineering Design. **N** CIVL 3225, CIVL 3226.	1
CIVL 3612	Environmental and Fluids Engineering	6	**A** CIVL 2611 Fluid Mechanics.	1
CIVL 2110	Materials	6	**A** CHEM 1001, ENGG 1802.	1
CIVL 2410	Soil Mechanics	6	**A** CIVL 2201 Structural Mechanics.	1, 2
CIVL 3206	Steel Structures 1	6	**A** CIVL 2110 Materials, CIVL 2201 Structural Mechanics, CIVL 2230 Introduction to Civil Engineering Design. **N** CIVL 3227.	2
CIVL 3510	Surveying	2	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3612	Environmental and Fluids Engineering	6	**A** CIVL 2611 Fluid Mechanics.	1
CIVL 3812	Project Appraisal	6	**N** CIVL 4803 Engineering Management.	2

Specialisation Requirements : Civil Engineering (except Project Engineering and Management) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
For elective subjects CIVL 3235 Structural Analysis, CIVL 3613 Coastal Engineering and CIVL 3411 Foundation Engineering students should choose 2 out of 3 subjects.				
■ Fourth Year				
CIVL 4001	Thesis/Design/Project A	0	**P** 40 credit points of Senior Subjects. **N** CIVL 4003 and CIVL 4004.	1, 2
CIVL 4002	Thesis/Design/Project B	5	**P** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001. **N** CIVL 4003 and CIVL 4004. *NB: Department permission required for enrolment in Session 1.*	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 (144 credit points). They are also required to gain at least 18 credit points from the 3rd year elective units of study listed below, and 18 credit points from fourth year units of study. The remaining 12 credit points can be obtained from any of the listed elective units or from units of study in other Faculties subject to approval from the Head of Civil Engineering.

Candidates commencing one of the combined degree options from 2001 onwards (that is, Bachelor of Engineering in Civil Engineering with either a Bachelor of Arts, Bachelor of Science, Bachelor of Laws or Bachelor of Commerce) are required to complete all of the core units of study listed above (144 credit points), This total of 144 credit points (plus 12 credit points of electives from the list of electives below for combined degrees with Bachelor of Arts and Bachelor of Science) 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:

	Unit of study		*Acceptable alternative.*
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 4014	Thesis/Design/Project	5	*CIVL 4013.*

Recommended elective units of study

■ Third Year

CIVL 3235	Structural Analysis	6	**A** CIVL 2201 Structural Mechanics, CIVL 2230 Introduction to Civil Engineering Design, Math 2002 Matrix Applications and MATH 2005 Fourier Series and Differential Equations.	2
CIVL 3411	Foundation Engineering	6	**A** CIVL 2410 Soil Mechanics.	2
CIVL 3613	Coastal Engineering	6	**A** CIVL 2611 Fluid Mechanics CIVL 3612 Environmental and Fluids Engineering.	2

■ Fourth Year

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
CIVL 4222	Finite Element Methods	5	**A** CIVL 3204 Structural Analysis.	1
CHNG 4504	Environmental Decision Making	4	*NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.*	2
MECH 4220	Environmental Engineering	6	**P** 24 credit points of third year units of study. **N** MECH 4240 Energy and the Environment and MECH 4230 Environmental Acoustics and Noise Control.	1
CIVL 4221	Bridge Engineering	5	**A** CIVL 3225 or CIVL 3223 Concrete Structures – Behaviour, CIVL 3226 or 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

Specialisation Requirements : Civil Engineering (except Project Engineering and Management) (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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 3613	Coastal Engineering	6	**A** CIVL 2611 Fluid Mechanics CIVL 3612 Environmental and Fluids Engineering.	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 2004
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
CIVL 3813	Contracts Formulation and Management	6	**A** CIVL 3805 Project Scope, Cost & Time Management.	2
CIVL 3805	Project Scope, Time and Cost Management	6		1
CIVL 4810	Project Quality Risk and Procurement Mgt	6		2

Notes

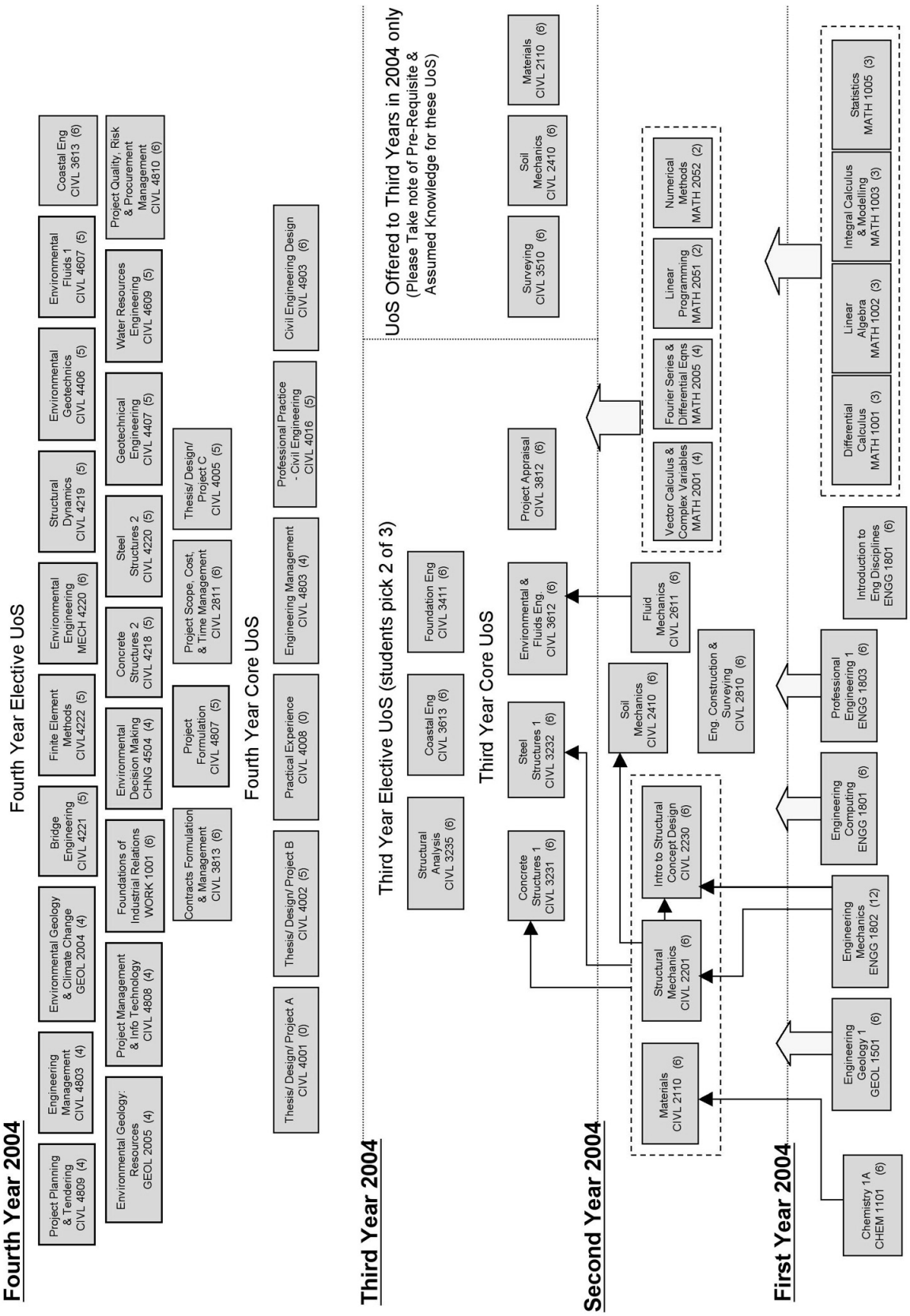
1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.
2. For the BE (Civil) degree students must take at least 20 elective credit points ofstudy at Fourth Year level, however two 4 credit points of study may be replaced by at least 8 credit points available elsewhere in the Faculty of Engineering and subject to the approval of the Head of Civil Engineering.
3. Alternate units of study for the core units CIVL 4001 and CIVL 40002 Thesis are 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 4808, CIVL 4809, CIVL 2811, CIVL 3813, CIVL 3814

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

Environmental Stream: CIVL 4406, CIVL 4607, CIVL 4609, CHNG 4504, (MECH 4220), CIVL 3613

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


Civil Engineering Course Map (Core and Elective UoS)
Please note that significant revisions will occur in Civil Eng Curriculum for 2005_
Fourth Year 2004
Fourth Year Elective UoS
Project Planning & Tendering CIVL 4809 (4)
Engineering Management CIVL 4803 (4)
Environmental Geology & Climate Change GEOL 2004 (4)
Bridge Engineering CIVL 4221 (5)
Finite Element Methods CIVL4222 (5)
Environmental Engineering MECH 4220 (6)
Structural Dynamics CIVL 4219 (5)
Environmental Geotechnics CIVL 4406 (5)
Environmental Fluids 1 CIVL 4607 (5)
Coastal Eng CIVL 3613 (6)
Environmental Geology: Resources GEOL 2005 (4)
Project Management & Info Technology CIVL 4808 (4)
Foundations of Industrial Relations WORK 1001 (6)
Environmental Decision Making CHNG 4504 (4)
Concrete Structures 2 CIVL 4218 (5)
Steel Structures 2 CIVL 4220 (5)
Geotechnical Engineering CIVL 4407 (5)
Water Resources Engineering CIVL 4609 (5)
Project Quality, Risk & Procurement Management CIVL 4810 (6)
Fourth Year Core UoS
Contracts Formulation & Management CIVL 3813 (6)
Project Formulation CIVL 4807 (5)
Project Scope, Cost, & Time Management CIVL 2811 (6)
Thesis/ Design/ Project C CIVL 4005 (5)
Thesis/ Design/ Project A CIVL 4001 (0)
Thesis/ Design/ Project B CIVL 4002 (5)
Practical Experience CIVL 4008 (0)
Engineering Management CIVL 4803 (4)
Professional Practice - Civil Engineering CIVL 4016 (5)
Civil Engineering Design CIVL 4903 (6)
Third Year 2004
Third Year Elective UoS (students pick 2 of 3)
UoS Offered to Third Years in 2004 only
(Please Take note of Pre-Requisite & Assumed Knowledge for these UoS)
Structural Analysis CIVL 3235 (6)
Coastal Eng CIVL 3613 (6)
Foundation Eng CIVL 3411 (6)
Third Year Core UoS
Project Appraisal CIVL 3812 (6)
Surveying CIVL 3510 (6)
Soil Mechanics CIVL 2410 (6)
Materials CIVL 2110 (6)
Concrete Structures 1 CIVL 3231 (6)
Steel Structures 1 CIVL 3232 (6)
Environmental & Fluids Eng. CIVL 3612 (6)
Vector Calculus & Complex Variables MATH 2001 (4)
Fourier Series & Differential Eqns MATH 2005 (4)
Linear Programming MATH 2051 (2)
Numerical Methods MATH 2052 (2)
Second Year 2004
Soil Mechanics CIVL 2410 (6)
Fluid Mechanics CIVL 2611 (6)
Intro to Structural Concept Design CIVL 2230 (6)
Eng. Construction & Surveying CIVL 2810 (6)
Materials CIVL 2110 (6)
Structural Mechanics CIVL 2201 (6)
Engineering Computing ENGG 1801 (6)
Professional Engineering 1 ENGG 1803 (6)
Introduction to Eng Disciplines ENGG 1801 (6)
Differential Calculus MATH 1001 (3)
Linear Algebra MATH 1002 (3)
Integral Calculus & Modelling MATH 1003 (3)
Statistics MATH 1005 (3)
First Year 2004
Chemistry 1A CHEM 1101 (6)
Engineering Geology 1 GEOL 1501 (6)
Engineering Mechanics ENGG 1802 (12)

Project Engineering and Management

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 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 units of study

■ First Year

MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
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
ENGG 1800	Introduction to Engineering Disciplines	6	*NB: Department permission required for enrolment. Flexible first year core unit of study.*	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
CHEM 1101	Chemistry 1A	6	**A** HSC Chemistry and Mathematics. **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **N** May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909).	1, 2, Summer

■ Second Year

MATH 2001	Vector Calculus and Complex Variables	4	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** 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** MATH 2905.	2, Summer
MATH 2051	Linear Programming	2	**C** MATH 2001 or 2901, and MATH 2002 or 2902. **N** MATH 2953.	2
MATH 2052	Numerical Methods	2	**C** MATH 2001 or 2901.	2
CIVL 2201	Structural Mechanics	6	**A** CIVL 1051 Dynamics and CIVL 1052 Statics.	1
CIVL 2810	Engineering Construction and Surveying	6	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3805	Project Scope, Time and Cost Management	6		1
CIVL 2230	Intro to Structural Concepts and Design	6	**A** ENGG 1802 Engineering Mechanics, CIVL 2110 Materials CIVL 2201 Structural Mechanics.	2
CIVL 2410	Soil Mechanics	6	**A** CIVL 2201 Structural Mechanics.	1, 2
CIVL 2611	Fluid Mechanics	6	**A** Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005.	2

■ Third Year

CIVL 3205	Concrete Structures 1	6	**A** CIVL 2110 Materials, CIVL 2201 Structural Mechanicsm CIVL 2230 Introduction to Civil Engineering Design. **N** CIVL 3225, CIVL 3226.	1
CIVL 2110	Materials	6	**A** CHEM 1001, ENGG 1802.	1
CIVL 3510	Surveying	2	**A** MATH 1001, MATH 1002, MATH 1003, MATH 1005.	1
CIVL 3812	Project Appraisal	6	**N** CIVL 4803 Engineering Management.	2
CIVL 3813	Contracts Formulation and Management	6	**A** CIVL 3805 Project Scope, Cost & Time Management.	2
CIVL 4810	Project Quality Risk and Procurement Mgt	6		2

■ Fourth Year

CIVL 4001	Thesis/Design/Project A	0	**P** 40 credit points of Senior Subjects. **N** CIVL 4003 and CIVL 4004.	1, 2
CIVL 4002	Thesis/Design/Project B	5	**P** 40 credit points of Senior Subjects. A satisfactory result in CIVL 4001. **N** CIVL 4003 and CIVL 4004. *NB: Department permission required for enrolment in Session 1.*	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

Project Engineering and Management (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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 (156 credit points). They are also required to gain at least 24 credit points from the third and fourth year table of electives listed below. The remaining 12 credit points required for the degree can be obtained from the list of electives below or from other units of study offered by the University of Sydney subject to approval by the Head of Civil Engineering. 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, which are not required, therefore only 144 credit points are needed. This total of 144 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 units of study

	Unit of study		*Acceptable alternative.*
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 4014	Thesis/Design/Project	5	*CIVL 4013.*

Recommended elective units of study for the BE Project Engineering and Management (Civil)

■ Fourth Year

ECON 1001	Introductory Microeconomics	6	**A** Mathematics.	1, Summer
CIVL 4222	Finite Element Methods	5	**A** CIVL 3204 Structural Analysis.	1
CIVL 4221	Bridge Engineering	5	**A** CIVL 3225 or CIVL 3223 Concrete Structures – Behaviour, CIVL 3226 or CIVL 3224 Concrete Structures – Design and CIVL 3227 or CIVL 3206 Steel Structures 1.	1
CIVL 4218	Concrete Structures 2	5	**A** CIVL 3223 or CIVL 3225 Concrete Structures – Behaviour, CIVL 3224 or 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 3613	Coastal Engineering	6	**A** CIVL 2611 Fluid Mechanics CIVL 3612 Environmental and Fluids Engineering.	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

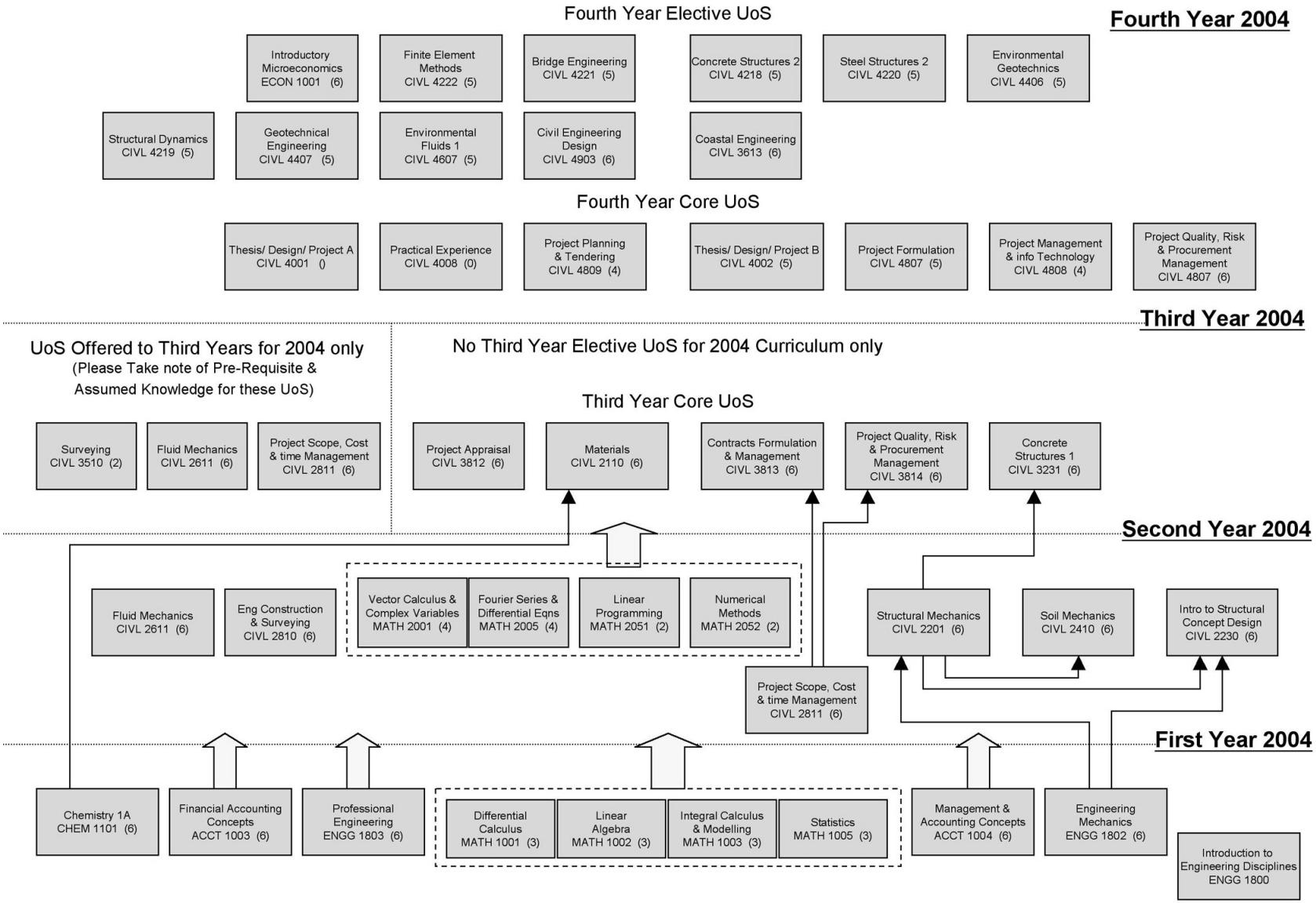
1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.
2. For the BE Project Engineering and Management (Civil) degree, students must take at least 36 elective credit points at third and fourth year level, however 12 credit points maybe taken from units of study available elsewhere in the Faculty of Engineering or University of Sydney subject to the approval of the Head of Civil Engineering

3.Alternate units to the core unit of study CIVL 4001 and CIVL 4002 Thesis are CIVL 4003 and CIVL 4004 Honours Thesis.

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

Project Engineering & Management (Core UoS and 4th Year Electives) for 2004 only

Please note that significant revisions will occur in Project Engineering and Management Curriculum for 2005_



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

Candidates for the degree of Bachelor of Engineering in 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.

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

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 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 fulfil the 192 credit point requirement.

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

Candidates in the combined degree course of Bachelor of Engineering in Computer Engineering with the Bachelor of Science, Bachelor of Arts, or Bachelor of Medical Science, or with the Bachelor of Commerce (if first enrolled prior to 2003), 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.

Candidates in the combined degree course with the Bachelor of Commerce, who first enrolled in 2003, are not required to complete the units of study: SOFT 2001 Concurrent Programming and MATH 2005 Fourier Series and Differential Equations.

Core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics MATH (1001/1901, 1002/1902, 1003/1903). MATH 1005/1905 would also be useful. **N** 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** 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

■ Second 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	**P** 36 credit points. **N** CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**A** MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	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

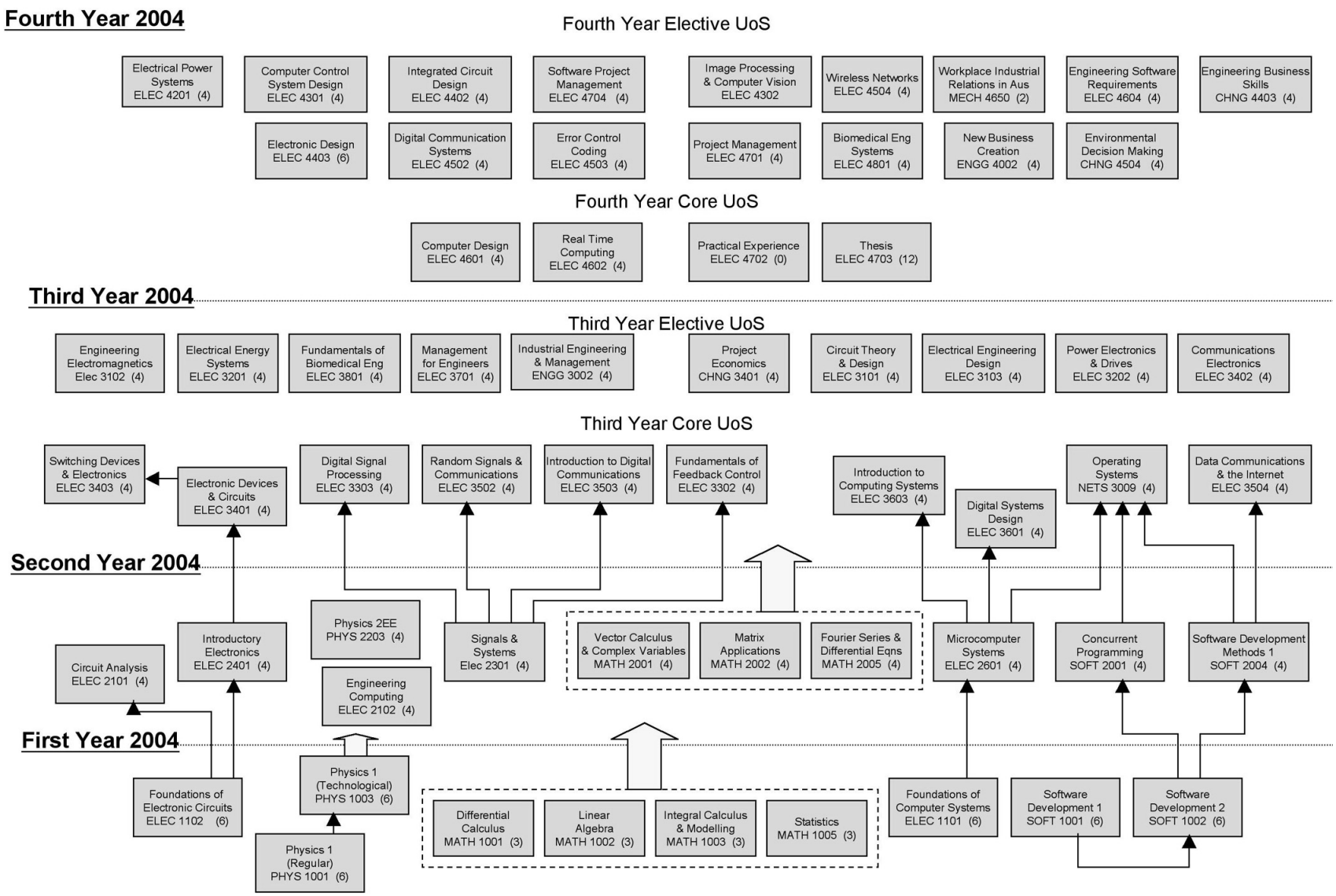
Computer Engineering (continued)

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** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
PHYS 2203	Physics 2EE	4		2
SOFT 2001	Concurrent Programming	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2901.	2
SOFT 2004	Software Development Methods 1	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2904 or COMP (2004 or 2904).	1, Summer
■ Third year				
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 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	**A** ELEC 2301 Signals and Systems.	2
ELEC 3504	Data Communications and the Internet	4	**A** (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). **N** 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	**A** ELEC 2601 Microcomputer Systems.	1
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
■ Fourth year				
ELEC 4601	Computer Design	4	**A** ELEC 3403 Switching Devices and Electronics, and ELEC 3601 Digital Systems Design. **N** MECH 4730 Computers in Real time Instrumentation and Control.	1
ELEC 4602	Real Time Computing	4	**A** ELEC 3601 Digital Systems Design or ELEC 3603 Introduction to Computing Systems.	1
ELEC 4702	Practical Experience	0	**P** 28 credit points of level 3 or 4 units of study.	1, 2
ELEC 4703	Thesis	12	**P** 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.

Computer Engineering (Core and Elective UoS)

Please note that significant revisions will occur in Computer Eng Curriculum for 2005_



Electronic Commerce

Unit of study	CP	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
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

■ Bachelor of Engineering in Electronic Commerce combined with Bachelor of Commerce

Candidates in the combined degree course of Bachelor of Engineering in Electronic Commerce with the Bachelor of Commerce, who first enrolled prior to 2003, are required to complete:

- 148 credit points comprising all of the core units of study except ACCT 1003 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.

Candidates in the combined degree course with the Bachelor of Commerce, who first enrolled in 2003, need not complete CLAW 2006 Legal Issues for eCommerce as part of the requirements for the Bachelor of Engineering.

Electronic Commerce 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	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
MKTG 1001	Marketing Principles	6	**N** MKTG 2001.	1, Summer
SOFT 1001	Software Development 1	6	**A** HSC Mathematics Extension 1. **N** May not be counted with SOFT 1901 or COMP (1001 or 1901).	1, 2, 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

■ Second year

CLAW 2006	Legal Issues for eCommerce	8	**P** 48 credit points at level 1000.	1, 2
ELEC 2102	Engineering Computing	4	**P** 36 credit points. **N** CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**A** MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	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.	1, 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	**P** MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **N** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** MATH 2902.	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	**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

■ Third 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 Programming	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

Electronic Commerce (continued)

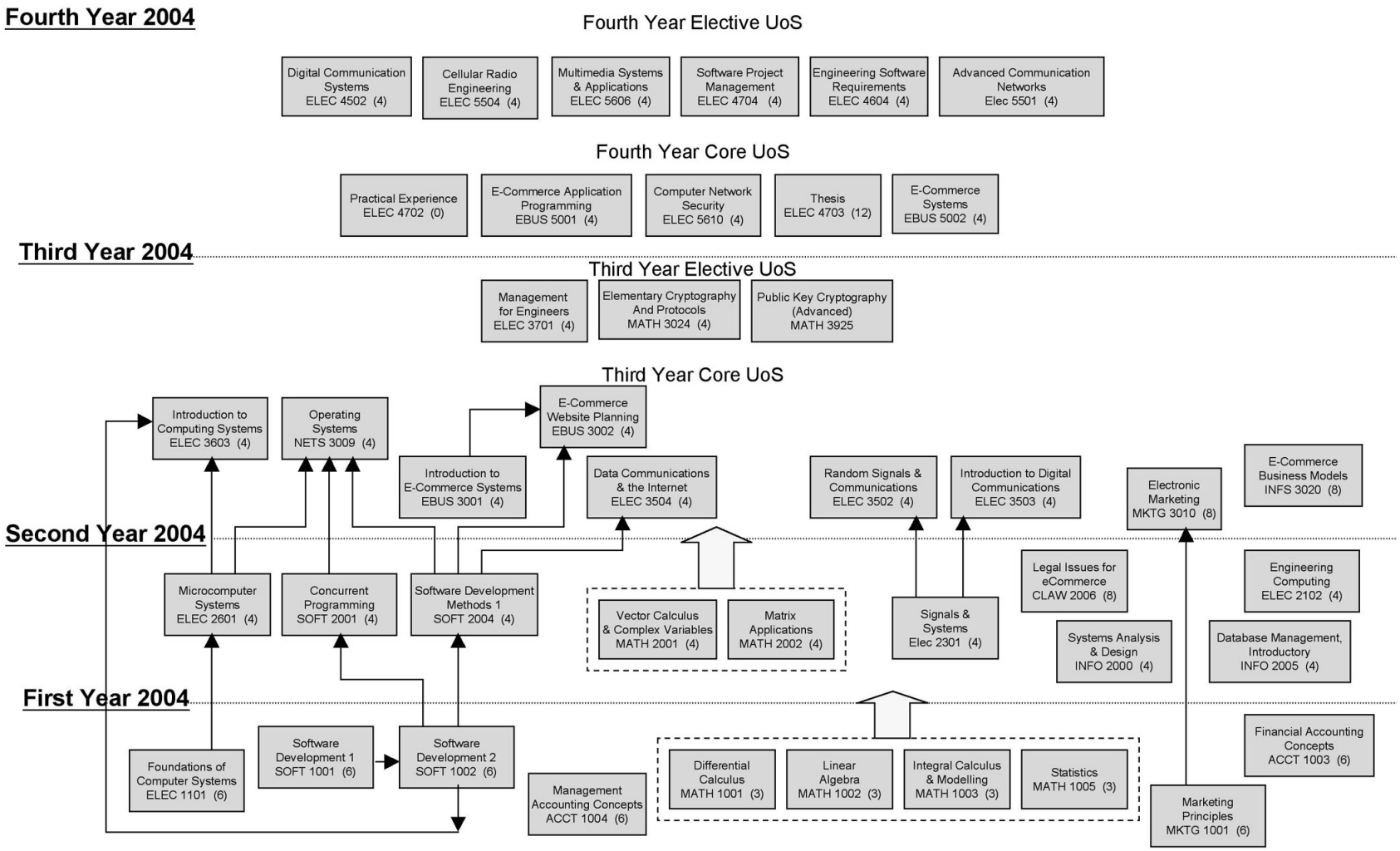
Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
ELEC 3504	Data Communications and the Internet	4	**A** (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). **N** ELEC 4501 Data Communication Networks.	2
ELEC 3603	Introduction to Computing Systems	4	**A** ELEC 2601 Microcomputer Systems.	1
INFS 3020	E-Commerce Business Models	8	**P** One of INFS 1000, ISYS 1003 and INFO 1000. Also at least 48 credit points. **N** ACCT 3006.	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
NETS 3017	Network Programming and Distributed Apps	4	**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). **N** May not be counted with NETS 3917 or ELEC 3604.	2
MKTG 3010	Electronic Marketing	8	**P** MKTG 1001 or MKTG 2001.	2
■ **Fourth year**				
EBUS 5001	E-Commerce Application Programming	4	**A** EBUS 3001 Introduction to E-Commerce Systems. **N** ELEC 5608 Electronic Commerce.	1
EBUS 5002	E-Commerce Systems	4	**A** EBUS 5001 E-Commerce Application Programming.	2
ELEC 4702	Practical Experience	0	**P** 28 credit points of level 3 or 4 units of study.	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	**A** (ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks) or ELEC 3504 DataCommunications and the Internet. **N** NETS 3016 Computer and Network Security. NETS 3916 Computer and Network Security (Advance).	1

Electronic Commerce recommended elective units of study

ACCT 3005	IT Assurance and Control	8	**A** INFO 1000. **P** ACCT 2003.	N/A in 2004
ECMT 1011	Econometrics IA Stream 1	6	**N** MATH 1005, MATH 1905.	N/A in 2004
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 undertake Econometrics 1B before attempting 1A.*	N/A in 2004
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** 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** 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
ELEC 5501	Advanced Communication Networks	4	**A** NETS 3007 Network Protocols or ELEC 3604 Internet Engineering.	2
ELEC 5504	Cellular Radio Engineering	4	**A** ELEC 3502 Random Signals and Communications, and ELEC 3503 Introduction to Digital Communications.	1
ELEC 5606	Multimedia Systems and Applications	4	**A** NETS 3007 Network Protocols or ELEC 3504 Data Communications and Internet. **N** ELEC 3604 Internet Engineering. *NB: Department permission required for enrolment. Permission required for enrolment.*	1

Electronic Commerce Engineering (Core and Elective UoS)

Please note that significant revisions will occur in Electronic Commerce Eng Curriculum for 2005_



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 fulfil the 192 credit point requirement.

■ Bachelor of Engineering in Electrical Engineering in a combined degree course

Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Science, Bachelor of Arts, or Bachelor of Medical Science, or with the Bachelor of Commerce (if first enrolled prior to 2003) 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.

Candidates in the combined degree course with the Bachelor of Commerce, who first enrolled in 2003, are not required to complete the units of study: SOFT 2001 Concurrent Programming and MATH 2005 Fourier Series and Differential Equations.

Electrical Engineering core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics MATH (1001/1901, 1002/1902, 1003/1903). MATH 1005/1905 would also be useful. **N** 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** 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

■ Second year

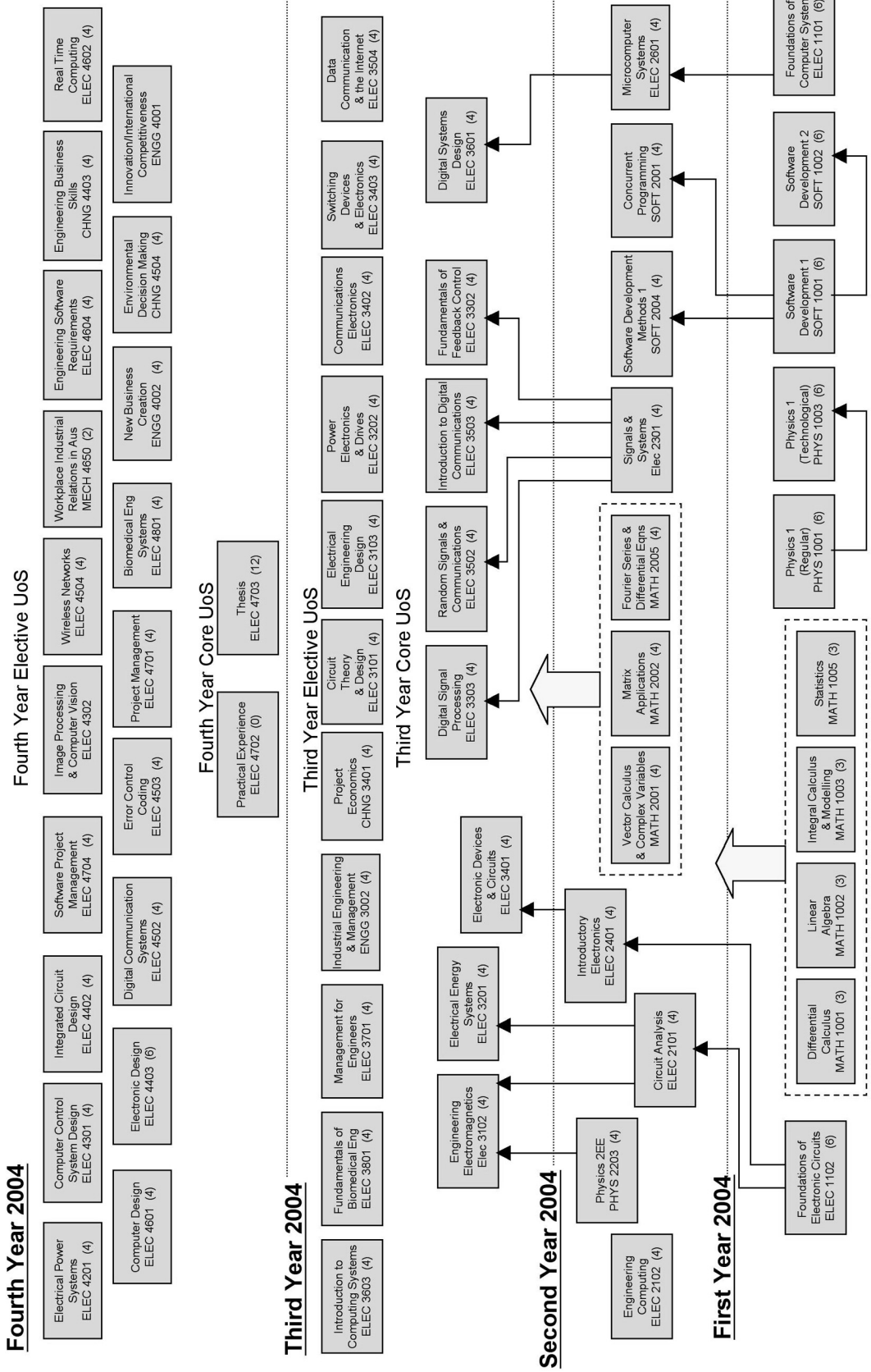
ELEC 2101	Circuit Analysis	4	**A** ELEC 1102 Foundations of Electronic Circuits. **N** ELEC 2001 Electrical and Electronic Engineering and ELEC 2003 Electrical and Electronic Engineering A.	1
ELEC 2102	Engineering Computing	4	**P** 36 credit points. **N** CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**A** MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	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
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** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
PHYS 2203	Physics 2EE	4		2
SOFT 2001	Concurrent Programming	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2901.	2
SOFT 2004	Software Development Methods 1	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2904 or COMP (2004 or 2904).	1, Summer

Electrical Engineering (continued)

Unit of study		CP		A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Third 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** **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 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
■ Fourth year					
ELEC 4702	Practical Experience	0	**P**	28 credit points of level 3 or 4 units of study.	1, 2
ELEC 4703	Thesis	12	**P**	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.					

Electrical Engineering (Core and Elective UoS)

Please note that significant revisions will occur in Electrical Eng Curriculum for 2005_



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 fulfil the 192 credit point requirement.

■ Bachelor of Engineering in Software Engineering in a combined degree course

Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Science, Bachelor of Arts, or Bachelor of Medical Science, or with the Bachelor of Commerce (if first enrolled prior to 2003) 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.

Candidates in the combined degree course with the Bachelor of Commerce, who first enrolled in 2003, are not required to complete the unit of study: MATH 2005 Fourier Series and Differential Equations.

Software Engineering core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics MATH (1001/1901, 1002/1902, 1003/1903). MATH 1005/1905 would also be useful. **N** 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** 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

■ Second year

ELEC 2102	Engineering Computing	4	**P** 36 credit points. **N** CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**A** MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	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
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.	1, 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 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
MATH 2011	Topics in Discrete Mathematics	4	**A** HSC Mathematics Extension 1. **P** 6 credit points of Junior Mathematics. **N** MATH (1004 or 1904).	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

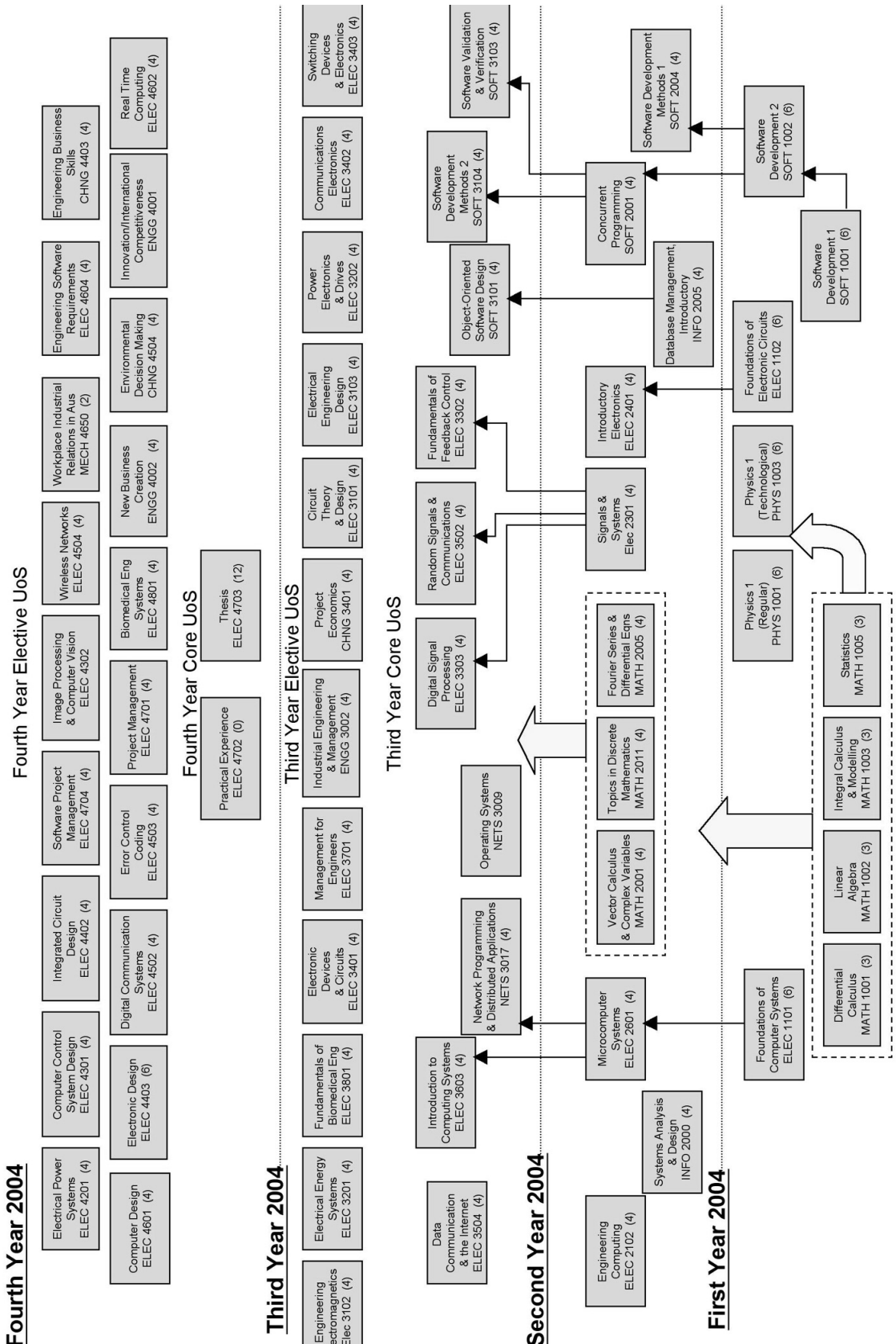
Software Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
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
■ Third year				
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 3502	Random Signals and Communications	4	**A** ELEC 2301 Signals and Systems.	1
ELEC 3504	Data Communications and the Internet	4	**A** (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). **N** ELEC 4501 Data Communication Networks.	2
ELEC 3603	Introduction to Computing Systems	4	**A** ELEC 2601 Microcomputer Systems.	1
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
NETS 3017	Network Programming and Distributed Apps	4	**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). **N** May not be counted with NETS 3917 or ELEC 3604.	2
SOFT 3101	Object-Oriented Software Design	4	**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)]. **N** May not be counted with SOFT 3801 or COMP (3008 or 3908).	1
SOFT 3103	Software Validation and Verification	4	**P** [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901) and MATH (1005 or 1905). **N** May not be counted with SOFT 3803.	2
SOFT 3104	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
■ Fourth year				
ELEC 4602	Real Time Computing	4	**A** ELEC 3601 Digital Systems Design or ELEC 3603 Introduction to Computing Systems.	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	**P** 28 credit points of level 3 or 4 units of study.	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	**P** 36 credit points from third and fourth year units of study.	2
ELEC 5610	Computer and Network Security	4	**A** (ELEC 3604 Internet Engineering and ELEC 4501 Data Communication Networks) or ELEC 3504 DataCommunications and the Internet. **N** NETS 3016 Computer and Network Security. NETS 3916 Computer and Network Security (Advance).	1

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

Software Engineering (Core and Elective UoS)

Please note that significant revisions will occur in Software Eng Curriculum for 2005_



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 the 4 or 5 level; and
- other additional elective units of study approved by the Head of School to fulfil the 192 credit point requirement.

■ Bachelor of Engineering in Telecommunications Engineering in a combined degree course

Candidates in the combined degree course of Bachelor of Engineering in Telecommunications Engineering with the Bachelor of Science, Bachelor of Arts, or Bachelor of Medical Science, or with the Bachelor of Commerce (if first enrolled prior to 2003) 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.

Candidates in the combined degree course with the Bachelor of Commerce, who first enrolled in 2003, are not required to complete the units of study: SOFT 2001 Concurrent Programming and MATH 2005 Fourier Series and Differential Equations.

Telecommunications Engineering core units of study

■ First year

ELEC 1101	Foundations of Computer Systems	6	**A** HSC Maths extension 1.	1, Summer
ELEC 1102	Foundations of Electronic Circuits	6	**A** HSC Physics 2 units, MATH 1001 Differential Calculus.	2
MATH 1001	Differential Calculus	3	**A** HSC Mathematics Extension 1. **N** MATH 1011 or 1901 or 1906.	1, Summer
MATH 1002	Linear Algebra	3	**A** HSC Mathematics Extension 1. **N** MATH 1902 or 1012.	1, Summer
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mathematics Extension 2 or MATH 1001. **N** MATH 1013 or 1903 or 1907.	2, Summer
MATH 1005	Statistics	3	**A** HSC Mathematics. **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022).	2, Summer
PHYS 1001	Physics 1 (Regular)	6	**A** HSC Physics MATH (1001/1901, 1002/1902, 1003/1903). MATH 1005/1905 would also be useful. **N** 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** 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

■ Second 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	**P** 36 credit points. **N** CHNG 1302 Computing for Chemical Engineers 1B, MECH 1820 Introduction to Computing.	1
ELEC 2301	Signals and Systems	4	**A** MATH 1001 Differential Calculus, and MATH 1002 Linear Algebra, and MATH 1003 Integral Calculus and Modelling. **N** MATH 3019 Signal Processing and MATH 3919 Signal Processing (Adv).	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
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** MATH 2901.	1, Summer
MATH 2002	Matrix Applications	4	**P** MATH (1002 or 1902) or Distinction in MATH 1012. **N** 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** MATH 2905.	2, Summer
PHYS 2203	Physics 2EE	4		2
SOFT 2001	Concurrent Programming	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2901.	2
SOFT 2004	Software Development Methods 1	4	**Q** SOFT (1002 or 1902) or COMP (1002 or 1902). **N** May not be counted with SOFT 2904 or COMP (2004 or 2904).	1, Summer

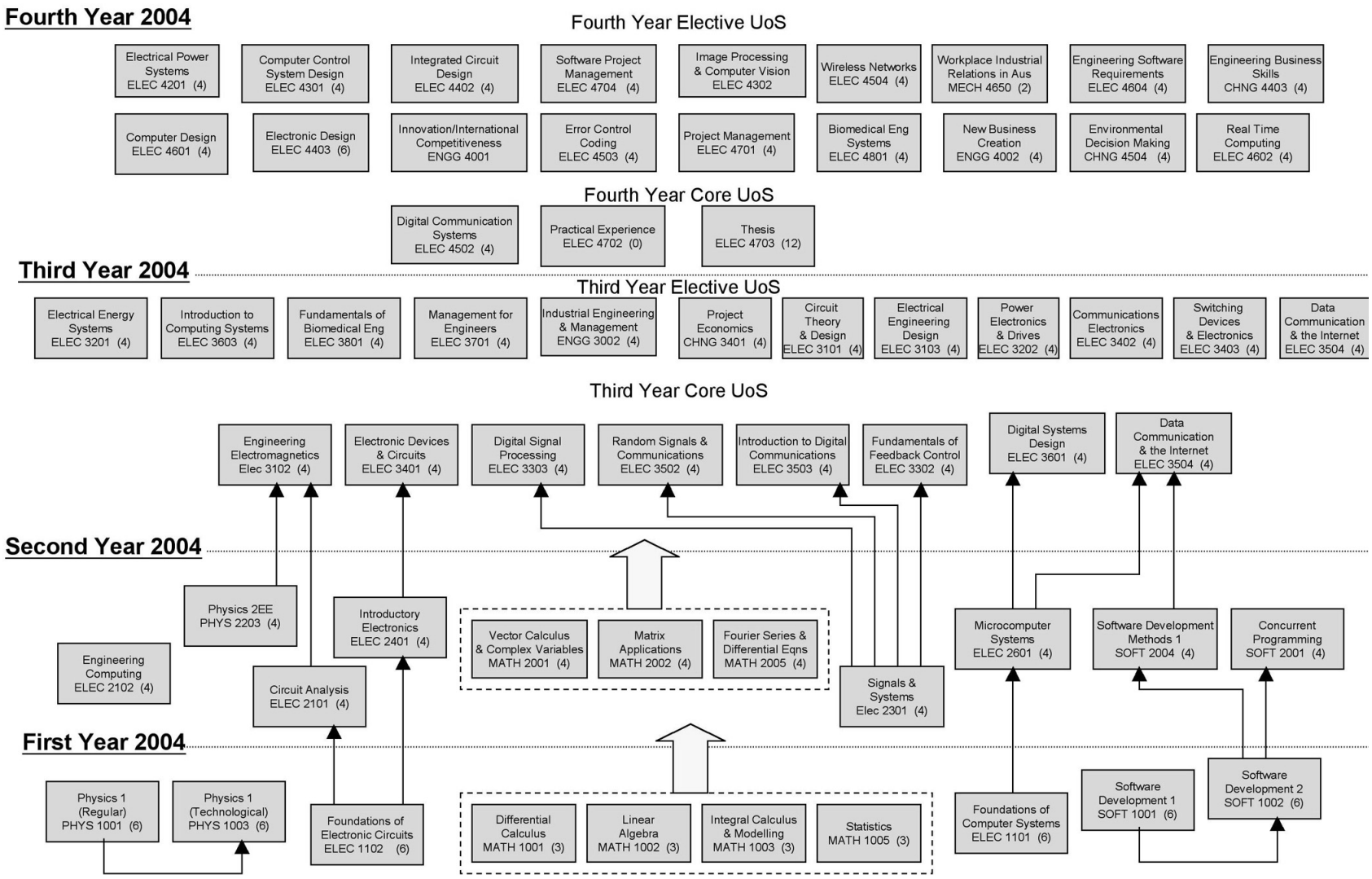
Telecommunications Engineering (continued)

Unit of study		CP	A: Assumed knowledge P: Prerequisite Q: Qualifying C: Corequisite N: Prohibition	Session
■ Third year				
ELEC 3102	Engineering Electromagnetics	4	**A** PHYS 2203 Physics2EE and (ELEC 2101 Circuit Analysis or ELEC 2001 Electrical and Electronic Engineering).	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 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	**A** (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice) and (NETS 2009 Network Organisation or ELEC 2601 Microcomputer Systems). **N** 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
■ Fourth 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	**P** 28 credit points of level 3 or 4 units of study.	1, 2
ELEC 4703	Thesis	12	**P** 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.

Telecommunications Engineering (Core and Elective UoS)

Please note that significant revisions will occur in Telecommunications Eng Curriculum for 2005_



■ 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 engineering. 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 Engineering.				
ENGG 1061	Advanced Engineering 1A	6	**P** UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **C** ENGG 1062 Advanced Engineering 1B. **N** Mutually exclusive with a number of other first year units of study. As these will vary depending on the stream of Engineering, students considering this option are advised to see their Head of Department prior to enrolment. *NB: Department permission required for enrolment. 1st year Interdisiplinary unit for all degree streams in Engineering. Permission required for enrolment.*	1
ENGG 1062	Advanced Engineering 1B	6	**P** UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **C** ENGG 1061 Advanced Engineering 1A. **N** Mutually exclusive with a number of other first year units of study. As these will vary depending on the stream of engineering, students considering this option are advised to see their Head of Department prior to enrolment. *NB: Department permission required for enrolment. 1st year Interdisiplinary unit for all degree streams in Engineering. Permission required for enrolment.*	1
ENGG 1002	Introduction to Engineering Leadership	2		N/A in 2004
ENGG 1800	Introduction to Engineering Disciplines	6	*NB: Department permission required for enrolment. Flexible first year core unit of study.*	1
ENGG 1801	Engineering Computing	6	**N** Introductory computer courses given at Junior Level (see current handbook, MECH 1820).	1
ENGG 1802	Engineering Mechanics	6		2
ENGG 1803	Professional Engineering 1	6		1, 2
ENGG 2002	Advanced Engineering Project	2	**P** Only students who have been named on the Dean's list at the end of Year 1 will be eligible. *NB: Department permission required for enrolment.*	2
ENGG 2003	Introduction to Engineering Management	4	**N** ELEC 3701, MECH 3620, MECH 3621.	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	**P** Only students who have been named on the Dean's list at the end of Year 2 will be eligible. *NB: Department permission required for enrolment.*	2
ENGG 3002	Industrial and Engineering Management	4	**P** ENGG 2003. **N** MECH 4610.	1
ENGG 4002	New Business Creation	4	*NB: Department permission required for enrolment.*	2
ENGG 4003	Commercial Engineering Practice	4		2
ENGG 4004	Advanced Engineering Design Project	12	**P** Only students on the Dean's List at the end of Year 3 will be invited to join this interdisciplinary group. *NB: Department permission required for enrolment.*	2

Note

1: This unit of study may be taken as an elective or as a replacement for one of the following units of study: CHNG 4201, CHNG 4202, CIVL 4001, CIVL 4002, CIVL 4003, CIVL 4004, ELEC 4703, MECH 4110, MECH 4610, MECH 4620, MECH 4650.

4 Undergraduate units of study

■ Aeronautical Engineering

AERO 1400 **Intro to Aircraft Construction & 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. Enrolment subject to number of places available.

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

Syllabus Summary

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

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

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

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

Objectives/Outcomes

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

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

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

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

AERO 1560 **Introduction to Aerospace Engineering**

6 credit points. **Session**: 1. **Classes**: (1 lec, two 2hr tut, one 3hr lab)/wk. **Prohibition**: MECH 1560 Introduction to Mechanical Engineering, MECH 1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. **Assessment**: Assignments, practical work.

NB: Unit of study Web Page: www.aeromech.usyd.edu.au/AERO1560

First Year course for the degree in Aeronautical and Space Engineering.

Objective / Outcome

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.

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

Glossary of terms for aerospace vehicles and their components. A 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.

Workshop Practice

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.

Reference

Jane's All the World's Spacecraft (Annual)
Jane's All the World's Aircraft (Annual)
Stinton The Anatomy of the Aeroplane (Collins, 1985)
Cutler Understanding Aircraft Structures (BSP Professional, 1988)

AERO 2201 **Fluid Mechanics 1**

4 credit points. **Session**: 2. **Classes**: (three lec, one 1hr lab/tut)/wk. **Prerequisite**: MATH 1001, MATH 1002, MATH 1003. **Prohibition**: MECH 2202 Fluids 1. **Assessment**: assignments, practical work, 2hr examination.

NB: Web page: www.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 non-dimensional parameters, Reynolds number, Mach number, Froude number, Weber number, Knudsen number.

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

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

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

Introduction to turbomachinery.

Textbooks

Fox and McDonald, Introduction to Fluid Mechanics (5th Ed, Wiley)
Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold, 1988)
Ower and Pankhurst The Measurement of Airflow (Pergamon, 1977)

AERO 2300 **Mechanics of Solids 1**

4 credit points. **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:0–13–016467–4, 848pp

AERO 2500 **Intro Flight Mechanics and Performance**

4 credit points. **Session**: 1. **Classes**: (3 lec, one 1hr 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 (Roskam A&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 1hr 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**: 1. **Classes**: (2 lec, one 1hr tut,)/wk one 3 hr lab. **Prerequisite**: AERO 2201 Fluid Mechanics 1 or 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.

Syllabus Summary

Navier-Stokes equations – derivation, significance and fundamental importance. Pipe flow – Bernoulli, shear losses, minor losses, networks. Pumps – pump types, characteristics, applications. Flow around a cylinder, lift, drag, etc. Boundary layers – derivation of equations, solution procedures for Laminar case, introduce the concept of turbulence, transition. Turbulence – concept, properties of turbulence, eddy viscosity, more advanced approaches. Turbulent flow near a wall – law of the wall, pipe flow velocity profiles. Channel flow – flow in a channel, weir, hydraulic jump, etc. Introduction to gas dynamics, steady one-dimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube. Introduction to steady two-dimensional supersonic flow.

Reference books

Potter & Wiggert, Mechanics of Fluids, Prentice Hall

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

Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)

Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)

Liepmann and Roshko Elements of Gas Dynamics (Wiley 1957)

Schlichting Boundary Layer Theory (McGraw Hill, 1960)

AERO 3301 **Aerospace Structures 1**

4 credit points. **Session**: 1. **Classes**: (3 lec, 1hr tut/lab) per week. **Prerequisite**: AERO 2300 Mechanics of Solids 1. **Assessment**: Assignments/lab reports and quizzes.

Objectives/Outcomes

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

Syllabus Summary
Solid mechanics; stress and strain; linear elasticity; strain energy. Plane stress systems. Elastic vibration and buckling. Structural analysis; airframe structures. Loads and reactions in airframes. Analysis of multi-cell box beams and tubes. Analysis of rings.
Reference books
Timoshenko Strength of Materials, Part I and II (Van Nostrand)
Langtiaar Energy methods in Applied Mechanics (Wiley)
Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)
Megson Aircraft Structures for Engineering Students (Edward Arnold, 1972)

AERO 3400 **Aircraft Design 1**
3 credit points. **Session**: 1. **Classes**: (1 lec, one 3hr tut)/wk. **Prerequisite**: AERO 2300 Mechanics of Solids 1 and MECH 2400 Mechanical Design 1. **Prohibition**: AERO 3401 Aerospace Design 1. **Assessment**: Tutorial assignments, major and minor design projects.
Objectives/Outcomes
To develop an understanding of the procedures for design. Students will gain skills in designing aircraft components.
Syllabus Summary
Introduction to design; the process of aircraft design; safety and its implications; component design; structural analysis.
Reference books
Svennson Introduction to Engineering Design (UNSW Press,1981)
Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

AERO 3401 **Aerospace Design**
4 credit points. **Session**: 1. **Classes**: 1 lec, one 3hr tut per week. **Prerequisite**: AERO 2300 Mechanics of Solids 1 and MECH 2400 Mechanical Design 1. **Prohibition**: AERO 3400 Aircraft Design 1. **Assessment**: Tutorial 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 3hr tut)/wk. **Prerequisite**: MECH 2400 Mechanical Design 1. **Assessment**: Assignments, major and minor design projects.
Objectives/Outcomes
To develop an understanding of the procedures for design. Students will gain skills in designing aircraft components.
Syllabus Summary
Optimisation; design for manufacture; joints and fasteners; vibration; fatigue; human factors, the art of design; social responsibilities.
Reference books
Svennson Introduction to Engineering Design (UNSW Press,1981)
Bruhn Analysis and Design of Flight Vehicle Structures (Tri-State Offset)

AERO 3500 **Flight Mechanics 1**
4 credit points. **Session**: 2. **Classes**: (3 lec, one 1hr 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 (Roskam A&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 mid-semester 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.
Syllabus Summary
Principles and practice of aviation and airline management. Discussion and analysis of airline operations. Flight safety and airworthiness standards. Risk and reliability management.
Textbooks
Reference books: To be advised by the Lecturer.

AERO 3700 **Space Engineering 2**
8 credit points. **Session**: 2. **Classes**: 4 lec, one 2hr tut/lab per week; site visits. **Prerequisite**: AERO 2701 Space Engineering 1 or AERO 2702 Space Engineering 1. **Assessment**: exam (50%), assignments(50%).
Objectives/ Outcomes
Students will gain skills in solving problems typically encountered in Space Engineering. An appreciation of the complexity of space vehicle design and component integration will be gained. Methods of program management to ensure absolute quality control will be shown to have paramount importance.
Syllabus Summary
Advanced spacecraft subsystems; propellant budgets, attitude control, thermal view factor calculations, nuclear generation of power, surface tension propellant tanks, sensor and actuator sizing.

Introduction to Quality Assurance; Product Assurance.

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

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

AERO 4200 **Aerodynamics 3**
3 credit points. **Session**: 1. **Classes**: (2 lec, one 1hr tut/lab)/wk. **Prerequisite**: AERO 3250 Aerodynamics 2. **Assessment**: 2hr exam(50%), assignments/lab reports(50%).
Objectives/Outcomes
To develop an understanding of modern applications of aerodynamic theory. Students will gain skills in problem solving using state of the art methods for air and fluid flows.
Syllabus Summary
Panel method techniques for the solution of inviscid two and three dimensional flows. Vortex lattice; doublette/vortex panel methods. Linearised compressibility corrections. Modelling of complete aircraft configuration.

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

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

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

Reference books

McCormick Aerodynamics,,Aeronautics and Flight Mechanics (Wiley, 1979)
Pankhurst and Holder Wind Tunnel Technique (Wiley)
Bertin and Smith Aerodynamics for Engineers (Prentice Hall 1979)
Abbott and Von Doenhoff Theory of Wing Sections (Dover 1959)
Houghton and Brock Aerodynamics for Engineering Students (Edward Arnold)
Anderson Fundamentals of Aerodynamics (McGraw-Hill, 1986)
Thompson Compressible Fluid Dynamics (McGraw-Hill)

AERO 4201 **Propulsion**

4 credit points. **Session**: 2. **Classes**: (3 lec, one 1hr tut/lab)/wk. **Prerequisite**: MECH 3203 Heat Transfer. **Assessment**: 2hr exam and 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, gas-turbine engines to rockets.

Syllabus Summary

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

Reference

McCormick Aerodynamics,,Aeronautics and Flight Mechanics (Wiley, 1979)
Glauert The Elements of Aerofoil and Airscrew Theory (C.U.P.)
Kerrebrock Aircraft Engines and Gas Turbines (MIT Press, 1977)
Archer and Salazsy Introduction to Propulsion (Prentice-Hall 1996)

AERO 4250 **Aerodynamics 4**

3 credit points. **Session**: 2. **Classes**: (2 lec, one 1hr tut/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 4290 **Rotary Wing Aircraft**

4 credit points. **Session**: 1. **Classes**: (3 lec, one 1hr tut/lab)/wk. **Prerequisite**: AERO 3250 Aerodynamics 2. **Assessment**: course assignments and a written examination.

Objectives/Outcomes

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

Syllabus Summary

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

Reference books

Bramwell Helicopter Dynamics (Arnold)
Gessow and Myers Aerodynamics of the Helicopter (Mcmillan)

AERO 4292 **Aeroelasticity**

3 credit points. **Session**: 2. **Classes**: (2 lec, one 1hr tut/lab)/wk. **Prerequisite**: AERO 3250 Aerodynamics 2. **Assessment**: Course assignments/lab assessments.

Objectives/Outcomes

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

Syllabus Summary

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

Reference books

Abbott and Von Doenhoff Theory of Wing Sections. (Dover,1959)
Bertin and Smith Aerodynamics for Engineers (Prentice Hall, 1979)
Fung An Introduction to Theory of Elasticity (Dover, 1969)

AERO 4305 **Aerospace Structures 2**

8 credit points. **Session**: 1. **Classes**: (3 lec, 3.5 hr tut/lab)/wk. **Prerequisite**: MECH 3310 Mechanics of Solids 2, AERO 3301 Aerospace Structures 1. **Assessment**: 2 hr exam, assignments, lab reports.

Objectives/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.R. Chandrupatla and A.D. Belegundu, Introduction to Finite 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

References

T.H.G. Megson, Aircraft Structures for Engineering Students, 2nd Edition, Edward Arnold, Amember of
the Hodder Headline Group, London Sydney Auckland, 1990
S.P. Timoshenko & J.N. Goodier, Theory of Elasticity, McGraw-Hill Book Company, 1985
SP 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 (Roskam A&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.

Syllabus Summary

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

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

Reference books

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

AERO 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 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

Etkin Dynamics of Atmospheric Flight (Wiley, 1972)
Roskam Airplane Flight Dynamics and Automatic Flight Controls (Roskam A&EC, 1979)
D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4590 **Advanced Flight Mechanics**

3 credit points. **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 modern aircraft. Students will gain skills in problem solving in the areas of dynamic aircraft behaviour, control systems and aircraft handling.

Syllabus Summary

Overview of aircraft dynamic system modelling.

Identification of dynamic systems. Model structure. Introduction to parameter estimation techniques. Application to estimation of aircraft static, dynamic and control derivatives.

Aircraft state estimation. State estimation in the presence of noise and modelling errors. Introduction to Kalman filtering.

Overview of applications of digital flight control systems. Review of classical continuous system controller characteristics and control system design. Discretised dynamic system characteristics. Controllability and observability. Modern control techniques and their application to guidance, control, navigation and structural-dynamic control problems. Common control system design software.

Reference Books

Stevens and Lewis Aircraft Control and Simulation (Wiley, 1992)
Roskam Airplane Flight Dynamics and Automatic Flight Controls (Roskam A&EC, 1979)
D'Azzo and Houpis Linear Control System Analysis and Design: Conventional and Modern (McGraw-Hill, 1995)

AERO 4600 **Practical Experience**

No credit points. **Session**: 1, 2. **Classes**: 12 weeks of prac work experience. **Prerequisite**: 40 credit points of 3rd year UOS. **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.

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.

AERO 4700 **Space Engineering 3**

4 credit points. **Session**: 1. **Classes**: (3 lec and one 1hr tut/lab) per week. **Prerequisite**: AERO 3700 Space Engineering 2. **Assessment**: Assignments.

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 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 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.

AMME 1060 **Engineering Applications**

6 credit points. **Session**: 2. **Classes**: (2 lec, one 3hr workstation lab)/wk. **Assessment**: Course tasks and Assignments.

NB: Unit of study Web site:
problemsolvers.aeromech.usyd.edu.au/

1st Year core course for the degree in Aeronautical Engineering, Mechanical Engineering, Mechatronic Engineering and Space Engineering.

Objectives/Outcomes

To provide competency in basic computational skills for engineering problem solving. 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 networks.

To extend students knowledge in the area of engineering dynamics and simulation. Students will formulate simulation models of simple dynamic systems in order to understand the governing principles, equations, and system behaviour.

Syllabus

Programming in an engineering environment:
(Based on the MATLAB programming language)

Review of 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. The use of graph plotting, curve fitting and interpolation to analyse results and predict outcomes. Search and retrieval of engineering data; use of online information systems and the Australian Standards.

Engineering applications

Problems in engineering dynamics, governing equations, analytical solutions, numerical solution techniques. Applications to solve problems relating to position, velocity and acceleration of a point; straight line motion; curvilinear motion; orbital mechanics; relative motion; force and acceleration; Newton's 2nd law; linear & angular momentum; collisions; work & energy; kinetic energy; potential energy; power. Introduction to iterative solution methods for non-linear problems; trajectory simulation; particle dynamics; mass flows & variable mass systems. Solution of simultaneous linear equations; applications in structural analysis. Introduction to the solution of ordinary differential equations; applications in fluid statics, structural mechanics. Introduction to SIMULINK and the solution of equations of motion.

Textbooks

J.L. Meriam and L.G. Kraige Engineering Mechanics
Volume 1, STATICS (SI version), 4th Edition and
Volume 2, DYNAMICS (SI version), 4th Edition

Reference

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)

■ Chemical Engineering

CHNG 1103 **Material & Energy Transformations Intro**

6 credit points. **Session**: 2. **Classes**: Summary: Material transformations related topics will include: unit systems and unit conversion; properties of fluids; mass balance calculations on flow systems; equilibrium compositions of reacting systems; vapour pressure and humidity. Energy related topics will include: first law of thermodynamics applied to flow systems; thermodynamic properties such as enthalpy, internal energy, heat capacities; calculations for ideal gas and liquid gas systems and thermochemistry. Introduction to HYSYS flowsheeting software package. **Assumed knowledge**: Aims: students should develop generic attributes in the following areas: Knowledge skills: develop a body of knowledge in the fields of material and energy balances; be able to apply theory to practice in familiar and unfamiliar situation; be able to identify, access, organise and communicate knoweldge gains. Thinking skills: be able to exercise critical judgement; be an independent thinker; adopt a problem solving approach. Personal skills: be able to work productively with others. Practical skills: test hypotheses experimentally; apply technical skills; use flowsheeting computational tools to analyse elementary problems. **Prerequisite**: Field trips to industrial sites will help put into context course material. These trips will highlight selected processes carried out in today's chemical and process industries, with particular emphasis on the material and energy transformations. The economic and environmental aspects of these processes will also be introduced and examined. **Prohibition**: Objectives: students should: develop an understanding of and competence in the formulation and solution of material and energy balance problems in engineering; develop competence in using basic flowsheet analysis and appropriate computational tools; improve their group work and problem solving skills; gain an ability to extract a simplified version of a problem from a complex situation.

This unit of study is an introduction to chemical engineering processes and calculations.

Practical: Tutorial exercises will expose students to a range of typical problems on process systems. Larger projects will allow students to apply approaches and procedures to more realistic scenarios and enable students to gain appreciation of how these techniques would be used in the engineering design process.

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 light-hearted design exercise brings the student body together, encouraging them to apply their understanding to unusual problems and to think laterally.

Students will develop generic skills in:
- technical problem solving
- scaling and thinking non-dimensionally
- operating and analysing process plant
- working in small groups on unusual problems.

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

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

CHNG 2301 **Chemical Engineering Computations**
4 credit points. **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: Department permission required for enrolment. 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: Department permission required for enrolment. 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 3101 Unit Ops (Heat Transfer)

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 heat-transfer mechanisms. Nucleate and flow boiling. Evaporators and reboilers. Radiation fundamentals. Black and non-black radiation and absorption. Radiation interchange between black and grey bodies. Electrical analogies. Reradiating surfaces. Gas radiation. Furnace calculations.

CHNG 3102 Unit Ops (Mass Transfer)

4 credit points. **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.

CHNG 3103 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 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 (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Prerequisite**: advisory prerequisites: CHNG 2101 Chemical Engineering 2A; CHNG 2102 Chemical Engineering 2B. **Assessment**: Assignments; final examination.

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

Objectives/Outcomes

The major objectives are:

(i) To perform energy analyses of process flowsheets.

(ii)To estimate the thermodynamic properties of fluids.

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

Syllabus

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

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

CHNG 3106 **Thermodynamics 2**

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

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

Objectives/Outcomes

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

Syllabus Summary

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

CHNG 3303 **Flowsheeting and Optimisation**

4 credit points. **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: Department permission required for enrolment. 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 process flowsheets and 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. **Classes**: Syllabus: The unit of study covers the range of technologies (physical, chemical and biological) which are available for treating for gaseous, liquid and solid waste streams, based on process principles.

NB: Department permission required for enrolment.

Third year elective unit of study for the degree in Chemical Engineering. Objectives/outcomes: Students will gain an understanding of the operational and legal framework surrounding waste generation and treatment. They will obtain an improved understanding of issues pertaining to management of environmental hazards in the process industry.

Textbooks

Tutorials, assignment and a 2 hour final examination.

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.

Practical: A minimum of 10 weeks work experience in a Chemical Engineering related industry.

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 4003 **Advances in Chemical Engineering A**

4 credit points. **Session**: N/A in 2004. **Classes**: Two (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Assessment**: Assignments; final examination.

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

Objectives/Outcomes

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

Syllabus

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

CHNG 4004 **Advances in Chemical Engineering B**

4 credit points. **Session**: N/A in 2004. **Classes**: Two (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Assessment**: Assignments; final examination.

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

Objectives/Outcomes

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

Syllabus

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

CHNG 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.

CHNG 4101 **Separation Processes**

4 credit points. **Session**: N/A in 2004. **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.

NB: Department permission required for enrolment.

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 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.

NB: Department permission required for enrolment.

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

Objectives/Outcomes

To develop an understanding of:

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

Students will develop skills in:

- Laboratory and conceptual work.
- Verbal and written communication (project work).
- Solving engineering problems involving polymers.

Syllabus Summary

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

CHNG 4104 **Reaction Engineering 2**

4 credit points. **Session**: N/A in 2004. **Classes**: Two (1 hr) lectures and one (2 hr) tutorial per week. **Prerequisite**: Advisory prerequisite: CHNG 3107 Reaction Engineering 1. **Assessment**: Tutorials (20%), assignment (20%) and a final examination (60%).

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

Objectives/Outcomes

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

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

(a) Refine the problem statement.
(b) Set up the equations which define the system.
(c) Select the appropriate numerical method / computer package to solve the equations.
(d) Present and discuss the results obtained and their implications with respect to the problem statement.

Syllabus Summary

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

CHNG 4105 **Advanced Thermodynamics**

4 credit points. **Session**: N/A in 2004. **Classes**: Three hours of lectures and tutorials per week for one semester. **Prerequisite**: Advisory prerequisites: CHNG 3105 and CHNG 3106. **Assessment**: May vary from year to year.

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

Objectives/Outcomes

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

Syllabus Summary

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

The syllabus details may change as specialist lecturers become available.

CHNG 4201 **Chemical Engineering Design 1**

4 credit points. **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.

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. **Qualifier**: WAM greater than credit average. **Assessment**: Thesis; case study reports; oral presentation; poster presentation.

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.

Syllabus
The major component of this unit of study is the conduct of a project in industry under joint University/industry supervision. The project will encompass many of the features of CHNG 4002 Thesis, but will be larger in scope. The student will be required to submit a bound report to both the University and any company involved.

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

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

CHNG 4301 **Advanced Fluid Dynamics Modelling**

4 credit points. **Session**: N/A in 2004. **Classes**: Four hours per week consisting of a mixture of lectures and practical sessions. **Assessment**: Assignments and project work.

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

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

Students will develop skills in:
- using a CFD package;
- breaking a complex problem into simpler pieces;
- solving real problems.

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

CHNG 4304 **Process Control 2**

4 credit points. **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. **Assumed knowledge**: CHNG 3302 Process Control 1; CHNG 4304 Process Control 2. **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 tutorialsl per week for one semester. **Assessment**: Participation in class exercises, tutorial work, reports and a final examination.

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

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

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

CHNG 4403 **Engineering Business Skills**

4 credit points. **Session**: 1. **Classes**: Three hours per week of group work with a (nominated) company for one semester, plus 3 one-hour lectures in semester 2. **Assessment**: Group report and a final examination at the end of 2nd semester.

NB: Department permission required for enrolment. Students MUST register with Young Achievement Australia early in Semester 1.

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

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

Syllabus Summary
Participants in this program will be exposed to a range of business issues including the following:
- the factors affecting business outcomes;
- the importance of cash flow management;
- the core requirements of any enterprise team (whatever its size);
- leadership and management skills;
- how specialist areas of expertise can combine to reach a common goal;
- the advantages and disadvantages of risk-taking, and ways of coping with both;
- strategies for achieving (and communicating) clear expectations, objectives and requirements in business and the community.

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

CHNG 4501 **Biochemical Engineering**

8 credit points. **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.
3. Provide an understanding of the major fundamental aspects of biochemical engineering.
4. Use this fundamental understanding to study some selected industrial applications.

Syllabus Summary

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

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

CHNG 4502 **Adv Topics in Environmental Engineering**

4 credit points. **Session**: N/A in 2004. **Classes**: Two (1hr) lectures plus one (1 hr) tutorial per week for one semester. **Prerequisite**: All four components of unit Operations; CHNG 3106 Thermodynamics 2. **Assessment**: tutorial assignments; project/s; possible final examination.

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

Objectives/Outcomes

To apply selected chemical engineering methods, principles, and processes to identify, analyse, and solve problems associated with the environment and/or sustainable development.

Syllabus

The syllabus will be adjusted from time to time in accordance with current staff and issues. The course may focus either on topic areas (such as energy, air, water cycles, soil systems, etc) or on tools and their application (such as modelling fate and transport processes, life cycle thinking, pollution prevention, risk assessment, etc).

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.

NB: Final year students enrolled in the Environment and Energy stream must enrol in this unit of study.

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 4601 **Advanced Particle Mechanics**

4 credit points. **Session**: N/A in 2004. **Classes**: 3hrs lec & tut/wk for one semester. **Prerequisite**: All four components of unit Operations. **Assessment**: Assignments and final examination.

Fourth Year elective unit for the degree in Chemical Engineering.

Syllabus summary

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

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

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

CHNG 4604 **Chemical Modelling of Aqueous Systems**

4 credit points. **Session**: 1. **Classes**: Three hours of lectures/tutorials per week for one semester. **Prerequisite**: CHNG 3101, CHNG 3102, CHNG 3103, CHNG 3104 and CHNG 3106. **Assessment**: Class assignments, tutorials and a final examination.

NB: Department permission required for enrolment.

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

Objectives/Outcomes

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

Students will develop skills in the following:

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

Syllabus Summary

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

Case studies and applications include: the removal/recovery of heavy metals (eg, Cd, Cu, Cr, Zn) from wastewaters; lime as a reagent; effect of atmospheric CO2 on metal precipitation and disposal; gypsum solubility; gas solubility, absorption and 'sour' water treatment; mineral processing (leaching, solvent extraction, flotation); complexing ligands (SO42-, Cl-, NH3, CO2, SO2); aluminium in the environment; aqueous corrosion.

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:

- devising strategies to achieve extraction process objectives, within the constraints imposed by social, economic and physical environments;
- working in groups;
- verbal and written communication.

Syllabus Summary

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

Hydrometallurgical processing of low-grade ores and electrowinning.

■ Civil Engineering

CIVL 2110 **Materials**

6 credit points. **Session**: 1. **Assumed knowledge**: CHEM 1001, ENGG 1802. **Assessment**: Laboratory assignments and one 3 hr closed book exam covering the whole syllabus at the end of the semester.

Objectives

To understand the mechanical properties of the materials used in civil engineering and their relation to the methods of manufacture and resulting microstructures.

Outcomes

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

Syllabus summary

Material properties of metals, concrete, timber, ceramics and soil. Fracture, fatigue, fire resistance, corrosion, durability, serviceability and the influence of these on the design and use of structures.

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

CIVL 2230 **Intro to Structural Concepts and Design**

6 credit points. **Session**: 2. **Classes**: 26 hours lectures, 39 hours design and tutorials. **Assumed knowledge**: ENGG 1802 Engineering Mechanics, CIVL 2110 Materials CIVL 2201 Structural Mechanics. **Assessment**: Design class assignments and one 3 hr closed book exam covering the whole syllabus at the end of the semester.

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

Objectives

To provide an understanding of design concepts and the design of steel, concrete and timber structures. To provide an understanding of limit states design and structural loading. To be aware of different foundation systems and their choice. To provide an introduction to design of steel, concrete and timber elements.

Outcomes

Proficiency in the selection of foundation and structural systems including bracing, and floor systems. Proficiency in the computation of permanent, imposed, wind and earthquake loads. Proficiency in the design of simple structural elements for flexure in concrete, steel and timber.

Textbooks

Introduction to Structural Concepts and Design Lecture Notes, Department of Civil Engineering, University of Sydney.

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

Reference Books

Chen, Handbook of Structural Engineering, CRC Press (1997)

Warner, Rangan, Hall and Faulkes, Concrete Structures (Longman)

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

Timber Design Handbook, SAA HB108–1998

CIVL 2410 **Soil Mechanics**

6 credit points. **Session**: 1, 2. **Classes**: 39 hours lectures, 13 hours tutorial, 13 hours laboratory. **Assumed knowledge**: CIVL 2201 Structural Mechanics. **Assessment**: Tutorials, laboratory reports, mid-semester test, final 3 hour exam.

Objectives

To develop an understanding of: the nature of soils as engineering materials; the common soil classification systems and their uses; the importance of water in the soil and the engineering effects of water movement; the factors controlling soil settlement and the methods of settlement calculation; the concept of soil strength and how this can be used to calculate earth pressures.

Outcomes

Students will be able to: Give an engineering classification of any piece of soil, and on this basis predict how it will perform as an engineering material; understand the principle of effective stress, and be able to apply this to calculate the stresses causing soil deformation; calculate quantities of water flowing through the ground, and understand the engineering consequences of water flow; calculate the settlements, and rates of settlement, under structures of various shapes and sizes; explain the advantages and limitations of the different methods of settlement calculation; determine the strength parameters appropriate to a range of stability problems, and understand the difference between total and effective stress approaches; evaluate strength parameters from laboratory data

Syllabus summary

Terminology, Soil classification, Compaction, Effective stress, Steady state seepage, One-dimensional compression, Stresses beneath loaded areas, 1-D settlement analysis, Consolidation, Numerical analysis of consolidation, 3-D settlement analysis using elasticity, Shear strength, Introduction to critical state soil mechanics, Earth pressure theories.

Reference books

C.R. 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 2611 **Fluid Mechanics**

6 credit points. **Session**: 2. **Classes**: 26 hrs lectures, 42 hours laboratory & tutorial. **Assumed knowledge**: Assumed knowledge: MATH 1001, MATH 1002, MATH 1003, MATH 1005. **Assessment**: Reports, tutorials and assignments.

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: visualize and determine fluid movements and forces in pipes and open channels and around bodies in fluid streams; understand energy principles related to fluid mechanics.
Syllabus summary
Equations of motion. Velocity patterns. One-dimensional flow principles. Flow measurements. Open channel flow. Viscous and turbulent flow. Resistance to flow of fluids. Flow in closed conduits.

CIVL 2810 **Engineering Construction and Surveying**
6 credit points. **Session**: 1. **Classes**: 39 hrs lectures, 42 hours fieldwork & tutorial. **Assumed knowledge**: MATH 1001, MATH 1002, MATH 1003, MATH 1005. **Assessment**: Regular coursework, fieldwork, reports, tutorials and assignments.
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. To provide basic analogue methods of distance, angle and height measurement. To provide an understanding of three dimensional mapping using basic total station electronic field equipment with associated data capture ability. To give an insight into future trends in the use of GPS and GIS systems.
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. Proficiency in the design and implementation of mapping systems in Civil Engineering, using analogue and electronic field equipment and associated software packages.
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. Introduction to engineering surveying, distance measurement, angle measurement, levelling, traversing, topographic surveys, electronic surveying equipment, future surveying technologies.

CIVL 3235 **Structural Analysis**
6 credit points. **Session**: 2. **Assumed knowledge**: CIVL 2201 Structural Mechanics, CIVL 2230 Introduction to Civil Engineering Design, Math 2002 Matrix Applications and MATH 2005 Fourier Series and Differential Equations. **Assessment**: One 3 hr exam at end of semester plus assessment of assignments.
Third year A-elective unit of study for the degree in Civil Engineering.
Objectives
To provide an understanding of the principles of structural analysis by a) introducing the strain-displacement, stress-strain and equilibrium relationships for beam members, b) applying the relationships to the matrix displacement analysis of frame structures and c) using computer software to conduct the linear-elastic and buckling analyses of frame structures.
Outcomes
To be able to a) deduce appropriate structural models for frame structures, and b) use computer methods and simple hand methods to obtain internal forces and displacements as well as buckling loads for frame structures.
Syllabus summary
Theoretical background (strain-displacement, stress-strain and equilibrium relationships), types of analysis, model generation, matrix displacement method, introduction to the finite element analysis, buckling analysis.
Library classification:
620.1 Engineering Mechanics
624.17 Structural Analysis

CIVL 3411 **Foundation Engineering**
6 credit points. **Session**: 2. **Classes**: 26 hours lectures, 52 hours project work. **Assumed knowledge**: CIVL 2410 Soil Mechanics. **Assessment**: 3 projects, final 2 hour exam.
Objectives
To develop an understanding of how the concept of soil strength is used in estimating foundation stability; to develop an understanding of current methods used in the investigation and design of foundations and the limitations of these methods.
Outcomes
Students will be able to: evaluate strength and stiffness parameters from laboratory and field data; critically analyse foundation stability and slope stability problems; develop and use spreadsheets to perform parametric studies and produce design charts for simple foundation design problems; develop an appreciation of the interaction between soil, the foundation system, and the supported structure; communicate the results of experiments and analyses using written, visual and oral methods appropriate for professional geotechnical engineers.
Syllabus
Site investigation, Slope stability, Design and analysis of retaining walls, Design and analysis of shallow foundations, Strip and raft foundations, Pile foundation analysis and design
Reference Books
Tomlinson Foundation Design and Construction
Peck et al Foundation Engineering
Poulos and Davis Pile Foundation Analysis and Design
Fleming et al Piling Engineering

CIVL 3510 **Surveying**
2 credit points. **Session**: 1. **Classes**: 13 hrs lectures, 18 hours fieldwork & tutorial. **Assumed knowledge**: MATH 1001, MATH 1002, MATH 1003, MATH 1005. **Assessment**: fieldwork, reports, tutorials and assignments.
Objectives
To provide basic analogue methods of distance, angle and height measurement. To provide an understanding of three dimensional mapping using basic total station electronic field equipment with associated data capture ability. To give an insight into future trends in the use of GPS and GIS systems.
Outcomes
Proficiency in: the design and implementation of mapping systems in Civil Engineering; using analogue and electronic field equipment and associated software packages.
Syllabus summary
Introduction to engineering surveying, distance measurement, angle measurement, levelling, traversing, topographic surveys, electronic surveying equipment, future surveying technologies.

CIVL 3612 **Environmental and Fluids Engineering**
6 credit points. **Session**: 1. **Assumed knowledge**: CIVL 2611 Fluid Mechanics.
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; to determine machine requirements for various systems; and to determine the stability of vessels.
Syllabus summary
Floating vessels, dimensional analysis and similitude, open channel flow, flood routing, pipe networks, hydro and aero-foils, pumps and turbines, compressible flow, and unsteady flows.

CIVL 3613 **Coastal Engineering**
6 credit points. **Session**: 2. **Assumed knowledge**: CIVL 2611 Fluid Mechanics CIVL 3612 Environmental and Fluids Engineering.
Objectives
To develop an understanding of: ocean wave generation, transmission and coastal effects; the principles of sediment transport; break-water design, fluid-structure interaction; flood detention basins, and advanced flood routing techniques.
Outcomes
Students will be able to: list and describe the major parameters affecting ocean wave generation; describe the processes of ocean wave transmission; calculate energy transfer by waves; describe the behaviour of waves in shallow water; explain the fundamental principles of sediment transport; describe sediment transport processes in rivers; describe coastal sediment transport processes; explain basic performance requirements for breakwaters, and factors considered in their design; describe several fluid structures, together with associated fluid-structure interaction, including, but not limited to, spillways, stilling basins, bridge piers, water supply intakes; describe design considerations for flood detention basins; explain the principles of advanced flood routing techniques utilizing computer programs.

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

CIVL 3812 **Project Appraisal**
6 credit points. Coordinator Prof. A. Jaafari. **Session**: 2. **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 3813 **Contracts Formulation and Management**
6 credit points. **Session**: 2. **Assumed knowledge**: CIVL 3805 Project Scope, Cost & Time Management.
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.

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 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)

CIVL 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 they will work as professional engineers.
Outcomes
Knowledge of occupational health and safety act; knowledge of procedures for quality assurance both in design and construction; understanding of industrial relations issues; understanding of basic civil engineering contracts; awareness of ethical issues related to the engineering profession, and the social responsibility of engineers.
Syllabus summary
The lectures will be delivered by practising engineers and other experts in the following subject areas: (a) Social responsibility in engineering, social and environmental issues and ethics of engineering practice; (b) Industrial relations, legal contracts and law; (c) Occupational health and safety, (d) quality assurance; (e) engineering contracts and documentation.
Reference books
As advised during course, and:
Tagg et al. Civil Engineering Procedure (Thomas Telford).
Wearne Civil Engineering Contracts (Thomas Telford).

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

CIVL 4218 Concrete Structures 2

5 credit points. **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
AS1170 Parts 1 and 2 Loading Code, and
AS3600 Concrete Structures Code, or
AS HB2.2 Structural Engineering Standards.

Reference books

Lin and Burns Design of Prestressed Concrete Structures (Wiley).
Park and Gamble Reinforced Concrete Slabs (Wiley).
Other books as indicated in classes.

CIVL 4219 Structural Dynamics

5 credit points. **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. (Allen & Unwin, 1983).
Clough & Penzien Dynamics of Structures (McGraw-Hill Book Co., 1993).
'Vibrations in Civil Engineering', Postgraduate Course, Department of Civil Engineering, The University of Sydney, May, 1981.
AS 1170.2–1989 SAA Loading Code Part 2: Wind Loads (Standards Australia).
Aynsley, Melbourne and Vickery Architectural Aerodynamics (Applied Science Publishers).
Narayanan and Roberts Ed. Structures Subjected to Dynamic Loading (Elsevier Applied Science).
Holmes, Walker and Melbourne A Commentary on the Australian Standard for Wind Loads (Australian Wind Engineering Society).

CIVL 4220 Steel Structures 2

5 credit points. **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.

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-frequency-duration curves and explain their use; calculate design rainfall intensities; calculate peak flows from catchments; determine runoff hydrographs for various storm durations and intensities; state the principles of flood routing and perform flood routing calculations; assess surface runoff and infiltration in catchment; list and utilise design procedures for storage and service reservoirs; calculate reservoir safe yield; determine evaporation from reservoirs and evapo-transpiration from catchments.

Textbooks

Australian Rainfall and Runoff (I.E. Aust., 1987).
Computer Applications in Hydraulic Engineering Haestad Press

Reference books

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

CIVL 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 re-use; irrigation techniques and demands; hydro-power systems.

Outcomes

Students will be able to: state the requirements of water quality for various purposes; detail the physical methods of water treatment; detail the biological methods used in water treatment; detail the chemical methods used in water treatment; design multi-node water distribution networks; explain the design principles of water supply for high-rise buildings; describe water conservation methods and management principles for water use, including storm water detention and treatment; explain 'grey water' re-use techniques and their applications; describe various irrigation methods and associated hydraulic design; design small scale hydro-power installations.

CIVL 4803 Engineering Management

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

Syllabus summary:

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

Textbooks

Lecture Notes on Operations Analysis and Management.

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

Reference books

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

Barrie and Paulson. Professional Construction Management.

CIVL 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 – High Strength Structural Bolting Code

MAI Steel Structures

Austroads Bridge Design Specification

AS1720 – Timber Engineering Code

(Purchase of separate codes is recommended)

■ Electrical Engineering

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

4 credit points. **Session**: 1. **Classes**: Two lectures and a 2hr tutorial/ laboratory per week. **Assumed knowledge**: COMP 1002 Introductory Computer Science or SOFT 1002 Software Development 2. **Assessment**: Three assignments and a 2hr exam at end of semester.

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

The unit aims to examine the main issues involved in designing and managing successful Internet projects. The unit does not address implementation issues (eg, programming).

The unit has five modules:

- Electronic Commerce Technology Fundamentals: Computer and communications technology for electronic commerce. Electronic shops, markets and trading.
- Business to Consumer Electronic Commerce: Introduction to web design for electronic sales and service.
- Business to Business Electronic Commerce: The business supply chain, software support for business transactions, EDI standards.
- Business to Employee Electronic Commerce: Software support for internal management, intranets, the paperless office.
- Electronic Commerce Project: Describing and managing an e-commerce project.

EBUS 3002 **E-Commerce Website Programming**

4 credit points. **Session**: 2. **Classes**: One 2hr lecture and a 2hr lab/tut per week. **Assumed knowledge**: EBUS 3001 Introduction to E-Commerce Systems and (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice). **Assessment**: Assignments, online work and an exam at the end of semester.

Core unit of study for the degree Bachelor of Engineering (Electronic Commerce). Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

This unit of study provides the skills required to implement a basic dynamic database driven Web site. The unit has four modules:

- Client-side programming, mark-up languages, scripting and tools.
- Server-side scripting.
- Database programming.
- Web engineering topics: security, integration and data warehousing.

EBUS 5001 **E-Commerce Application Programming**

4 credit points. **Session**: 1. **Classes**: one 2hr lecture and a 2hr lab per week. **Assumed knowledge**: EBUS 3001 Introduction to E-Commerce Systems. **Prohibition**: ELEC 5608 Electronic Commerce.

Core unit of study for the degree Bachelor of Engineering (Electronic Commerce). Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

This unit focuses on the development of E-Commerce web-applications using Java Servlets and JSP under a J2EE environment. The unit is designed to provide students with the skills and knowledge required to develop enterprise web applications.

The unit has four modules: JSP and Java Servlets, accessing databases using JDBC, SQL and PL/SQL queries, parsing and building XML documents, and implementing web services using XML and SOAP.

Students will apply the material covered in lectures during the laboratory sessions, where a significant web-application will be developed in stages over the semester. Some prior experience in software design (preferably Java), XML concepts and SQL query syntax will be assumed.

EBUS 5002 **E-Commerce Systems**

4 credit points. **Session**: 2. **Classes**: two 1hr lectures and a 2hr lab/tut per week. **Assumed knowledge**: EBUS 5001 E-Commerce Application Programming. **Assessment**: Lab mark and an exam at end of semester.

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

This unit focuses on the development of E-Commerce web applications and application frameworks. The unit has four modules: Introduction to Web Application Frameworks; Middleware and distributed frameworks; PLSQL Database programming and TCL Server Scripting and a case study of the OACS Application Framework.

Students will apply the material covered in lectures during the laboratory sessions, where a significant web-application framework such as a contect management system will be extended in stages over the semester.

Students will be expected to be familiar with the material covered in

EBUS 5001, namely J2EE, XML, JDBC and SOAP.

ELEC 1101 **Foundations of Computer Systems**

6 credit points. **Session**: 1, Summer. **Classes**: Two 1hr 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 2hr tut 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 1hr 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.

Microprocessor fundamentals: architecture of a standard 8-bit microprocessor. Instruction set and addressing modules. Assembly language programming. Clock and reset circuits. Memory and I/O interfacing.

ELEC 2003 **Electrical and Electronic Engineering A**

4 credit points. **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 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 1hr 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 1hr 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 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.

ELEC 2301 **Signals and Systems**

4 credit points. **Session**: 2. **Classes**: Two 1hr 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, time-invariance, causality, stability. Linear time-invariant (LTI) systems: the convolution sum and convolution integral, characterisation by differential and difference equations, impulse response, singularity functions. Fourier series for continuous-time and discrete-time signals: definition, properties and effects of symmetry, periodic signals and LTI systems. Fourier transform for continuous-time and discrete-time signals: definition and properties, the generalised transform. Frequency response of LTI systems, linear and non-linear phase, Bode plots. Introduction to filtering. Sampling: impulse train sampling, the sampling theorem, reconstruction of signals, effects of undersampling. Laplace and z-transforms: definitions of bilateral and unilateral transforms, properties, pole-zero maps, analysis of LTI systems, transfer functions.

ELEC 2401 **Introductory Electronics**

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures per week, and a 1hr 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**: one 1hr lecture per week and nine 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 1hr 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 3201 **Electrical Energy Systems**

4 credit points. **Session**: 1. **Classes**: Two 1hr lectures and one 2hr lab/tut per week. **Assumed knowledge**: ELEC 2101 Circuit Analysis. **Assessment**: Tutorials, one 1hr 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 1hr 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.

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

ELEC 3303 Digital Signal Processing

4 credit points. **Session**: 1. **Classes**: Two 1hr 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 Engineering.

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. IIR 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 1hr lectures per week, a 3hr lab and a 1hr 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 Telecommunications 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 opto-electronic 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 1hr 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 (TTL, Schottky TTL, nMOS and CMOS), inverter and basic gates, output stage (open drain and tri-state), metastability and latch-up in CMOS, logic family characteristics (voltage levels, noise margins, power and switching speed), interfacing logic families, protection and opto-isolators, digital circuits (switch debouncing, driving relays, reset circuits, oscillators), high speed analogue interfacing (transmission line effects and termination, inductive loads, line drivers, RFI, crosstalk and shielding).

ELEC 3502 Random Signals and Communications

4 credit points. **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 conversion and demodulation, frequency/phase modulation (FM/PM), transmission bandwidth and distortion, generation and detection of FM/PM, interference, receivers for FM/PM, frequency division multiplexing, a case study of analog communication systems, noise in analog communication systems.

ELEC 3503 Introduction to Digital Communications

4 credit points. **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**: A 1hr 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 Mechatronics 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, erasable programmable logic devices (EPLD), field programmable gate arrays (FPGA), state machine design, datapath functions, computer arithmetic, serial and parallel arithmetic-logic-units, computer design, computer upgrade design exercise, design for testability, arithmetic pipe-lines, digital systems design project, specification languages, simulation.

ELEC 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 1hr lectures and a1hr 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, electromyogram, electroneurogram. Introduction to diagnostic imaging systems – principles of CT scanning, ultrasonic, nuclear and magnetic resonance imaging. Biomedical signal processing – sampling, A/D and D/A conversion, digital filters, ECG detection methods and systems.

ELEC 4201 **Electrical Power Systems**

4 credit points. **Session**: 1. **Classes**: Two 1hr lectures and a 1hr 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 4302 **Image Processing and Computer Vision**

4 credit points. **Session**: 1. **Classes**: Two 1hr 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.

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 4502 **Digital Communication Systems**

4 credit points. **Session**: 1. **Classes**: Two 1hr 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 multi-channel 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 1hr 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, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording, convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission, multidimensional codes, turbo codes.

ELEC 4504 **Wireless Networks**

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures and a 1hr 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 MobileIP. WAP.

ELEC 4601 **Computer Design**

4 credit points. **Session**: 1. **Classes**: Two 1hr lectures and a 2hr lab/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 1hr lectures and a 2hr lab/tut per week. **Assumed knowledge**: ELEC 3601 Digital Systems Design or ELEC 3603 Introduction to Computing Systems. **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 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. **Prerequisite**: 28 credit points of level 3 or 4 units of study. **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 that 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 unit 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 by a responsible officer of the company prior to submission.

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 1hr 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 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 5501 Advanced Communication Networks

4 credit points. **Session**: 2. **Classes**: two 1hr 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.

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 1hr lectures and a 1hr 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 1hr 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, log-normal fading, mean propagation loss, propagation models. Cellular technologies: cell types, coverage, frequency allocation, link budget, power budget, traffic capacity. TDMA cellular systems – GSM standard: coding and modulation, special characteristics and features, logical and physical channels, frame structure, general packet radio services (GPRS), GSM evolution towards UMTS. CDMA cellular systems – IS-95 standard: physical and logical channels, asynchronous data, short message service, packet data services for CDMA cellular/PCS systems, cdma 2000 layering structure.

ELEC 5506 Optical Networks

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures and a 1hr 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 1hr lectures and a 1hr 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 1hr lectures and a 1hr 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 5610 **Computer and Network Security**

4 credit points. **Session**: 1. **Classes**: Two 1hr 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.

■ Mechanical Engineering

MECH 1560 **Introduction to Mechanical Engineering**

6 credit points. **Session**: 1. **Classes**: Two 1 hour classes and one 3 hour lab/week. **Prohibition**: AERO 1560 Introduction to Mechanical Engineering, MECH 1751 Introductiory Mechatronic Engineering, MECH 1600 Manufacturing Technology. **Assessment**: In class assessments, assignments, exam, practical work.

First year core unit of study for Mechanical and Biomedical Engineering students.

Syllabus

Introductory Mechanical and Biomedical Engineering (3 Cr):

Subject introduces the Mechanical and Biomedical Engineering degrees. An overview of the range of roles of a Mechanical and Biomedical engineer (people, case studies, guests, etc.). The skills/knowledge required of an engineer and the relationship between the subjects in the degree program and how they are applied by practicing engineers. Fundamentals of machinery and equipment common to these two degrees, with some introductory analysis techniques and problem solving methods.

Manufacturing Technology (3 Cr):

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.

Workshop Technology practical work in:

(a) Fitting – Measurement, marking, hammers, cutting, tapping and screwing, reaming and scraping.
(b) Machining – lathe, mill, grinder, drill, shaper, and finishing operations.
(c) Welding – Practical work in gas and electric welding.
(d) Blacksmithing and forging.
(e) Foundary – moulding and casting.

Objectives

- To develop an understanding of the role of Mechanical or Biomedical engineers.
- To understand the content of the degree structure and how the subjects are applied.
- To develop an understanding of a range of machining and manufacturing processes required to make mechanical components.

Expected outcomes

Students will be able to:

- Work in a group.
- Communicate effectively
- Recognise the engineering content of common machinery and systems.
- Analyse simple engineering problems

Student will develop skills in machining and manufacturing methods through practical experience.

MECH 1751 **Introduction to Mechatronics Engineering**

6 credit points. **Session**: 1. **Classes**: One 2 hour lecture/tut and one 3 hour lab/week. **Prohibition**: AERO 1560 Intro to Aerospace Engineering, MECH 1560 Intro Mechanical Engineering, MECH 1600 Manufacturing Technology. **Assessment**: In class assessments, assignments, exam, practical work.

First year core unit of study for Mechatronic Engineering students.

Syllabus

Mechatronic Design: (2 Cr):

Introduction to the design of mechatronic systems. Elements of mechatronic systems; actuators, sensors. Industrial examples.

Manufacturing Technology (3 Cr):

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.

Workshop Technology practical work in:

(a) Fitting – Measurement, marking, hammers, cutting, tapping and screwing, reaming and scraping.
(b) Machining – lathe, mill, grinder, drill, shaper, and finishing operations.
(c) Welding – Practical work in gas and electric welding.
(d) Blacksmithing and forging.
(e) Foundary – moulding and casting.

Objectives:

- Develop skills in the use of mechatronics elements.
- To develop an understanding of a range of machining and manufacturing processes required to make mechanical components.

Expected outcomes

Students will be able to:

- Develop an understanding of the design of mechatronic systems.

Student will develop skills in machining and manufacturing methods through practical experience.

MECH 1760 **Mechatronics 1**

6 credit points. **Session**: 2. **Classes**: Two 1hr lec and two 2hr lab/tut/ week. **Assumed knowledge**: HSC Maths Extension 1. **Prohibition**: ELEC 1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC 1902 Computational Science in C (Advance), COSC 1002 Computational Science in C. **Assessment**: Assignments and exam.

First year core unit for Mechatronic Engineering students.

Objectives

To provide an introduction to the analysis and design of digital logic circuits. To provide a foundation for the study of systems and embedded programming for the degree in Mechatronic Engineering.

Syllabus Summary

Introductory Digital Systems 3 CR: 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.

Introductory Software Engineering (3 Cr): 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 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.
- Students will develop skills in the design, coding, documentation, debugging, testing of computer programs.

Textbooks
Wakerly, Introduction to Digital Design, 3ed., Prentice-Hall, 2000. Library Classification: 621.3819, 621.39
Deitel & Deitel, C How to Program, 3ed, Prentice-Hall, 2001
Reference
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 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 2200 Thermofluids, AERO 2201 Fluid Mechanics 1. **Assessment**: One 1 1/2 hr exam, assignments and laboratory work.
Second year unit of study for the degrees in Mechanical and Mechatronic Engineering.
Syllabus Summary
Fluid properties, pressure, shear, hydrostatics, forces, moments, buoyancy, stability, continuity equations, streamlines, Euler, Bernoulli equations, linear momentum, propulsion, angular momentum, turbomachinery, dimensional analysis, boundary layers, pipe flow and friction.
Objectives
The understanding of fluids fundamentals.
Expected outcomes
To be able to analyse engineering problems involving fluid flow.
Textbooks
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 hr tut/wk plus two 3hr lab sessions. **Prohibition**: CIVL 2101 Properties of Materials. **Assessment**: One 2 hr exam plus assignment work.
Second year core unit of study for the degrees in Mechanical Engineering and Aeronautical Engineering.
Syllabus Summary
Materials classification; understanding materials properties and their relation to structure as a function of forming methods and heat treatment processes; materials behaviour in service; selection criteria and case studies for engineering applications.
Objectives
To understand the classification of engineering materials, their properties in relation to microstructure.
Expected outcomes
Students should be able to appreciate the properties of a range of engineering materials and how and why these are connected with microstructures and forming and treatment methods.
Textbooks
Callister Jr Materials Science and Engineering – An Introduction 3rd edn (John Wiley, 1994)
Reference books
Ashby and Jones Engineering Materials 1-An Introduction to their Properties and Applications (Pergamon, 1981)
Ashby and Jones Engineering Materials 2-An Introducjtion to Microstrucjtures, Processing and Design (Pergamon, 1986)
Bailey The Role of Microstructure in Metal (Metallurgical Services, 1966)
Bailey Introductory Practical Metallography (Metallurgical Services, 1966)
Bailey The Structure and Strength of Metal (Metallurgical Services, 1967)
John Understanding Phase Diagrams (Macmillan, 974)
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**: MATH 1001, MATH 1002 and MECH 1530 Engineering Mechanics or MECH 1510 Kinematics & Dynamics or PHYS 1001. **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. **Prerequisite**: MECH 1701 Introductory Digital Systems and MECH 1702 Introductory Software Engineering. **Prohibition**: ELEC 2601 Microcomputer Systems. **Assessment**: Exam and assignments.

NB: Website: www.acfr.usyd.edu.au/teaching/2nd-year/mech2701-Mx2

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.

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. 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 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 Thermofluids or MECH 2201 Thermodynamics 1. **Prohibition**: MECH 3200 Thermal Engineering 1. **Assessment**: One 2hr exam, assignments and laboratory reports.

Third year year core unit of study for the degree in Aeronautical, Mechanical and Space Engineering

Syllabus summary

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

Objectives

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

Expected outcomes

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

Textbooks

Cengel and Boles Thermodynamics, an Engineering Approach (McGraw-Hill) 2nd Edn.
Library Classification: 536.7, 621.4

MECH 3203 **Heat Transfer**

4 credit points. **Session**: 2. **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.

Syllabus summary

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 DeWitt Fundamentals of Heat and Mass Transfer (Wiley)
Library Classification: 536.2

MECH 3211 **Fluid Mechanics 2**

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

3rd Year core course for the degree in Mechanical Engineering

Syllabus Summary

Navier-Stokes equations – derivation, significance and fundamental importance. Pipe flow – Bernoulli, shear losses, minor losses, networks. Pumps – pump types, characteristics, applications. Flow around a cylinder, lift, drag, etc. Boundary layers – derivation of equations, solution procedures for Laminar case, introduce the concept of turbulence, transition. Turbulence – concept, properties of turbulence, eddy viscosity, more advanced approaches. Turbulent flow near a wall – law of the wall, pipe flow velocity profiles. Channel flow – flow in a channel, weir, hydraulic jump, etc. Introduction to gas dynamics, steady one-dimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube. Introduction to steady two-dimensional supersonic flow.

Objectives/ Outcomes
To develop an understanding of the fundamental equations governing aerodynamics and their application to aeronautical problems. Students will gain skills in problem solving in area of flow theory, boundary layers and gas dynamics.
Reference books
Potter & Wiggert, Mechanics of Fluids, Prentice Hall
McCormick Aerodynamics,,Aeronautics and Flight Mechanics (Wiley, 1979)
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 and assignments as specified at the commencement of the semester.
Third year core unit of study for the degrees in Aeronautical and Mechanical Engineering.
Syllabus summary
Short-term and long-term mechanical properties, introductory fracture and fatigue mechanics, dislocations, polymers and polymer composite materials, ceramics and glasses, structure-property relationships, selection of materials in mechanical design.
Objectives
(a) to understand the relationship between properties of materials and their microstructures; and
(b) to improve mechanical design based on knowledge of mechanics and properties of materials.
Expected outcomes
Students should gain the capabilities to select proper materials for simple engineering design.
Textbooks
Lecture notes
Reference Books
Ashby & Jones Engineering Materials 1 (Butterworth Heinemann)
Ashby & Jones Engineering Materials 2 (Butterworth Heinemann)
Higgins Properties of Engineering Materials (Edward Arnold)
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 quizzes.
Third year core unit of study for the degrees in Mechanical and Mechatronic Engineering
Syllabus Summary
The following areas of design are usually included, together with others which may be added: 3 Dimensional drawings and solid models. Application programming from within a CAD system. Scheduling design and manufacturing tasks, Analysis of springs. Evolution and selection of CAD system for design and drafting applications. Hydrodynamic bearings. Gears and gear drives. Clutches and brakes. Open ended projects that utilises many elements of the unit of study.
Objectives
To provide students with techniques with which they can analyse classes of machine components. To demonstrate that these techniques have common underlining principles which may be applied with various degrees of precision. To make the student aware of the range of machinery that has thus far been invented and developed and how this process is continuing. To provide an understanding of the functions of the design engineer in a company structure and the effectiveness of management techniques in ensuring successful designs.
Expected outcomes
Students will be able to set up mathematical models representing the stresses, deflection and fatigue life expectancy of a range of machine components. This will provide the student with the means of applying the underlining principles to new parts and assemblies. To be able to function in a team, set up communication links, distribute work load and make adjustments leading to desired conclusions.
Textbooks
R.L. Norton Machine Design, An Intergrated Approach (Prentice Hall), or
J.Shigley et al Mechanical Engineering Design (McGraw-Hill)
Reference Books
Orlov Fundamentals of Machine Design Vol I to V (M.I.R. Moscow)
Library classification: 621.815, 001.6443

MECH 3500 **Engineering Dynamics 2**

4 credit points. **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 3 hr exam, assignments and laboratory work.

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

Syllabus Summary

Vibration of machines and structures. Modelling of linear and nonlinear mechanical systems; equations of motion; state-space representation; numerical solution. Linear system analysis in the frequency and time domains; transfer functions. Matrix formulation for multi-degree-of-freedom systems; natural frequencies; modal analysis. Introduction to the analysis of vibration 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/wk for tut, lab and industrial visits. **Prerequisite**: MECH 1600 Manufacturing Technology. **Prohibition**: MECH 3601. **Assessment**: Assignments, quizzes, industrial visits and experimental labs.

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 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. **Prohibition**: ENGG 2003.

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 3701 **Mechatronics 3**

6 credit points. **Session**: 1. **Classes**: (one 2hr lec and one 3hr lab/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: Website: www.acfr.usyd.edu.au/teaching/3rd-year/mech3701-Mx3

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 microprocessor-based 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 1hr 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 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 (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**: 2hr 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 a topic.

In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his or her practical work and the general layout of the thesis itself.

Thesis A is the first part of Thesis A and Thesis B and requires the student to make significant progress toward the objectives outlined in the Proposal. This includes any workshop drawings and experimental setup. Generally about 50% of the total Thesis A & B time should be spent in Thesis A. Progress is assessed by the supervisor through regular contact with the student and through the formal Progress Report.

MECH 4102 **Thesis B**

12 credit points. **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 Kolling Prize may be awarded for the best graduation thesis.

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 acceptrable 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 writtten report is required. Pass/Fail grade only is awarded. Marks will not be given. (This unit of study will not contribute to the weighted averages used to determine Honours.).

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

Syllabus summary

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

The industrial experience report must be submitted early in Semester 1. The report is assessed on content in accordance with details that are distributed to students earlier. The report should contain a section on management.

Objectives

To give students the opportunity to work in an engineering organisation and gain some professional experience. To enhance student abilities and experience in technical report writing.

Expected outcomes

(i) A better appreciation of the role of engineers in the workplace.

(ii) The ability to present structured observations and reflections in the mode of a formal written report.

MECH 4210 **Computational Fluid Dynamics**

4 credit points. **Session**: 1. **Classes**: 2 lectures and one tutorial per week. **Prerequisite**: MECH 3210 or MECH 3211 or AERO 3250. **Assessment**: Tutorial work and projects.

Fourth year elective unit of study.

Syllabus summary

Conservation equations of fluid flow; boundary conditions, classification of flow problems. Numerical solution schemes based on pressure correction; the SIMPLE algorithm and its variants, convection schemes. Solution of the resulting algebraic equations. Turbulence modelling; implementation of boundary conditions in turbulent flow. Coupled heat transfer: convection, combustion, radiation heat transfer. Multiphase flow. Introductions to compressible flow, the physical significance of hyperbolic equations; characteristic based methods; FCT and TVD schemes. Pitfalls to avoid in CFD.

Objectives

To give students an understanding of basic Navier-Stokes solution methods and turbulence models.

Expected outcomes

Ability to write a simple Navier-Stokes solver and to use a state-of-the-art CFD package.

Reference books

Fletcher Computational Techniques for Fluid Dynamics, vols I and 2 (Springer, 1988)

Patankar Numerical Heat Transfer and Fluid Flow (Hemisphere, 1983)

MECH 4220 **Environmental Engineering**

6 credit points. **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 1.5hr exam 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, CO2 capture and sequestration and other emerging control technologies.

Objectives
To acquaint students with the methods engineers use to assess and deal with the environmental consequences of industry and other human activities, with particular emphasis on impact assessment and noise.
Expected outcomes
Students will appreciate the social, economic, and legislative aspects of environmental protection. They will understand the requirements of an environmental impact statement. They will be able to make the calculations and measurements necessary to estimate acoustic noise levels in machinery, buildings and the outside environment and to make recommendations as to how best to reduce them.
Reference books
Bies and Hansen Engineering Noise Control (Allen and Unwin, 1988).
Hassall and Zaveri Acoustic Noise Measurement (Bruel and Kjaer, 1988).
Preliminary reading can be made on the web at www.ieagreen.org.uk.
Other books as advised during classes.
Library Classification: 534.8, 620.23, 620.8, 628.1

MECH 4230 **Environmental Acoustics & Noise Control**

2 credit points. **Session**: 1. **Classes**: 2 hrs per week. **Prerequisite**: 24 credit points of third year units of study. **Prohibition**: MECH 4220 Environmental Engineering. **Assessment**: Assignments and 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
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, CO2 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**: 2. **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**: N/A in 2004. **Classes**: 2 lec/tuts per week. **Prerequisite**: MECH 3201 and MECH 3202 or MECH 3201 and MECH 3203. **Assessment**: Group Project and 1.5hr exam. Students will work in groups to develop a Fire Engineering Design for a building space.
Fourth year elective unit of study.
Syllabus summary
Introduction to fire hazards, phases of fire development and spread. Fire Engineering Design. Fire growth rates and fully-developed fires. CFD applied to fires in buildings, smoke and toxic products. Radiation from fires. Fundamentals of combustion science, premixed, non-premixed flames. Chemical kinetics and pollutant formation.
Objectives
Students will learn about Fire Engineering design for buildings. Characteristics of fire growth, hazards, toxic products, design of buildings to save lives and property are covered. Students will use computational modelling to predict smoke and toxic product dispersal. Students will also get an understanding of the basic physics and chemistry of combustion processes and how pollutants and toxic species are formed.
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.
Reference
A set of lecture notes is available.
Fire Engineering Guidelines, Fire Code Reform Centre, 1996
SFPE Handbook of Fire Protection Engineering., NFPA 2002.
An Introduction to Fire Dynamics, Drysdale, Wiley, 1998
Combustion Fundamentals of Fire ed. Cox, 1995
An Introduction to Combustion, Turns, McGraw-Hill, 2000
Principles of Combustion, Kuo, Wiley, 1986
Fundamentals of Heat and Mass Transfer, Incropera and De Witt, Wiley, 1996

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 structure-property relationships of advanced engineering materials, (b) to improve the performance of engineering structures through tailoring materials microstructure and manufacturing processes, and (c) to conduct failure diagnosis of simplified failure cases of engineering structures
Textbooks
Lecture notes
Reference books
Ashby, Materials Selection in Mechanical Design (Pergamon, 1993)
Atkins and Mai, Elastic and Plastic Fracture (Ellis Horwood, 1985)
Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)
Chawala, Composite Materials (Springer-Verlag, 1987)

Crawford, Plastic Engineering (second edition, Maxwell-Macmillan, 1987)
Davidge, Mechanical Behaviour of Ceramics (C.U.P., 1979)
Eckold, Design and Manufacture of Composite Structures (McGraw-Hill, 1994)
Gibson, Principles of Composite Material Mechanics (McGraw-Hill, 1994)
Richerson, Modern Ceramic Engineering (M. Dekker, 1982)
Harris, Engineering Composite Materials (Institute of Metals, 1986)
Jones, Engineering Materials 3 – Materials Failure Analysis (Pergamon, 1993)
Richerson,Modern Ceramic Engineering (M Dekker, 1982)

MECH 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 class quiz (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

Reference books

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 class quiz (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 books

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 4510 **Machine Vibration and Monitoring**

3 credit points. **Session**: N/A in 2004. **Classes**: 3 hrs/wk including tutorials and practical sessions. **Prerequisite**: MECH 3500 Engineering Dynamics 2. **Assessment**: One 2 hr exam plus assignments.

Fourth year elective unit of study.

Syllabus summary

Review of dynamics, including modal analysis of lumped and continuous systems and appropriate methods for nonlinear systems. Aspects of applied problems, especially the dynamics of rotating machinery, the measurement of vibration and condition monitoring of machines. Some aspects of random vibrations, including measurement and prediction of failure.

Objectives

To acquaint students with:

- the types of vibration which can arise in machinery
- mathematical models which can be used to analyse vibration
- vibration measuring devices and analysis of measurements
- machine condition monitoring by vibration measurements

Expected outcomes

Students will be able to identify the causes of damaging vibration from measurements and analysis, predict the likelihood of failure due to vibration, and determine how to deal with it in order to minimise cost and loss of production

MECH 4605 **Industrial Engineering**

8 credit points. **Session**: 1. **Classes**: 7 lec/wk plus associated tut and lab work and industrial visits. **Prerequisite**: MATH 2001 and MATH 2005 and one of MECH 3620, MECH 3621, ENGG 2003. **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 anagement, 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**: One of MECH 3620, MECH 3621, ENGG 2003. **Prohibition**: MECH 4605 Industrial Engineering. **Assessment**: Assignments.

NB: ENGG 4004 is an acceptable 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.

Textbooks

Samson D., Management for Engineering (Longmans)

Reference books

Hicks, Introduction to Industrial Engineering and Management Science (McGraw- Hill, 1977)
Harding, Production Management 2nd edn (MacDonald & Evans, 1974)
Hussey, Introducing Corporate Planning (Pergamon, 1972)
Currie, Work Study 4th edn (Pitman, 1977)
Heyde, Concise MODAPTS (AAPTS&R, 1975)
Koontz, et al. Management 7th edn (McGraw-Hill, 1980)
Hunt, Managing People at Work (McGraw-Hill, 1979)
Blakemore, The Quality Solution (Australian Business Library, Vic.)
Kotler, Fitzroy, Shaw, Australian Marketing Management (Prentice-Hall)
Macnamara, Australian Marketing and Promotion Handbook (Australian Business Library)
Case Studies in Australian Strategic Management

MECH 4620 **Industrial Ergonomics**

2 credit points. **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 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 4605 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. ntroduction 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 or MECH 3620 or MECH 3621 or ENGG 2003. **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. 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**: (Two 2hr lec and one 2hr 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:
1) Modelling: State-space system models, models of uncertainty, information and stochastic processes
2) 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.
3) 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 applying 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 3700 or MECH 3701. **Assessment**: Assignments (35%), Tutorials (35%), 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 healing, fracture fixation, electrical stimulation of bone healing. Overview of the design, manufacture and use of artificial ligaments, hip, knee and shoulder joint prosthesis, bone cement, finite element modelling of prostheses, material considerations, testing of orthopaedic implants, failure of implants.
Objectives
To introduce students to the biomechanics of the musculo-skeletal system and to the fundamentals of biomedical engineering as applied to orthopaedic devices used for the replacement and repair of the diseased or damaged skeleton.
Expected outcomes
Students will become acquainted with the physical properties of human bones and joints. They will understand how the skeleton functions as an engineering structure. They will learn the physical characteristics of the materials from which the musculoskeletal system is fabricated and be able to adapt basic engineering principles to the design and fabrication of prosthetic joints and to other devices used for replacement and repair of bones and joints.

MECH 4910 **Biomechanics and Biomaterials**

4 credit points. **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 1002 **Introduction to Engineering Leadership**

2 credit points. **Session**: N/A in 2004. **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 1061 **Advanced Engineering 1A**

6 credit points. **Session**: 1. **Prerequisite**: UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **Corequisite**: ENGG 1062 Advanced Engineering 1B. **Prohibition**: Mutually exclusive with a number of other first year units of study. As these will vary depending on the stream 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. 1st year Interdisiplinary unit for all degree streams in Engineering. Permission required for enrolment.

The project is a major component of this unit of study. Students will be allotted to groups based on their preferences and will work on a particular project. 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 complete an engineering project by the end of Semester 1.

ENGG 1062 **Advanced Engineering 1B**

6 credit points. **Session**: 1. **Prerequisite**: UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **Corequisite**: ENGG 1061 Advanced Engineering 1A. **Prohibition**: Mutually exclusive with a number of other first year units of study. As these will vary depending on the stream 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. 1st year Interdisiplinary unit for all degree streams in Engineering. Permission required for enrolment

The project is a major component of this unit of study. Students will be allotted to groups based on their preferences and will work on a particular project. 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 complete an engineering project by the end of Semester 1

ENGG 1800 **Introduction to Engineering Disciplines**

6 credit points. **Session**: 1. **Classes**: 3 hours of lectures and one 3 hour laboratory session per week. **Assessment**: Essay researching roles of engineers, Case studies of projects, etc. Technical assignments solving a problems related to technical topics covered above.

NB: Department permission required for enrolment. Flexible first year core unit of study.

Objectives

- To introduce students to subjects in the Engineering Disciplines of Aeronautical, Chemical, Civil, Mechanical and Mechatronic Engineering, and Project Engineering and Management

Syllabus Summary

School of Aerospace, Mechanical and Mechatronic Engineering (4 weeks)

Each academic will give an overview of the range of roles an engineer does in each stream (people, case studies, guests, etc.), how each of the subjects taught relate to the skills/knowledge and applications required of the engineers. Basically make sure they fully understand what engineers are in the discipline areas and why the students do the subjects they do.

In each stream, one engineering technical topic will be taught as a problem solving exercise. Possible examples are: Aero – Bernoulli's equation and then relate it to lift/drag, Mechanical – Shaft and bearing assembly, then shaft analysis and bearing selection, Biomed – forces generated by a muscle in arm movement, MX – simple feedback system, Space – variable mass rocket.

Note these are examples only, and the specific projects to be covered will be decided.

Department of Civil Engineering (4 weeks)

Introductory lectures in Engineering Economics and Construction Planning, Foundation Engineering, Structural Engineering, Materials, Environmental Engineering.

Each student will be involved in the erection and dismantling of an 8 metre high steel and timber tower in the Civil Engineering Courtyard. Preliminary lectures related to the tower will include safety issues, loading, statical analysis, foundation calculations, construction management, engineering drawings and detailing, geometric calculations, and survey measurements. Exercises related to these issues will be performed before assembly and disassembly of the tower.

Department of Chemical Engineering (4 weeks)

This course will enable students to gain an appreciation of (i) the methods and materials of construction of items of process equipment, (ii) the role of this equipment in building 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 parameters.

ENGG 1801 **Engineering Computing**

6 credit points. **Session**: 1. **Classes**: 2 hours of lectures and one 2 hour computer laboratory session per week. Nine 1 hour CAD sessions during the semester. **Prohibition**: Introductory computer courses given at Junior Level (see current handbook, MECH 1820). **Assessment**: One 2 hr examination at end of semester plus assessment of computer exercises during semester.

Objectives

- To provide a basic introduction to computer and IT systems and their relevance to engineering. No assumed knowledge is required as the unit will be aimed at covering the fundamentals. By the end of the semester the primary objective will be to have all students achieving a minimum standard of computer skills which can be utilized and developed further in subsequent units of study.
- To provide training in the use of desktop software for document manipulation, Internet communication and information search and retrieval.
- To provide an introduction to the tools for numerical analysis and engineering problem solving.
- 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.
- To provide training in the operation of Computer Aided Drafting (Design) software.

Outcomes

Students are expected to achieve an acceptable level of competence in the operation of faculty and department computer facilities. Students will gain familiarity with the university IT systems for student administration and communication. The following specific criteria are expected to be attained by the students attending this unit.

1.Competence in the use of word processing and spreadsheet software.

2.Ability to use electronic communication systems effectively, such as Internet, Intranet, email and noticeboards.

3.Familiarity and basic understanding of the logic of computer programming and the detail and structure of computer programs.

4.Confidence in the use of programming methods to translate physical engineering problems into numerical computer solutions.

5.The ability to create their own computer programs to solve simple engineering problems.

6.Skills in generation and manipulation of graphic images and the use of these to convey information about Engineering problems.

7.Reasonable competence in the use of CAD software for the design and drawing of detailed plans and computer models.

Syllabus summary

Introduction to the use of computers in an engineering environment.

Introduction to the University of Sydney 'MyUni' intranet system. Details of usage of this system to manage most aspects of student administration. Introduction to departmental, faculty and university wide computing resources, the use of email and the Internet.

Use of word processing for report writing; use of spreadsheet packages for data manipulation, numerical calculations and graphing.

Introduction to the fundamental concepts of computer programming. These concepts will be taught in the context of the MATLAB programming environment. The logic of sequential programming steps; allocation of values and variables; arithmetic operations; loops; conditional statements to control the flow of the program. The concept of structured programming; the use of parameters and functions. Use of the MATLAB editing/run time environment; script files; program execution and debugging strategies. Introduction to the use of scalar, vector and matrix variables; the manipulation of matrix variables in arithmetic functions. The use of trigonometric, numerical integration and graphics functions of MATLAB. Introduction to input/output; the use of files and their various formats; ASCII and binary formatting conventions; the conversion and transfer of data files between various software systems.

Introduction to object hierarchies including high and low level graphics functions, object properties, plotting functions and colour maps.

Introduction to the concept of MATLAB toolboxes.

Techniques for the formulation of computer scripts that can be used to represent physical applications in the field of Engineering. Methodologies for problem solving.

Introduction to Computer Aided Drafting (Design). This component will be taught using the Solidworks CAD software system. Concepts in computer drafting; entities; connectivity. Viewing objects in two and three dimensions, theory of transformations, data structures, perspective and parallel projections and, hidden surfaces. Sizing and dimensions; kinematic interactions; surface and solid modeling.

Online Course Material

www.eng.usyd.edu.au/ENGG1800

Textbooks

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

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

F.S. Hill. Computer Graphics, MacMillan, 1990.

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

Reference Sites

www.mathworks.com

ENGG 1802 **Engineering Mechanics**

6 credit points. **Session**: 2. **Classes**: Two one hour lectures each week, Tutorials: 3 hours per week. Some tutorials will include experiments. **Assessment**: Assessment marks for assignments and examinations will be based upon: oLayout of the solution (communication) oSolution method (clearly showing the students understands) oCorrect answer (worth no more than 10% of the mark).

Syllabus Summary

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

Unit of study 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. Ability to extract a simplified version of a problem from a complex situation. Ability to work in 3D as well as 2D

This unit of study is aimed at developing the students generic attributes in the following areas:

Knowledge skills

- Develop a body of knowledge in the fields of static, kinematics and dynamics
- Be able to apply theory to practice in familiar and unfamiliar situations
- Be able identify, access, organize and communicate knowledge gained.

Thinking skills

- Be able to exercise critical judgement
- Be an independent thinker
- Adopt a problem solving approach

Personal skills

- The ability to work with others

Practical Skills

- Test hypotheses experimentally
- Apply technical skills

Student Learning Outcomes:

- By the end of this UoS, students will 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 statically determinate 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
Text required:
J.L. Meriam and L.G. Kraige Engineering Mechanics
Volume 1, STATICS (SI version), 5th Edition and
Volume 2, DYNAMICS (SI version), 5th Edition

ENGG 1803 **Professional Engineering 1**

6 credit points. **Session**: 1, 2. **Classes**: 1 hr lecture, 3hr tutorial/project work (on average – varies week by week). **Assessment**: Individual assignments, group project (proposal, design, delivery), examination (2hr).

Objectives
- To create an awareness of the principles and processes of professional engineering (as per IEAust graduate attributes), including social, economic and environmental aspects
- To immerse students in the practical application of these principles and processes through structured educational experiences
- To establish the academic requirements for the accessing & communication of information (both written and oral)
- To expose students to the skills of problem identification, formulation and solution
- To allow students to function, individually and in teams, as professionals-in-training.

Outcomes
1. An understanding of the principles and processes of professional engineering, including group work
2. Initial competence in the practical application of professional engineering principles and processes to meet challenges and grasp opportunities in social, economic and environmental areas
3. Acquisition of the skills needed to function successfully in an academic environment
4. An understanding of the basics of the engineering problem solving.
5. An understanding of the requirements of individual responsibility and team accountability, including time management, prioritising and decision making
6. Demonstrated report writing and other communication skills, including information gathering.

Syllabus summary
The subject is structured around a project/design/build contest. The idea is to teach the students professional engineering aspects and then have them apply what they are learning to an engineering project.

Professional engineering topics to be covered include: accessing information, teamwork, leadership, written and oral communication, problem solving, ethics, liability, occupational health and safety and environmental issues.

The subheadings below and the points they contain have been produced as an indicative overview of the aims, outcomes, processes and assessment contained within the proposed unit of study, Professional Engineering 1.

Professional Engineering 1 is seen as an introductory unit of study within the Faculty of Engineering, University of Sydney. It seeks to acquaint newly admitted undergraduates with the principles of professional engineering practice, a range of contemporary professional engineering issues, together with the skills of academic study within an engineering environment.

As such, this foundation unit of study spans the various Faculty degree programs.

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, MECH 3621. **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. Permisson required for enrolment
Special project specified for individual requirement

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 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.

Approved as a recommended elective unit of study for Electrical, Computer, Telecommunications and Software Engineering.

1. The commercial working environment.
2. Managing and being managed.
3. Workplace, workforce and commercial ethics.
4. What the Marketing Department wants.
5. What the Production Department wants.
6. Communication: language and form.
7. Conflict resolution and working relationships.
8. Time management.
9. Report writing and documentation.
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 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 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.

■ Other Faculties

ACCT 1003 **Financial Accounting Concepts**

6 credit points. **Session**: 1. **Classes**: 2 lectures/week. **Prohibition**: Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002. **Assessment**: Group assignment; Mid-semester exam; Final exam.

Provides an introduction to the concepts underlying 'external' accounting and is designed for students who are not majoring in accounting. The unit utilises a transaction-effect approach to the preparation of financial statements with basic bookkeeping minimalised. Accounting-method choices are analysed for their effect on the financial statements, and, thus, on decision-making.

ACCT 1004 **Management Accounting Concepts**

6 credit points. **Session**: 2. **Classes**: 3 hours of lectures – one 2hr lecture and one 1 hour lecture/week. **Prohibition**: Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002. **Assessment**: Mid-semester exam; Final exam; Progressive assessment.

This unit is designed to explain how managers use accounting information, with an emphasis on identifying relevant accounting information for decision-making. Topics include: estimating cost functions, relevant costing, cost allocation, budgeting, short and long term decision making and managing within a changing environment.

ACCT 3005 **IT Assurance and Control**

8 credit points. Mr Edwards. **Session**: N/A in 2004. **Assumed knowledge**: INFO 1000. **Prerequisite**: ACCT 2003. **Assessment**: Mid-semester exam 20%; Major assignment 20%; Tutorial participation 10%; Final exam 50%.

Critically important to the success and survival of an organization is effective management and control of information and related Information Technology (IT). This criticality arises from i) increasing dependence on information and the systems that deliver this information, ii) increasing vulnerabilities and a wide spectrum of threats, such as cyber threats and information warfare, iii) scale and cost of the current and future investments in information and information systems, and iv) potential for technologies to dramatically change organisations and business practices, create new opportunities, and reduce costs. For many organisations, information and the technology that supports it represent the organisation's most valuable assets.

Moreover, in today's very competitive and rapidly changing business environment, management has heightened expectations regarding IT delivery functions. Management requires increased quality, functionality, and ease of use; decreased delivery time; and continuously improving service levels-while demanding that this be accomplished at lower costs. Thus, management needs to have an appreciation for and a basic understanding of the risks and constraints of IT in order to provide effective direction and adequate controls. This course examines ways in which accountants and process users bridge the gaps between business risks, control needs and technical issues. It provides good exposure across a domain and process framework and presents activities in a manageable and logical structure.

ASNS 2601 **Asian Studies 1A**

4 credit points. Ms Yasumoto. **Session**: N/A in 2004.

Students attend classes for JPNS 1111. See unit description.

ASNS 2602 **Asian Studies 1B**

4 credit points. Ms Yasumoto. **Session**: N/A in 2004. **Prerequisite**: ASNS 2601.

Students attend classes for either JPNS 1012 or JPNS 1112. See relevant course descriptions.

ASNS 2603 **Asian Studies 2A**

4 credit points. Ms Yasumoto. **Session**: N/A in 2004. **Prerequisite**: ASNS 2602.

Students attend classes for either JPNS 2011 or JPNS 2111. See relevant course descriptions.

ASNS 2604 **Asian Studies 2B**

4 credit points. Ms Yasumoto. **Session**: N/A in 2004. **Prerequisite**: ASNS 2603.

Students attend classes for either JPNS 2012 or JPNS 2112. See relevant course descriptions.

BCHM 2001 **Genes and Proteins**

8 credit points. Dr Denyer, Dr Hancock, Biochemistry staff. **Session**: N/A in 2004. **Classes**: 3 lec & 5 prac/wk & voluntary tutorials. **Qualifier**: 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. **Prohibition**: May not be counted with AGCH 2001 or BCHM 2101 or 2901. **Assessment**: One 3hr exam, one 2hr theory of prac exam, prac tasks.

The lectures in this unit of study introduce the main principles of biochemistry – ie, the molecular basis of life. In the beginning, the unit of study concentrates on proteins and, in particular, the mechanisms of action of enzymes in the light of what we know of their structures. The second half of the unit of study concentrates on nucleic acids (DNA and RNA) as the molecules of heredity and gene expression, and includes a section on DNA replication, transcription and translation. The processes of replication and transcription are highly controlled in multicellular organisms and these control mechanisms are discussed. The last section of the unit of study will describe how these processes are put together in a whole organism in order to maintain life. Particular emphasis will be put on the anabolism and catabolism of fuels under normal conditions and under conditions of feeding, starvation or exercise.

Practical: The practical component complements the theory component of BCHM 2001 by exposing students to experiments which investigate the regulation of gene expression, the manipulation of DNA molecules, the purification of proteins and the manipulation of 3-D protein images using computer graphics software. During the unit of study, students will acquire a wide range of generic skills; including computing skills, communication and articulation skills (written and oral), criticism and data analysis/evaluation skills, experimental design and hypothesis testing skills. Students perform practical sessions in small groups and, therefore, problem solving and team work form an integral part of each activity. In addition to the generic skills, students will learn important laboratory/technical abilities with an emphasis on the equipment used in molecular biology and protein chemistry research.

Textbooks

Garrett RH & Grisham CM. Biochemistry. Saunders 1999

Resource Manual for Biochemistry 2 Practical Sessions, Sem 1

Study Resource for Biochemistry 2001 (Study Guides and Past Papers)

BIOL 1001 **Concepts in Biology**

6 credit points. **Session**: 1, Summer. **Classes**: 3 lec & 3 hrs prac/wk. **Assumed knowledge**: No previous knowledge required. Students who have not taken HSC biology are recommended to take the Biology Bridging Course. **Prohibition**: BIOL (1101 or 1901 or 1500). **Assessment**: One 2.5hr exam, assignments, classwork.

Concepts in Biology is an introduction to the major themes of modern biology. Starting with interactions between organisms in biological communities, we move on to the diversity of microorganisms. This is followed by introductory cell biology, which particularly emphasises how cells obtain and use energy, and leads into an introduction to molecular biology through the role of DNA in protein synthesis and development. The genetics of organisms is then discussed, leading to consideration of theories of evolution and the origins of the diversity of modern organisms. It is recommended that BIOL (1001 or 1101 or 1901) be taken before all Semester 2 Junior units of study in Biology.

Textbooks

Knox R B et al. Biology. McGraw-Hill, 2nd ed, 2001.

BIOL 1003 **Human Biology**

6 credit points. **Session**: 2, Summer. **Classes**: 2 lec, 1 session independent study & 3 prac/wk. **Assumed knowledge**: 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. **Prohibition**: BIOL (1903 or 1500) or EDUH 1016. **Assessment**: One 2.5hr exam, assignment, classwork.

This unit of study provides an introduction to human evolution and ecology, cell biology, physiology and anatomy, through both lectures and practical work. It begins with human evolution, human population dynamics and the impact of people on the environment. The unit of study includes human nutrition, distribution of essential requirements to and from the cells, control of body functions and defence mechanisms. After discussion of reproduction and development, it concludes with some modern studies and research in biotechnology and human genetics. It is recommended that BIOL (1001 or 1101 or 1901) be taken before this unit of study. Enrolment may be restricted by the availability of places. This unit of study, together with BIOL (1001 o r1101 or 1901), provides entry to Intermediate units of study in Biology, but the content of BIOL (1002 or 1902) is assumed knowledge for BIOL (2001 or 2002 or 2003 and 2004) and students entering from BIOL (1003 or 1903) will need to do some preparatory reading.

Textbooks

Seeley, RR et al. Essentials of Anatomy and Physiology. McGraw Hill, 4th ed, 2002

Benjamin C L. et al. Human Biology. McGraw Hill, 2000 (Chapters 19, 20, 21, 22)

CHEM 1101 **Chemistry 1A**

6 credit points. **Session**: 1, 2, Summer. **Classes**: 3 lec & 1 tut/wk & 3hrs prac/wk for 10 wks. **Assumed knowledge**: HSC Chemistry and Mathematics. **Corequisite**: Recommended concurrent units of study: 6 credit points of Junior Mathematics. **Prohibition**: May not be counted with CHEM (1001 or 1901 or 1903 or 1905 or 1906 or 1909). **Assessment**: A theory examination is held at the end of the semester. Students are advised at the beginning of the semester about other factors contributing to assessment in the unit of study.

Chemistry 1A is built on a satisfactory prior knowledge of the HSC 2-unit Chemistry course. A brief revision of basic concepts of the high school course is given. Chemistry 1A covers chemical theory and physical chemistry.

Lectures: A series of 39 lectures, three per week throughout the semester.

Practical: A series of 10 three-hour laboratory sessions, one per week for 10 weeks of the semester.

Textbooks

A booklist is contained in the booklet Information for Students distributed at enrolment. Further information can be obtained from the School.

CHEM 1102 **Chemistry 1B**

6 credit points. **Session**: 1, 2, Summer. **Classes**: 3 lec & 1 tut/wk & 3hrs prac/wk for 10 wks. **Qualifier**: CHEM 1101 or a Distinction in CHEM 1001 or 1901 or equivalent. **Corequisite**: Recommended concurrent units of study: 6 credit points of Junior Mathematics including MATH (1003 or 1903). **Prohibition**: CHEM (1002 or 1902 or 1904 or 1907 or 1908). **Assessment**: A theory examination is held at the end of the semester. Students are advised at the beginning of the semester about other factors contributing to assessment in the unit of study.

Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A and covers inorganic and organic chemistry. Chemistry 1B is an acceptable prerequisite for entry into Intermediate Chemistry units of study.

Lectures: A series of 39 lectures, three per week throughout the semester.

Practical: A series of 10 three-hour laboratory sessions, one per week for 10 weeks of the semester.

Textbooks

A booklist is contained in the booklet Information for Students distributed at enrolment. Further information can be obtained from the School.

CHEM 2101 **Chemistry 2 (Environmental)**

8 credit points. **Session**: 1. **Classes**: 4 lec & 4hr prac/wk. **Prerequisite**: 6 credit points of Junior Mathematics. **Qualifier**: CHEM (1102 or 1902 or 1904 or 1909). **Prohibition**: May not be counted with CHEM (2001 or 2301 or 2901 or 2903 or 2311 or 2312 or 2502). **Assessment**: Theory (67%), lab exercises (33%).

The aim of this unit of study is to provide students interested in environmental science with the chemical knowledge required for an understanding of the area.

Practical: As for CHEM 2001.

CLAW 2006 **Legal Issues for eCommerce**

8 credit points. **Session**: 1, 2. **Prerequisite**: 48 credit points at level 1000. **Assessment**: Literature review; Business report; Optional assignments.

Commerce and business in an electronic environment has arrived and is in constant use. This unit focuses on the transactional and financial aspects of electronic commerce. The unit includes detailed coverage of legal aspects of electronic finance – Internet banking and digital cash and cards, electronic trade – contracts and digital signatures, taxation of electronic commerce and electronic property issues – copyright, patents and trade marks for digital property.

The unit assumes no previous legal training or knowledge or knowledge of the electronic media. The unit will also cover basic introductory legal skills such as legal research and legal writing and citation as well as provide an introduction to electronic commerce, the history and operation of the Internet and major tools used in electronic commerce. Students with previous knowledge in these areas will not need to attend these sections of the unit.

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

4 credit points. **Session**: 1. **Classes**: Two lectures and a 2hr tutorial/ laboratory per week. **Assumed knowledge**: COMP 1002 Introductory Computer Science or SOFT 1002 Software Development 2. **Assessment**: Three assignments and a 2hr exam at end of semester.

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

The unit aims to examine the main issues involved in designing and managing successful Internet projects. The unit does not address implementation issues (eg, programming).

The unit has five modules:

- Electronic Commerce Technology Fundamentals: Computer and communications technology for electronic commerce. Electronic shops, markets and trading.
- Business to Consumer Electronic Commerce: Introduction to web design for electronic sales and service.
- Business to Business Electronic Commerce: The business supply chain, software support for business transactions, EDI standards.
- Business to Employee Electronic Commerce: Software support for internal management, intranets, the paperless office.
- Electronic Commerce Project: Describing and managing an e-commerce project.

EBUS 3002 **E-Commerce Website Programming**

4 credit points. **Session**: 2. **Classes**: One 2hr lecture and a 2hr lab/tut per week. **Assumed knowledge**: EBUS 3001 Introduction to E-Commerce Systems and (SOFT 2004 Software Development Methods 1 or COMP 2004 Programming Practice). **Assessment**: Assignments, online work and an exam at the end of semester.

Core unit of study for the degree Bachelor of Engineering (Electronic Commerce). Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

This unit of study provides the skills required to implement a basic dynamic database driven Web site. The unit has four modules:

- Client-side programming, mark-up languages, scripting and tools.
- Server-side scripting.
- Database programming.
- Web engineering topics: security, integration and data warehousing.

EBUS 5001 **E-Commerce Application Programming**

4 credit points. **Session**: 1. **Classes**: one 2hr lecture and a 2hr lab per week. **Assumed knowledge**: EBUS 3001 Introduction to E-Commerce Systems. **Prohibition**: ELEC 5608 Electronic Commerce.

Core unit of study for the degree Bachelor of Engineering (Electronic Commerce). Recommended elective unit of study for Computer, Electrical, Software and Telecommunications Engineering.

This unit focuses on the development of E-Commerce web-applications using Java Servlets and JSP under a J2EE environment. The unit is designed to provide students with the skills and knowledge required to develop enterprise web applications.

The unit has four modules: JSP and Java Servlets, accessing databases using JDBC, SQL and PL/SQL queries, parsing and building XML documents, and implementing web services using XML and SOAP.

Students will apply the material covered in lectures during the laboratory sessions, where a significant web-application will be developed in stages over the semester. Some prior experience in software design (preferably Java), XML concepts and SQL query syntax will be assumed.

EBUS 5002 **E-Commerce Systems**

4 credit points. **Session**: 2. **Classes**: two 1hr lectures and a 2hr lab/tut per week. **Assumed knowledge**: EBUS 5001 E-Commerce Application Programming. **Assessment**: Lab mark and an exam at end of semester.

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

This unit focuses on the development of E-Commerce web applications and application frameworks. The unit has four modules: Introduction to Web Application Frameworks; Middleware and distributed frameworks; PLSQL Database programming and TCL Server Scripting and a case study of the OACS Application Framework.

Students will apply the material covered in lectures during the laboratory sessions, where a significant web-application framework such as a contect management system will be extended in stages over the semester.

Students will be expected to be familiar with the material covered in EBUS 5001, namely J2EE, XML, JDBC and SOAP.

ECMT 1011 **Econometrics IA Stream 1**

6 credit points. **Session**: N/A in 2004. **Prohibition**: MATH 1005, MATH 1905.

The first of a sequence of two units that together provide an introduction to quantitative methods used in economics and related disciplines. Topics in basic statistics include: methods available for handling, analysing and interpreting data, discussion of probability distributions, an introduction to sampling theory and simple estimation problems. Mathematics of finance is also covered. A key component is the provision of instruction and experience in the use of computers and statistical software as an aid in the analysis of data.

ECMT 1021 **Econometrics IB Stream 1**

6 credit points. **Session**: N/A in 2004. **Assumed knowledge**: Mathematics Extension 2. **Corequisite**: ECMT 1011. **Prohibition**: MATH 1005, MATH 1905.

NB: Other than in exceptional circumstances, it is strongly recommended that students do not undertake Econometrics 1B before attempting 1A.

Builds on the work in Econometrics IA. Introduces hypothesis testing, simple and multiple regression analysis, time series analysis and decision theory. This statistical material is complemented by mathematical topics including matrices and partial differentiation. Again there is an important computing component that is integrated into this unit. Applications to economics, business and related disciplines in the social sciences are provided.

ECON 1001 **Introductory Microeconomics**

6 credit points. **Session**: 1, Summer. **Assumed knowledge**: Mathematics.

Introductory Microeconomics addresses the economic decisions of individual firms and households and how these interact in markets. It is a compulsory core unit for the Bachelor of Economics and Bachelor of Commerce and an alternative core unit for the the Bachelor of Economic and Social Science.

Economic issues are pervasive in contemporary Australian society. Introductory Microeconomics introduces students to the language and analytical framework adopted in Economics for the examination of social phenomena and public policy issues. Whatever one's career intentions, coming to grips with economic ideas is essential for understanding society, business and government. Students are given a comprehensive introduction to these ideas and are prepared for the advanced study of microeconomics in subsequent years.

ECON 1002 **Introductory Macroeconomics**

6 credit points. **Session**: 2, Summer. **Assumed knowledge**: Mathematics.

Introductory Macroeconomics addresses the analysis of the level of employment and economic activity in the economy as a whole. It is a compulsory core unit for the Bachelor of Economics (BEc) and for the Bachelor of Commerce and an alternative core unit for the Bachelor of Economic and Social Science.

Introductory Macroeconomics examines the main factors that determine the overall levels of production and employment in the economy, including the influence of government policy and

international trade. This analysis enables an exploration of money, interest rates and financial markets, and a deeper examination of inflation, unemployment and economic policy.

GEOL 1501 Engineering Geology 1

6 credit points. **Session**: 2. **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 units of study GEOL 1001 and GEOL 1002 have been completed. Second year core unit of study for the degree in Project Engineering and Management (Civil).

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

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

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

Textbooks

T West, Geology Applied to Engineering; or
A Holmes, Principles of Physical Geology 4th Edition.

GEOL 2004 Environmental Geology and Climate Change

4 credit points. Dr Hughes and Prof Davies. **Session**: 1. **Classes**: 3 lec/wk & fieldwork. **Prerequisite**: 24 credit points of Science units of study. **Assessment**: One 2hr exam and assignments.

The Earth sciences provide an essential framework for understanding the environmental changes that arise from short- and long-term geological processes. This unit of study introduces students to several geological phenomena that can impact detrimentally on society. As the welfare of much of the world's population is sensitive to climate change, a major component of the course will include an examination of global climate change over a variety of timescales ranging from millions of years to tens of years. The record of recent climate change and projections of future climate change will be reviewed in the context of their natural and human causes.

GEOL 2005 Environmental Geology: Resources

4 credit points. Professor Iain Mason. **Session**: N/A in 2004. **Classes**: 3 lec/wk & fieldwork. **Prerequisite**: 24 credit points of Science units of study. **Assessment**: One 2hr exam.

Australia is a major primary producing nation and mining accounts for a substantial part of its export income. This segment of the environmental geology program is concerned with the application of geological information and techniques in solving conflicts that may arise when new mines are proposed. It shows how geological principles can be used to minimise environmental degradation in areas of active mining. Topics covered include renewable and non-renewable global energy resources, the importance of minerals in an industrialised society, mineral extraction and processing, the environmental impact of mining and mineral processing, site reclamation, recycling, ecologically sustainable development, global climate change and environmental law.

INFO 2000 Systems Analysis and Design

4 credit points. **Session**: 1, Summer. **Classes**: Two 1hr lectures, one 1 hr tutorial, or one 1hr practical; 1 unscheduled lab work with a CASE tool. **Qualifier**: 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). **Prohibition**: May not be counted with INFO 2900. **Assessment**: Written and practical assignments + written exam.

The syllabus covers data-centred, process-oriented and object-centred methodologies for requirements analysis and system description to address organisational needs, including the gathering of facts, diagnosis of problems, recommendation of appropriate and feasible solutions. A CASE tool will be used to develop practical skills.

INFO 2005 Database Management, Introductory

4 credit points. **Session**: 2. **Classes**: 2 lec, 1 tut/wk; 1 unscheduled lab work. **Qualifier**: 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). **Prohibition**: May not be counted with INFO 2905. **Assessment**: Written and practical assignments plus written exam.

The syllabus covers use of databases through forms and through SQL language; data representation and basic interfaces; good design of tables through normalisation. Use of a variety of data modelling techniques. A commercial strength PC based database system will be used to develop practical skills.

INFS 3020 E-Commerce Business Models

8 credit points. **Session**: 2. **Prerequisite**: One of INFS 1000, ISYS 1003 and INFO 1000. Also at least 48 credit points. **Prohibition**: ACCT 3006. **Assessment**: Tutorials; Examinations; Group project; Individual assignments.

This unit provides a detailed overview of the concepts and processes used in doing business electronically. It will provide a basic understanding of e-commerce business models and their evaluation. This course provides a strong knowledge foundation to students to work in the new digital economy and e-business era. This course offers concepts and tools that students in commerce need to analyze, synthesize and implement e-business models. Importantly, this course will provide the critical link between technologies and firm's performance and takes a business management perspective in teaching and learning. The emphasis will be on the way technologies enable the business and its effective management, rather than the technologies itself.

IREL 1001 Macro Industrial Relations

6 credit points. **Session**: N/A in 2004. **Classes**: (2 lectures & 1 tutorial)/wk.

This unit introduces the institutions and processes of Australian industrial relations with an emphasis on laws, institutions and social processes. It combines theoretical and historical understandings of Australian industrial relations with a detailed examination of the current problems and strategies of the key industrial relations players. The topics studied include:

- the regulatory framework of industrial relations;
- policies of federal and state governments;
- the history and policies of unions and employer associations;
- the practices of Australia's arbitral tribunals;
- the development of wage determination;
- emerging patterns of dispute resolution and bargaining.

MATH 1001 Differential Calculus

3 credit points. **Session**: 1, Summer. **Classes**: 2 lec & 1 tut/wk. **Assumed knowledge**: HSC Mathematics Extension 1. **Prohibition**: MATH 1011 or 1901 or 1906. **Assessment**: One 1.5 hour examination, assignments and quizzes.

MATH 1001 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study looks at complex numbers, functions of a single variable, limits and continuity, vector functions and functions of two variables. Differential calculus is extended to functions of two variables. Taylor's theorem as a higher order mean value theorem.

There are comprehensive details of this unit of study in the Junior Mathematics Handbook distributed at the time of enrolment.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH 1002 Linear Algebra

3 credit points. **Session**: 1, Summer. **Classes**: 2 lec & 1 tut/wk. **Assumed knowledge**: HSC Mathematics Extension 1. **Prohibition**: MATH 1902 or 1012. **Assessment**: One 1.5 hour examination, assignments and quizzes.

MATH 1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

There are comprehensive details of this unit of study in the Junior Mathematics Handbook distributed at the time of enrolment.

Textbooks

As set out in the Junior Mathematics Handbook

MATH 1003 Integral Calculus and Modelling

3 credit points. **Session**: 2, Summer. **Classes**: 2 lec & 1 tut/wk. **Assumed knowledge**: HSC Mathematics Extension 2 or MATH 1001. **Prohibition**: MATH 1013 or 1903 or 1907. **Assessment**: One 1.5 hour examination, assignments and quizzes.

MATH 1003 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study first develops the idea of the definite integral from Riemann sums, leading to the Fundamental Theorem of Calculus. Various forms of integration are considered, such as integration by parts.The second part is an introduction to the use of first and second order differential equations to model a variety of scientific phenomena.

There are comprehensive details of this unit of study in the Junior Mathematics Handbook distributed at the time of enrolment.

Textbooks

As set out in the Junior Mathematics Handbook

MATH 1004 **Discrete Mathematics**

3 credit points. **Session**: 2, Summer. **Classes**: 2 lec & 1 tut/wk. **Assumed knowledge**: HSC Mathematics Extension 1. **Prohibition**: MATH 1904 or MATH 2011. **Assessment**: One 1.5 hour examination, assignments and quizzes.

MATH 1004 is designed to provide a thorough preparation for further study in Mathematics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirements in the Faculty of Engineering.

This unit provides an introduction to fundamental aspects of discrete mathematics, which deals with 'things that come in chunks that can be counted'. It focuses on the enumeration of a set of numbers, viz. Catalan numbers. Topics include sets and functions, counting principles, Boolean expressions, mathematical induction, generating functions and linear recurrence relations, graphs and trees.

There are comprehensive details of this unit of study in the Junior Mathematics Handbook distributed at the time of enrolment.

Textbooks

As set out in the Junior Mathematics Handbook

MATH 1005 **Statistics**

3 credit points. **Session**: 2, Summer. **Classes**: 2 lec & 1 tut/wk. **Assumed knowledge**: HSC Mathematics. **Prohibition**: MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022). **Assessment**: One 1.5 hour examination, assignments and quizzes.

MATH 1005 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit offers a comprehensive introduction to data analysis, probability, sampling, and inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

There are comprehensive details of this unit of study in the Junior Mathematics Handbook distributed at the time of enrolment.

Textbooks

As set out in the Junior Mathematics Handbook

MATH 2001 **Vector Calculus and Complex Variables**

4 credit points. **Session**: 1, Summer. **Classes**: 3 lec & 1 tut/wk. **Prerequisite**: MATH (1001 or 1901or 1906) and (1002 or 1902) and (1003 or 1903 or 1907). **Prohibition**: MATH 2901. **Assessment**: One 2hr exam, assignments, tutorial quizzes.

This unit of study has two major components: firstly, a study of functions of several real variables from a vector point of view, and secondly an introduction to functions of a complex variable. Vector calculus topics include line integrals and multiple integrals, surface integrals, change of variables, theorems of Green, Gauss and Stokes with their physical significance. Complex variables topics include definitions and properties of complex functions, differentiability, Cauchy Riemann conditions and analyticity, contour integration and residues.

MATH 2002 **Matrix Applications**

4 credit points. **Session**: 1, Summer. **Classes**: 2 lec, 1 tut & 1 computer lab/wk. **Prerequisite**: MATH (1002 or 1902) or Distinction in MATH 1012. **Prohibition**: MATH 2902. **Assessment**: One 2hr exam, assignments, tutorial quizzes.

This unit is a continuation of the first year unit MATH 1002. It starts with an examination of the computational efficiency of various methods of solving linear systems, then discusses LU factorisation of a matrix and partial pivoting. The first year work on vectors and matrices is put in a more general setting by developing vector space theory (axioms of a vector space, subspace, linear independence and basis, rank and nullity, linear transformations, eigenvalues and eigenvectors, diagonalisation, orthogonal diagonalisation). These theoretical topics are illustrated by applications, which include fitting polynomials to data sets, applying rotations, reflections, shears and scalings to the plane, solving linear recurrence relations and systems of linked differential equations by diagonalisation, optimising constrained quadratic forms using orthogonal diagonalisation and developing numerical methods of findingeigenvalues and eigenvectors.

MATH 2005 **Fourier Series & Differential Equations**

4 credit points. **Session**: 2, Summer. **Classes**: 3 lec & 1 tut/wk. **Prerequisite**: MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **Prohibition**: MATH 2905. **Assessment**: One 2hr exam, assignments, quizzes.

In the Fourier Series segment, periodic phenomena such as wave motion are given a systematic treatment. The basic problem is to represent a periodic function of one variable as the sum of an infinite series of sines and cosines. The theory has extensive applications in engineering, acoustics, internal and surface waves in fluids, etc., as well as in pure mathematics. Then a review of first order equations is followed by a systematic treatment of second order equations using the methods of variation of parameters, undetermined coefficients and the theory of Laplace Transforms. Linear systems of differential equations are treated using matrices and vectors. The final part of the unit of study deals with partial differential equations with the emphasis on the application of the method of separation of variables to first and second order linear equations and on Laplace transforms for initial value problems.

MATH 2011 **Topics in Discrete Mathematics**

4 credit points. **Session**: 1. **Classes**: 2 lec, 1 tut & 1 prac/wk. **Assumed knowledge**: HSC Mathematics Extension 1. **Prerequisite**: 6 credit points of Junior Mathematics. **Prohibition**: MATH (1004 or 1904). **Assessment**: One 2hr exam, assignments, quizzes.

In this unit we introduce students to several related areas of discrete mathematics, which serve their interests for further study in pure and applied mathematics, computer science and engineering. Topics include recursion; summation techniques; recurrences and generating functions; elementary number theory, including an introduction to primality testing and cryptography; combinatorics, including connections with probability theory; asymptotics and analysis of algorithms; set theory and logic.

Textbooks

Printed notes for purchase, made available by lecturer.

MATH 2051 **Linear Programming**

2 credit points. **Session**: 2. **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 Janovich, 1989.

Swanson, LW. Linear Programming, Basic Theory and Applications. McGraw-Hill, 1987.

Taha, HA. Operations Research: An Introduction. 5th edn, Macmillan, 1992.

Thie, PR. An Introduction to Linear Programming and Game Theory. Wiley, 1988.

Winston, WL. Introduction to Mathematical Programming: Applications and Algorithms. 2nd edn, Duxbury, 1995.

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

MATH 2052 **Numerical Methods**

2 credit points. **Session**: 2. **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 rules; Gaussian quadrature. Numerical solution of ordinary differential equations – Runge-Kutta methods; stability and stiffness.

Textbooks

Course notes: Numerical Methods, D.J. Galloway and C. Macaskill, 2003, available from Kopystop.

MATH 3024 **Elementary Cryptography and Protocols**

4 credit points. **Session**: 1. **Classes**: 2 lec & 1 prac/wk. **Prerequisite**: 12 credit points of Intermediate Mathematics. Strongly advise MATH 2008 or 2908 or 2918. **Assessment**: One 2hr exam plus assignments.

Cryptography is the branch of mathematics that provides the techniques which enable confidential information to be transmitted over public networks. This unit introduces the student to cryptography, with an emphasis on the cryptographic primitives that are in most common use today. Following a review of classical cryptosystems, modern symmetric cryptosystems (chiefly DES) and non-symmetric cryptosystems (chiefly RSA) will be studied. In the second part of the unit, these cryptographic primitives will be used to construct protocols for realising digital signatures, data integrity, identification, authentication and key distribution. An important feature of the course will be weekly exercises in practical cryptography using the Computer Algebra system Magma.

MATH 3925 **Public Key Cryptography (Advanced)**

4 credit points. **Session**: 2. **Classes**: 2 lec & 2 prac/wk. **Prerequisite**: 12 credit points from Intermediate or senior mathematics. Strongly recommend MATH 3902. **Assessment**: One 2hr exam plus assignments.

Public Key Cryptography (PKC) enables two parties to communicate securely over a public communications network, without them first having to exchange a secret key. PKC provides secure communications over the Internet, over mobile phone networks and in many other situations. This course draws on ideas from algebra, number theory and geometry to provide the student with a thorough grounding in the mathematical basis of the most popular PKC's. Specifically, the unit treats PKC's based on the difficulty of integer factorization (RSA), the discrete logarithm problem in a finite field (Diffie-Hellman, ElGamal) and the discrete logarithm problem in the group of rational points of an elliptic curve over a finite field. Attacks on these cryptosystems will be treated in some depth.

MICR 2001 **Introductory Microbiology**

8 credit points. Dr Peter New. **Session**: 1. **Classes**: 3 lec, 1 tut & 4 prac/wk. **Prerequisite**: 6 credit points of Junior Chemistry. **Qualifier**: 6 credit points of Junior Biology. **Prohibition**: MICR (2003 or 2901). **Assessment**: One 2hr exam, continuous assessment in prac, 2 assignments, prac exam.

NB: It is highly recommended that students complete 12 credit points of Junior Biology and MBLG (2001 or 2101 or 2901).

This unit of study aims to give the student sufficient knowledge and technical skills to provide a foundation for future study of microbiology. It is also suitable for students requiring a working knowledge of microbiology while specialising in related fields – eg, molecular biology.

Topics covered include history and scope of microbiology, methodology, comparative study of the major groups of microorganisms (bacteria, algae, protozoa, fungi and the viruses), a detailed study of bacteria including structure, classification and identification, growth, death and control.

An introduction to microbial ecology (soil, aquatic and agricultural microbiology, as well as examples of microbial interactions) illustrates the significance of microorganisms in the global, natural cycles of synthesis and degradation.

The practical component focuses on basic, safe microbiological techniques and the use of these to study examples of microbial activity which are illustrative of the lecture series.

Textbooks

Prescott L M et al. Microbiology.5th edn, WCB/McGraw-Hill, 2002

MICR 2007 **Microbiology for Engineers A**

4 credit points. **Session**: 1.

For details, contact the Faculty of Science.

MICR 2008 **Microbiology for Engineers B**

4 credit points. **Session**: 2.

For details, contact the Faculty of Science.

MKTG 1001 **Marketing Principles**

6 credit points. Dr Paul Henry. **Session**: 1, Summer. **Prohibition**: MKTG 2001. **Assessment**: Marketing Plan 20%; Group Presentation 15%; Tutorial Assignment 15%; Two Exams 50%.

This unit of study examines the relationships among marketing organizations and final consumers in terms of production-distribution channels or 'value chains.' It focuses on consumer responses to various marketing decisions (product mixes, price levels, distribution channels, promotions, etc.) made by private and public organizations to create, develop, defend, and sometimes eliminate, product markets. Emphasis is placed on identifying new ways of satisfying the needs and wants, and creating value for consumers. While this unit of study is heavily based on theory, practical application of the concepts to 'real world' situations is also essential. Specific topics of study include: (a) market segmentation strategies, (b) market planning, (c) product decisions, (d) new product development, (e) branding strategies, (f) channels of distribution, (g) promotion and advertising, (h) pricing strategies, and (i) customer database management.

MKTG 3010 **Electronic Marketing**

8 credit points. Ms Jeaney Yip. **Session**: 2. **Prerequisite**: MKTG 1001 or MKTG 2001. **Assessment**: Paper 20%; Group project 35%; Group presentation 10%; Exam 35%.

'This course explores how new technologies can be embraced effectively for marketing purposes. This unit of study builds upon the principles and concepts of traditional marketing studied in 'Marketing Principles'. It focuses on the applicability of those concepts in the electronic environment, namely the Internet. It aims to show how the Internet, as a new and evoloving medium with its innovative interface, can play a role in Marketing in important areas such as segmentation and targeting, consumer behaviour, market research, and the marketing mix. It also aims to show why companies do or do not embrace this new technology and their implications for those decisions.

NETS 3009 **Operating Systems**

4 credit points. **Session**: 2. **Classes**: Two 1hr lecture, one 1–2 hr tutorial/practical. **Prerequisite**: [NETS (2008 or 2908) or ELEC 2601] and [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT(2001 or 2901). **Prohibition**: May not be counted with NETS 3909 or COMP (3009 or 3909). **Assessment**: Written assignments and exam.

This unit covers the internal details of operating systems. Building on NETS 2008 which introduces the concepts from a user-viewpoint, discussing the functionality of each aspect of an OS, NETS 3009 shows how software can provide that functionality. The topics include the internal structure of OS; several ways each major aspect (process scheduling, interprocess communication, memory management, device management, file systems) can be implemented; the performance impact of design choices.

NETS 3017 **Network Programming and Distributed Apps**

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures, one 1–2 hr tutorial/practical. **Prerequisite**: [[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). **Prohibition**: May not be counted with NETS 3917 or ELEC 3604. **Assessment**: Written assignments and exam.

This is a practically-oriented subject in which students learn to write code that uses communication primitives such as sockets, RPC and Java RMI. In contrast, SOFT 3105 assumes the existence of middleware that hides most of the details of creating sockets, sending and receiving data etc.

PHYS 1001 **Physics 1 (Regular)**

6 credit points. **Session**: 1. **Classes**: three 1hr lectures, one 3hr laboratory, one 1hr tutorial. **Assumed knowledge**: HSC Physics MATH (1001/1901, 1002/1902, 1003/1903). MATH 1005/1905 would also be useful. **Prohibition**: PHYS (1002 or 1901). **Assessment**: laboratory (20%), assignments (5%), progressive test (5%), skills test (5%), examination (65%).

This unit of study is for students who gained 65 marks or better in HSC Physics or equivalent. The lecture series contains three modules on the topics of mechanics, thermal physics and waves.

Textbooks

Young & Freedman. University Physics. 10th edition, Addison Wesley Longman 2000–

Experimental Physics Laboratory Manual – School of Physics Publication.

PHYS 1003 **Physics 1 (Technological)**

6 credit points. **Session**: 1, 2. **Classes**: three 1hr lectures, one 3hr laboratory, one 1 hr tutorial. **Assumed knowledge**: 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. **Prohibition**: PHYS (1004 or 1902). **Assessment**: laboratory (25%), assignments (5%), examination (70%).

This unit of study is designed for students majoring in physical and engineering sciences and emphasis is placed on applications of physical principles to the technological world. The lecture series contains modules on the topics of fluids, electromagnetism, and quantum physics. It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit

Textbooks

Young & Freedman. University Physics, 10th edition, Addison Wesley Longman 2000–

Experimental Physics Laboratory Manual – School of Physics Publication.

PHYS 2203 **Physics 2EE**

4 credit points. **Session**: 2.

SOFT 1001 **Software Development 1**

6 credit points. **Session**: 1, 2, Summer. **Classes**: One 1hr lecture, one 2 hr tutorial, one 3hr practical. **Assumed knowledge**: HSC Mathematics Extension 1. **Prohibition**: May not be counted with SOFT 1901 or COMP (1001 or 1901). **Assessment**: Written and practical assignments, quizzes, exam.

Computers are highly versatile: the same machine can be used to manage the payroll for an enterprise, or play multi-user games, or predict changing weather activity. The reason is that people can write software that causes the machine to behave in very different ways. This unit is the first in a long sequence that build students' skills in software development. For many students these skills are the key to their employment as IT professionals. The unit introduces object-oriented software development with design-by-contract, which is the state-of-the-art in industry. Java is the programming language used. Students work in small groups, so they experience many of the issues of team interaction that are important in practice. Also, students take responsibility to plan their own learning to meet required objectives, so they will develop skills to learn from resources including reference materials and examples, just as happens in the profession.

SOFT 1002 **Software Development 2**

6 credit points. **Session**: 1, 2, Summer. **Classes**: One 1hr lecture, one 2hr tutorial, one 3 hr practical. **Qualifier**: SOFT (1001 or 1901) or COMP (1001 or 1901). **Prohibition**: May not be counted with SOFT 1902 or COMP (1002 or 1902). **Assessment**: Written and practical assignments, quizzes, exam.

This unit extends the students' software development skills in several important directions. It covers a number of advanced features of Java programming such as inheritance and recursion. It deals with important issues in using library classes to manage collections of similar objects. It also provides students with experience in design; that is, in choosing which classes to write to respond to a user's demands. Design in group work raises special issues of dealing with conflict and misunderstanding between group members.

SOFT 2001 **Concurrent Programming**

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures, one 2hr practical. **Qualifier**: SOFT (1002 or 1902) or COMP (1002 or 1902). **Prohibition**: May not be counted with SOFT 2901. **Assessment**: Written assignments, exam.

There are many sorts of computing infrastructure such as an operating system kernel or network protocol stack or web server, where one activity may start before other activities have finished. This requires the software to interleave the processing from different activities. This software is called 'concurrent' or 'multithreaded', and it requires special programming techniques which are taught in this unit. In particular, there is a need to synchronise the activities when they deal with shared data, using primitives such as semaphores or mutual exclusion locks. Emphasis is also given to a similar 'event-handling' style for writing graphical user interfaces.

SOFT 2004 **Software Development Methods 1**

4 credit points. **Session**: 1, Summer. **Classes**: Two 1hr lectures, one 2hr practical. **Qualifier**: SOFT (1002 or 1902) or COMP (1002 or 1902). **Prohibition**: May not be counted with SOFT 2904 or COMP (2004 or 2904). **Assessment**: Written assignments, exam.

In this unit of study we cover elementary methods for developing robust, efficient, and re-usable software. Specific topics include memory management and the pragmatic aspects of implementing data structures such as lists and hash tables. Debugging tools and techniques are discussed and common programming errors are considered along with defensive programming techniques to avoid such errors. Testing regimes, such as regression testing, are introduced. The subject is taught from a practical engineering viewpoint and it includes a considerable amount of programming practice, using existing tools as building blocks to complete a large-scale task.

SOFT 3101 **Object-Oriented Software Design**

4 credit points. **Session**: 1. **Classes**: Two 1hr lectures, one 1–2 hr tutorial/practical. **Prerequisite**: SOFT (2001 or 2901) and INFO (2000 or 2900) and INFO (2005 or 2905) and [SOFT (2004 or 2904) or COMP (2004 or 2904)]. **Prohibition**: May not be counted with SOFT 3801 or COMP (3008 or 3908). **Assessment**: Written assignments and exam.

An important benefit of the object-oriented approach to software development is that the modelling style (classes with attributes and methods, related by inheritance) is useful throughout the lifecycle. One can represent the problem space as classes, and then adapt these to give a design which is suitable for coding. In this unit, we study a methodical approach to developing a design for a substantial software project. In particular, many 'patterns' will be introduced. These describe common ways to solve recurring issues, especially ways that use inheritance to reduce the coupling between parts of the system. We will also cover the precise principles behind design-by-contract, espeically the relationship between assertions and inheritance. We will use UML as a notation for expressing designs, and study some ways to structure large designs for improved understanding.

SOFT 3103 **Software Validation and Verification**

4 credit points. **Session**: 2. **Classes**: Two 1hr lectures, one 1–2 hr tutorial/practical. **Prerequisite**: [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901) and MATH (1005 or 1905). **Prohibition**: May not be counted with SOFT 3803. **Assessment**: Written assignments and exam.

This unit will introduce a thorough approach to ensure the quality of software. It will focus on how to design and carry out effective testing. Testing needs to address both functionality and also non-functional issues such as performance, usability, conformance to policy. We will learn to evaluate test strategies in terms of coverage and contribution to system reliability. Attention is also paid to the automation and management of the testing process.

SOFT 3104 **Software Development Methods 2**

4 credit points. **Session**: 1. **Classes**: Two 1hr lectures, one 1–2 hr tutorial/practical. **Prerequisite**: [SOFT (2004 or 2904) or COMP (2004 or 2904)] and SOFT (2001 or 2901). **Prohibition**: May not be counted with SOFT 3804 or COMP (3100 or 3800). **Assessment**: Written assignments and exam.

At the end of this course you should have an easy familiarity with C++ and know when (and when not) to use it to solve a problem. In particular, we deal with those issues which differ from Java and C, including multiple inheritance, name spaces, destructors, the difference between virtual and non-virtual overriding, and templates. You should be comfortable reading the STL source. In addition, you will have had experience with refactoring, use of software configuration management systems (such as CVS, RCS, SCCS, Perforce), and use of metrics in Personal Software Process.

WORK 1001 **Foundations of Industrial Relations**

6 credit points. Dr S Jamieson. **Session**: 1. **Prerequisite**: None. **Prohibition**: IREL 1001. **Assessment**: Essay; Exam; Presentation.

NB: This is one of the compulsory units of study for the Industrial Relations/Human Resource Management major.

This is the first unit of study in the Work and Organisational Studies program. It provides a foundation for studying the major issues affecting the regulation of paid work in the current industrial relations framework. At a time of immense change in the nature of employment and in the processes affecting it, this unit begins by providing students with a range of conceptual tools and competing points of view about rights, rules and conflicts at work. Thereafter, the central concern of the unit is to examine the social, economic and political context of industrial relations. This means that there is a focus on the role of key

institutional parties such as unions, employer associations and government as well as upon employees and managers themselves. This unit combines theoretical and historical understandings of Australian industrial relations with a detailed examination of the current problems and strategies of these key industrial relations players.

5 Postgraduate units of study

■ Aeronautical Engineering units of study

AERO 5301 **Applied Finite Element Analysis**

6 credit points. **Session**: N/A in 2004. **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 5101 **Chemical Equilibrium Modelling of Aq Sys**

8 credit points. Dr Peter Linkson (linkson@chem.eng.usyd.edu.au. **Session**: 1. **Assessment**: Class assignments, tutorials and an examination.

NB: This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

Objectives

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

Students will develop skills in the following:

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

This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

Syllabus summary

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

Case studies and applications include:

The removal/recovery of heavy metals (eg, Cd, Cu, Cr, Zn) from wastewaters; Lime as a reagent; Effect of atmospheric CO2 on metal precipitation and disposal; Gypsum solubility; Gas solubility; absorption and 'sour' water treatment; mineral processing (leaching, solvent extraction, flotation); complexing ligands (SO42-, Cl-, NH3, CO2, SO2); aluminium in the environment; aqueous corrosion.

CHNG 5401 **Process Plant Risk Management**

8 credit points. Adjunct Associate Professor D.O. White (dwhite@chem.eng.usyd.edu.au). **Session**: 1. **Classes**: 3 hours of lectures, tutorials and class exercises per week for one semester. **Assessment**: Assessment: Participation in class exercises, tutorial work, reports and a final examination.

Objectives

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.

This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

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 5402 **Project Engineering A**

8 credit points. Adjunct Associate Professor D.O. White (dwhite@chem.eng.usyd.edu.au). **Session**: 1. **Classes**: 3 hours of lectures, seminars and discussions per week for one semester. **Assessment**: Tutorial assignments, seminar presentations and a final examination.

NB: This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

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.

This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

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 5503 **Environmental Decision Making**

8 credit points. Professor J. Petrie (petrie@chem.eng.usyd.edu.au). **Session**: 2. **Classes**: One 2-hour lecture and one 1-hour tutorial per week for one semester. **Assessment**: Major project, 2 minor projects, assignments.

NB: This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

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.

This unit of study is available to undergraduate students who meet the prerequisites for this unit of study, namely to pass all undergraduate units of study in chemical engineering at the third-year level.

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.

■ Civil Engineering

CIVL 5252 **Plates and Shells**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5257 **Concrete Structures: Prestressed**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5258 **Advanced Structural Steel Design**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5259 **Advanced Structural Steel Analysis**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5351 **Environmental Geotechnics**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5353 **Environmental Oceanography & Meteorology**

4 credit points. Ian Jones. **Session**: 1. **Classes**: Lectures 26 hrs Monday afternoons. Offered every year. **Prerequisite**: Core unit, Prerequisite to CIVL 5654. **Assessment**: Assessment: Assignments, 2 hour exam.
NB: Department permission required for enrolment.
Unit of study for the degree of Master of Engineering Studies, Graduate Diploma in Geotechnical Engineering or Graduate Diploma in Structural and Foundation Engineering, Graduate Certificate of Greenhouse Gas Mitigation.
Objectives
To obtain an understanding of the basic meteorology and oceanography relevant to an environmental engineer.
Outcomes
An appreciation will be obtained of the equation governing geophysical fluid dynamics and knowledge of the sources for forecasts of the environment.
Syllabus summary
The impact of the air or water environment on engineering projects or the implications of construction or industrial processes on the atmosphere or the ocean need to be assessed with a knowledge of the fundamental processes governing the hydrosphere. Topics include historical review of the important physical concepts. The equations of fluid mechanics and the simplifications for a rotating earth. The routine collection of data. Numerical models. Forecasting.
Reference books:
Hasse, L. and F. Dobson, Introductory Physics of the Atmosphere and Ocean, D. Reidel Publishing Co., Holland, 1986.
Jones, I S F and Y Toba, Wind stress over the Ocean. Cambridge University Press, Cambridge, 2001.
Wells, N., The Atmosphere & Ocean, Taylor & Francis, 1986.
Stommel, H., A View of the Sea. A Discussion Between a Chief Engineer and an Oceanographer about the Machinery of the Ocean Circulation, Princeton University Press, 1987.
Jones I.S.F. and J.E. Jones, Oceanography in the Days of Sail. Hale & Iremonger, Sydney, 1992.

CIVL 5450 **Analysis and Design of Pile Foundations**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5454 **Rock Engineering**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5456 **Earth and Rockfill Dams**

6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5654 **Ocean Mixing**

4 credit points. **Session**: 2. **Classes**: Lectures – 26 hours on Monday afternoons in Semester 2. Offered every year. **Assessment**: Assignments and 2 hour exam.
NB: Department permission required for enrolment.
Unit of study for the degree of Master of Engineering Studies, Graduate Diploma in Geotechnical Engineering or Graduate Diploma in Structural and Foundation Engineering or Graduate Certificate of Greenhouse Gas Mitigation.
Prerequisite
Environmental Oceanography and Meteorology CIVL 5353
Objectives
To introduce the physics of mixing in the ocean of pollutants. To provide access to data needed for design.
Outcomes
Competency in engineering aspects of disposal of pollutants in the ocean.
Syllabus summary
Turbulent diffusion, dilution advection. Wind mixing and ocean stratification. Ocean outfalls. Ocean dumping. Coastal cooling water systems. Ocean Nourishment.
Reference books
Fisher, Hugo B., E.John List, Robert C.Y. Koh, Jorg Imberger, Norman H. Brooks, Mixing in Inland and Coastal Waters, Academic Press, (1979). Csanady, C T (1972) Turbulent Diffusion in the Environment. D Reidel, pp.248.

CIVL 5850 **Project Planning and Optimisation**

6 credit points. **Session**: 2.
NB: Department permission required for enrolment.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5851 **Civil Engineering Project**

6 credit points. **Session**: 1, 2.
NB: Department permission required for enrolment.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5852 **Project**

12 credit points. **Session**: 1, 2.
NB: Department permission required for enrolment.
For more information see the Faculty of Engineering Postgraduate Handbook.

CIVL 5853 **Seminar**

2 credit points. **Session**: 1, 2.
NB: Department permission required for enrolment.
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**: 1. **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**: 2. **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**: N/A in 2004. **Classes**: 3 lec/tut per week. **Prohibition**: MECH 4260 Combustion and Fire Safety. **Assessment**: Assignments, Group Project and 2hr exam. Students will work in groups to develop a Fire Engineering Design for a building space.

Syllabus summary
Revision of thermo-fluids fundamentals. Introduction to fire hazards, phases of fire development and spread. Fire Engineering Design. Fire growth rates and fully-developed fires. CFD applied to fires in buildings, smoke and toxic products. Radiation from fires. Fundamentals of combustion science: premixed and non-premixed flames, chemical kinetics and pollutant formation
Objectives
Students will learn about Fire Engineering design for buildings. Characteristics of fire growth, hazards, toxic products, design of buildings to save lives and property are covered. Students will use computational modelling to predict smoke and toxic product dispersal. Students will also get an understanding of the basic physics and chemistry of combustion processes and how pollutants and toxic species are formed.
Reference
A set of lecture notes is available.
Fire Engineering Guidelines, Fire Code Reform Centre, 1996
SFPE Handbook of Fire Protection Engineering., NFPA 2002.
An Introduction to Fire Dynamics, Drysdale, Wiley, 1998
Combustion Fundamentals of Fire ed. Cox, 1995
An Introduction to Combustion, Turns, McGraw-Hill, 2000
Principles of Combustion, Kuo, Wiley, 1986
Fundamentals of Heat and Mass Transfer, Incropera and De Witt, Wiley, 1996

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, embrittlement, creep rupture, damage tolerance, structure integrity and reliability, thin film science and technology, advanced polymer matrix composites, toughening mechanisms, processing and manufacturing, superalloys, advanced joining methods.
Objectives
To understand (a) how to conduct failure diagnosis of engineering structures, (b) how to define the relationship between properties and microstructures of advanced engineering materials, and (b) how to improve mechanical design with the knowledge of mechanics and properties of materials.
Expected outcomes
Students should gain the capabilities: (a) to conduct failure diagnosis of simplified failure cases of 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 (Ellis Horwood, 1985)
Broek, Elementary Fracture Mechanics (third edition, Martinus Nijhoff, 1982)
Chawala, Composite Materials (Springer-Verlag, 1987)
Crawford, Plastic Engineering (second edition, Maxwell-Macmillan, 1987)
Davidge, Mechanical Behaviour of Ceramics (C.U.P., 1979)
Eckold, Design and Manufacture of Composite Structures (McGraw-Hill, 1994)
Gibson, Principles of Composite Material Mechanics (McGraw-Hill, 1994)
Richerson, Modern Ceramic Engineering (M. Dekker, 1982)
Harris, Engineering Composite Materials (Institute of Metals, 1986)
Jones, Engineering Materials 3 – Materials Failure Analysis (Pergamon, 1993)
Richerson,Modern Ceramic Engineering (M Dekker, 1982)

MECH 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**: 4hrs lec/tut per week. **Prohibition**: MECH 4220 Environmental Engineering, MECH 4240 Energy and the Environment. **Assessment**: Assignments and 2hr exam.

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, CO2 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

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 lec and 1 Lab/Tut per week. **Prohibition**: MECH 4720 Sensors and Signals. **Assessment**: Assignments (35%), Tutorials (35%), 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 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 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

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. **Classes**: 3hrs per week. **Prohibition**: MECH 4220 Environmental Engineering, MECH 4230 Environmental Acoustics and Noise Control. **Assessment**: Assignments and one 1.5hr exam or special project.

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
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 **Quantitative Methods: Project Management**
6 credit points. **Session**: 1.
NB: Department permission required for enrolment.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5868 **Qualitative Methods: Project Management**
6 credit points. **Session**: 1.
NB: Department permission required for enrolment.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5869 **Advanced Knowledge in Project Management**
6 credit points. **Session**: 1, 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**: N/A in 2004.
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 HR Management and Leadership**
6 credit points. **Session**: 1, 2.
NB: Department permission required for enrolment in Session 1.

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**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5875 **ICT and Innovation Project Management**
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**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5877 **Management of Project 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**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5879 **Project Portfolio & Program Management**
6 credit points. **Session**: N/A in 2004.
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**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5882 **Project Formulation & Multidiscipline PI**
12 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5883 **Dissertation**
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**: N/A in 2004. **Prerequisite**: PMGT 5883.
For more information see the Faculty of Engineering Postgraduate Handbook.

PMGT 5885 **Event Project Management**
6 credit points. **Session**: N/A in 2004.
For more information see the Faculty of Engineering Postgraduate Handbook.

■ Interdisciplinary

ENGG 5601 **Greenhouse Gas Mitigation**
6 credit points. A/Professor Ian Jones otg@otg.usyd.edu.au. **Session**: 2. **Classes**: 26 hours lectures 13 hours tutorial/lab/site visits. **Assessment**: Assignments and final examination.
NB: Unit Administration: Web CT
Graduate unit of study designed for environmental engineering students, either M.E.S. or Grad. Cert. of GHG Mitigation
Keywords
Greenhouse science, energy efficiency, carbon sinks, climate change amelioration

Objectives
To develop an understanding of, the significance of carbon dioxide in climate; the role of increasing fossil fuel energy conversion efficiency; the international framework for carbon sinks; the size, cost, potential and nature of terrestrial and oceanic sinks of carbon; the amelioration of the impacts of climate change.
Outcomes
Students will be able to make recommendations of the most cost effective approach to enterprises meeting carbon dioxide limits expected to be imposed as a result of the Kyoto Protocol.
Textbooks
P. Riemer, A. Smith, K. Thambimuthu (1998). Greenhouse Gas Mitigation, Elsevier, Amsterdam. pp777.

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 units of study 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.

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

Illness or misadventure

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

Any student who believes that his/her performance has been or may be adversely affected by an occurrence of illness or misadventure may request the Faculty to make special consideration of same. All such requests must include a special consideration application on the form provided by the Faculty, supplied within one week of the occurrence and accompanied by an appropriate medical certificate or other relevant documentary evidence apart from the student's own submission. Such certificates or documentary evidence should state not only the nature of the illness or misadventure but also (where relevant) the opinion of the issuer as to the extent of the disability involved.

If the student has completed the assessment for which special consideration is requested, then further documentary evidence of the extent of the disability from a specialist medical practitioner/ counsellor etc. must also be supplied. For example, if a student completes an examination but still wishes to request special consideration for it, this additional specialist evidence is required.

Finally, the Faculty intends only to compensate for sub-standard performance in assessments which do not reflect a student's true competence in a subject, and such provisions must not act to the disadvantage of other students. The Faculty will only compensate students when there is clear evidence that results have been adversely affected by the disability for which special consideration is requested.

Financial assistance

Special assistance

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

Students wishing to apply for financial assistance should make enquiries from either of the following:

Financial Assistance Office, Student Services, (02) 9351 2416.

President of the Students' Representative Council, (02) 9660 5222.

J.N. Ellis Memorial†Fund

The J.N. Ellis Memorial Fund was established in 1969 following an appeal made to all graduates in engineering to honour the memory of Neil Ellis, who as Sub-Dean and later as Administrative Assistant to the Dean over a considerable period of years was able, by sympathetic counselling, to help many students who were having difficulties in completing their studies.

The object of the fund is to provide financial assistance to students in the Faculty of Engineering who are in such a position that without assistance they would not be able to continue their studies. Students seeking such assistance should apply to Financial Assistance, Student Services, phone (02) 9351 2416. Awards are made on the recommendation of the Dean. Value: $500. Applications may be made at any time.

Those who receive assistance from the fund are asked to make a contribution to it when they are financially able to do so. In this way the fund will be able to continue and grow in the extent to which it can help deserving students in future years.

Learning assistance

The University's Learning Assistance Centre offers a wide range of workshops and other activities to assist students develop the learning and language skills needed for academic study. The workshops are available free to all enrolled students of the University. Workshop topics include essay and assignment writing, oral communication skills, studying at university, conducting research.

The Learning Assistance Centre is located on Level 7 of the new Education Building next to Manning House, phone (02) 9351 3853.

■ List of staff by departments

Acting Dean

Professor Gregory J. Hancock, B.E., B.Sc., Ph.D, D Eng, F.I.E.Aust. BHP Steel Professor of Steel Structures

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)

Professor Liangchi Zhang,BSc MEng *Zhejiang* PhD *Peking* MASME MASPE MJSPE MJSME

Associate Dean (Undergraduate)

Dr Douglass J.Auld,BSc BE MEngSc PhD

Associate Dean (Research)

Professor John P. Carter, B.E., Ph.D., M.A.S.C.E., F.I.E.Aust., C.P. Eng.

Associate Dean (Teaching and Learning)

John Currie BA,DipEd, MA(Hons) *Woollongong*

Associate Dean (First Year)

Professor Gregory J. Hancock, B.E., B.Sc., Ph.D, D Eng, F.I.E.Aust.

Associate Dean (International)
Professor Liyong Tong,BSc MEngSc *Dalian* PhD *B.U.A.A.,*FIEAust MAIAA
Executive Officer
Mr Eric van Wijk BSc *(ANU)* DipEd , DipAppEcon *(UCan)*
Secretary to the Faculty and Finance Officer
Mr Michael Whitley, BA(Hons) *East Anglia* 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
Administrative Assistant Ms Myra Koureas BEd, MEd (Mgmt & HRD)
External Relations and Scholarships
Vacant
Faculty Librarian
Irene Rossendell BA (*Qld*), Dip Lib *UNSW*, ALIA

Advisers to undergraduate students

Aerospace, Mechanical and Mechatronic†Engineering
To be advised
Chemical Engineering
First Year— Dr M Valix
Second Year – A/Prof T Langrish
Third Year —Dr V Gomes
Fourth Year —Dr H See
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—tba

Electrical and Information Engineering

First Yr — Dr Xiheng Hu
Second Yr – Dr Swamidoss Sathiakumar
Third Yr — Dr Iain Collings
Fourth Yr — Dr Yash Shrivastava
Combined degree courses — Associate Professor Hansen Yee
International students — Dr Xiheng Hu

Aerospace,Mechanical and Mechatronic Engineering

Head of School
Lin Ye,BS *Harbin* MS PhD B.U.A.A
P.N.Russell Professor
Roger I.Tanner,BSc *Brist.*MS *Calif.*PhD *Manc.*FRS FAA FTSE FIEAust FASME.Appointed 1975
Lawrence Hargrave Professor
Vacant
Professors
Robert W.Bilger,BSc BE *NZ* DPhil *Oxf* FAA,.FTSE FIEAust. Appointed 1976
Hugh F.Durrant-Whyte,BSc(Eng)*Lond.*MSE PhD *Penn,*.Federation Fellow, FTSE Appointed 1995
John H.Kent,BE MEngSc PhD FIEAust.Appointed 2001
Yiu-Wing Mai,BSc (Eng) PhD DSc*HK* DEng *Syd* FAA FTSE FASME FHKIE FIE Aust, Federation Fellow. Appointed 1987
Assaad R.Masri,BE PhD Appointed 2002
Eduardo M.Nebot,BS *Bahia Blanca* MS PhD *Colorado State.* Appointed 2003
Michael V Swain,BSc,PhD *UNSW* .Appointed 1997
Liyong Tong,BSc MEngSc *Dalian* PhD *B.U.A.A.*,FIEAust
Lin Ye,BS *Harbin* MS PhD *B.U.A.A,* Appointed 2003
Liangchi Zhang,BSc MEng *Zhejiang* PhD *Peking* MASME MASPE MJSPE MJSME. Appointed 2003
Associate Professors
Steven W Armfield,BSc *Flinders* PhD
J.Dennis Bobyn,BSc MSc *McGill* PhD *Toronto*
Reader
Vacant
Senior Lecturers
Douglass J.Auld,BSc BE MEngSc PhD
Peter W.Gibbens,BE, PhD *N'cle (NSW),*MAIAA
Andrei Lozzi,BSc *UNS,* MEngSc PhD
Paul J.McHugh,BSc BE
David C.Rye,BE *Adel.*PhD
Karkenahalli Srinivas,BE *Bangalore*,ME PhD *I.I.Sc.*
Kee Choon Wong,BE PhD,MAIAA
Lecturers
Steven Scheding,BE PhD
Hugh Stone,BSc BE PhD
Salah Sukkarieh,BE PhD
Stefan Williams,BASc *Wat,* PhD
Adjunct Professor
Francis Rose, BSc (Hons), PhD *Sheff*, FTSE
Donald O. White, BE *Liv*
Adjunct Associate Professors
Allen Lowe,BE ME *UNSW,* PhD *N'cle (NSW)*
Simmy Grewal,BSc *Coventry*,PhD *Liv*
Donald O.White,BE *Liv*
Adjunct Senior Lecturer
Rob Widders, BE MEngSc *NSW*
Adjunct Lecturer
Captain Peter L.Bates ,BE
Visiting Professors
Brian Cotterell,BE (Eng) *London,* PhD *Cantab*
Nhan Phan-Thien,BE, Phd, FAA FIE Aust
Gordon Williams,BSc (Eng), PhD DSc *Lond,* FRS FCGI FREng FIMechE FIM

Chemical Engineering

Head of Department
James G Petrie BSc, PhD *Capetown*
Professors
Brian S Haynes, BE PhD *U.N.S.W.,* FIChemE, FIEAust, CPEng Appointed 1997
Emeritus Professor Rolf G.H. Prince, AO, BE BSc *N.Z.* PhD, FIChemE HonFIEAust FTSE FREng Appointed 1969
Jose Romagnoli, BE *N.delSur.Arg.* PhD *Minn.* Appointed 1991
James G Petrie BSc, PhD *Capetown* Appointed 1997
Associate Professors
Geoffrey W. Barton, BE PhD
Timothy A.G. Langrish, BE *N.Z.* DPhil *Oxf.,* MIChemE
Senior Lecturers
Vincent G. Gomes, BTech MEng PhD *McGill*
Marjorie Valix, BSc, PhD *UNSW*
Howard See, BSc, BE, MSc *Tokyo*, PhD *Nagoya*
Honorary Appointments
Adjunct AssociateProfessor
David Fletcher BSc, PhD *Exeter*
Donald O. 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, B.Sc., B.E., M.Eng.Sc., F.I.E.Aust., M.A.S.C.E.
Challis Professor of Civil Engineering
John P. Carter, B.E., Ph.D., M.A.S.C.E., F.I.E.Aust., C.P. Eng. Appointed Professor 1990 Appointed Challis Professor 1999
Professors
Ali Ja'afari, B.Sc., M.E. *Tehr.*, M.Sc. Ph.D. *Sur.* Appointed Professor 2001 BHP Steel Professor of Steel Structures
Gregory J. Hancock, B.E., B.Sc., Ph.D, D Eng, F.I.E.Aust. Appointed Professor 1990
Adjunct Professor
Robert Herbertson BSc BE MPhil DIC FIEAust MIStructE MICE CPEng NPER
Associate Professors
Kim J.R. Rasmussen, M.Eng.Sc. *T.U. Denmark,* Ph.D.
Stuart G. Reid, BE (Hons) (Cant.), M.E *Cant*., Ph.D. *McG.*
John C. Small, B.Sc. *Lond*., Ph.D., F.I.E.Aust., M.A.S.C.E.
Robert J. Wheen, B.Sc., B.E., M.Eng. Sc., F.I.E.Aust., M.A.S.C.E.
Adjunct Associate Professor
Ian S.F. Jones, B.E., *U.N.S.W.,* Ph.D., *Wat.* M.I.E.Aust.
Emeritus Professors
Harry G. Poulos, AM, BE, Ph.D, D.Sc.Eng., F.I.E.Aust., F.A.S.C.E., F.A.A.
Nicholas S. Trahair, B.Sc., B.E., M.Eng.Sc., Ph.D., D.Eng., F.I.E.Aust.

Honorary Associate Professors
Andrew Abel, Dipl. Ing., *T.U. Bud.,* M.Sc. *McM.,* Ph.D., *U.N.S.W.*, C.Eng., F.I.M.
Peter Ansourian, B.Sc., B.E., Ph.D..
Honorary Associate
Professor Y.K. Cheung, OBE, B.Sc, PhD, DSc, D.E, F.Eng, C.Eng, FICE, F.I.Struct.E, FIEAust, FHKIE(Hon).
Senior Lecturer
David W. Airey, B.A., M.Phil., Ph.D. *Camb.*
Lecturers
Abbas El Zein, B.E., *American Uni Lebanon,*. M.Sc., Ph.D., *Southampton,* M.S., *ENPC,Paris*, M.I.E.Aust.
Noel L. Ings, B.E., M.Eng.Sc. *U.N.S.W.,* M.A.S.C.E., M.I.E.Aust.
Li Liu, BE (NUTD), MBA (AIT), MTax (USyd), PhD (AGSM)
Tim Wilkinson, B.Sc., B.E., M.A., Ph. D.
Graeme Wood, B.Eng.(Hons), Ph.D *Edin.*
Professional Officers
Nigel P. Balaam, B.E., Ph.D.
Timothy S. Hull, B.E., Ph.D.
John P. Papangelis, B.E., Ph.D., M.I.E.Aust.
Honorary Research Associates
Russell Q. Bridge, B.E. (Hons) *U.N.S.W.*, Ph.D., F.I.E.Aust.
Howard B. Harrison, B.E., Ph.D., M.I.E.Aust.
Harold Roper, B.Sc., Ph.D. *Witw.,* M.Eng.Sc., M.A.I.M.M.
Richard D. Watkins, B.E. *Qld,* Ph.D. *Aberd.,* M.I.E.Aust.
Honorary Teaching Associate
Ian G. Bowie, M.Sc. *Manc*., M.A.S.C.E, M.I.E.Aust.

Electrical and Information Engineering

Head of School
Branka Vucetic, MSc PhD *Belgrade*
P.N. Russell Professor
Trevor William Cole, BE *WAust* PhD *Camb,* FTSE, HonFIEAust Appointed 1980
Professors
David Hill, BE BSc *Qld* 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 IPT* MSE *Mich* PhD *Yale* Personal Chair 1997
Associate Professors
Abbas Jamalipour, BSc *Isfahan* MSc *Sharif* PhD *Nagoya,* SMIEEE MURSI, MIEICE, MSITA, MAAEE
David Levy, MScEng PhD *Natal*, MIEEE MACM
Stephen W. Simpson, BSc PhD, FAIP
Hansen Yee, BSc BE PhD, MIEEE
Reader
Andre van Schaik, MSc *Twente*, PhD *EPFL,* SMIEEE
Senior Lecturers
Javid Atai, BSc(Hons) *WAust* PhD *ANU,* SMIEEE
Richard Coggins, BE BSc PhD, MIEEE
Iain Collings, BE *Melb* PhD *ANU,* SMIEEE
Xiheng Hu, MEng *Chongqing* PhD
Björn Landfeldt, PhD *UNSW*, MIEEE
James G. Rathmell, BSc BE PhD, MIEEE
Swamidoss Sathiakumar, BSc *American Coll. India* BE ME PhD *IISc*
Yash Shrivastava, BTech *IIT Kanpur*, PhD *Iowa,* MIEEE
Lecturers
Craig Jin, BSc *Stan* MS *Caltech* PhD
Rafael Calvo, Licenciado in Physics PhD *Universidad Nacional de Rosario*
Guoqiang Mao, BE, *Hubei PolyUni*, ME *Southeast, China*, PhD *Edith Cowan*, MIEEE
Professional Officers
William Fong, BE *WAust* MEngSc
Ross Hutton, BE *QIT,* ME(Res)
Van sPham, BE *SAust* MEngSc PhD *UNSW,* MIEEE
Michael Rados, BSc BE MEngSc
Robert G. Sutton, ME *UNSW*
Manager, Academic Support Office
Erica R Ring, MA
Manager, Information Technology Unit
David Brown, BSc BE
Manager, Resources
Paul Beed, BBus *UWS*, CPA
Executive Officer, Electrical and Information Engineering Foundation
Stuart Glanfield, MA DipEd
Honorary Appointments and Academic Titles
Professores Emeriti
W.N. Christiansen, DSc *Melb,* FInstP FAIP FIEE FIEAust FAA FIREE(Aust)
Hugo K. Messerle, MEngSc DSc *Melb* PhD, FTS FIEE FIEAust FIREE FIEEE FAIP
Honorary Professor
S.Y.R. Hui, BSc *Birm* PhD *Lond*
Adjunct Associate Professors
John Brydon, BA (Hons) *Camb* MSc *Lond* PhD *UNSW*
Peter M. Nickolls, MB BS BSc BE PhD
Andrew Parfitt, BE PhD *Adel* SMIEEE
Honorary Associate Professor
David G. Wong, BSc BE MEngSc PhD
Adjunct Senior Lecturer
Tim Scott, BSc BE PhD
Honorary Senior Lecturers
Brian Campbell, ME
David F. Gosden, ME *UNSW* MBA *AGSM*, MIEAust
Research Affiliate
J.J. Lowke, BSc PhD DipEd *Adel*

■ Scholarships and prizes

Many students enrolling in the Faculty of Engineering obtain financial assistance by way of a cadetship or scholarship, either at the time of enrolment, or at a later stage in their studies.

Information about the Australian government Austudy Scheme *is available from the State Director, Department of Employment, Education and Training, 477 Pitt Street, Sydney 2000.*

Scholarships are also awarded by a number of industrial organisations. Many of these do not require the student to enter into a financial bond.

Some government departments and public authorities provide cadetships or traineeships, which require the student to enter into an agreement to work for the employer for a specified number of years after graduation.

Before accepting a bonded cadetship or traineeship students should give careful consideration to the conditions of the 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** (IEPS, ordinary and combined degrees, $1000 pa + $3500 for 10 weeks paid work experience).

The scholarships web site is at www.eng.usyd.edu.au/scholarships.

W M Neirous†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 over $81,00 for 5 years.

Other Scholarships are provided by Transfield, RTA, ABB, Baulderstone Hornibrook, Evans & Peck, Turbomeca, and Resmed.

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

Contact: Faculty Scholarships Office
Myra Koureas, Administration Officer
Phone: (02) 9351 2834/2131

Fax: (02) 9351 3885
Email: scholarships@eng.usyd.edu.au

■ The major industrial project placement scheme for undergraduates (MIPPS)

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 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 at $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: In this, our third year, projects being carried out include:

- Transient modelling of heat recovery steam generators
- Upgrade of industrial oxygen plantsModelling of interest rates in the Australian financial markets
- 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 are 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 www.library.usyd.edu.au.

The library offers electronic database classes and personal assistance with research needs. The librarians are involved in an extensive Information skills program within the Faculty undertaking classes for all Engineering courses during the semester.

Books may be borrowed by Undergraduate students for two weeks with renewals available if the item is not placed on hold for another borrower. Postgraduates and academics are entitled to a two month loan period with renewals available if the item is not required by another borrower. Journals are not borrowable but photocopying facilities are available for print journals and many journals are available in electronic format. Printing facilities are available in the library and remote access is available via the internet. High demand material is also put into a Reserve collection for two hour loan during the day and overnight loan.

The Engineering Library opens from 8.30 am to 7 pm on Monday and Thursday and 8.30 am to 6 pm Tuesday, Wednesday and Friday during semester. Vacation hours are 9 am to 5 pm Monday to Friday.

Summer School

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

Engineering associations

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.

SUSPECTS

SUSPECTS is the Sydney Uni Software Power Electrical Computer Telecom (Engineering) Students Society! The student body was formed in 2002 to formalise links between staff, students and the Electrical and Information Engineering Foundation.

SUSPECTS organises activities and events to enhance the University experience for all Electrical and Information Engineering Students. As an official Union club, it makes full use of the Union's assistance with funding and operations. In 2002 SUSPECTS ran an O-Week stall, a number of BBQs, a Trivia Night and a two-day Power Station trip to the Hunter Valley. A new student Common Room on Level 4 of the Electrical Engineering Building will be maintained by SUSPECTS, and all students are invited to see the room, get involved and look for the notices of upcoming events.

Institution of Engineers, Australia

The professional body for Engineering in Australia is the Institution of Engineers, Australia, whose first objective is to 'promote the science and practice of engineering in all its branches'.

The institution functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession – eg, civil, electrical, mechanical, chemical and transportation to name a few.

Any student of an approved School of Engineering can join the Institution as a student member (StudIE Aust).

As a student member you will receive the fortnightly magazine *Engineers Australia*, containing articles of general engineering interest and advising you of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, and so on.

Student members may freely use the comprehensive library and reference facilities maintained by the Institution – a handy place to obtain a hard-to-get book or periodical.

Within most divisions is a Graduates and Students Section, known as GAS, and all graduates of, or students at, approved engineering schools are eligible for membership.

The Graduates and Students Sections organise film nights, site tours and other activities of general interest. The Malcolm Stanley Speakers' Competition for public speaking is held each year, usually in September, and prizes are awarded for the best speeches.

For membership information and application forms enquire at the Faculty Office or at the Sydney Division Office:

118 Alfred Street, Milsons Point 2061 (PO Box 138)
Phone (02) 9929 8544.

The Institution of Chemical Engineers

An alternative organisation for Chemical Engineering students is the Institution of Chemical Engineers. The Institution welcomes and values student members, offering special rates for technical meetings, together with Institution literature and guides to gaining employment. For further information contact the General Office in Chemical Engineering, phone (02) 9329 3046.

The Association of Professional Engineers, Scientists and Managers, Australia

APESMA is a professional organisation that represents the industrial interests of its members. Its major focus is on providing advice and assistance on employment-related matters, including individual representation and improving salaries and conditions for professional engineers, scientists and managers. The Association also provides members with legal, financial and insurance services and runs an extensive management education program.

APESMA has some 19,000 members in all areas of public and private sectors in Australia. In addition, 6500 university students in engineering and science-related disciplines are student members.

The Association invites students to become 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

The 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 website 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 non-academic and is a conduit between academic staff, parents and industry. In addition, the Foundation supports department activities and is an integral part of the department's function.

The Foundation is the arm of the civil engineering industry within the University receives all it's funding from the industry. The Foundation has gained a reputation for holding unusual fund raising activities being widely supported by industry.

This funding is used to foster education and research and to ensure the department is fully equipped to engage in such civil engineering research and development. Many civil engineering consultants, contractors and architects use the department's research capabilities before any major works are commenced.

The Foundation also promotes Lectures, Seminars, Short Courses, Masters programs and technical notes to ensure the Australian civil engineering industry is kept at the fore front of world practice.

Management of the Foundation is through a council of civil engineering industry representatives and department staff who meet regularly to monitor the progress of the department and its students.

The Foundation can be contacted through the Executive Officer:

Phone: (02) 9351 2127
Fax: (02) 9351 6284
Email: foundation@civil.usyd.edu.au.

Electrical and Information Engineering Foundation

The mission of the Electrical and Information Engineering Foundation is to build a successful partnership between the School of Electrical and Information Engineering, industry and the profession which facilitates, in Australia, the achievement of world-class performance through education, research and development.

The Foundation is managed by a Board made up of representatives from industry, university staff, students and graduates.

The Foundation's activities include:

- 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: eief@ee.usyd.edu.au
Web: www.ee.usyd.edu.au/foundation

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 close to the Camperdown/Darlington campus 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: accomm@stuserv.usyd.edu.au
Web: www.usyd.edu.au/accom

Admissions Office

The Admissions Office is responsible for overseeing the distribution of offers of undergraduate admission and can advise prospective local undergraduate students regarding admission requirements. Postgraduate students should contact the appropriate faculty. If you are an Australian citizen or a permanent resident but have qualifications from a non-Australian institution, phone (02) 9351 4118 for more information. For enquiries regarding special admissions (including mature-age entry), phone (02) 9351 3615. Applicants without Australian citizenship or permanent residency should contact the International Office.

Student Centre
Ground Floor, Carslaw Building, F07
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 4117 or (02) 9351 4118
Fax: (02) 9351 4869
Email: admissions@records.usyd.edu.au

Applying for a course

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 www.uac.edu.au 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 www.usyd.edu.au/su/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 Web site of the International Office, www.usyd.edu.au/io.

Assessment

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

Careers Information

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

Careers Centre
Ground Floor, Mackie Building, K01
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 3481
Fax: (02) 9351 5134
Email: info@careers.usyd.edu.au
Web: www.careers.usyd.edu.au

Casual Employment Service

The Casual Employment Service helps currently enrolled students find casual and part-time work during their studies and University vacations.

Level 7, Education Building, A35
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 8714
Fax: (02) 9351 8717
Email: ces@stuserv.usyd.edu.au
Web: www.usyd.edu.au/cas–emp

Centre for Continuing Education

The Centre for Continuing Education offers a wide range of short courses for special interest, university preparation and professional development. Subject areas include IT, business, languages, history and culture, overseas study tours, creative arts and social sciences. Courses are open to everyone.

The Centre will be relocating at the end of 2003. Please refer to the Centre's Web site for up-to-date information on location/contact details, or phone the existing general enquiry number (02) 9351 2907 for redirection.

Mackie Building, KO1
The University of Sydney
NSW 2006 Australia Ph: (02) 9351 2907
Fax: (02) 9351 5022
Email: info@cce.usyd.edu.au
Web: www.cce.usyd.edu.au

Centre for English Teaching

CET offers a range of English language courses including Academic English, General English, Business English and IELTS preparation. The University is now also an IELTS testing centre. The English programs help international students to reach the required English levels for entry to degrees at the University. At the end of their language training, students have the opportunity to take the CET university direct entry test (e-test).

Level 2, Building F, 88 Mallett St
University of Sydney (MO2)
NSW 2006 Australia

Phone: (02) 9351 0706
Fax: (02) 9351 0710
Email: info@cet.usyd.edu.au
Web: www.usyd.edu.au/cet

Child care

Contact the Child Care Information Officer for information about children's services for students and staff of the University who are parents.

Child Care Information Officer
Level 7, Education Building, A35
Phone: (02) 9351 5667
Fax: (02) 9351 7055
Email: childc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/childcare

The Co-op Bookshop

In addition to providing the required course textbooks, the Co-op Bookshop stocks a wide range of supplementary material, including recommended readings, course notes, study aids and reference books.

We also house an extensive range of general books including fiction, non-fiction, academic and professional titles.

A one-off membership fee of $25 entitles discounts on most books.

Software for students and academics is available at up to 70% off the usual RRP.

The Co-op is situated in the Sydney University Sports and Aquatic Centre, just off City Road.

Phone: (02) 9351 3705 or (02) 9351 2807
Fax: (02) 9660 5256
Email: sydu@coop-bookshop.com.au
Web: www.coop-bookshop.com.au

Counselling Service

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

Level 7, Education Building, A35
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 2228
Fax: (02) 9351 7055
Email: counsell@mail.usyd.edu.au
Web: www.usyd.edu.au/counsel

Disability Services

Disability Services is the principal point of contact and advice on assistance available for students with disabilities. The Service works closely with academic and administrative staff to ensure that students receive reasonable accommodations in all areas of their study. Assistance available includes the provision of note taking, 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 3320TTY: (02) 9351 3412
Email: disserv@stuserv.usyd.edu.au
Web: www.usyd.edu.au/disability

Enrolment and pre-enrolment

Students entering first year

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

All other students

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

Examinations

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

Examinations and Exclusions Office
Student CentreLevel 1, Carslaw Building, F07
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 4005 or (02) 9351 4006
Fax: (02) 9351 7330
Email: exams.office@exams.usyd.edu.au

Fees

The Fees Office provides information on how to pay fees, where to pay fees and if payments have been received. The Fees Office also has information on obtaining a refund for fee payments.

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: fao@stuserv.usyd.edu.au
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, out of date or misleading.
  (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 made within a specified time period, generally 21 days. Determinations are made by the University's Registrar.

While application may be made 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, function and the kinds of documents held. The Summary of Affairs identifies the University's policy documents and provides information on how to make an application for access to University documents.

Further information and copies of the current reports may be found at www.usyd.edu.au/arms/foi.

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
Fax: (02) 9351 5072

(Grievances) appeals

Many decisions about academic and non-academic matters are made each year and you may consider that a particular decision affecting your candidature for a degree or other activities at the University may not have taken into account all the relevant matters.

In some cases the by-laws or resolutions of the Senate (see University Calendar) specifically provide for a right of appeal against particular decisions; for example, there is provision for appeal against academic decisions, disciplinary decisions and exclusion after failure.

A document outlining the current procedures for appeals against academic decisions is available at the Student Centre, at the SRC, and on the University's Web site at www.usyd.edu.au/su/planning/policy/.

If you wish to seek assistance or advice regarding an appeal, contact:

Students' Representative Council
Level 1, Wentworth Building, G01
The University of Sydney
NSW 2006 Australia
Phone: (02) 9660 5222

HECS and PELS

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 (www.helpdesk.usyd.edu.au) on(02) 9351 6000, located in the University Computer Centre (Building H08), or through the University Access Labs (www.usyd.edu.au/su/is/labs/). 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 'extro' 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 (www.helpdesk.usyd.edu.au/services.html);
- Online course material (www.groucho.ucc.usyd.edu.au:9000/webct/public/home.pl);
- Student facilities via the intranet (www.intranet.usyd.edu.au), 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: info@io.usyd.edu.au
Web: www.usyd.edu.au/io

International Student Services unit

Phone: (02) 9351 4749
Fax: (02) 9351 6818
Email: info@issu.usyd.edu.au
Web: www.usyd.edu.au/issu

Study Abroad and Exchange unit

Study Abroad

Phone: (02) 9351 3699
Fax: (02) 9351 2795
Email: studyabroad@io.usyd.edu.au
Web: www.usyd.edu.au/io/studyabroad

Exchange

Phone: (02) 9351 3699
Fax: (02) 9351 2795
Email: exchange@io.usyd.edu.au
Web: www.usyd.edu.au/io/exchange

Koori Centre and Yooroang Garang

The Koori Centre provides programs, services and facilities to encourage and support the involvement of Aboriginal and Torres Strait Islander people in all aspects of tertiary education at The University of Sydney. The Centre provides tutorial assistance, access to computers, an Indigenous Research library, study rooms, an orientation program at the beginning of the year and assistance in study and learning skills. In particular the Koori Centre aims to increase the successful participation of Aboriginal and Torres Strait Islander people in undergraduate and postgraduate degrees, develop the teaching of Aboriginal Studies, conduct research in the field of Aboriginal Education, and establish working ties with schools and communities.

Close collaboration is also maintained with Yooroang Garang, School of Indigenous Health Studies in the Faculty of Health Sciences on the University's Cumberland campus. Yooroang Garang provides advice, assistance and academic support for Indigenous Health Sciences students, as well as preparatory undergraduate and postgraduate courses in Aboriginal Health and Community.

Koori Centre

Ground Floor, Old Teachers College, A22
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 2046 (General Enquiries)
Toll Free: 1800 622 742
Community Liaison Officer (02) 9351 7003
Fax: (02) 9351 6923
Email: koori@koori.usyd.edu.au
Web: www.koori.usyd.edu.au

Yooroang Garang

T Block, Level 4
Cumberland Campus, C42
The University of Sydney
NSW 2006 Australia
Phone: (02) 9351 9393
Toll Free: 1800 000 418
Fax: (02) 9351 9400
Email: yginfo@fhs.usyd.edu.au
Web: www.yg.fhs.usyd.edu.au

Language Centre

The Language Centre provides multimedia teaching rooms for Faculty of Arts courses. Technical support for teaching staff is available on site. Student self-access facilities for curriculum materials, access to multilingual satellite television broadcasts and a broadcast copying service are also provided by the centre. The centre maintains a resource collection of multimedia language materials in 140+ languages and has three language laboratories, four audiovisual classrooms, two access computer labs and one student audiovisual study room.

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

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

Library

Students are welcome to use any of the 19 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, www.library.usyd.edu.au, as well as in the printed Library Guide, available at any library. Consult the Library staff for assistance.

The libraries listed below are located on the Camperdown/Darlington campus unless otherwise specified.

Architecture Library
Wilkinson Building, G04
Phone: (02) 9351 2775
Fax: (02) 9351 4782
Email: architecture@library.usyd.edu.au

Badham Library
Badham Building, A16
Phone: (02) 9351 2728
Fax: (02) 9351 3852
Email: badham@library.usyd.edu.au

Biochemistry Library

Expected to close in December 2003 and collection transferred to other libraries in the University.

Burkitt-Ford Library
Sir Edward Ford Building, A27
Phone: (02) 9351 4364
Fax: (02) 9351 7125
Email: burkittford@library.usyd.edu.au

Camden Library
University Farms, Werombi Rd, Camden, C15
Phone: (02) 9351 1627
Fax: (02) 4655 6719
Email: camden@library.usyd.edu.au

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

Engineering Library
PN Russell Building, J02
Phone: (02) 9351 2138
Fax: (02) 9351 7466
Email: engineering@library.usyd.edu.au

Fisher Library
Eastern Ave, F03
Phone: (02) 9351 2993
Fax: (02) 9351 4328
Email: fishinf@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

Madsen Library
Madsen Building, F09
Phone: (02) 9351 6456
Fax: (02) 9351 6459
Email: madsen@library.usyd.edu.au

Mathematics Library
Carslaw Building, F07
Phone: (02) 9351 2974
Fax: (02) 9351 5766
Email: mathematics@library.usyd.edu.au

Medical Library
Bosch Building, D05
Phone: (02) 9351 2413
Fax: (02) 9351 2427
Email: medical@library.usyd.edu.au

Music Library
Seymour Centre, J09
Phone: (02) 9351 3534
Fax: (02) 9351 7343
Email: music@library.usyd.edu.au

Nursing Library
88 Mallett St, Camperdown, M02
Phone: (02) 9351 0541
Fax: (02) 9351 0634
Email: nursing@library.usyd.edu.au

Orange Library
Leeds Parade, Orange
Phone: (02) 6360 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: library@conmusic.usyd.edu.au

Mathematics Learning Centre

The Mathematics Learning Centre assists students to develop the mathematical knowledge, skills and confidence that are needed for studying their first level mathematics or statistics units 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 Australia
Phone: (02) 9351 4061
Fax: (02) 9351 5797
Email: mlc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/mlc

Part-time, full-time

Undergraduate students

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

Postgraduate students (coursework)

Whether a postgraduate coursework student is part-time or full-time is determined solely by credit-point load for all coursework programs. A student 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 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, instead they 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 and the NSW Health Records and Information Privacy Act 2002. Central to the both Acts are the sets of Information Protection Principles (IPPs) and Health Privacy Principles which regulate the collection, management, use and disclosure of personal and health information. In compliance with the Privacy and Personal Information Protection Act the University 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, the Health Records and Information Privacy 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, KO1
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/scholarships

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
Web: www.usyd.edu.au/su/studentcentre

Student identity cards

The student identity 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 University. 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 and 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 that 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.

The Student Intranet

The University is continually increasing the amount of information and services for students it provides through the Web. The new Student Intranet (intranet.usyd.edu.au/student/) gathers information and services together in one place and organises them by the use of tabs.

Categories such as 'MyStudy' provide links to courses and units of study information, student administration matters (eg, exam results, Web Enrolment Variations, etc.) and links to online learning courses – and of course the study-related services available to all students provided by the Library. Communication services – such as access to free student Email:, the online phone directory and face-to-face services provided by the Student Centre, International Office and ITS Help Desk – is another category.

The Services category provides access to student services such as Child Care, Counselling, I.T. Help and guidance in the use of the online Student Administration services. While Student Life focuses on campus life – accommodation, employment, sporting facilities, political life and where to eat and drink.

News and Events and Campuses provide links to what is happening right across the large and diverse learning community that is The University of Sydney.

MyUni is the personalised section of the intranet. 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.

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 and Mathematics Learning Centre. The Web site is at www.usyd.edu.au/stuserv.

The Sydney 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 its entire 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 5 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. A small Winter School is also run from the Summer School office. This has mainly postgraduate offerings with a few undergraduate units of study. Information can be found on the summer school Web site.

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

The University Health Service provides full general practitioner services and emergency medical care to all members of the University community. Medical centres on the Camperdown and Darlington Campuses offer general practioners, physiotherapy and some specialist services.

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

The Students' Representative Council is the organisation which represents undergraduates both within the University and in the wider community. All students enrolling in an undergraduate course automatically become members of the SRC.

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) 9351 1291 Pitt St – Conservatorium
Fax: (02) 9660 4260
Email: postmaster@src.usyd.edu.au
Web: www.src.usyd.edu.au

Sydney University Postgraduate Representative Association (SUPRA)

SUPRA is an organisation that 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/

Sydney University Sport

Sydney University Sport provides 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: admin@susport.usyd.edu.au

University of Sydney Union

University of Sydney Union
Foyer, Holme Building, A09
Science Rd, The University of Sydney
NSW 2006 Australia
Phone: 1800 013 201 (Switchboard)
Fax: (02) 9563 6216
Email: info@usu.usyd.edu.au
Web: www.usydunion.com

Abbreviations and Glossary

■ Acronyms

Listed below are the more commonly used acronyms that appear in University documents and publications.

A	
AARNet	Australian Academic Research Network
AAT	Administrative Appeals Tribunal
AAUT	Australian Awards for University Teaching
ABC	Activity Based Costing
ABS	Australian Bureau of Statistics
ABSTUDY	Aboriginal Study Assistance Scheme
ACER	Australian Council for Educational Research
AGSM	Australian Graduate School of Management
ANZAAS	Australian and New Zealand Association for the Advancement of Science
APA	Australian Postgraduate Awards
APAC	Australian Partnership for Advanced Computing
APAI	Australian Postgraduate Awards (Industry)
APA-IT	Australian Postgraduate Awards in Information Technology
APDI	Australian Postdoctoral Fellowships Industry
APEC	Asia-Pacific Economic Co-operation
APF	Australian Postdoctoral Fellowship
AQF	Australian Qualifications Framework
ARC	Australian Research Council
ARCA	Australian Research Council Act
ASDOT	Assessment Fee Subsidy for Disadvantaged Overseas Students
ATN	Australian Technology Network
ATO	Australian Taxation Office
ATP	Australian Technology Park
ATPL	Australian Technology Park Limited
AUQA	Australian Universities Quality Agency
AusAID	Australian Agency for International Development
AUTC	Australian Universities Teaching Committee
AVCC	Australian Vice-Chancellors Committee
B	
BAA	Backing Australia's Ability
BAC	Budget Advisory Committee
BITLab	Business Intelligence Lab
BLO	Business Liaison Office
BOTPLS	Bridging for Overseas Trained Professionals Loans Scheme
C	
CAF	Cost Adjustment Factor
CAUT	Committee for Advancement of University Teaching
CDP	Capital Development Program
CDP-IT	Capital Development Program - Information Technology
CEP	Country Education Profile
CEQ	Course Experience Questionnaire
CFO	Chief Financial Officer
CHASS	College of Humanities and Social Sciences
CHS	College of Health Sciences
CIO	Chief Information Officer
CPI	Consumer Price Index
CPSU	Community and Public Sector Union
CRC	Cooperative Research Centre
CREO	Centre for Regional Education, Orange
CRICOS	Commonwealth Register of Institutions and Courses for Overseas Students
CRRI	Centre for Rural and Regional Innovation
CSIRO	Commonwealth Scientific and Industrial Research Organisation

CST	College of Sciences and Technology
CUSTD	Committee for University Teaching and Staff Development
D	
DAC	Data Audit Committee
DEST	Commonwealth Department of Education, Science and Training
DET	NSW Department of Education and Training
D-IRD	Discovery-Indigenous Researchers Development Program
DISR	Department of Industry, Science and Resources
DoFA	Department of Finance and Administration
DVC	Deputy Vice-Chancellor
E	
EB	Enterprise Bargaining
EFTSU	Equivalent Full Time Student Unit
EIP	Evaluations and Investigations Program
ELICOS	English Language Intensive Course of Study
EMU	Electron Microscope Unit
ESOS Act	Education Services for Overseas Student Act
F	
FlexSIS	Flexible Student Information System
FMO	Facilities Management Office
FOS	Field of Study
FTE	Full Time Equivalent (Staff)
G	
GATS	General Agreement on Trade in Services
GCCA	Graduate Careers Council of Australia
GDS	Graduate Destination Survey
GPOF	General Purpose Operating Funds
GSA	Graduate Skills Assessment
GST	Goods and Services Tax
GWSLN	Greater Western Sydney Learning Network
H	
HDR	Higher Degree Research
HECS	Higher Education Contribution Scheme
HEEP	Higher Education Equity Program
HEFA	Higher Education Funding Act 1988
HEIP	Higher Education Innovation Programme (DEST)
HEO	Higher Education Officer
HERDC	Higher Education Research Data Collection
I	
IAS	Institute of Advanced Studies
ICT	Information and Communication Technology
IGS	Institutional Grants Scheme (DEST)
IO	International Office
IP	Intellectual Property
IPRS	International Postgraduate Research Scholarships
IREX	International Researcher Exchange Scheme
ISFP	Indigenous Support Funding Program
ISIG	Innovation Summit Implementation Group
ISSU	International Student Services Unit
IT	Information Technology
ITC	Information Technology Committee
ITL	Institute for Teaching and Learning
ITS	Information Technology Services
J	
JASON	Joint Academic Scholarships On-line Network
L	
LBOTE	Language Background Other Than English
M	
MBA	Master of Business Administration
MISG	Management Information Steering Group
MNRF	Major National Research Facilities Scheme
MOU	Memorandum of Understanding
MPG	Major Projects Group

MRB	Medical Rural Bonded Scholarship Scheme
N	
NBCOTP	National Bridging Courses for Overseas Trained Program
NCG	National Competitive Grant
NESB	Non-English-Speaking Background
NHMRC	National Health and Medical Research Council
NOIE	National Office for the Information Economy
NOOSR	National Office for Overseas Skill Recognition
NRSL	Non-Recent School Leaver
NSW VCC	New South Wales Vice-Chancellors' Conference
NTEU	National Tertiary Education Industry Union
O	
OECD	Organisation for Economic Co-operation and Development
OLA	Open Learning Australia
OLDPS	Open Learning Deferred Payment Scheme
OPRS	Overseas Postgraduate Research Scholarships
P	
PAYE	Pay As You Earn
PAYG	Pay As You Go
PELS	Postgraduate Education Loans Scheme
PSO	Planning Support Office
PVC	Pro-Vice-Chancellor
Q	
QA	Quality Assurance
QACG	Quality Advisory and Coordination Group
R	
R&D	Research and Development
R&R	Restructuring and Rationalisation Program
RC	Responsibility Centre
REG	Research and Earmarked Grants
REP	Research Education Program
RFM	Relative Funding Model
RIBG	Research Infrastructure Block Grant (DEST)
RIEF	Research Infrastructure Equipment and Facilities Scheme
RISF	Restructuring Initiatives Support Fund
RMO	Risk Management Office
ROA	Record of Achievement
RQ	Research Quantum
RQU	Recognition Quality Unit (Higher Education Division – DEST)
RRTMR	Research and Research Training Management Reports
RSL	Recent School Leaver
RTS	Research Training Scheme (DEST)
S	
SCA	Sydney College of the Arts
SCEQ	Sydney Course Experience Questionnaire
SCM	Sydney Conservatorium of Music
SCR	Science Capability Review
SDF	Strategic Development Fund
SDVC	Senior Deputy Vice-Chancellor
SEG	Senior Executive Group
SES	Socioeconomic Status
SI	Scholarship Index
SNA	Safety Net Adjustment
SPIRT	Strategic Partnerships with Industry – Research and Training Scheme
SRC	Students' Representative Council
SSR	Student/Staff Ratio
SUPRA	Sydney University Postgraduate Students' Representative Association
SUSport	Sydney University Sport
SUSU	Sydney University Sports Union (now SUS)
SUWSA	Sydney University Women's Sports Association (now SUS)
T	
TAFE	Technical and Further Education
TFN	Tax File Number
TMUI	Treasury Measure of Underlying Inflation

TPI	Teaching Performance Indicator
U	
UAC	Universities Admissions Centre
UMAP	University Mobility in Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPA	University Postgraduate Awards
V	
VCAC	Vice-Chancellor's Advisory Committee
VET	Vocational Education and Training
W	
WIT	Western Institute of TAFE
WRP	Workplace Reform Program
WTO	World Trade Organization

■ Glossary

This glossary describes terminology in use at the University of Sydney.

AAM (Annual Average Mark)

This mark is calculated using the unit of study credit point value for each Semester and for the year. This mark may also be calculated cumulatively for every currently enrolled student, based on all unit of study completions to the end of the last completed semester, as a cumulative measure of progression.

The formula for this calculation is:

$$AAM = \frac{\sum(marks \times creditPointValue)}{\sum(creditPointValue)}$$

The 'marks' used in this formula are the actual marks obtained by the student in each unit of study, as recorded on the student's record, including any marks of less than 50, and in the case of a failing grade with no mark, the mark defaults to 0. Pass/Fail assessed subjects and credit transfer subjects (from another institution) are excluded from these calculations, however the marks from all attempts at a unit of study are included. (Effective from 1 January 2004.)

Academic Board

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 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 dishonesty

A student is suspected of presenting another person's ideas, findings or written work as his or her own by copying or reproducing them without due acknowledgement of the source and with intent to deceive the examiner. Academic dishonesty also covers recycling, fabrication of data, engaging another person to complete an assessment or cheating in exams.

Academic record

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

A printed statement setting out a student's academic record at the University. There are two forms of academic transcript: external and internal. (See also External transcript, Internal transcript.)

Academic year

For the purposes of FlexSIS, an academic year indicates the current calendar year in which the student is currently enrolled. An academic year indicates a calendar 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

Governed by the University's admission policy, this 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

A classification based on how a student was admitted to a course, for example 'UAC' or 'direct'.

Admission period

The period during which applications for admission to courses are considered. The main admission period takes place before Semester 1, but there may also be an admission period for mid-year applicants before the beginning of Semester 2, and other admission periods.

Admission reply

A code used by FlexSIS to indicate whether an applicant who has received an offer has accepted the offer or not.

Admission result

A code used by FlexSIS to indicate the result of a direct application to study at the University (eg, offer, unsuccessful, withdrawn).

Admission year

The year the student began the course.

Advanced diplomas

See *Award course*.

Advanced standing

See *Credit*.

Advisor

A member of academic staff appointed in an advisory role for some postgraduate coursework students. (See also Associate supervisor, Instrumental supervisor (teacher), Research supervisor, Supervision.)

AGSM (Australian Graduate School of Management)

From 1999 The University of Sydney entered into a joint venture with the University of New South Wales leading to the formation of a new Australian Graduate School of Management (AGSM). The new joint venture AGSM is derived from the Graduate

School of Business at The University of Sydney and the existing AGSM at the University of New South Wales.

Students enrolled at the new joint venture AGSM are students of both The University of Sydney and the University of New South Wales. The agreement for reporting enrolments, load and staff at the joint venture requires that The University of Sydney report all student enrolments and staff numbers, but that only one third of both the Student load (EFTSU) and full-time equivalent staff (FTE) be attributed to The University of Sydney.

Annual Progress Report

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 it is 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 *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

Attendance is classified as full-time, part-time or external. The type of attendance in which a student is classified depends on the student's mode of attendance and the student load.

The mode of attendance is a classification of whether a student is internal, external or multi-modal in accordance with the definition provided by DEST.

Internal mode of attendance

When all units of study for which the student is enrolled are undertaken through attendance at the University on a regular basis. It also refers to the case when the student is undertaking a higher degree course for which regular attendance is not required, but attends the University on an agreed schedule for purposes of supervision and/or instruction.

External mode of attendance

When all units of study for which the student is enrolled involve special arrangements whereby lesson materials, assignments, etc, are delivered to the student, and any associated attendance at the University is of an incidental, irregular, special or voluntary nature.

Multi-modal mode of attendance

When at least one unit of study is undertaken on an internal mode of attendance and at least one unit of study is undertaken on an external mode of attendance.

Students with an external mode of attendance are classified as being external for the type of attendance.

Students with either an internal or multi-modal mode of attendance are classified as being full-time or part-time depending on the load associated with the courses in which they are enrolled. According to the definition provided by DEST, a student whose enrolment in all courses generates 0.373 EFTSU or higher for a semester is classified as full-time, otherwise the student is classified as part-time.

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 proportion being undertaken by the student of the normal full-time load specified for the course in which the student is enrolled. To be considered full-time, a coursework student must undertake at least 0.75 of the normal full-time load over the academic cycle or at least 0.375 if only enrolling in half of an academic year. It is important to note however that, for some purposes, to be considered full-time a student may need to be enrolled in at least 0.375 in each half year. Research students, with the approval of their faculty, nominate whether they wish to study part-time or full-time. The attendance status is then recorded on FlexSIS as part of the application or enrolment process. (See also Coursework, Student load.)

Attendance status

Full or part time.

AusAID

Australian Agency for International Development.

AUSTUDY

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

Award course

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. A bachelor's degree course normally requires three or four years of full-time study or the part-time equivalent. Bachelor degree refers to Bachelor (Graduate Entry), Bachelor (Honours) end on, and Bachelor which comprises Bachelor (Pass) and Bachelor (Honours) concurrent. (See also Award course.)

Barrier

An instruction placed on a student's FlexSIS record that prevents the student from re-enrolling or graduating. (See also *Deadlines (fees)*, *Suppression of results*.)

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

A program, named in recognition of the Aboriginal people of the land on which the University is located, designed to increase the

successful participation of Aboriginal and Torres Strait Islanders in degree courses in all faculties at The University of Sydney.

Applicants seeking admission under the Program are assessed under a broad set of criteria embracing relevant educational background, work and life experience and motivation. An essential aspect of the Program is the provision of academic support.

All applicants are assessed prior to enrolment and on the basis of those assessments may be recommended for alternative study options, including enrolment in a reduced course load in the first year of their degree and concurrent enrolment in an Academic Skills course run by the Koori Centre.

An intensive Orientation Program is conducted immediately prior to the commencement of the academic year and students may request additional tutoring in particular subject areas.

CAF (Cost Adjustment Factor)

The amount by which the Commonwealth increases payments to institutions each year towards increases in salary and non-salary costs.

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 (Sydney Conservatorium of Music), Cumberland (Health Sciences), Mallett Street (Nursing), Orange (Faculty of Rural Management and Centre for Regional Education), Rozelle (Sydney College of the Arts), St James (Law) and Surry Hills (Dentistry).

Cancellation

For non-payment of fees.

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

Centrelink

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

Ceremony

See *Graduation ceremony.*

Chancellor

The non-executive head of the University. An honorary position, the Chancellor chairs meetings of the University's governing body, the Senate, and presides over graduation ceremonies amongst other duties.

Class list

A listing of all currently enrolled students in a particular unit of study. (See also *unit of study.*)

College of Health Sciences

Consists of the Faculties of Dentistry; Health Sciences; Medicine; Nursing; and Pharmacy.

College of Humanities and Social Sciences

Consists of the Faculties of Arts; Economics and Business; Education; Law; the Sydney College of the Arts; and the Sydney Conservatorium of Music.

College of Sciences and Technology

Consists of the Faculties of Agriculture, Food and Natural Resources; Architecture; Engineering; Rural Management; Science; and Veterinary Science.

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 and continuing enrolments

Enrolments are classified as commencing or continuing in accordance with the definition provided by DEST. In general, an enrolment is classified as commencing if a student has enrolled in a particular degree or diploma for the first time between 1 September of the year prior to the current year and 31 August of the current year. There are a number of exceptions to this general rule, of which the most important are:

(a) an enrolment in the LLB is not classified as commencing if the student was previously enrolled in a combined law degree; and,

(b) an enrolment in an Honours degree (Bachelor or Master) is not classified as commencing if the student was previously enrolled in the corresponding Pass degree.

Commencing student

A student enrolling for the first time in an award course at The University of Sydney. 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, compulsory subscriptions depend on the level of study.

Undergraduate

The University of Sydney Union, Students' Representative Council (SRC) and Sydney University Sport.

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

This form is issued to each student after enrolment showing the course and the units of study in which the student is enrolled, 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.

Conjoint ventures

Two or more institutions co-operate to provide a unit or course of study to postgraduate coursework students. Arrangements exist between individual departments at The University of Sydney and individual departments at UNSW and UTS whereby students enrolled for a degree at one institution complete one or more units of study at the other institution to count towards the award program at their 'home' institution.

Continuing professional education

A process which 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

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 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*.)

Cotutelle scheme

Agreement between The University of Sydney and a French university for joint supervision and examination of a PhD student as part of an ongoing co-operative research collaboration. If successful, the student receives a doctorate from both universities with each testamur acknowledging the circumstances under which the award was made.

Course

An award course or non-award course undertaken at The University of Sydney. (See also Award course, Non-award course.)

Course alias

Each course in FlexSIS is identified by a unique five-digit alpha-numeric code.

Course code

See *Course alias*.

Course enrolment status

A student's enrolment status in a course is either 'enrolled' or 'not enrolled'. A course enrolment status of 'not enrolled' is linked to a not enrolled reason.

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 are recorded internally by the faculty). Students on leave are regarded as having an active candidature, but they are not entitled to a student card. At undergraduate level leave is not counted towards the total length of the course. Students who are absent from study without approved leave may be discontinued and may be required to reapply formally for admission. The term 'suspension of candidature' was previously used to describe research students on course leave.

Course (Research)

A classification of courses in which students undertake supervised research leading to the production of a thesis or other piece of written or creative work over a prescribed period of time. The research component of a research course must comprise 66% or more of the overall course requirements.

Course rules

Rules which 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

A transfer which 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

A DEST code.

Coursework

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

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

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

Credit points

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

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)

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 variation*.

Deadlines (fees)

The University has deadlines for the payment of fees (eg, HECS, compulsory subscriptions, course fees). 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 Sydney Conservatorium of Music or the Sydney College of Arts).

Dean's certificate

A statement from the dean certifying that all requirements, including fieldwork and practical work, have been met and that the student is eligible to graduate. Not all faculties use dean's certificates. In faculties that do, qualified students have 'Dean's Certificate' noted on their academic record.

Deferment

See *Admission (deferment)*, *Leave*.

Degree

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

Delivery mode

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

distance mode and an external student may attend campus for one or more units.

Department or school

The Senate Resolutions define a department or school as consisting of such of the members of the teaching staff and the research staff of the University and such other persons or classes of persons as are appointed to it or assigned to it by the Senate or the Vice-Chancellor on the recommendation of the faculty or college board concerned.

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.

Increasingly, as departments merge into larger schools, the term department is also used to describe the constituent parts of a school. Alternatively, the term Discipline is used. DEST uses the term Academic Organisational unit (AOU) and for reporting purposes each AOU is assigned a Field of Education classification.

DEST

The Department of Education, Science and Training (DEST) 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 and, annually, information about staff, finance, research and space allocation. Among other things, the Government uses this information in its funding deliberations.

Differential HECS

See *Higher Education Contribution Scheme (HECS)*.

Diploma

The award granted following successful completion of diploma course requirements. A diploma course usually requires less study than a degree course. Graduate diploma courses are only available to students who already hold an undergraduate degree. (See also *Award course*.)

Direct admissions

For some courses, applications may be made directly to the University. Applications are received by faculties or the International Office, registered on FlexSIS and considered by the relevant department or faculty body. Decisions are recorded on FlexSIS and FlexSIS produces letters to applicants advising them of the outcome. (See also Admission, UAC admissions.)

Disability information

Students may inform the University of any temporary or permanent disability, other than a financial disability, which affects their life as a student. Disability information is recorded in FlexSIS but it is only visible to particular authorised users because of its sensitive nature.

Disciplinary action

Undertaken as the result of academic or other misconduct – eg, plagiarism, cheating, security infringement, criminal activity.

Discipline codes

A four-letter code 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 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

A mode of learning which 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. (See *Award course*, *Doctorate*, *PhD*.)

Doctorate

A high-level postgraduate award 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. (See also Award course, PhD.)

Double degree

Completing a second degree while enrolment is suspended from the first degree – eg, students enrolled in the Bachelor of Engineering may transfer to the Bachelor of Science, complete the requirements for the BSc and then resume the Bachelor of Engineering.

Downgrade

Where a student is enrolled in a PhD and where the research they are undertaking is not at an appropriate level for a PhD and the institution recommends that the student downgrade their degree to a Master's by Research course, or where the student, for personal or academic reasons, seeks to revert to a Master's by Research course. There would be no interval between the candidature for the PhD and Master's degree unless the interval was covered by a period of suspension.

With a downgrade, the research undertaken by the student while enrolled for the PhD would either be continued in the Master's by Research degree or modified to meet the requirements of the Master's program.

Earliest date

See *Research candidature*.

EFTSU

The equivalent full-time student unit (EFTSU) is a measure of student load expressed as a proportion of the workload for a standard annual program for a student undertaking a full year of study in a particular award course. A student undertaking the standard annual program of study (normally 48 credit points) generates one EFTSU.

EFTYR

See *EFTSU*.

Embedded courses/programs

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 – eg, the Graduate Certificate in Information Technology, Graduate Diploma in Information Technology and Master of Information Technology sequence.

Enrolment

A student enrols 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

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 variable for students both with relation to course and unit of study. (See *Course enrolment status* and *unit of study enrolment status*)

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*.)

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 time set each semester for the conduct of formal examinations.

Examiner (coursework)
The person assessing either the written/oral examination, coursework assignments, presentations, etc of a student or group of students.

Exchange student
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
A 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*.)

Exemption
A decision made at a sub-unit of study level to allow a student to complete a unit of study without also completing all the prescribed components of coursework and/or assessment. (See also *Credit*, *Waiver*.)

Expulsion
The ultimate penalty of disciplinary action is to expel the student from the University. The effect of expulsion is:
- the student is not allowed to be admitted or to re-enrol in any course at the University;
- the student does not receive their results;
- the student is not allowed to graduate; and
- the student does not receive a transcript or testamur.

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
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 formal part of the University's academic governance structure, consisting mainly of academic staff members and headed by a dean, which is responsible for all matters concerning the award courses that it supervises. Usually, a faculty office administers the faculty and student or staff inquiries related to its courses. The University Calendar sets out the constitution of each of the University's faculties. (See also Board of studies, Supervising faculty.)

Fail
A mark of less than 50% which is not a concessional pass. This grade may be used for students with marks of 46–49 in those faculties which do not use PCON. (See also *Results*.)

Fee-paying students
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 Senior Deputy Vice-Chancellor.

Flexible learning
See *Distance and Flexible Learning*.

Flexible Start Date
Full fee-paying distance students are not restricted to the same enrolment time frames as campus-based or HECS students.

FlexSIS
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.

FTE (Full-time equivalent)
This is a measurement of staff resources and relates to the amount of time a staff member devotes to his/her current duties (ie, the job in which a staff member is working at the reference date of 31 March).

A staff member can have either a full-time, fractional full-time or casual work contract. A full-time work contract has an FTE of 1.0. A fractional full-time work contract has a value less than 1.0 (eg, 0.5).

Casual FTE values are calculated in the following manner:

$$Lecturing = \frac{ContactHours}{243}$$

$$Tutoring\backslash Demonstrating = \frac{ContactHours}{675}$$

$$Marking(singleActivity)\backslash Research\backslash Other = \frac{ContactHours}{1820}$$

The denominator values of the above equations represent the hours worked by one full-time staff member in each of the occupation groups – ie, Lecturing, Tutoring/Demonstrating, etc., as imputed by DEST.

Full-time student
See *Attendance status*, *EFTSU*.

Funding Category
Funding Category comprises the following:
(1) Funded from Operating Grant*,
(2) Fee-paying local postgraduates,
(3) Fee-paying local undergraduates,
(4) Fee-paying international students,
(5) Non-fee exchange international students,
(6) Non-award (local fee-paying),
(7) Research outside time limits,
(8) Funded by employer.

*Refers to HECS liable students, local students enrolled under the Research Training Scheme, and local disadvantaged students enrolled in an enabling course or holding a Commonwealth-funded merit-based undergraduate HECS-exemption scholarship.

GPOF (General Purpose Operating Funds)
GPOF (General Purpose Operating Funds) includes:
General income – eg, Commonwealth and State base operating grants, fee income and miscellaneous income;
Other (Non-DEST) activities include commercial and other internal business activities not receiving a base operating grant allocation;
Specific Operating allocations includes PVC Research allocations (major equipment, etc.); and
Research infrastructure allocations.

Grade
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 student who has completed all the requirements for an award course but has not yet graduated. (See also Graduation, Potential graduand.)

Graduate
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
A list of all graduates of the University. (See also *Graduation*.)

Graduation
The formal conferring of awards either at a ceremony or in absentia. (See also *In absentia*, *Potential graduand*.)

Graduation Ceremony
A ceremony where the Chancellor confers awards upon graduands. The Registrar publishes the annual schedule of graduation ceremonies.

Head of Department
The head of the academic unit which has responsibility for the relevant unit of study, or equivalent program leader.

HECS (Higher Education Contribution Scheme)
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 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. These are all determined annually by the Commonwealth Government.

HECS census date
The date at which a student's enrolment, load and HECS liability are finalised before this information is reported to DEST. The following dates apply:
- Semester 1: 31 March
- Semester 2: 31 August.

Higher Doctorates
See *Award course*.

Higher Education Officer (HEO)
General staff are employed under a ten level Higher Education Officer award structure. The structure, introduced at The University of Sydney in October 1993, applies to general staff in all Australian universities.

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 I, Class II, Class III) and sometimes there are two divisions within Class II.

HSC
The NSW Higher School Certificate (HSC), 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
Latin for 'in the absence of'. Awards are conferred in absentia when graduands do 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 Sydney Conservatorium of Music and BMus students on the Camperdown Campus have an instrumental teacher appointed. (See also *Advisor*, *Associate supervisor*, *Research supervisor*, *Supervision*.)

Internal
See Attendance mode.

Internal transcript
A record of a student's academic record for the University's own internal use. It includes the student's name, student identifier (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*.

Legitimate co-operation
Any constructive educational and intellectual practice that aims to facilitate optimal learning outcomes through interaction between students.

Liability status code
A code used by DEST to identify the liability status of a student (eg, 10 – HECS liable deferred, 11 – HECS liable upfront with discount, 13 – PELS, 19 – Local UG full fee paying, 20 – Local PG full fee paying, 22 – International fee paying, etc.)

Life membership
Under some circumstances (eg, after five full-time years of enrolments and contributions) students may be granted life membership of various organisations. This means they are exempt from paying yearly fees. (See also Compulsory subscriptions.)

Load
The sum of the weights of all the units of study in which a student is enrolled. Each unit of study (subject) in which a student may enrol is assigned a weight. This is determined by the proportion of a full year's work represented by the unit of study in the degree or diploma for which the student is a candidate. These weights can be aggregated in a number of different ways (by student, degree/course, department, faculty) to give student load. Student load is measured in terms of Equivalent Full-Time Student units (EFTSU).

A full-time research student is counted as 1.0 EFTSU while a part-time research student is counted as 0.5 EFTSU. (See also *EFTSU*, *HECS*.)

Local student
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 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 simultaneously.

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 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.

Misconduct

(a) Conduct on the part of a student which is prejudicial to the good order and government of the University or impairs the reasonable freedom of other persons to pursue their studies or research in the University or to participate in the life of the University; and

(b) Refusal by a student to give satisfactory particulars of the student's identity in response to a direction to do so by a prescribed officer and any other form of wilful disobedience to a reasonable direction of a prescribed officer.

Mixed Mode

See *Attendance mode*.

Mode

See *Attendance mode* and *Delivery mode*.

Model income

Income allocated to Colleges through the University's funding model.

Mutually exclusive units of study

See *Prohibited combinations of units of study.*

MyUni

A personalised space for staff and students on The University of Sydney's intranet, called USYDnet. MyUni is used to deliver information and services directly through a central location, while also allowing users to customise certain information. Students are able to access such services as exam seat numbers, results, timetables and FlexSIS pre-enrolment and enrolment variations on MyUni. (See also *USYDnet*.)

Non-award course

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

Non-award enrolment

See *Enrolment non-award*.

Non-specific credit

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

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

Non-standard session

A teaching session other than the standard February and August sessions – eg, Summer School, in which units of study are delivered and assessed in an intensive mode during January of each year, is an example of a non-standard session. (See also *Semester*, *Session*.)

Not enrolled reason

These reasons include: potential enrolment, did not re-enrol, not continuing, cancelled, on leave (suspended), transferred, under examination, completed.

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*.

PeopleSoft HRMS

The University's Human Resources (HR) IT system.

PELS (Postgraduate Education Loans Scheme)

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).

Permanent home address

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. 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. In University Statistics publications, entries headed PhD include other Doctorates by advanced coursework and research, such as the S.J.D. and Ed.D. (See also *Award course*, *Doctorate*.)

Plagiarism

Presenting another person's ideas, findings or work as one's own by copying or reproducing them without the acknowledgement of the source.

Postgraduate

A term used to describe a course leading to an award such as graduate diploma, a master's degree or PhD which usually requires prior completion of a relevant undergraduate degree (or diploma) course. A 'postgraduate' is a student enrolled in such a course.

Potential graduand

A student who has been identified as being eligible to graduate on the satisfactory completion of their current studies. (See also *Graduand*, *Graduation*.)

Pre-enrolment

Pre-enrolment takes place in October for the following year. Students indicate their choice of 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 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

Awarded by the University, a faculty or a department for outstanding academic achievement.

Probationary candidature

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
See *Pre-enrolment*.

Qualification
An academic attainment recognised by the University.

Qualifier
A mandatory (compulsory) prerequisite unit of study which must have a grade of Pass or better. (See also Assumed knowledge, Corequisite, Prerequisite, Waiver.)

Recycling
The submission for assessment of one's own work, or of work which substantially the same, which has previously been counted towards the satisfactory completion of another unit of study, and credited towards a university degree, and where the examiner has not been informed that the student has already received credit for that work.

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 candidature
Master's by research, PhD and other doctorates such as Doctor of Juridical Studies (SJD), but not Higher Doctorates – eg, DSc.

Research course
See Course (*research*).

Research/coursework higher degrees
A student's candidature in a higher degree is deemed to be by Research if 66% or more of the workload over the length of the degree is by research. Otherwise the candidature is deemed to be by Coursework.

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 supervisor

Resolutions of Senate
Regulations determined by the Senate of The University of Sydney that pertain to degree and diploma course requirements and other academic or administrative matters.

Result processing
Refers to the processing of assessment results for units of study. Departments tabulate results for all assessment activities of a unit of study and assign preliminary results for each unit of study. Preliminary results are considered by the relevant Board of Examiners, which approves final results. Students are notified of results by result notices that list final marks and grades for all units of study. (See also *Assessment*, *Examination period*.)

Result processing schedule
The result processing schedule will be determined for each academic cycle. It is expected that all departments and faculties will comply with this schedule. (See also *Assessment*, *Examination period, Result processing*.)

Results
The official statement of the student's performance in each unit of study attempted as recorded on the academic transcript, usually expressed as a grade:

HD	High distinction	a mark of 85–100
D	Distinction	a mark of 75–84
CR	Credit	a mark of 65–74
P	Pass	a mark of 50–64
R	Satisfied requirements	This is used in pass/fail only outcomes.
UCN	Unit of study continuing	Used at the end of semester for units of study that have been approved to extend into a following semester. This will automatically flag that no final result is required until the end of the last semester of the unit of study.
PCON	Pass (concessional)	a mark of 46–49. Use of this grade is restricted to those courses that allow for a concessional pass of some kind to be awarded. A student may re-enrol in a unit of study for which the result was PCON.–†no more than one sixth of the total credit points for a course can '.
F	Fail	A mark of 0-49. 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 (i.e. within the first four weeks of enrolment).
DNF	† 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	† 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 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 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 (e.g. Honours).

RTS (Research Training Scheme)
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.

Scholarships
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*.

Semester
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 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 governing body of the University. (See the University Calendar for more details of its charter and powers.)

Senate appeals
Senate appeals are held for those students who, after being excluded by a 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
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 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*.

SID (Student Identifier)
A 9-digit number which uniquely identifies a student at the University.

Space allocation
Departmental space has been measured in accordance with space inventory classifications adopted by DEST. Departmental space includes academic staff studies, non-academic staff offices, special purpose teaching rooms such as laboratories, studios, computer terminal rooms, seminar rooms under 35m2, common rooms, workshops, departmental storage spaces, departmental libraries, research space including laboratories and office accommodation, postgraduate rooms and a variety of special purpose departmental rooms. Where space is shared by a number of departments it is apportioned according to use. Departmental spaces do not include general teaching spaces over 35m^2.

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
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
Financial support of a student by a company or government body. Sponsors are frequently invoiced directly.

SRS
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 (equivalent to year/s of enrolment)
For the purposes of administration, a course may be divided into stages to be studied consecutively. Part-time students progress through a course more slowly and would often enrol in the same stage more than once.

Stream
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, a library borrower's bar code and a passport-style photo. 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 Load
See *Load*.

Student/Staff Ratios (SSR)
These are calculated on a departmental/faculty basis by dividing the student load attributable to a particular department/faculty by

the full-time equivalent academic staff employed to teach in or on behalf of that department/faculty.

Student type

Student type can be Local, International – Fee Paying, International – Study Abroad, International – Incoming Exchange, International – Sponsored Award.

Study Abroad Program

A scheme administered by the International 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. The program covers a broad spectrum of courses in Liberal Arts, Agriculture, Architecture, Economics, Education, Engineering, Health Sciences, Law, Music, Nursing and Science. (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 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

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.*)

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

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 certificate of award provided to a graduate usually at a graduation ceremony.

Thesis

A major work that is the product of an extended period of supervised independent research.† means the earliest date at which a research student can submit the thesis. '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.*

Tuition fees

Tuition fees may be charged to students in designated tuition fee-paying courses. Students who pay fees are not liable for HECS.

UAC

The Universities Admissions Centre (UAC) receives and processes applications for admission to undergraduate courses at recognised universities in NSW and the ACT. Most commencing undergraduate students at the University apply through UAC.

UAC admissions

Most local undergraduates (including local undergraduate fee payers) apply through the Universities Admission Centre (UAC).

The University Admissions Office coordinates the processing of UAC applicants with faculties and departments and decisions are recorded on the UAC system.

Applicants are notified by UAC and an electronic file of applicants who have been made offers of admission to courses at the University is loaded onto FlexSIS. (See also *Admission, Direct admissions*.)

UAI (Universities Admission Index)

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

The smallest stand-alone component of a student's course that is recordable on a student's transcript. Units of study have an integer credit point value, normally in the range 3–24. Each approved unit of study is identified by a unique sequence of eight characters, consisting of a four character alphabetical code which usually identifies the department or subject area, and a four character numeric code which identifies the particular unit of study. Units of study can be grouped by subject and level. (See also *Core unit of study, Course, Major.*)

Unit of study enrolment status

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

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 to be outstanding.

UPA

University Postgraduate Award.

Upgrade

Where a student is enrolled in a Master's by research course and where the research they are undertaking is at such a standard that

either the University recommends that the student upgrade their degree to a PhD or the student seeks to upgrade to a PhD and this is supported by the University. There would be no interval between the candidature for the Master's degree and the PhD unless the interval was covered by a period of suspension.

With an upgrade, the research undertaken by the student while enrolled for the Master's by research degree would either be continued in the PhD or modified to meet the requirements for a PhD program.

USYDnet

The University of Sydney's intranet system. In addition to the customised MyUni service, it provides access to other services such as directories (maps, staff and student, organisations), a calendar of events (to which staff and students can submit entries), and a software download area. (See also MyUni.)

Variation of enrolment

See *Enrolment variation*.

Vice-Chancellor and Principal

The chief executive officer of the University, responsible for its leadership and management. The Vice-Chancellor and Principal 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, Exemption*.)

WAM (Weighted Average Mark)

This mark uses the unit of study credit point value in conjunction with an agreed 'weight'. The formula for this calculation is:

$$WAM = \frac{\sum(marks \times creditPointValue \times levelWeight)}{\sum(creditPointValue \times levelWeight)}$$

The 'marks' used in this formula are the actual marks obtained by the student in each unit of study, as recorded on the student's record, including any marks of less than 50, and in the case of a failing grade with no mark, the mark defaults to 0. Pass/Fail assessed subjects and credit transfer subjects (from another institution) are excluded from these calculations, however the marks from all attempts at a unit of study are included.

Faculty resolutions may also include specific formulae for the purpose of calculating progression between years, or for calculating entrance into an honours year. If such a formula is not specified in the faculty resolutions, the formula outlined above is used. (Effective from 1 January 2004.)

YAM (Yearly Average Mark)

This term has been renamed AAM (Annual Average Mark). See AAM in this Glossary.

YFE (Year of First Enrolment)

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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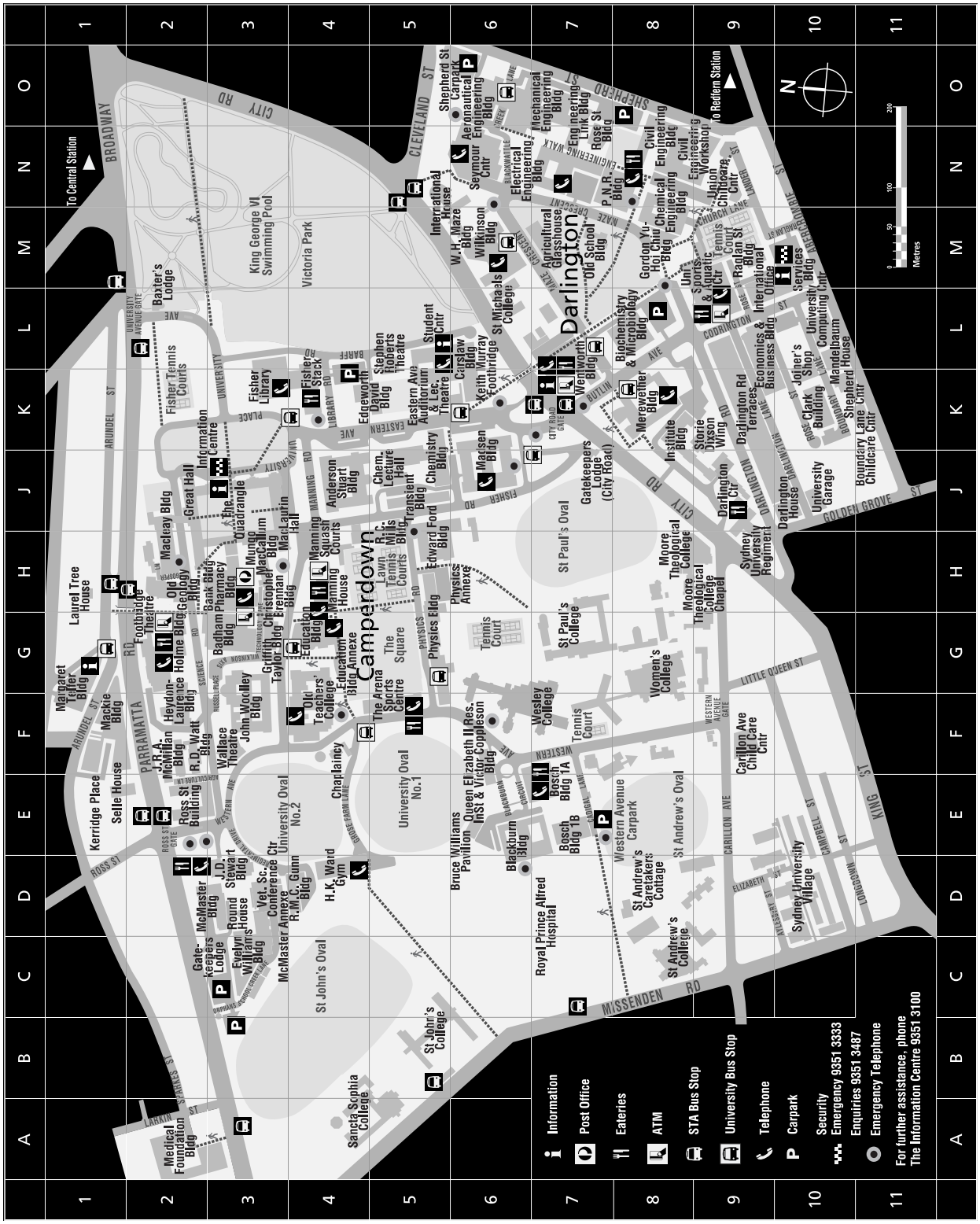
Main campus map



University Buildings

O6 Aeronautical Engineering Building
J4 Anderson Stuart Building
G3 Badham Building
H3 Bank Building
L2 Baxter's Lodge
L8 Biochemistry and Microbiology Building
E6 Blackburn Building
E7 Bosch Building 1A
E7 Bosch Building 1B
E6 Bruce Williams Pavilion
L6 Carslaw Building
F4 Chaplaincy
M8 Chemical Engineering Building
J5 Chemistry Building
H3 Christopher Brennan Building
N8 Civil Engineering Building
N9 Civil Engineering Workshop
K10 Clark Building
J9 Darlington Centre
J10 Darlington House
K9 Darlington Road Terraces
K5 Eastern Avenue Auditorium and Lecture Theatre Complex
L9 Economics and Business Building
K4 Edgeworth David Building
G4 Education Building
G4 Education Building Annexe
H5 Edward Ford Building
N7 Electrical Engineering Building
N7 Engineering Link Building
C3 Evelyn Williams Building
K3 Fisher Library
K4 Fisher Library Stack
C3 Gatekeeper's Lodge
J7 Gatekeeper's Lodge (City Road)
M8 Gordon Yu-Hoi Chui Building
J2 Great Hall
G3 Griffith Taylor Building
D4 H.K.Ward Gymnasium
F2 Heydon-Laurence Building
G2 Holme Building
K8 Institute Building
N5 International House
F2 J.R.A.McMillan Building
D3 J.D.Stewart Building
F3 John Woolley Building
F1 Mackie Building
H3 MacLaurin Hall
H2 Macleay Building
G1 Margaret Telfer Building
J6 Madsen Building
H4 Manning House
H4 Manning Squash Courts
D3 McMaster Annexe
D3 McMaster Building
O6 Mechanical Engineering Building
A2 Medical Foundation Building
K8 Merewether Building
H3 Mungo MacCallum Building
H2 Old Geology Building
M7 Old School Building
F4 Old Teachers' College
H3 Pharmacy Building
H6 Physics Annexe
G5 Physics Building
N8 P.N.R.Building
E6 Queen Elizabeth II Research Institute
H5 R.C.Mills Building
F2 R.D.Watt Building
D4 R.M.C.Gunn Building
M9 Raglan Street Building
N7 Rose Street Building
E2 Ross Street Building
G2 Science Road Cottage
E1 Selle House
M10 Services Building
N6 Seymour Centre
K10 Shepherd Centre
O6 Shepherd Street Carpark
L5 Stephen Roberts Theatre
K9 Storie Dixson Wing
F5 The Arena Sports Centre
J3 The Quadrangle
J5 Transient Building
L10 University Computing Centre
J10 University Garage
M9 University Sports and Aquatic Centre
D3 Veterinary Science Conference Centre
E6 Victor Coppleson Building
F3 Wallace Theatre
K7 Wentworth Building
E7 Western Avenue Carpark
M6 W.H.Maze Building
M6 Wilkinson Building

Academic Colleges (offices)

H5 Health Sciences
F4 Humanities and Social Sciences
N8 Sciences and Technology

Childcare Centres

K11 Boundary Lane
F9 Carillon Avenue
H1 Laurel Tree House
N9 Union

Colleges and Residential Accommodation

J10 Darlington House
K9 Darlington Road Terraces
N5 International House
L10 Mandelbaum House
A4 Sancta Sophia College
C8 St Andrew's College
B5 St John's College
L6 St Michael's College
G7 St Paul's College
E1 Selle House
D10 Sydney University Village
F7 Wesley College
G8 Women's College

Computer Access Centres (ITS)

G3 Brennan
G4 Education
K3 Fisher
N7 Link
L6 McGrath (Carslaw)
H3 Pharmacy

Cultural Venues

G2 Footbridge Theatre
H2 Macleay Museum
J3 Nicholson Museum
N6 Seymour Centre
K7 Sir Hermann Black Gallery
M6 Tin Sheds Gallery
J2 War Memorial Art Gallery

Faculties (offices)

F2 Agriculture
M6 Architecture
H3 Arts
K8 Economics and Business
G4 Education
N7 Engineering
H5 Medicine
H3 Pharmacy
L6 Science
D3 Veterinary Science

Libraries

M6 Architecture
G3 Badham
H5 Burkitt-Ford
K3 Curriculum Resources
N8 Engineering
K3 Fisher
J6 Madsen
L6 Mathematics
E7 Medical
N6 Music
H6 Physics
H5 Schaeffer Fine Arts

Retail

H3 Australia Post Office
H3 Bank Building
J9 Darlington Centre
G2 Holme Building
H4 Manning House
F5 The Arena Sports Centre
M9 University Copy Centre
K7 University Health Service
M9 University Sports and Aquatic Centre
M9 University Co-op Bookshop
D3 Veterinary Hospital and Clinic
K7 Wentworth Building

Security

M10 Emergency Services
M10 Lost Property
J3 Information Centre
M10 Traffic and Parking

Sports and Recreational Venues

K2 Fisher Tennis Courts
D4 HK Ward Gymnasium
H5 Lawn Tennis Courts
H4 Manning Squash Courts
F5 The Arena Sports Centre
G5 The Square
E5 University Oval No1
E3 University Oval No2
M9 University Sports and Aquatic Centre

Unions and Associations (offices)

K7 Students' Representative Council (SRC)
M9 Sydney University Postgraduate Representative Association (SUPRA)
M9 Sydney University Sport
G2 University of Sydney Union

University Administration and Services

F3 Business Liaison Office
F1 Careers Centre
G1 Cashier
F1 Centre for Continuing Education
H3 Chancellor
L10 Computing Centre
H3 Development, Alumni Relations and Events
M10 Development Services
H2 Executive Offices
J3 Information Centre
L10 Information Technology Services
L9 International Office
G1 Personnel
M10 Printing Services (UPS)
H2 Publications Office
H3 Research Office
M10 Room Bookings and Venue Management
F1 Scholarships Unit
L5 Student Centre
G1 Student Housing
G4 Student Services Unit
K8 Summer School
C3 Veterinary Hospital and Clinic
H2 Vice-Chancellor