The University of Sydney

Faculty of Engineering Handbook 2006

University dates

University semester and vacation dates 2006

Summer School	
Lectures begin	Tuesday 3 January
Lectures end	Friday 3 March
Semester One	
Lectures begin	Monday 6 March
AVCC common week/non-teaching Easter period	Friday 14 April to Friday 21 April
Last day of lectures	Friday 9 June
Study vacation: one week beginning	Monday 12 June to Friday 16 June
Examination period	Monday 19 June to Saturday 1 July
Semester ends	Saturday 1 July
AVCC common week/non-teaching period	Monday 3 July to Friday 7 July
Semester Two	
Lectures begin	Monday 24 July
AVCC common week/non-teaching period	Monday 25 September to Friday 29 September
Last day of lectures	Friday 27 October
Study vacation	Monday 30 October to Friday 3 November
Examination period	Monday 6 November to Saturday 18 November
Semester ends	Saturday 18 November

These dates (and any updates) are also available at:
www.usyd.edu.au/fstudent/undergrad/apply/scm/datcs.shtml

Last dates for withdrawal or discontinuation 2006

Semester One units of study	
Last day to add a unit	Friday 17 March
Last day for withdrawal	Friday 31 March
Last day to discontinue without failure (DNF)	Friday 28 April
Last day to discontinue (Discontinued - Fail)	Friday 9 June
Semester Two units of study	
Last day to add a unit	Friday 4 August
Last day for withdrawal	Thursday 31 August
Last day to discontinue without failure (DNF)	Friday 8 September
Last day to discontinue (Discontinued - Fail)	Friday 27 October
Last day to withdraw from a non standard unit of study	By the census date of the non standard unit of study which must not be earlier than 20 per cent of the way through the period of time during which the unit is undertaken.

Details are in the session calendar on the timetabling website **http://web.timetable.usyd.edu.au**.

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This book (and other handbooks) can also be found at:
www.usyd.edii.aii/handbooks

The University of Sydney

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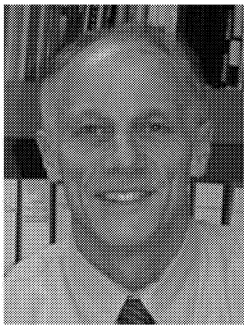
Contents

Faculty of Engineering Handbook

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Message from the Dean



Welcome to the Faculty of Engineering at the University of Sydney. Our Faculty has a very long history having commenced in 1883 and has produced many distinguished graduates who have contributed immensely to the infrastructure of Sydney and Australia, and played a major role in the Australian economy through the engineering activities of the industries in which they have been employed. Our graduates are recognised world wide, particularly since our programs are accredited by Engineers Australia our professional engineering body in Australia. Engineers Australia are authorised under the Washington Accord to accredit four-year Engineering degree programs to a world wide standard thus affording our graduates professional recognition in many countries including Canada, USA, UK, South Africa, Hong Kong, New Zealand and Ireland.

Engineers create new structures, systems and products to achieve the goals of an industry or community. They are creative but must rely on their basic training in Mathematics and Science to achieve these goals. Our engineering programs are designed to produce engineers who are well educated in the fundamentals but have acquired problem solving and design skills to allow them to work in a large range of industries. The attributes of our graduates to which we aspire in our programs are listed below. Graduates of the Faculty of Engineering will:

- *be able to create new knowledge and understanding through the process of research and inquiry*
- *be able to use information effectively in a range of contexts*
- *be able to work independently and sustainably, in a way that is informed by openness, curiosity and a desire to meet new challenges*
- *hold personal values and beliefs consistent with their role as responsible members of local, national, international and professional communities*
- *recognise and value communication as a tool for negotiating and creating new understanding, interacting with others, and furthering their own learning*

The Faculty has strong links with Australian and increasingly international industry. Much of this takes place through our Foundations and Centres as well as Alumni. This often starts with consulting and research but flows through into our teaching programs which are practically oriented. We frequently seek advice on our programs from industry and make use of adjunct staff to teach in areas of great practical value to students. Our new Faculty wide body called Engineering Sydney encompasses the Foundations, Centres, Alumni (Sydney University Engineering Alumni) and Students (Sydney University Engineering Undergraduates Association).

The Flexible First Year program has been designed to allow students to enter the faculty before deciding the branch/discipline of engineering they wish to specialise. Taken with the combined degrees in Science, Commerce, Medical Science, Arts and Law, we have one of the most flexible programs in Australia.

We do hope you enjoy your studies in Engineering at the University of Sydney which we believe will lead to rewarding careers.

Professor Gregory Hancock
Dean, Faculty of Engineering

Letter from the SUEUA President

Established 85 years ago, the Sydney University Engineering Undergraduates Association (SUEUA) has a long history as an integral part of the Engineering Faculty. The faculty has an exceptional reputation for producing the best engineers and world class leaders. It is a privilege of the highest degree to be writing to you as the SUEUA President. Through SUEUA I have been given the opportunity to continue my own development as a leader and to genuinely experience the engineering community. Through my involvement I have learned to manage my time between my academic life and social adventures, which has made me a more balanced person - a priceless quality in today's corporate world. I feel that I have grown into a better leader, team player and person.

SUEUA attempts to make the transition from high school to university as enjoyable as possible. Every year we hold our "First Year Camp" in the first few weeks of Semester One. The camp gives first years the opportunity to go away for the weekend and meet their fellow engineers, both freshman and the more senior engineers, who will continue to guide them through their university life. Last year we released a survival guide that introduced new students to SUEUA and the Faculty.

We plan the year out with various events which are largely based on tradition. These events include: Slip N Slide barbeque, Beer N Bangers, pub crawls, Harbour Cruises and of course the not-to-be-missed Engineering Ball. We also hold weekly barbeques on the engineering lawns.

SUEUA also organises the representation for Engineering in Interfaculty Sport - an array of different of events from rugby to ultimate frisbee. In 2004 the Engineering Faculty won the Men's Shield and the overall Interfaculty Sports Shield. We have a strong tradition in sport dominating the shield.

Another important role of SUEUA is to act as the student representation for the Faculty. We have a presence on many of the boards including The Faculty Board and the Teaching and Learning Committee, in order to ensure that students' views are aired. We are also able to approach the Faculty directly to help you in any way we can with any problems you may experience in academia. SUEUA liaises with departmental societies, representing the entire engineering body, before the Faculty and the University. We aim to represent every student, whether they are from Civil, Chemical, Electrical, Mechanical or Aeronautical Engineering.

The majority of people say that university was the best time of their life, so get involved! SUEUA is always willing to aid in your development of team work and social interaction. There are so many benefits that I can't even begin to mention.

And remember, there's more to university than just a degree.

Rachel Hollis
2006 SUEUA President
BE(Aeronautical)(Space)

1. Guide to the Faculty

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

University dates

Please see the University Dates (http://www.usyd.edu.au/fstudent/undergrad/apply/scm/dates.shtml) page for a listing of all current semester, holiday and examination dates within the University of Sydney.

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Associate Dean (Postgraduate)
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Associate Dean (Teaching and Learning)
John Currie, BA DipEd MA(Hons) *Wollongong*

Associate Dean (First Year)
Craig Jin, BSc Stan MS Caltech PhD

Associate Dean (International)
Professor Liyong Tong, BSc MEngSc *Dalian* PhD *BUAA* , FIEAust

MAIAA

Associate Dean (ICT and T&L)
Rafael Calvo, Licenciado in Physics PhD Universidad Nacional de Rosario

Executive Officer
Mr Eric van Wijk BSc *(ANU*) DipEd DipAppEcon *(UCan*)

Secretary to the Faculty and Finance Officer
Mr Michael Whitley, BA(Hons) *EastAnglia* MCom *UNSW*, ASA CIA FCIS FICD Dip

Student Administration Staff
Postgraduate Adviser - Ms Josephine Harty, BA *Macq*
Undergraduate Adviser - Ms Annamaria Brancato
Administrative Assistant - Mr Lee Levsen BE

External Relations and Scholarships
Ms Myra Koureas, BEd MEd MIntBus & Law

Engineering Sydney
Ms Susanna Smith, BSoc Sc *UNSW* MA *UNSW*

Faculty Librarian
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The branches of Engineering

Aerospace, Mechanical and Mechatronic Engineering

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Head of School: Professor Lin Ye
Administrative Officer: Anne Robertson

The School of Aerospace, Mechanical and Mechatronic Engineering offers four-year undergraduate programs leading to Bachelor of Engineering degrees in aeronautical, mechanical and mechatronic engineering as well as 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.

Aeronatuical 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 the first two years of undergraduate study provide students with an introduction to engineering science, design and manufacturing methods, management, computing, electronics and flight mechanics so that by the end of the second year, a broad field has been covered.

In the third year, Aeronautical Engineering students will focus on the fundamentals of flight mechanics and dynamics, aircraft materials and structures, aerodynamics and aircraft design. 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.

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

Phone:+61 2 9351 2470
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Head: Associate Professor Geoff Barton
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, environmental and societal considerations.

The process industries continue to be major employers of chemical engineers: examples include 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. In addition, over recent years chemical engineering has continued to develop, and now encompasses many other technologically important fields: examples include bio-processing and nano-technology.

Chemical engineering studies are based on chemistry, mathematics and physics and the first two are taken to some depth. 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.

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

The Department has a number of active exchange programs with leading Departments overseas. The exchanges, with the Royal Institute of Technology, Stockholm, the Ecole Nationale Superieure D'Ingenieurs de Genie Chimique in Toulouse, and Imperial College, London UK, 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

Phone:+61 2 9351 2136
Fax:+61 2 9351 3343
Email: office@civil.usyd.edu.au
Head: Professor Kim Rasmussen
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 - e.g. 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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Web: www.ee.usyd.edu.au
Head: Associate Professor David Levy
Manager, Academic Support Services: Raymond Patman

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

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

This chapter contains the regulations governing undergraduate degrees throughout the University and the regulations governing undergraduate degrees offered by the Faculty of Engineering.
Please see the University of Sydney (Coursework) Rule 2000.

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.
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.

Please see the University of Sydney (Coursework) Rule 2000

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.

/. *Specialisations*

The BE degree is awarded in the following specialisations:
(1) School of Aerospace, Mechanical and Mechatronic Engineering-
  (a) Aeronautical Engineering
  (b) Aeronautical Engineering (Space)
  (c) Mechanical Engineering
  (d) Mechanical Engineering (Biomedical)
  (e) Mechanical Engineering (Space)
  (f) Mechatronic Engineering
  (g) Mechatronic Engineering (Space)
(2) Department of Chemical Engineering -
  (a) Chemical Engineering
(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) Electronic Commerce
  (d) Software Engineering
  (e) Telecommunications Engineering

2. *Combined degree courses*

The BE degree is offered in the following combined degree courses:
(1) Bachelor of Engineering/Bachelor of Arts
(2) Bachelor of Engineering/Bachelor of Commerce
(3) Bachelor of Engineering/Bachelor of Laws
(4) Bachelor of Engineering/Bachelor of Medical Science
(5) Bachelor of Engineering/Bachelor of Science

3. Requirements for the degree at pass level

(1) Single degree course
To qualify for the award of the BE degree at pass level, a student must:
  (a) complete successfully units of study giving credit for a total of 192 credit points; and
  (b) satisfy the requirements of all other relevant By-laws, Rules and Resolutions of the University.
(2) Combined degree course
To qualify for the award of the BE degree at pass level in a combined degree course, a student must complete the requirements published in the Resolutions of the Faculty of Engineering and in the Joint Resolutions of the Faculty of Engineering and the Faculties of Arts, Economics and Business, Law or Science, as the case may be.

4. Requirements for the degree with Honours

To qualify for the award of the BE degree with Honours, both in the single degree and the combined degree courses, a student must:
(1) complete the requirements for the pass degree;
(2) complete the Honours requirements published in the Resolutions of the Faculty of Engineering relating to the BE degree; and
(3) satisfy the requirements of all other relevant By-laws, Rules and Resolutions of the University.

Resolutions of the Faculty of Engineering

Section 1

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

Definitions

In these Resolutions:

Committee for Undergraduate Studies - means the Committee for Undergraduate Studies of the Faculty of Engineering

credit points - are a measure of value indicating the contribution that each unit of study provides towards meeting the BE degree completion requirements

Dean - means the Dean of the Faculty of Engineering

degree - means the degree of Bachelor of Engineering

department - means the department or school in the Faculty of Engineering in which the student is proceeding (namely: the School of Aerospace, Mechanical and Mechatronic Engineering; the Department of Chemical Engineering; the Department of Civil Engineering; or the School of Electrical and Information Engineering)

Faculty - means the Faculty of Engineering

GWAM - means Grand Weighted Average Mark and is the WAM calculated over all units of study undertaken in a degree course (except those "Discontinued - Not to count as failure" and those with only a "Satisfied Requirements" result), weighted according to credit point value and the year-levels (1, 2, 3 or 4) of the units of study. The GWAM may be expressed as:

$$GWAM = \frac{\sum (Mark \times Creditpoints \times YearLevel)}{\sum (Creditpoints \times YearLevel)}$$

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:

$$SWAM = \frac{\sum (Mark \times Creditpoints)}{\sum (Creditpoints)}$$

unit of study or unit - is the smallest stand-alone component of a canditate's course that is recordable on a candidate's transcript

University - mean the University of Sydney

WAM - means the Weighted Average Mark and is the average mark obtained over a nominated set of units of study weighted according to one or more characteristics of the units

/. *Specialisations*

(1) The degree of Bachelor of Engineering is offered in the following specialisations:
  (a) in the School of Aerospace, Mechanical and Mechatronic Engineering -
    (i) Aeronautical Engineering
    (ii) Aeronautical Engineering (Space)
    (iii) Mechanical Engineering
    (iv) Mechanical Engineering (Biomedical)
    (v) Mechanical Engineering (Space)
    (vi) Mechatronic Engineering
    (vii) Mechatronic Engineering (Space)
  (b) in the Department of Chemical Engineering -
    (i) Chemical Engineering
  (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) Electronic Commerce
    (iv) Software Engineering
    (v) 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. Admission requirements

An applicant may gain admission to the Bachelor of Engineering degree by satisfying requirements as set out below:

(1) School leavers
The NSW Higher School Certificate [HSC], or its interstate or overseas equivalent, at a level determined each year by the Faculty of Engineering. Entry levels are determined based on University Admission Index (UAI) and may vary depending on the stream of Engineering for which entry is sought.

(2) Mature age students
Applicants who have attained the age of 21 years by 1 st March in the year of intended enrolment may apply for Mature Age Admission. Applicants for Mature Age Admission must present evidence that they have attained a standard of education and experience adequate for entry to the stream of Engineering through an approved preparation program under the terms set out in the Admissions policy of the University of Sydney.

(3) Previous Tertiary Study at the University of Sydney
Applicants who have completed the requirements of a BSc or BST may apply for admission to the Bachelor of Engineering. Entry levels for the different streams of Engineering will be determined by the faculty and will be based on the Weighted Average Mark (WAM) achieved in the BSc or BST. The minimum requirements for entry to any stream of Engineering are a WAM of 50 for BSc and BST.

(4) Other categories of admission
Other applicants may gain admission to the Bachelor of Engineering under the conditions set out in the Admissions policy of the University of Sydney.

4. Flexible First Year Program

(1) Students entering first year may choose to undertake the flexible first year program.
Two options are available:
  (a) Students planning on entering Aeronautical, Biomedical, Chemical, Civil, Project Management or Mechanical specialisations can enrol in program A. Students in this program can choose their final specialisation at the end of first year, except in the case of Chemical where the choice is made at the end of first semester.
  (b) Students planning on entering Computer, Electrical, Electronic Commerce, Mechatronic, Software, Space or Telecommunications specialisations can enrol in program B. Students then make their final choice of specialisation at the end of 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. See transfer requirements in Table shown below.

(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.
(5) Transfer from Flexible First Year into streams will be assessed based on either of the following two conditions:
(a) Students have met the UAI requirement for the stream at the time of initial enrolment,
(b) Students have achieved a WAM as shown in the following requirements table, based on units of study completed over the previous year for Stream A (or semester: Stream B).

Engineering Stream	Flexible Entry Stream	WAM requirement
Aeronautical	A	65
Aeronautical (Space)	B	75
Civil	A	N/A
Civil (Construction Management)	A	65
Civil (Environmental)	A	65
Civil (Geomechanics)	A	65
Civil (Structures)	A	65
Computer	B	65
Electrical	B	N/A
Electronic Commerce	B	65
Mechanical	A	N/A
Mechanical (Biomedical)	A	75
Mechanical (Space)	B	75
Mechatronics	B	65
Mechatronics (Space)	B	75
Project Engineering and Management (Civil)	A	65
Software	B	65
Telecommunications	B	65

(6) Students wishing to transfer between streams need to apply to the head of the department or school supervising the stream. Students will be assessed based on the above WAM criteria but will also be required to show that they have met progression requirements in their current stream as specified by the department and that they will able to complete the new stream in the normal time period.

(7) Students wishing to transfer between degrees must reapply to the Faculty or the University Admission Center to be considered for entry to the new degree.

5. ***Levels of award***

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

6. 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 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.

7. ***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).
(c) complete all requirements within a specified period of time for the degrees as indicated:
(i) 5 years for the BE degree
(ii) 6 years for BE/BSc, BE/BCom, BE/BA, BE/BMedSc.
(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.

8. 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 units 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 14.(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

9. 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" 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 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 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 unit, 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 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.

10. 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 30 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 (WAM > 75) in the two previous consecutive semesters of enrolment to enrol in excess of 60 credit points in one year and/or in excess of 30 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 and Winter Sessions
(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 or Winter Short Semester Sessions.
(b) A student may not enrol in more than 16 credit points during a Summer or Winter Session.

11. Credit for previous studies

(1) The head of the relevant department may grant to a student admitted to candidature credit towards the degree for previously completed studies.

(2) A student who has completed units of study towards a course in another faculty of the University or at another tertiary institution may be granted credit for:
(a) any of the specific units of study set out in the Specialisation Requirements, up to a maximum of 96 credit points, if that other course has been awarded or conferred or if the credit points accumulated towards that course are being maintained with a view to completion/award of the course; or
(b) any of the specific units of study set out in the Specialisation Requirements, provided that the student has abandoned credit for such units in the other faculty.

(3) Subject to the 96 credit point upper limit prescribed in subsection (2)(a), a student who has completed units of study that are not comparable with any of the units of study set out in the Specialisation Requirements may be granted non-specific credit at First, Second, Third and/or Fourth Year level.

12. 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.

13. 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 the following semester.
F	Fail	0-49
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.
(d) The award of PCON is not be available for Engineering units of study from 2005.

(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.

14, 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.
(d) Where a student has failed a unit of study in a particular semester, the student must repeat that unit or its equivalent in the next session in which it is available.

(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.

Discontinued results

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

(8) Satisfactory progress
(a) The Faculty requires students to demonstrate satisfactory progress with their studies.
(b) Satisfactory progress cannot be defined in all cases in advance, but, generally, a student may be deemed not to have made satisfactory progress in any semester if the student:
(i) fails to complete at least half the credit points in which he/she is enrolled, or
(ii) obtains an SWAM (Semester Weighted Average Mark) 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.

15. Academic honesty

(1) Pursuant to the Resolutions of the Academic Board relating to Academic Honesty in Coursework, the relevant departments) 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 (i.e. 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.

16. 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.

17. Transitional provisions

The provisions of these Resolutions came into force on 1 January 2005. 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.

18. 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)

/. *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-time study.
(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 84 credit points, of which at least 54 must be Second 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.
(3) Candidates may not enrol in any unit of study which is substantially the same as one they have already passed (or in which they are currently enrolled).

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 eligibility 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)

/. *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 (minimum of 48 senior 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) seven core units of study in Economics and Business Faculty (total 42 credit points) as specified in the Faculty of Economics and Business Handbook; and
  (c) either an award course a major (minimum of 36 senior credit points) or an advanced major (minimum of 48 level 2000 or 3000 credit points), comprising 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;
  International Business;
  Management; or
  Management Decision Sciences; or
  Marketing.

3. Requirements for the BE andBCom 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

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. Admission, progression and assessment criteria apply and are described in the resolutions for the BE specialisations shown above.

Students will be under the general supervision of the Faculty of Engineering for administrative matters. The Faculty of Science and the Faculty of Engineering shall jointly exercise authority in any academic matter concerning the combined course not otherwise dealt with in these resolutions.

Units of study must be selected as shown in the Engineering Specialisation Tables for the core components of the chosen Engineering specialisation. Units from the Science Faculty must be chosen as shown in the Science Faculty handbook to meet requirements of a Science major. The Faculty Resolutions (which are reproduced in the Engineering and Science Handbooks, as the case may be) specify:
(a) credit point values;
(b) corequisites/prerequisites/assumed learning/assumed knowledge; and
(c) any special conditions.

Requirements for the BE/BSc pass degree

(1) To qualify for the award of the pass degrees a student shall complete units of study having a total value of at least 240 credit points including:
(a) 96 credit points of units from Science subject areas,
(b) a major in a Science area, and
(c) Units of study as prescribed in the Tables of BE Specialisation Requirements for the specialisation that the student is pursuing.
(2) 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 resolution 5(1):
(a) complete at least 54 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;
(b) complete at least 24 credit points of Senior Science units of study at the Advanced level or as TSP units in a single Science subject area; and
(c) maintain in Intermediate and Senior Science units of study an average mark of 65 or greater in each year of enrolment.

Requirements for Honours Degrees

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

Students may at any stage abandon the combined degree course and elect to complete either a BSc or a BE in accordance with the resolutions governing those degrees

Resolutions covering admission, enrolment restrictions, progression requirements, satisfactory progress, cross-institutional study and assessment criteria for the combined degree are equivalent to those for the BE degree and specialisations, as shown in the Faculty Handbook.

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

1. 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:
   (a) except as provided in subsection (b), all units of study attempted in the BE degree have been completed with a grade of Pass or better;
   (b) 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);
   (c) the student is qualified to enrol in a major in a Science area; and
   (d) for admission to the Advanced streams, the student satisfies the requirements in Section 21 or 24 of the Resolutions of the Faculty of Science relating to the BSc degree.
2. Students will be under the supervision of the Faculty of Engineering for the period of BE degree enrolment and under the supervision of the Faculty of Science for the BSc enrolment and completion.
3. Units of study must be selected as shown in the Engineering Specialisation Tables for the core components of the chosen Engineering specialisation. Units from the Science Faculty must be chosen as shown in the Science Faculty handbook to meet requirements of a Science major. The Faculty Resolutions (which are reproduced in the Engineering and Science Handbooks, as the case may be) specify:
   (a) credit point values;
   (b) corequisites/prerequisites/assumed learning/assumed knowledge; and
   (c) any special conditions.
4. 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) 42credit points of Intermediate/Senior units of study in Science subject areas; and
   (2) a major in a Science area.

5. 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 4 and 5:
   (1) include at least 72 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.
6. The requirements of Sections 5 or 6 must be completed in one year of full-time study or two years of part-time study.
7. Students who complete at least 42 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 42 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.
8. Students who are so qualified may undertake 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.
9. On completion of the requirements of the BSc degree or BSc Honours course, students will be eligible to resume their enrolment toward the BE degree according the Faculty of Engineering resolutions for that degree. Students may abandon the BSc degree enrolment at any stage and resume their enrolment in the BE degree.
10. Resolutions covering admission, enrolment restrictions, progression requirements, satisfactory progress, cross-institutional study and assessment criteria for the Engineering component of the double degree are equivalent to those for the BE degree and specialisations, as shown in the Faculty Handbook.
11. The Deans of the Faculties of Engineering and Science shall jointly exercise authority in any matter concerning the double degree not otherwise dealt with in these resolutions.

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

/. Requirements for the BE/BMedSc Course

To qualify for the award of the BE/BMedSc combined degree a student must:
   (1) complete successfully units of study giving credit for a total of 240 credit points; and
   (2) satisfy the requirements of all other relevant By-Laws, Rules and Resolutions of the University.

2. *Specialisations, Streams or Majors*

The combined award course, BE/BMedSc, will be awarded in all of the Engineering specialisations that are available for the BE degree and all majors as are applicable under the resolutions of the Faculty of Science.

3. Requirements for the Honours degree

To qualify for the award of the honours degree a student must complete the honours requirements published in the Engineering Faculty Resolutions relating to the combined award course.

4. A student may proceed concurrently to the degrees of Bachelor of Medical Science, and Bachelor of Engineering. Admission, progression and assessment criteria apply and are described in the resolutions for the BE specialisations shown above.
5. Students will be under the general supervision of the Faculty of Engineering for administrative matters. The Faculty of Science and the Faculty of Engineering shall jointly exercise authority in any academic matter concerning the combined course not otherwise dealt with in these resolutions.
6. Units of study must be selected as shown in the Engineering Specialisation Tables for the core components of the chosen Engineering specialisation. Units from the Science Faculty must be chosen as shown in the Science Faculty handbook to meet requirements of a Science major. The Faculty Resolutions (which are reproduced in the Engineering and Science Handbooks, as the case may be) specify:
   (a) credit point values;
   (b) corequisites/prerequisites/assumed learning/assumed knowledge; and
   (c) any special conditions.

7. *Requirements for the BE/BMedSc pass degree*

(1) To qualify for the award of the pass degrees a student shall complete units of study having a total value of at least 240 credit points including:
   (a) Units of study as prescribed in the Tables of BE Specialisation Requirements for the specialisation that the student is pursuing.
   (b) at least 24 credit points from Junior Science units of study (which may be common with those of (a), but including CHEM1102 Chemistry IB, MBLG1001 Introductory Molecular Biology & Genetics and 12 credit points of Mathematics;
   (c) 48 credit points of Intermediate core units of study as listed in Table IV of the Science Faculty Handbook of units of study for the BMedSc;
   (d) at least 24 credit points of Senior units of study taken from the subject areas of Anatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology, Immunology, Infectious Diseases, Microbiology, Pharmacology and Physiology;
   (e) a 12 credit point interdisciplinary thesis jointly supervised by departments from Engineering and Science.

8. Requirements for honours degrees

(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) BMedSc with Honours

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

9. Students may at any stage abandon the combined degree course and elect to complete either a BMedSc or a BE in accordance with the resolutions governing those degrees
10. Resolutions covering admission, enrolment restrictions, progression requirements, satisfactory progress, cross-institutional study and assessment criteria for the combined degree are equivalent to those for the BE degree and specialisations, as shown in the Faculty Handbook.
11. 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)

(These resolutions are undergoing transition in preparation for new LLB structure in 2007, contact Associate Dean Undergraduate Studies for details on transition arrangements.)

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:
   (a) units of study as prescribed in the BE Specialisation Requirements for the specialisation that the student is pursuing,
   (b) 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:

3. Bachelor of Engine

The following information is a printed version of the kq
Please visit "http://www.usyd.edu.au/handbooks/".

Faculty of Engineering : Flexible First]

Unit of Study			*CP A: Assumi*
Students wishing to proceed to the degree of Bachelor of Engineering ^ the two options of the Flexible First year program. For details on elig on resolutions pertaining to Flexible First Year.			
Students will not need to decide their choice of Engineering specializai			
Core units of study for Stream A specialization Engineering or Project Management can elec			
First Year			
ENGG **1800**	Engineering Disciplines (Intro) Stream A	6	
ENGG 1801	Engineering Computing	6	NMECH18 Informati DESC91' Computa
ENGG **1802**	Engineering Mechanics	6	
ENGG 1803	Professional Engineering 1	6	
MATH 1001	Differential Calculus	3	**A** HSC Mat **NMATHK**
MATH 1002	Linear Algebra	3	**A** HSC Mat **NMATH1<**
MATH 1003	Integral Calculus and Modelling	3	**A** HSC Mat **NMATHK**
MATH 1005	Statistics	3	A HSC Mat **N** MATH (1
See note 1 below			
CHEM 1101	Chemistry 1A	6	A HSC Che C Recomm* N CHEM (1
Elective unit of study			
In addition, a 6 credit Junior Level Unit of Study must be choosen to cc imposed by Faculties on some specific Junior Level units.			
Notes :			
1. Students wishing to proceed to the degree of Bachelor of Engineerin cialisation in semester 2.			
2. It is strongly advised that before choosing the 2nd semester elective, elective will help with core progression and prerequisite requiremen			
Core units of study for Stream B specialization; Electrical, Mechanical (Space), Mechatronic! can elect to choose this option			
First Year			
ENGG 1804	Engineering Disciplines (Intro) Stream B	6	NB: Flexibl
PHYS 1001	Physics 1 (Regular)	6	A HSC Phy C Recomm* NPHYS(1(
MATH 1001	Differential Calculus	3	A HSC Mat NMATHK
MATH 1002	Linear Algebra	3	A HSC Mat NMATHK
MATH 1003	Integral Calculus and Modelling	3	A HSC Mat NMATHK

School of Aeronautical, Mechanical and Mechatronic Engineering

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

The School of 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.

Aeronautical Engineering

Unit of Study	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Core units of study			
First Year			
MATH 1001 Differential Calculus	3	A HSC Mathematics Extension 1 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002 Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG 1801 Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Informatíon Technology Tools, DESC9101 Introductíon to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below			
AERO 1560 Introduction to Aerospace Engineering	6	N MECH1560 Introduction to Mechanical Engineering, MECH1751 Introduction to Mechatronics Engineering, MECH1600 Manufacturing Technology. NB: Unit of Study Web Page: www.aeromech.usyd.edu.au/AERO1560	Semester 1
ENGG 1803 Professional Engineering 1	6		Semester 2, Semester 1
MATH 1003 Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005 Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG 1802 Engineering Mechanics	6		Semester 2
See note 4 below			
AMME 1060 Engineering Applications	6	NB: Unit of study web page:http://problemsolvers.aeromech.usyd.edu.au/	Semester 2
See note 2 below			
AERO 1400 Intro to Aircraft Construction & Design	6	NB: Department permission required for enrolment. Enrolment subject to number of places available.	Semester 2
See note 2 below			
Second Year			
MATH 2061 Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
See note 5 below			
AERO 2703 Aerospace Technology 1	6	A AERO 1560	Semester 1
AMME 2301 Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME 2500 Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
MATH 2065 Partial Differential Equations (Intro)	6	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2005 or 2905 or 2965 or 2067)	Semester 2
See note 2 below			
AMME 2302 Materials 1	6		Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
MECH **2400**	Mechanical Design 1	6		Semester 2
AMME **2200**	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2

Third Year

AERO 3360	Aerospace Structures 1	6	PAMME2301 orAERO2300; (MATH2061 orMATH2067 or (MATH2001 and MATH2005))	Semester 1
AMME **3500**	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
AERO 3460	Aerospace Design 1	6	P AMME2301 or AERO2300; MATH1001; MATH1002; MATH1003	Semester 1
AERO 3660	Aerospace Management	6		Semester 1
See note 2 below				
AERO 3260	Aerodynamics 1	6	PAERO2201 orMECH2202 orAMME2200	Semester 2
AERO 3560	Flight Mechanics 1	6	P MECH2500 or AMME2500	Semester 2
AERO 3465	Aerospace Technology 2	6	A AERO 1400; AMME2302 PAERO1560 or AERO1701; MECH2400; AMME2301 or AERO2300	Semester 2
See note 2 below				
AERO 3261	Propulsion	6	P AMME2200 or (MECH2201 and (AERO2201 or MECH2202))	Semester 2

Fourth Year

AERO 4360	Aerospace Structures 2	6	A An understanding of aerospace structural designs (AERO 3465). P(AMME2301orAERO2300) and (AERO3360 or AERO3301)	Semester 1
AERO 4460	Aerospace Design 2	6	A AERO 1400 Introduction to Aircraft Construction and Design and AER03465 P Mandatory: MECH2400; AERO3460 or (AERO3450 and (AERO3400 or AERO3401))	Semester 1
AERO 4560	Flight Mechanics 2	6	P AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500	Semester 1
AMME **4100**	Practical Experience	0	P 28 credit points of second year units of study.	Semester 1, Semester 2
AMME **4101**	Thesis A	6	P 34 credit points of senior units of study.	Semester 1, Semester 2
AERO 4260	Aerodynamics 2	6	AMECH3261 orAERO3260 P Mandatory: AMME2200 or (MECH2201 and (AERO2201 or MECH2202))	Semester 2
See note 2 below				
AMME **4102**	Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

1. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.
2. Students in combined degrees are exempt from these units.
3. SOFT 1001 is an acceptable alternative.
4. PHYS 1001 is an acceptable alternative.
5. Combined degree students should replace MATH 2061 Linear Maths & Vector Calculus with MATH 2067. DEs & Vector Calculus for Engineers

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

BE(Aeronautical)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 12 credits points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Aeronautical).

BE(Aeronautical) / BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 16 credit points from the table of recommended elective units of study for Aeronautical Engineering. 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 in which they are undertaking the combined degree.

BE(Aeronautical) / BSc or BCom

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc or the Faculty of Economics and Business for the BE/BCom. 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.

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

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

AERO 4290			NB: *** No info available for 2006. ***	
AERO 4490			NB: *** No info available for 2006. ***	
AERO 4591	Advanced Flight Mechanics	6	P AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500; AERO4501 or AERO4560	Semester 2
MECH 4210			NB: *** No info available for 2006. ***	
MECH 4310	Advanced Engineering Materials	6	P MECH3300 Materials 2 or MECH3362 N MECH4315 Advanced Aerospace Materials.	Semester 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 (Space Engineering)

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Core units of study				
First Year				
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG 1801	Engineering Computing	6	N MECH 1800 Computational Engineering 1A, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below				
AERO 1560	Introduction to Aerospace Engineering	6	N MECH1560 Introduction to Mechanical Engineering, MECH1751 Introduction to Mechatronics Engineering, MECH 1600 Manufacturing Technology. NB: Unit of Study Web Page: www.aeromech.usyd.edu.au/AERO1560	Semester 1
ENGG 1803	Professional Engineering 1	6		Semester 2, Semester 1
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG 1802	Engineering Mechanics	6		Semester 2
See note 4 below				
ELEC 1103	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
AERO 1400	Intro to Aircraft Construction & Design	6	NB: Department permission required for enrolment. Enrolment subject to number of places available.	Semester 2
See note 2 below				
Second Year				
MATH 2067	DEs and Vector Calculus for Engineers	6	P MATH(1001 or 1901 or 1906) and MATH(1002 or 1902) and MATH(1003 or 1903 or 1907) N MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1, Summer
ELEC 2104	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
See note 2 below				
AMME 2301	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME 2500	Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
AMME 2302	Materials 1	6		Semester 2
AERO 2705	Space Engineering 1	6	P AERO1560, MATH1001, MATH1002, MATH1003 and either MATH1004 or MATH1005 (or the advanced versions of the MATH units)	Semester 2
MECH 2400	Mechanical Design 1	6		Semester 2
AMME 2200	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2
Third Year				
AERO 3360	Aerospace Structures 1	6	PAMME2301 orAERO2300; (MATH2061 orMATH2067 or (MATH2001 and MATH2005))	Semester 1
AERO 3460	Aerospace Design 1	6	P AMME2301 or AERO2300; MATH1001; MATH1002; MATH1003	Semester 1
AMME 3500	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
AERO 3660	Aerospace Management	6		Semester 1
See note 2 below				
AERO 3260	Aerodynamics 1	6	PAERO2201 orMECH2202 orAMME2200	Semester 2
See note 2 below				
AERO 3560	Flight Mechanics 1	6	P MECH2500 or AMME2500	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
AERO 3760	Space Engineering 2	6	PAERO2705 or AERO2702	Semester 2
AERO 3261	Propulsion	6	P AMME2200 or (MECH2201 and (AERO2201 or MECH2202))	Semester 2
See note 2 below				

Fourth Year

AERO 4360	Aerospace Structures 2	6	A An understanding of aerospace structural designs (AERO 3465). P(AMME2301orAERO2300) and (AERO3360 or AERO3301)	Semester 1
AERO 4701	Space Engineering 3	6	**P** (AERO3560 or AERO3500) and (AERO3760 or AERO3700) and (AMME3500 or MECH3800)	Semester 1
AMME **4101**	Thesis A	6	**P** 34 credit points of senior units of study.	Semester 1, Semester 2
AERO 4560	Flight Mechanics 2	6	PAERO3500 orAERO3560; (MECH3500 andMECH3800) orAMME3500	Semester 1
AMME **4100**	Practical Experience	0	**P** 28 credit points of second year units of study.	Semester 1, Semester 2
AMME **4102**	Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

1. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.
2. Students in combined degrees are exempt from these units.
3. SOFT 1001 is an acceptable alternative.
4. PHYS 1001 is an acceptable alternative.

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

BE(Aeronautical Engineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 6 credit points from the table of recommended elective units of study for Aeronautical (Space) Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of BE(Aeronautical)(Space).

BE(Aeronautical Engineering)(Space)/ BSc or B Com

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc or the Faculty of Economics and Business for the BE/BCom. 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 Engineering)(Space)/ BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 16 credit points from the table of recommended elective units of study for Aeronautical Engineering. 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 in which they are undertaking the combined degree.

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 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 Aeronautical (Space) Engineering

AERO 4290			NB: *** No info available for 2006. ***	
AERO 4490			NB: *** No info available for 2006. ***	
AERO 4591	Advanced Flight Mechanics	6	**P** AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500; AERO4501 or AERO4560	Semester 2
MECH 4210			NB: ***** No info available for 2006. ***	
MECH 4310	Advanced Engineering Materials	6	**P** MECH3300 Materials 2 or MECH3362 N MECH4315 Advanced Aerospace Materials.	Semester 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.

Mechanical Engineering

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Core units of study				
First Year				
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG 1801	Engineering Computing	6	N MECH 1800 Computational Engineering 1A, MECH 1801 Computational Engineering IC, INFO 1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below				
MECH 1560	Introduction to Mechanical Engineering	6	N AERO 1560; MECH1751; MECH1600	Semester 1
ENGG 1803	Professional Engineering 1	6		Semester 2, Semester 1
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG 1802	Engineering Mechanics	6		Semester 2
See note 4 below				
AMME 1060	Engineering Applications	6	NB: Unit of study web page:http://problemsolvers.aeromech.usyd.edu.au/	Semester 2
See note 2 below				
MECH 1400	Mechanical Construction	6	P MECH 15 60	Semester 2
See note 2 below				
Second Year				
MATH 2061	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and:MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
See note 5 below				
ELEC 2004	Electrical Engineering: Foundations	6	P 36 credit points. **N** ELEC 1001 Introductory Electrical Engineering, ELEC 1101 Foundations of Computer Systems, ELEC 1102 Foundations of Electronic Circuits, ELEC2001 Electrical and Electronic Engineering, ELEC2003 Electrical and Electronic Engineering A, ELEC1103 Professional Electronic Engineering, ELEC 1601 Professional Computer Engineering.	Semester 1
AMME 2301	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME 2500	Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
MATH 2065	Partial Differential Equations (Intro)	6	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2005 or 2905 or 2965 or 2067)	Semester 2
See note 2 below				
AMME 2302	Materials 1	6		Semester 2
MECH 2400	Mechanical Design 1	6		Semester 2
AMME 2200	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2
Third Year				
MECH 3361	Mechanics of Solids 2	6	A MATH 1001, MATH 1002, MATH 1003, ENGG 1802 P AMME2301 or AERO2300 or MECH2300; MATH2061 or MATH2067 or MATH2005	Semester 1
AMME 3500	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MECH 3261	Fluid Mechanics	6	P (AMME2200 or AERO2201 or MECH2202) and (MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MECH 3660	Manufacturing Engineering	6	A AMME2200, AMME2301, AMME2302, (MATH2061 or MATH2067) P MECH 15 60 and ENGG 1802	Semester 1
MECH 3661	Engineering Management	6	A ENGG 1803	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
See note 2 below				
MECH 3460	Mechanical Design 2	6	A ENGG1802; AMME2301; AMME2500. P MECH2400	Semester 2
MECH 3362	Materials 2	6	**P** (AMME 2302 or MECH2300) and (AMME 2301 or AERO2300)	Semester 2
MECH 3260	Thermal Engineering	6	A Fundamentals of thermodynamics are needed to begin this more advanced course. P (AMME2200 or MECH2200 or MECH2201)	Semester 2

Fourth Year

MECH 4060	Professional Engineering 2	3	AMECH3661,ENGG1803,AMME4100 P MECH3660	Semester 1
AMME 4101	Thesis A	6	**P** 34 credit points of senior units of study.	Semester 1, Semester 2
AMME 4100	Practical Experience	0	**P** 28 credit points of second year units of study.	Semester 1, Semester 2
AMME 4102	Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

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

2. . Students in combined degrees are exempt from these units.

3. SOFT 1001 is an acceptable alternative.

4. PHYS 1001 is an acceptable alternative

5. Combined degree students should replace MATH 2061 Linear Maths & Vector Calculus with MATH 2067. DEs & Vector Calculus for Engineers

Resolutions of the Faculty of Engineering relating to this table

BE(Mechanical Engineering)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 21 credit points from the table of recommended elective units of study for Mechanical Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechanical).

BE(Mechanical Engineering) / BSc or B Com or B Med Sci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 9 credit points from the table of recommended elective units of study for Mechanical Engineering and at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. 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(Mechanical Engineering) / BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 21 credit points from the table of recommended elective units of study for Mechanical Engineering and 4 credit points of free 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 in which they are undertaking the combined degree

BE(Mechanical Engineering) / LLB

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 9 credit points from the table of recommended elective units of study for Mechanical Engineering and at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 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.

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

AMME 4210	Computational Fluid Dynamics	6	A Partial differental equations.finite difference methods,linear algebra,matrix methods,pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. PMECH3261 orAERO3260	Semester 1
MECH 4231	Environmental Acoustics & Noise Control	3	P 24 credit points of third year units of study.	Semester 1
MECH 4241	Energy and the Environment	6	P 24 credit points of third year units of study,	Semester 1
MECH 4250	Air Conditioning and Refrigeration	3	P (MECH3260 and MECH3261) or MECH3201; (MECH3202 or MECH3203)	Semester 2
MECH 4260	Combustion and Fire Safety	3	P (MECH3260 and MECH3261) or MECH3362	Semester 2
MECH 4310	Advanced Engineering Materials	6	P MECH3300 Materials 2 or MECH3362 N MECH4315 Advanced Aerospace Materials.	Semester 2
MECH 4410	Advanced Design and Analysis 1	3	P (MECH 3400 and MECH 3410) or MECH 3460	Semester 1

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
MECH 4611	Industrial and Engineering Management	3	A MECH 3661, ENGG1803	Semester 1
MECH 4621	Industrial Ergonomics	3	A It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline.	Semester 1
MECH 4636	Introduction to Operations Research	3	PMATH1005, [(MATH2061, MATH2065) or MATH2067]	Semester 1
MECH 4641	Product Life Cycle Design	6	P MECH 3660	Semester 2
MECH 4651	Workplace Industrial Relations in Aust	3	NB: Department permission required for enrolment.	Semester 2
MECH 4961	Biomechanics and Biomaterials	6	A MECH3300 or MECH3362 P MECH2300 or AMME2302; MECH2900 or MECH2901 N MECH4960	Semester 1

Mechanical Engineering (Space Engineering)

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites 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

MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG **1801**	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
* ENGG 1801 - See note 3 below				
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	Semester 1
ENGG **1803**	Professional Engineering 1	6		Semester 2, Semester 1
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG **1802**	Engineering Mechanics	6		Semester 2
* ENGG 1802 - See note 4 below				
ELEC **1103**	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
AERO 1400	Intro to Aircraft Construction & Design	6	NB: Department permission required for enrolment. Enrolment subject to number of places available.	Semester 2
* AERO 1400 - See note 2 below				

Second Year

MATH 2067	DEs and Vector Calculus for Engineers	6	P MATH(1001 or 1901 or 1906) and MATH(1002 or 1902) and MATH(1003 or 1903 or 1907) N MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1, Summer
ELEC **2104**	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
AMME **2301**	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME **2500**	Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
AMME **2302**	Materials 1	6		Semester 2
AERO 2705	Space Engineering 1	6	P AERO1560, MATH 1001, MATH1002, MATH1003 and either MATH1004 or MATH1005 (or the advanced versions of the MATH units)	Semester 2
MECH **2400**	Mechanical Design 1	6		Semester 2
AMME **2200**	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2

Third Year

MECH **3361**	Mechanics of Solids 2	6	A MATH 1001, MATH 1002, MATH 1003, ENGG 1802 P AMME2301 or AERO2300 or MECH2300; MATH2061 or MATH2067 or MATH2005	Semester 1
AMME **3500**	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
AERO 3460	Aerospace Design 1	6	P AMME2301 or AERO2300; MATH1001; MATH 1002; MATH1003	Semester 1
MECH **3261**	Fluid Mechanics	6	P (AMME2200 or AERO2201 or MECH2202) and (MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MECH **3661**	Engineering Management	6	A ENGG 1803	Semester 2
* MECH 3661 - See note 2 below				
AERO 3560	Flight Mechanics 1	6	PMECH2500 or AMME2500	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
[1]* AERO 3560 - See note 2 below				
AERO 3760	Space Engineering 2	6	PAERO2705 or AERO2702	Semester 2
MECH 3260	Thermal Engineering	6	A Fundamentals of thermodynamics are needed to begin this more advanced course. P (AMME2200 or MECH2200 or MECH2201)	Semester 2

Fourth Year

AERO 4701	Space Engineering 3	6	**P** (AERO3560 or AERO3500) and (AERO3760 or AERO3700) and (AMME3500 or MECH3800)	Semester 1
AMME 4100	Practical Experience	0	**P** 28 credit points of second year units of study.	Semester 1, Semester 2
AERO 4560	Flight Mechanics 2	6	**P** AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500	Semester 1
[1]* AERO 4560 - See note 2 below				
AMME 4101	Thesis A	6	**P** 34 credit points of senior units of study.	Semester 1, Semester 2
AMME 4102	Thesis B	6	PAMME4101	Semester 1, Semester 2

Note

1. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.
2. Students enrolled in combined degrees are exempt from these units.
3. SOFT 1001 is an acceptable alternative
4. PHYS 1001 is an acceptable alternative

Resolutions of the Faculty of Engineering relating to this table

BE(Mechanical Engineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 12 credit points from the table of recommended elective units of study for Mechanical (Space) Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of BE(Aeronautical)(Space).

BE(Mechanical Engineering)(Space) / BSc or BCom or BMedSci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. 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(Mechanical Engineering)(Space) / BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 16 credit points from the table of recommended elective units of study for Mechanical Engineering and 4 credit points of free 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 in which they are undertaking the combined degree

Recommended elective units of study

AMME 4210	Computational Fluid Dynamics	6	A Partial differental equations.finite difference methods,linear algebra,matrix methods,pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. PMECH3261 orAERO3260	Semester 1
MECH 4231	Environmental Acoustics & Noise Control	3	P 24 credit points of third year units of study.	Semester 1
MECH 4241	Energy and the Environment	6	P 24 credit points of third year units of study,	Semester 1
MECH 4250	Air Conditioning and Refrigeration	3	P (MECH3260 and MECH3261) or MECH3201; (MECH3202 or MECH3203)	Semester 2
MECH 4260	Combustion and Fire Safety	3	P (MECH3260 and MECH3261) or MECH3362	Semester 2
MECH 4310	Advanced Engineering Materials	6	P MECH3300 Materials 2 or MECH3362 N MECH4315 Advanced Aerospace Materials.	Semester 2
MECH 4410	Advanced Design and Analysis 1	3	P (MECH 3400 and MECH 3410) or MECH 3460	Semester 1
MECH 4611	Industrial and Engineering Management	3	A MECH 3661, ENGG1803	Semester 1
MECH 4621	Industrial Ergonomics	3	A It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline.	Semester 1
MECH 4636	Introduction to Operations Research	3	PMATH1005, [(MATH2061, MATH2065) or MATH2067]	Semester 1
MECH 4641	Product Life Cycle Design	6	P MECH 3660	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
MECH 4651	Workplace Industrial Relations in Aust	3	NB: Department permission required for enrolment.	Semester 2
MECH 4961	Biomechanics and Biomaterials	6	A MECH3300 or MECH3362 **P** MECH2300 or AMME2302; MECH2900 or MECH2901 N MECH4960	Semester 1

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.

Mechatronic Engineering

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
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				
First Year				
MATH **1001**	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH **1002**	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG **1801**	Engineering Computing	6	N MECH 1800 Computational Engineering 1A, MECH 1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below				
MTRX 1701	Mechatronics Engineering Introductory	6		Semester 1
ENGG **1803**	Professional Engineering 1	6		Semester 2, Semester 1
MATH **1003**	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH **1005**	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG **1802**	Engineering Mechanics	6		Semester 2
See note 4 below				
ELEC **1103**	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
MTRX 1702	Mechatronics 1	6	NELEC1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC1902 Computational Science in C (Advance), COSC 1002 Computational Science in C	Semester 2
Second Year				
MATH **2061**	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
See note 5 below				
ELEC **2104**	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
AMME **2301**	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME **2500**	Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
MATH **2065**	Partial Differential Equations (Intro)	6	P MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2005 or 2905 or 2965 or 2067)	Semester 2
See note 2 below				
MTRX 2700	Mechatronics 2	6	P MECH 1760 or MTRX 1702 or (MECH 1701 and MECH 1702) NELEC2601	Semester 2
MECH **2400**	Mechanical Design 1	6		Semester 2
AMME **2302**	Materials 1	6		Semester 2
Third Year				
AMME **2200**	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2
See note 2 below				
AMME **3500**	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MECH **3660**	Manufacturing Engineering	6	A AMME2200, AMME2301, AMME2302, (MATH2061 or MATH2067) P MECH 15 60 and ENGG 1802	Semester 1
ELEC **3204**	Power Electronics and Drives	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic devices and basic circuits or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A. N ELEC3202 Power Electronics and Drives.	Semester 2
See note 2 below				

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
ELEC 3404	Electronic Circuit Design	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3401 Electronic Devices and Circuits.	Semester 1
MTRX 3700	Mechatronics 3	6	PMECH2701 orMTRX2700 NMECH4710	Semester 1
MECH 3661	Engineering Management	6	AENGG1803	Semester 2
See note 2 below				
MECH 3460	Mechanical Design 2	6	A ENGG1802; AMME2301; AMME2500. P MECH2400	Semester 2

Fourth Year

MECH 4060	Professional Engineering 2	3	A MECH3661, ENGG1803, AMME4100 P MECH3660	Semester 1
AMME 4100	Practical Experience	0	P 28 credit points of second year units of study.	Semester 1, Semester 2
AMME 4101	Thesis A	6	P 34 credit points of senior units of study.	Semester 1, Semester 2
AMME 4102	Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

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

2. Students enrolled in combined degrees are exempt from these units.

3. SOFT 1001 is an acceptable alternative

4. PHYS 1001 is an acceptable alternative

5. Combined degree students should replace MATH 2061 Linear Maths & Vector Calculus with MATH 2067. DEs & Vector Calculus for Engineers

Resolutions of the Faculty of Engineering relating to this table

BE(Mechatronic Engineering)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 21 credit points from the table of recommended elective units of study for Mechatronic Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points *h*> required to be eligible for the award of the degree of BE(Mechatronic).

BE(Mechatronic Engineering) / BSc or B Com or B Med Sci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 9 credit points from the table of recommended elective units of study for Mechatronic Engineering and at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. 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(Mechatronic Engineering) / BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 21 credit points from the table of recommended elective units of study for Mechatronic Engineering and 4 credit points of free 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 in which they are undertaking the combined degree

BE(Mechatronic Engineering) / LLB

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 9 credit points from the table of recommended elective units of study for Mechatronic Engineering and at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 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.

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 - Mechatronic Engineering

MECH 4410	Advanced Design and Analysis 1	3	**P** (MECH 3400 and MECH 3410) or MECH 3460	Semester 1
MECH 4621	Industrial Ergonomics	3	A It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline.	Semester 1
MECH 4636	Introduction to Operations Research	3	P MATH 1005, [(MATH2061, MATH2065) or MATH2067]	Semester 1
MECH 4641	Product Life Cycle Design	6	**P** MECH 3660	Semester 2
MECH 4720	Sensors and Signals	6	**PA** Strong Matlab skillsP MTRX 3700	Semester 1
MECH 4730	Computers in Real-Time Control and Inst	6	P MTRX3700 or MECH3701 or MECH3700 **N** ELEC 4602 Real Time Computing	Semester 1

Mechatronic Engineering (Space Engineering)

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites 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				
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG 1801	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below				
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	Semester 1
ENGG 1803	Professional Engineering 1	6		Semester 2, Semester 1
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG 1802	Engineering Mechanics	6		Semester 2
See note 4 below				
ELEC 1103	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
MTRX 1702	Mechatronics 1	6	NELEC1101 Foundations of Computer Systems, MECH 1802 C Programming, COSC1902 Computational Science in C (Advance), COSC1002 Computational Science in C	Semester 2
Second Year				
ELEC 2104	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
AMME 2301	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
MATH 2067	DEs and Vector Calculus for Engineers	6	P MATH(1001 or 1901 or 1906) and MATH(1002 or 1902) and MATH(1003 or 1903 or 1907) N MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1, Summer
AMME 2500	Engineering Dynamics	6	PMATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
AERO 2705	Space Engineering 1	6	P AERO1560, MATH 1001, MATH1002, MATH1003 and either MATH1004 or MATH1005 (or the advanced versions of the MATH units)	Semester 2
MTRX 2700	Mechatronics 2	6	P MECH 1760 or MTRX 1702 or (MECH 1701 and MECH 1702) NELEC2601	Semester 2
MECH 2400	Mechanical Design 1	6		Semester 2
AMME 2302	Materials 1	6		Semester 2
Third Year				
AERO 3460	Aerospace Design 1	6	P AMME2301 or AERO2300; MATH1001; MATH 1002; MATH1003	Semester 1
See note 2 below				
AMME 3500	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MTRX 3700	Mechatronics 3	6	PMECH2701 orMTRX2700 NMECH4710	Semester 1
AERO 3660	Aerospace Management	6		Semester 1
See note 2 below				
AMME 2200	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2
See note 2 below				
AERO 3560	Flight Mechanics 1	6	PMECH2500 or AMME2500	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
AERO 3760	Space Engineering 2	6	PAERO2705 or AERO2702	Semester 2
ELEC 3204	Power Electronics and Drives	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic devices and basic circuits or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A. N ELEC3202 Power Electronics and Drives.	Semester 2

Fourth Year

AERO 4560	Flight Mechanics 2	6	P AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500	Semester 1
*AERO 4560 - See note 2 below				
AERO 4701	Space Engineering 3	6	P (AERO3560 or AERO3500) and (AERO3760 or AERO3700) and (AMME3500 or MECH3800)	Semester 1
AMME 4100	Practical Experience	0	P 28 credit points of second year units of study.	Semester 1, Semester 2
AMME 4101	Thesis A	6	P 34 credit points of senior units of study.	Semester 1, Semester 2
AMME 4102	Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

1. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.
2. Students enrolled in combined degrees are exempt from these units.
3. SOFT 1001 is an acceptable alternative
4. PHYS 1001 is an acceptable alternative

Resolutions of the Faculty of Engineering relating to this table

BE(MechatronicEngineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 12 credit points from the table of recommended elective units of study for Mechatronic (Space) Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of BE(Mechatronic)(Space).

BE(Mechatronic Engineering)(Space)/ BSc or BCom or BMed Sci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. 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(Mechatronic Engineering)(Space)/ BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 80 credit points of units of study given by the Faculty of Arts for the BE/BA and 16 credit points from the table of recommended elective units of study for Mechatronic Engineering. 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 in which they are undertaking the combined degree

Recommended elective units of study - Mechatronic (Space) Engineering

MECH 4410	Advanced Design and Analysis 1	3	P (MECH 3400 and MECH 3410) or MECH 3460	Semester 1
MECH 4621	Industrial Ergonomics	3	A It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline.	Semester 1
MECH 4636	Introduction to Operations Research	3	PMATH1005, [(MATH2061, MATH2065) or MATH2067]	Semester 1
MECH 4641	Product Life Cycle Design	6	P MECH 3660	Semester 2
MECH 4720	Sensors and Signals	6	PA Strong Matlab skillsP MTRX 3700	Semester 1
MECH 4730	Computers in Real-Time Control and Inst	6	P MTRX3700 or MECH3701 or MECH3700 N ELEC 4602 Real Time Computing	Semester 1
MTRX 4700	Experimental Robotics	6	P AMME3500 or (MECH3500 and MECH3800); MTRX3700 or MECH3700	Semester 1

Mechanical Engineering (Biomedical)

Unit of Study	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites 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

MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG 1801	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
See note 3 below				
MECH 1560	Introduction to Mechanical Engineering	6	N AERO1560; MECH 1751; MECH 1600	Semester 1
CHEM 1101	Chemistry 1A	6	A HSC Chemistry and Mathematics C Recommended concurrent units of study: 6 credit points of Junior Mathematics N CHEM (1001 or 1901 or 1903 or 1909)	Semester 2, Summer, Semester 1
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG 1802	Engineering Mechanics	6		Semester 2
See note 4 below				
BIOL 1003	Human Biology	6	A HSC 2-unit Biology N BIOL 1903 or EDUH1016	Summer, Semester 2
ENGG 1803	Professional Engineering 1	6		Semester 2, Semester 1
See note 2 below				

Second Year

MATH 2067	DEs and Vector Calculus for Engineers	6	P MATH(1001 or 1901 or 1906) and MATH(1002 or 1902) and MATH(1003 or 1903 or 1907) N MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1, Summer
ELEC 2004	Electrical Engineering: Foundations	6	P 36 credit points. **N** ELEC 1001 Introductory Electrical Engineering, ELEC 1101 Foundations of Computer Systems, ELEC 1102 Foundations of Electronic Circuits, ELEC2001 Electrical and Electronic Engineering, ELEC2003 Electrical and Electronic Engineering A, ELEC1103 Professional Electronic Engineering, ELEC 1601 Professional Computer Engineering.	Semester 1
AMME 2301	Mechanics of Solids	6	P MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG 1802 orPHYSlOOl or 1901	Semester 1
AMME 2500	Engineering Dynamics	6	P MATH 1001; MATH 1002; ENGG 1802 orPHYSlOOl	Semester 1
AMME 2200	Thermodynamics and Fluids	6	A MATH 1001; MATH 1002; MATH 1003.	Semester 2
AMME 2302	Materials 1	6		Semester 2
MECH 2400	Mechanical Design 1	6		Semester 2
MECH 2901	Anatomy and Physiology for Engineers	6	A A basic understanding of biology. P Recommended: BIOL 1003 (or equivalent)	Semester 2

Third Year

AMME 3500	System Dynamics and Control	6	A AMME2500, MATH2061 P AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005)	Semester 1
MECH 3361	Mechanics of Solids 2	6	A MATH 1001, MATH 1002, MATH 1003, ENGG 1802 PAMME2301 or AERO2300 or MECH2300; MATH2061 or MATH2067 or MATH2005	Semester 1
MECH 3261	Fluid Mechanics	6	P (AMME2200 or AERO2201 or MECH2202) and (MATH2061 or MATH2067 or(MATH2001and MATH2005)	Semester 1
MECH 3660	Manufacturing Engineering	6	A AMME2200, AMME2301, AMME2302, (MATH2061 oi- MATH2067) P MECH1560 and ENGG1802	Semester 1
See note 2 below				
MECH 3921	Biomedical Design and Technology	6	A BIOL 1003; MECH2901; MECH2400; MECH2900	Semester 2

Unit of Study	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
MECH 3661 Engineering Management	6	AENGG1803	Semester 2
See note 2 below			
MECH 3460 Mechanical Design 2	6	A ENGG1802; AMME2301; AMME2500. P MECH2400	Semester 2
See note 2 below			
MECH 3362 Materials 2	6	P (AMME 2302 or MECH2300) and (AMME 2301 or AERO2300)	Semester 2

Fourth Year

ELEC 3802 Fundamentals of Biomedical Engineering	6	A ELEC2401 Introductory Electronics or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3801 Fundamentals of Biomedical Engineering.	Semester 1
MECH 4060 Professional Engineering 2	3	A MECH3 661, ENGG1803, AMME4100 P MECH3660	Semester 1
MECH 4961 Biomechanics and Biomaterials	6	A MECH3300 or MECH3362 P MECH2300 or AMME2302; MECH2900 or MECH2901 N MECH4960	Semester 1
AMME 4100 Practical Experience	0	P 28 credit points of second year units of study.	Semester 1, Semester 2
AMME 4101 Thesis A	6	P 34 credit points of senior units of study.	Semester 1, Semester 2
AMME 4970 Principles of Tissue Engineering	3	A MECH3921 or both of MECH3910 and MECH3920 P 6 credit points of junior biology6 credit points of junior chemistryMECH2900 or MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 2
*MECH 4970 see note 2 below			
AMME 4980 Applied Biomaterials	3	A MECH2400, MECH3921 or MECH3920, MECH3300 or MECH3362, MECH4960 P 6 credit points of junior biology6 credit points of junior chemistryMECH2300 or AMME2302	Semester 2
*MECH 4980 see note 2 below			
MECH 4901 Orthopaedic Engineering	3	A MECH3300 or MECH3362; MECH3310 or MECH3361 P MECH2300 or AMME2302; BIOL1003; MECH2900 or MECH2901	Semester 2
AMME 4102 Thesis B	6	PAMME4101	Semester 1, Semester 2

Notes

1. Students enrolled in Flexible First year will choose from Flexible First year table in place of these specific units.
2. Students enrolled in combined degrees are exempt from these units.
3. SOFT 1001 is an acceptable alternative
4. PHYS 1001 is an acceptable alternative

Resolutions of the Faculty of Engineering relating to this table

BE(Mechanical Engineering)(Biomedical)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 6 credit points chosen from Biomedical units of study (not necessarily in Engineering) or from the table of recommended elective units of study for Mechanical (Biomedical) Engineering and 12 credit points of free 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 or BCom or BMed Sci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. 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.

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 - Mechanical (Biomedical) Engineering

AMME 4210 Computational Fluid Dynamics	6	A Partial differental equations.finite difference methods,linear algebra,matrix methods,pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. PMECH3261 orAERO3260	Semester 1
MECH 4231 Environmental Acoustics & Noise Control	3	P 24 credit points of third year units of study.	Semester 1
MECH 4241 Energy and the Environment	6	P 24 credit points of third year units of study,	Semester 1
MECH 4250 Air Conditioning and Refrigeration	3	P (MECH3260 and MECH3261) or MECH3201; (MECH3202 or MECH3203)	Semester 2
MECH 4260 Combustion and Fire Safety	3	P (MECH3260 and MECH3261) or MECH3362	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
MECH 4310	Advanced Engineering Materials	6	P MECH3300 Materials 2 or MECH3362 N MECH4315 Advanced Aerospace Materials.	Semester 2
MECH 4410	Advanced Design and Analysis 1	3	P (MECH 3400 and MECH 3410) or MECH 3460	Semester 1
MECH 4611	Industrial and Engineering Management	3	A MECH 3661, ENGG1803	Semester 1
MECH 4621	Industrial Ergonomics	3	A It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline.	Semester 1
MECH 4636	Introduction to Operations Research	3	P MATH 1005, [(MATH2061, MATH2065) or MATH2067]	Semester 1
MECH 4641	Product Life Cycle Design	6	P MECH 3660	Semester 2
MECH 4651	Workplace Industrial Relations in Aust	3	NB: Department permission required for enrolment.	Semester 2
MECH 4961	Biomechanics and Biomaterials	6	A MECH3300 or MECH3362 P MECH2300 or AMME2302; MECH2900 or MECH2901 N MECH4960	Semester 1

Department of Chemical Engineering

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

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

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

Chemical Engineering

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites 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 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
CHEM **1101**	Chemistry 1A	6	A HSC Chemistry and Mathematics C Recommended concurrent units of study: 6 credit points of Junior Mathematics N CHEM (1001 or 1901 or 1903 or 1909)	Semester 2, Summer, Semester 1
CHEM **1102**	Chemistry IB	6	P CHEM (1101 or 1901) or a Distinction in CHEM 1001 or equivalent C Recommended concurrent units of study: 6 credit points of Junior Mathematics N CHEM (1002 or 1902 or 1904 or 1908)	Semester 2, Semester 1, Summer
CHNG 1103	Material & Energy Transformations Intro	6	A Mathematics Extension 1; 2 unit Physics; 2 unit Chemistry. NB: This unit of study replaces CHNG1101, CHNG 1102, CHNG 1001, CHNG 1201.	Semester 2
ENGG **1800**	Engineering Disciplines (Intro) Stream A	6		Semester 1
ENGG **1801**	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
ENGG **1803**	Professional Engineering 1	6		Semester 2, Semester 1
Second Year				
CHEM **2403**	Chemistry of Biological Molecules	6	P CHEM (1102 or 1902 or 1904 or 1909); 6 credit points of Junior Mathematics N CHEM (2001 or 2901 or 2311 or 2312 or 2903 or 2913) NB: To enrol in Senior Chemistry in 2007 it will be a requirement that students complete CHEM (2401 or 2911 or 2915) and CHEM (2402 or 2912 or 2916). Students are advised that combinations of CHEM2 units that do not meet this requirement will generally not allow progression to Senior Chemistry.	Semester 2
CHEM **2404**	Forensic and Environmental Chemistry	6	P CHEM 1102 or 1902 or 1904 or 1909; 6 credit points of Junior Mathematics N CHEM3107 or CHEM3197 NB: To enrol in Senior Chemistry in 2007 it will be a requirement that students complete CHEM (2401 or 2911 or 2915) and CHEM (2402 or 2912 or 2916). Students are advised that combinations of CHEM2 units that do not meet this requirement will generally not allow progression to Senior Chemistry.	Semester 1
CHNG 2801	Conservation and Transport Processes	6	A CalculusComputations (Matlab, Excel)Mass and Energy Balances **P** All core 1 st year engineering units of study.	Semester 1
CHNG 2802	Applied Maths for Chemical Engineers	6	A Enrolment in this unit of study assumes that all core science and engineering UoS in first-year have been successfully completed. P All core 1 st year engineering units of study. C CHNG 2803 (Analysis Practice 1)CHNG 2801 (Conservation and Transport Processes)CHEM 2404 (Forensic and Environmental Chemistry)	Semester 1

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
CHNG 2803	Energy and Fluid Systems Practice	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information P All core engineering 1 st year units of study. C CHNG 2801 (Conservation and Transport Processes)CHNG 2802 (Applied Mathematics for Chemical Engineers)CHEM 2404 (Forensic and Environmental Chemistry)	Semester 1
CHNG 2804	Chemical & Biological Systems Behaviour	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. P All core 1 st year engineering units of study. C CHNG 2805 (Industrial Systems and Sustainability)CHNG 2806 (Analysis Practice 2 - Treatment, Purification and Recovery Systems)CHEM 2403 (Chemistry of Biological Molecules)	Semester 2
CHNG 2805	Industrial Systems and Sustainability	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative information P All core 1 st year engineering units of study. C CHNG 2804 (Chemical and Biological Systems Behaviour)CHNG 2806 (Analysis Practice 2 - Treatment, Purification & Recovery Systems)CHEM 2403 (Chemistry of Biological Molecules)	Semester 2
CHNG 2806	Materials Purification and Recovery	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information P All core 1 st year engineering units of study. C CHNG 2804 (Chemical and Biological Systems Behaviour)CHNG 2805 (Industrial Systems and Sustainability)CHEM 2403 (Chemistry of Biological Molecules)	Semester 2

Third Year

CHNG 3801	Process Design	6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. P All 1 st and 2nd year units of study in the Chemical Engineering degree program. C CHNG 3803 (Design Practice 1 - Chemical & Biological Processes)CHNG 3802 (Operation, Analysis and Improvement of Industrial Systems) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.	Semester 1
CHNG 3802	Operating/Improving Industrial Systems	6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. P All 1 st and 2nd year units of study relating to the Chemical Engineering degree program. C CHNG 3801 (Process Design)CHNG 3803 (Design Practice 1 - Chemical & Biological Processes) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.	Semester 1
CHNG 3803	Chemical/Biological Process Design	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information P All 1 st and 2nd year units of study relating to the Chemical Engineering degree program. C CHNG 3801 (Process Design)CHNG 3802 (Operation, Analysis and Improvement of Industrial Systems) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.	Semester 1
CHNG 3805	Product Formulation and Design	6	A Mass and Energy Balances Conservation and Transport PhenomenaApplied Mathematics (for Chemical Engineering)Process Design ConceptsProcess Control and Optimisation Concepts P All 1 st and 2nd year units of study relating to the Chemical Engineering degree program. C CHNG 3806 (Management of Industrial Systems)CHNG 3807 (Design Practice 2 - Products and Value Chains) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.	Semester 2
CHNG 3806	Management of Industrial Systems	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative information P All 1st and 2nd year units of study relating to the Chemical Engineering degree. C CHNG 3805 (Product Formulation and Design)CHNG 3807 (Design Practice 2 - Products and Value Chains) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.	Semester 2

Unit	*of*	*Study*	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
CHNG 3807	Products and Value Chains		6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information P All 1st and 2nd year units of study relating to the Chemical Engineering degree. C CHNG 3805 (Product Formulation and Design)CHNG 3806 (Management of Industrial Systems) NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.	Semester 2

Fourth Year

CHNG 4001	Practical Experience		0	P Advisory prerequisite: 28 credit points of 3rd year units	Semester 1, Semester 2
CHNG 4801	Chemical Engineering Thesis A		6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. P CFING3801 Process Design CFING3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains N CHNG4002 Thesis	Semester 1
CHNG 4802	Chemical Engineering Design A		6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. P CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains N CHNG4201 Chemical Engineering Design 1 NB: This UoS is part of an integrated (two semester) fourth year program in chemical engineering design whose overarching aim is to complete the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. This unit of study will be offered for the 1 st time in 2006.	Semester 1
CHNG 4805	Chemical Engineering Thesis B		6	A Enrolment in this unit of study assumes that Chemical Engineering Thesis A and all (six) core chemical engineering UoS in third year have been successfully completed. P CHNG 4801 Chemical Engineering Thesis A NB: This UoS is part of an integrated (two semester) fourth year program involving a chemical engineering research project and thesis. It has the overarching aim of completing the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. This unit of study will be offered for the first time in 2006.	Semester 2
CHNG 4806	Chemical Engineering Design B		6	A Enrolment in this unit of study assumes that all core chemical engineering UoS in third-year have been successfully completed, as well as the related first semester UoS Chemical Engineering Design A. P CHNG4802 Chemical Engineering Design AOr CHNG4203 MIPPS N CHNG4202 Chemical Engineering Design 2 NB: This UoS is part of an integrated (two semester) fourth year program in chemical engineering design whose overarching aim is to complete the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. This unit of study will commence in 2006.	Semester 2

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 and from Second Year Chemistry.

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 156 credit points). They are also required to gain at least 24 credit points from the Third and Fourth Year electives listed in the table of Recommended Elective Units of Study for BE (Chem) as shown below.

Combined degree (Bachelor of Engineering in Chemical Engineering with either a Bachelor of Arts 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 12 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 144 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 12credit 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 144 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.

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

Recommended Elective Units of Study for BE (Chemical)

First Year

CHNG 1006	Professional Communication for Engineers	***2***	**Q** Students who fail a diagnostic skills test will be asked to enrol in this unit of study. C CHNG 1103 Semester NB: Department permission required for enrolment.	Semester 1, 2

Third Year

CHNG 3041	Exchange Program 3A	24	P Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. NB: Department permission required for enrolment.	Semester 2, Semester 1
CHNG 3042	Exchange Program 3B	24	P Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. NB: Department permission required for enrolment.	Semester 1, Semester 2
CHNG 3804	Biochemical Engineering	6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. P All 1 st and 2nd year units of study relating to the Chemical Engineering degree program. NB: This UoS is a third year elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries. Students with an interest in bio-engineering will find the background provided by this UoS particularly useful in their fourth year research thesis.	Semester 2
CHNG 3808	Polymer Engineering	6	A All core chemical engineering UoS in third year have been successfully completed or are currently being completed. P All 1st and 2nd year units of study relating to the Chemical Engineering degree.	Semester 1

Fourth Year

CHNG 4006	Professional Option	2	P advisory prerequisites: Passed at least 144 credit points. NB: Department permission required for enrolment. Student must be in the final semester of their degree program.	Semester 1, Semester 2
CHNG 4041	Exchange Program 4A	24	P Completion of all Year 1, 2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. NB: Department permission required for enrolment.	Semester 1, Semester 2
CHNG 4042	Exchange Program 4B	24	P Completion of all Year 1, 2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. NB: Department permission required for enrolment.	Semester 2, Semester 1
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.	Semester 1
CHNG 5001	Process Systems Engineering	6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. P CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains NB: This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries.	Semester 1
CHNG 5002	Environmental Decision Making	6	A Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems.Ability to understand basic principles of physical chemistry, physics and mechanics.Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature.Ability to write coherent reports and essays based on information from diverse sources. P CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains NB: This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries.	Semester 2
CHNG 5003	Green Engineering	6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. P CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains	Semester 2

Unit	*of*	*Study*	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
CHNG 5004	Particle and Surfaces		6	A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year and all unit operations have been successfully completed. P CFING3801 Process Design CFING3802 Operation, Analysis and Improvement of Industrial Systems CHNG3803 Design Practice 1 - Chemical & Biological Processes CHNG3805 Product Formulation and Design CHNG3806 Management of Industrial Systems CHNG3807 Design Practice 2 - Products and Value Chains NB: This UoS is an advanced Chemical Engineering elective.	Semester 1

Department of Civil Engineering

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

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

- 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: Prerequisites Q: Qualifying C: Corequisites 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 NMATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH **1002**	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
ENGG **1800**	Engineering Disciplines (Intro) Stream A	6		Semester 1
ENGG **1801**	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
CHEM **1101**	Chemistry 1A	6	A HSC Chemistry and Mathematics C Recommended concurrent units of study: 6 credit points of Junior Mathematics N CHEM (1001 or 1901 or 1903 or 1909)	Semester 2, Summer, Semester 1
MATH **1003**	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 N MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH **1005**	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ENGG **1802**	Engineering Mechanics	6		Semester 2
ENGG **1803**	Professional Engineering 1	6		Semester 2, Semester 1
GEOL **1501**	Engineering Geology 1	6	A No previous knowledge of Geology assumed N GEOL 1002	Semester 2
Second Year				
MATH **2061**	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
CIVL **2110**	Materials	6	A CHEM1001 Fundamentals of Chemistry 1A, ENGG1802 Engineering Mechanics	Semester 1
CIVL 2810	Engineering Construction and Surveying	6	A MATH 1001, MATH 1002, MATH 1003, MATH 1005	Semester 1
CIVL 2201	Structural Mechanics	6	A ENGG 1802 Engineering Mechanics	Semester 1
CIVL 2230	Intro to Structural Concepts and Design	6	A ENGG 1802 Engineering Mechanics, CIVL2110 Materials CIVL2201 Structural Mechanics	Semester 2
CIVL 2410	Soil Mechanics	6	A CIVL 2201 Structural Mechanics	Semester 2
CIVL 2611	Fluid Mechanics	6	A MATH 1001, MATH 1002, MATH 1003, MATH 1005	Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Third Year				
CIVL 3205	Concrete Structures 1	6	A CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 1
CIVL 3612	Environmental and Fluids Engineering	6	A CIVL 2611 Fluid Mechanics	Semester 1
CIVL 3010	Engineering and Society	6	A ENGG1803 Professional Engineering	Semester 1
CIVL 3812	Project Appraisal	6	N CIVL 4803 Engineering Management	Semester 1
CIVL 3206	Steel Structures 1	6	A CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design N CIVL3227	Semester 2
Fourth Year				
CIVL 4020	Thesis 1	6	P 30 credit points of third year units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
CIVL 4021	Thesis 2	6	P 30 credit points of third year units of study and successful completion of Thesis - Part 1	Semester 1, Semester 2
CIVL 4811	Engineering Design and Construction	6	A CIVL2810 Engineering Construction and Survey N CIVL3802 Engineering Construction 2	Semester 1
CIVL 4903	Civil Engineering Design	6	A CIVL3205 Concrete Structures 1 andCIVL3206 Steel Structures 1.	Semester 2
CIVL 4008	Practical Experience	0	P 30 credit points of third year courses	Semester 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 Director of the Learning and Teaching Committee 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 Medical 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) 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.

Candidates taking a combined degree with Science or Medical Science may count the Science subjects in the Civil Engineering core to their 96 credits points of Science subjects. Electives from the list below should be taken to complete 144 credit points of Engineering subjects.

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:

GEOL 1501 Engineering Geology 1 (6cps) - acceptable alternative: GEOL 1001 and GEOL 1002

ENGG 1802 Engineering Mechanics (6cps) - acceptable alternative: PHYS 1001 and PHYS 1003

Recommended elective units of study:

Second Year

CIVL 2511	Instrumentation & Measurement	6	A CIVL2201 Structural Mechanics, ENGG 1802 Engineering Mechanics	Semester 2

Third Year

CIVL 3235	Structural Analysis	6	**A** CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design, MATH2061 Linear Mathematics and Vector Calculus	Semester 2
CIVL 3411	Foundation Engineering	6	A CIVL 2410 Soil Mechanics	Semester 2
CIVL 3613	Coastal Engineering	6	A CIVL 2611 Fluid Mechanics CIVL3612 Environmental and Fluids Engineering	Semester 2
CIVL 3805	Project Scope, Time and Cost Management	6		Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Fourth Year				
CIVL 4412	Geotechnical Engineering	6	A CIVL2410 Soil Mechanics; CIVL3411 Foundation Engineering	Semester 1
CIVL 4414	Finite Element Analysis	6	P ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics	Semester 1
CIVL 4242	Bridge Engineering	6	A CIVL3206 Steel Structures 1 CIVL3205 Concrete Structures 1	Semester 1
CIVL 4614	Hydrology and Wind Engineering	6	A CIVL 2611 Fluid Mechanics; CIVL 3612 Fluids and Environmental Engineering; CIVL 2230 Introduction to Structural Concepts and Design; CIVL3235 Structural Analysis	Semester 1
CIVL 4615	Water Resources Engineering	6	A CIVL 2611 Fluid Mechanics, CIVL 3612 Fluids and Environmental Engineering	Semester 1
CIVL 4814	Project Planning and Tendering	6	A CIVL2810 Engineering Construction and Surveying, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 1
CIVL 4240	Concrete Structures 2	6	A ENGG1802 Engineering Mechanics; CIVL2201 Structural Mechanics; CIVL3235 Structural Analysis P CIVL3205 Concrete Structures 1	Semester 2
CIVL 4241	Steel Structures 2	6	A CIVL2201 Structural Mechanics, CIVL3235 Structural Analysis, CIVL3206 Steel Structures 1	Semester 2
CIVL 4413	Environmental Geotechnics	6	A CIVL2410 Soil Mechanics, CIVL3411 Foundation Engineering	Semester 2
CIVL 4815	Project Formulation	6	A MATH2061, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 2
CIVL 3813	Contracts Formulation and Management	6	A CIVL 3805 Project Scope, Cost & Time Management	Semester 2
CIVL 4810	Proj ect Quality Risk and Procurement Mgt	6		Semester 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 18 elective credit points of study from the recommended Third Year level and 18 elective credit points from the recommended Fourth Year electives. 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 Director of the Learning and Teaching Committee of Civil Engineering.

3. Thesis 1 should be taken in Semester 1 and Thesis 2 in Semester 2. With special permission from the Director of the Learning and Teaching Committee of Civil Engineering, it is possible to take Thesis 1 in Semester 2 and Thesis 2 in Semester 1.

4. To meet specialization requirements students must enrol in at least 3 electives from the relevant stream listed below and undertake a thesis in a related topic. Students may enroll in a maximum of 4 electives from the Constructions Engineering and Management stream.

Construction Engineering and Management Stream: : CIVL 4815, CIVL 4814, CIVL 3813, CIVL 3805, CIVL 4810

Structural Engineering Stream: : CIVL 3235, CIVL 4240, CIVL 4241, CIVL 4242

Environmental Stream: : CIVL 3613, CIVL 4413, CIVL 4614, CIVL 4615

Geotechnical Engineering Stream: CIVL 3411, CIVL 4413, CIVL 4412, CIVL 4414

Exchange Units of Study

CIVL0011, CIVL0012, CIVL0013, CIVL0014, CIVL0015, CIVL0016, CIVL0017 AND CIVL0018 are available for exchange study program in 2006 (see listing in Chapter 4).

Project Engineering and Management

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

Candidates for the degree of Bachelor of Engineering in Project Engineering and Management (Civil) are required to gain credit points 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 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
ACCT 1003	Financial Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	Semester 1
ACCT 1004	Management Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	Semester 2
ENGG 1800	Engineering Disciplines (Intro) Stream A	6		Semester 1
ENGG 1802	Engineering Mechanics	6		Semester 2
ENGG 1803	Professional Engineering 1	6		Semester 2, Semester 1
CHEM 1101	Chemistry 1A	6	A HSC Chemistry and Mathematics C Recommended concurrent units of study: 6 credit points of Junior Mathematics N CHEM (1001 or 1901 or 1903 or 1909)	Semester 2, Summer, Semester 1

Second Year

MATH 2061	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
CIVL 2201	Structural Mechanics	6	A ENGG 1802 Engineering Mechanics	Semester 1
CIVL 2810	Engineering Construction and Surveying	6	A MATH 1001, MATH 1002, MATH 1003, MATH 1005	Semester 1
CIVL 2230	Intro to Structural Concepts and Design	6	A ENGG 1802 Engineering Mechanics, C1VL2110 Materials C1VL2201 Structural Mechanics	Semester 2
CIVL 2410	Soil Mechanics	6	A CIVL 2201 Structural Mechanics	Semester 2
CIVL 2611	Fluid Mechanics	6	A MATH 1001, MATH 1002, MATH 1003, MATH 1005	Semester 2
CIVL 3805	Project Scope, Time and Cost Management	6		Semester 2
ENGG 1801	Engineering Computing	6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1

Third Year

CIVL 3010	Engineering and Society	6	A ENGG 1803 Professional Engineering	Semester 1
CIVL 2110	Materials	6	A CHEM1001 Fundamentals of Chemistry 1A, ENGG1802 Engineering Mechanics	Semester 1
CIVL 3812	Project Appraisal	6	N CIVL 4803 Engineering Management	Semester 1
CIVL 3813	Contracts Formulation and Management	6	A CIVL 3805 Project Scope, Cost & Time Management	Semester 2
CIVL 4810	Project Quality Risk and Procurement Mgt	6		Semester 2

Fourth Year

CIVL 4020	Thesis 1	6	P 30 credit points of third year units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
CIVL 4021	Thesis 2	6	P 30 credit points of third year units of study and successful completion of Thesis - Part 1	Semester 1, Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
CIVL 4811	Engineering Design and Construction	6	A CIVL2810 Engineering Construction and Survey N CIVL3802 Engineering Construction 2	Semester 1
CIVL 4815	Project Formulation	6	A MATH2061, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 2
CIVL 4814	Project Planning and Tendering	6	A CIVL2810 Engineering Construction and Surveying, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 1
CIVL 4008	Practical Experience	0	**P** 30 credit points of third year courses	Semester 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 of 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 Director of the Learning and Teaching Committee of Civil Engineering.

Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with 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 96 credit points for the combined degree will be taken in the Faculty of Economics and Business. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics and Business.

Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with Bachelor of Arts, Bachelor of Science, or Bachelor of Medical Science are required to complete all of the core units of study in the above specialisation requirements. This remaining 84 credit points should be taken from the relevant faculty unit of study subject to the Joint Resolutions of the Faculty of Engineering and the relevant faculty.

Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with Bachelor of Laws are required to complete all of the core units of study in the above specialisation requirements except CIVL 3010 and ENGG 1803. The remaining 96 credit points for the combined degree will be taken in the Faculty of Laws. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Laws.

Note: Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by 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.

GEOL 1501 Engineering Geology 1 (6cps) - acceptable alternative: GEOL 1001 andGEOL 1002.

ENGG 1802 Engineering Mechanics (6cps) - acceptable alternative: PHYS 1001 andPHYS 1003

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

Third Year

CIVL 3205	Concrete Structures 1	6	A CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 1
CIVL 3612	Environmental and Fluids Engineering	6	A CIVL 2611 Fluid Mechanics	Semester 1
CIVL 3206	Steel Structures 1	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design N CIVL3227	Semester 2
CIVL 3235	Structural Analysis	6	A CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design, MATH2061 Linear Mathematics and Vector Calculus	Semester 2
CIVL 3411	Foundation Engineering	6	A CIVL 2410 Soil Mechanics	Semester 2
CIVL 3613	Coastal Engineering	6	A CIVL 2611 Fluid Mechanics CIVL3612 Environmental and Fluids Engineering	Semester 2
CIVL 2511	Instrumentation & Measurement	6	A CIVL2201 Structural Mechanics, ENGG 1802 Engineering Mechanics	Semester 2

Fourth Year

CIVL 4414	Finite Element Analysis	6	**P** ENGG 1802 Engineering Mechanics, CIVL2201 Structural Mechanics	Semester 1
CIVL 4242	Bridge Engineering	6	A CIVL3206 Steel Structures 1 CIVL3205 Concrete Structures 1	Semester 1
CIVL 4240	Concrete Structures 2	6	A ENGG 1802 Engineering Mechanics; CIVL2201 Structural Mechanics; CIVL3235 Structural Analysis P CIVL3205 Concrete Structures 1	Semester 2
CIVL 4241	Steel Structures 2	6	A CIVL2201 Structural Mechanics, CIVL3235 Structural Analysis, CIVL3206 Steel Structures 1	Semester 2

Unit	*of*	*Study*	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
CIVL 4413	Environmental Geotechnics		6	A CIVL2410 Soil Mechanics, CIVL3411 Foundation Engineering	Semester 2
CIVL 4412	Geotechnical Engineering		6	A CIVL2410 Soil Mechanics; CIVL3411 Foundation Engineering	Semester 1
CIVL 4615	Water Resources Engineering		6	A CIVL 2611 Fluid Mechanics, CIVL 3612 Fluids and Environmental Engineering	Semester 1
CIVL 4903	Civil Engineering Design		6	A CIVL3205 Concrete Structures 1 and CIVL3206 Steel Structures 1.	Semester 2
CIVL 4614	Hydrology and Wind Engineering		6	A CIVL 2611 Fluid Mechanics; CIVL 3612 Fluids and Environmental Engineering; CIVL 2230 Introduction to Structural Concepts and Design; CIVL3235 Structural Analysis	Semester 1

Notes

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

2. Thesis 1 should be taken in Semester 1 and Thesis 2 in Semester 2. With special permission from the Director of the Learning and Teaching Committee of Civil Engineering, it is possible to take Thesis 1 in Semester 2 and Thesis 2 in Semester 1.

3. At least one of CIVL 3205 and CIVL 3612 must be taken.

Exchange Units of Study

CIVL0011, CIVL0012, CIVL0013, CIVL0014, CIVL0015, CIVL0016, CIVL0017 AND CIVL0018 are available for exchange study program in 2006 (see listing in Chapter 4).

School of Electrical and Information Engineering

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

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 units of study. The core units of study are set out in the tables below pertaining to each specialisation. The recommended units of study are as defined for each specialisation.

Note that not all recommended 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: Prerequisites Q: Qualifying C: Corequisites N: Prohibition Session*	
All candidates for the Bachelor of Engineering in Computer Engineering degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.				
Candidates will also need to choose a number of recommended units of study for Computer Engineering, which consist of:				
* all level 3, 4 and 5 ELEC and EBUS units which do not appear in the table of core units;				
* ENGG 1804 Introduction to Engineering Disciplines B; and				
** such other units of study as may be so designated by the Head of School.				

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 including at least 162 credit points made up of units from the table of core units and recommended units of study. The additional 30 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.

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 or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study.

Candidates in the combined degree course of Bachelor of Engineering in Computer Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM 1101 Chemistry 1A and BIOL 1001 Concepts in Biology.

Candidates in the combined degree course of Bachelor of Engineering in Computer Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.

Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second faculty concerned.

Computer Engineering core units of study

First year

ELEC **1103**	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. **N** ELEC1102 Foundations of Electronic Circuits.	Semester 2
ELEC **1601**	Professional Computer Engineering	6	A HSC Mathematics extension 1. **N** NETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).	Semester 1, Summer
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 **N** MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 **N** MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 **N** MATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics **N** MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics C Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) N PHYS (1002 or 1901)	Semester 1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. C Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. N PHYS (1004 or 1902)	Semester 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)	Semester 1, Semester 2
SOFT 1002	Software Development 2	6	P SOFT (1001 or 1901) or COMP (1001 or 1901) N May not be counted with SOFT 1902 or COMP (1002 or 1902) or DECO2011 NB: Students with Credit or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 1, Semester 2, Summer

Second year

ELEC 2103	Simulation & Numerical Solutions in Eng.	6	A 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. N ELEC2102 Engineering Computing, COSC1001 Computational Science in Matlab, COSC1901 Computational Science in Matlab (Advanced).	Semester 1
ELEC 2104	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
ELEC 2302	Signals and Systems	6	A MATH 1001 Differential Calculus and MATH 1002 Linear Algebra and MATH 1003 Integral Calculus and Modelling. N ELEC2301 Signals & Systems, MATH3019 Signal Processing, MATH3919 Signal Processing (Adv).	Semester 2
ELEC 2602	Digital System Design	6	A ELEC1101 Foundations of Computer Systems or ELEC 1601 Professional Computer Engineering. N ELEC3601 Digital Systems Design, ELEC3608 Digital Systems Design.	Semester 2
MATH 2061	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer
PHYS 2213	Physics 2EE	6	A MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful P PHYS (1001 or 1901) and PHYS (1003 or 1902) N PHYS (2203 or 2001 or 2901 or 2011 or 2911 or 2002 or 2902 or 2012 or 2912)	Semester 2
SOFT 2130	Software Construction 1	6	P SOFT (1002 or 1902) or COMP (1002 or 1902) N COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830). NB: Students with Distinction or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 2, Summer

Third year

ELEC 3506	Data Comunications and the Internet	6	A SOFT2004 Software Development Methods 1 or COMP2004 Programming Practice or SOFT2130 Software Construction. N NETS2150 Fundamentals of Networking, NETS2009 Network Organisation, NETS2909 Network Organisation (Adv), NETS3007 Network Protocols, NETS3907 Network Protocols (Advanced), ELEC3504 Data Communications and the Internet, ELEC4501 Data Communication Networks.	Semester 2
ELEC 3607	Embedded Computing	6	A ELEC1101 Foundations of Computer Systems or ELEC2602 Digital System Design. N ELEC2601 Microcomputer Systems.	Semester 2
At least 3 of the following 7 units of study:				
ELEC 3104	Engineering Electromagnetics	6	A PHYS2213 Physics 2EE (or PHYS2203 Physics 2EE) and MATH2061 Linear Algebra and Vector Calculus (or MATH2001 Vector Calculus and Complex Variables) and ELEC1103 Professional Electronic Engineering (or ELEC1102 Foundations of Electronic Circuits). N ELEC3102 Engineering Electromagnetics.	Semester 1
ELEC 3304	Control	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3302 Fundamentals of Feedback Control, MECH3800 Systems Control, AMME3500 System Dynamics and Control, CHNG3302 Process Control.	Semester 2
ELEC 3305	Digital Signal Processing	6	A ELEC2301 Signals & Systems or ELEC 2302 Signals & Systems. N ELEC 3303 Digital Signal Processing.	Semester 1
ELEC 3404	Electronic Circuit Design	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3401 Electronic Devices and Circuits.	Semester 1
ELEC 3605	Engineering Software Requirements	6	A SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. N ELEC4604 Engineering Software Requirements.	Semester 1
ELEC 3702	Management for Engineers	6	N ELEC3701 Management for Engineers, ENGG2003 Introduction to Engineering Management	Semester 1
NETS 3304	Operating System Internals	6	P (ELEC1601 or NETS(2008 or 2908) or COMP(2001 or 2901) or ELEC2601) and (SOFT(2130 or 2830) or SOFT(2004 or 2904) or COMP(2004 or 2904)). N May not counted with NETS(3009 or 3909 or 3604), COMP(3009 or 3909). NB: Students who were not able to do ELEC 1601, but have the remaining prerequisites, are encouraged to apply for special permission to enrol in this unit.	Semester 2

Fourth year

ELEC 4605	Computer Engineering	6	A (ELEC2601 Microprocessor Systems or ELEC3607 Embedded Computing) and (ELEC2602 Digital System Design or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design). NELEC4601 Computer Design.	Semester 1
ELEC 4702	Practical Experience	0	P 24 credit points of level 3 or 4 units of study NB: Department permission required for enrolment.	Semester 1, Semester 2

Unit of Study	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
ELEC 4707 Engineering Project	12	P 36 credit points of third and fourth year units of study. **N** ELEC4703 Thesis, ELEC4705 Interdisciplinary Project	Semester 1, Semester 2

Notes:

1. The Mathematics, Physics and Information Technology units of study offered by the Faculty of Science may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

2. Candidates for the BE/BMedSc in the combined degree course shall replace ELEC 4707 Engineering Project with ELEC 4705 Interdisciplinary Project.

Electronic Commerce

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

All candidates for the Bachelor of Engineering in Electronic Commerce degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.

Candidates will also need to choose a number of recommended units of study for Electronic Commerce Engineering, which consist of:

* all level 3, 4 and 5 ELEC and EBUS units which do not: appear in the table of core units;

* all level 3 COMP, INFO, ISYS, MULT, NETS and SOFT units of study listed in the Faculty of Science handbook;

* all INFS units listed in the Faculty of Economics and Business handbook;

* ENGG 1804 Introduction to Engineering Disciplines B;

* the units of study listed in the table of additional Electronic Commerce recommended units of study; and

* such other units of study as may be so designated by the Head of School.

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 including at least 162 credit points made up of units from the table of core units and recommended units of study. The additional 30 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.

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 are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.

Candidates shall also satisfy such other requirement!3 as are prescribed in the joint resolutions of the Faculty of Engineering and the Faculty of Economics and Business.

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.	Semester 1
ACCT **1004**	Management Accounting Concepts	6	N Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.	Semester 2
ELEC **1103**	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
ELEC **1601**	Professional Computer Engineering	6	A HSC Mathematics extension 1. NNETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).	Semester 1, Summer
MATH **1001**	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH **1002**	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH **1003**	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH **1005**	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
MKTG **1001**	Marketing Principles	6	NMKTG2001	Semester 1, Semester 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)	Semester 1, Semester 2
SOFT 1002	Software Development 2	6	P SOFT (1001 or 1901) or COMP (1001 or 1901) N May not be counted with SOFT 1902 or COMP (1002 or 1902) or DECO2011 NB: Students with Credit or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 1, Semester 2, Summer

Second year

CLAW **2206**	Legal Issues for e-Commerce	6	P Any 8 full semester first year units of study N CLAW2006	Semester 1, Semester 2
ELEC **2103**	Simulation & Numerical Solutions in Eng.	6	A 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. N ELEC2102 Engineering Computing, COSC1001 Computational Science in Matlab, COSC1901 Computational Science in Matlab (Advanced).	Semester 1
INFO 2110	Systems Analysis and Modelling	6	A Simple data modelling and simple SQL knowledge covered at ISYS 1003 or INFO 1000 level P (INFO(1003 or 1903 or 1000) or ISYS 1003 or INFS 1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or 6 credit points of COSC units of study of DECO2011. N INFO (2000 or 2810 or 2900)	Semester 1, Summer
INFO 2120	Database Systems 1	6	P INFO(1003 or 1903 or 1000) or ISYS1003 or INFS1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or (6 credit points of COSC) or DECO2011 N INFO (2005 or 2820 or 2905).	Semester 2
SOFT 2130	Software Construction 1	6	P SOFT (1002 or 1902) or COMP (1002 or 1902) N COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830). NB: Students with Distinction or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 2, Summer

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Third year				
EBUS 3003	e-Business System Design	6	A SOFT 1002 Software Development 2 and (ISYS 1003 Foundations of Information Technology or ELEC 1601 Professional Computer Engineering or ELEC1101 Foundations of Computer Systems). N EBUS3001 Introduction to E-Commerce Systems.	Semester 1
EBUS 3004	e-Business Programming	6	A EBUS3001 Introduction to E-Commerce Systems or EBUS3003 E-Business System Design. N EBUS3002 E-Commerce Website Programming.	Semester 2
ELEC **3506**	Data Comunications and the Internet	6	A SOFT2004 Software Development Methods 1 or COMP2004 Programming Practice or SOFT2130 Software Construction. N NETS2150 Fundamentals of Networking, NETS2009 Network Organisation, NETS2909 Network Organisation (Adv), NETS3007 Network Protocols, NETS3907 Network Protocols (Advanced), ELEC3504 Data Communications and the Internet, ELEC4501 Data Communication Networks.	Semester 2
ELEC 3605	Engineering Software Requirements	6	A SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. N ELEC4604 Engineering Software Requirements.	Semester 1
MKTG 3110	Electronic Marketing	6	P MKTG 1001 (orMKTG2001) NMKTG3010	Semester 2
Fourth year				
EBUS 4001	e-Business Engineering	6	A EBUS3002 E-Commerce Website Programming or EBUS3004 E-Business Programming. N EBUS5001 E-Commerce Application Programming.	Semester 1
ELEC 4702	Practical Experience	0	P 24 credit points of level 3 or 4 units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
ELEC 4707	Engineering Project	12	P 36 credit points of third and fourth year units of study. N ELEC4703 Thesis, ELEC4705 Interdisciplinary Project	Semester 1, Semester 2
Additional Electronic Commerce recommended units of study:				
ECMT 1020	Business and Economic Statistics B	6	CECMT1010 N ECMT 1021, ECMT 1022 and ECMT 1023 NB: Other than in exceptional circumstances, it is strongly recommended that students do not undertake Business and Economic Statistics B before attempting Business and Economic Statistics A.	Semester 2
ECON 1001	Introductory Microeconomics	6	A Mathematics	Semester 1, Summer
ECON 1002	Introductory Macroeconomics	6	A Mathematics	Semester 2, Summer
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics C Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) N PHYS (1002 or 1901)	Semester 1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. C Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. N PHYS (1004 or 1902)	Semester 2

The Mathematics, Physics and Information Technology units of study offered by the Faculty of Science may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

Electrical Engineering

Unit of Study	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

All candidates for the Bachelor of Engineering in Electrical Engineering degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.

Candidates will also need to choose a number of recommended units of study for Electrical Engineering, which consist of:

* all level 3, 4 and 5 ELEC and EBUS units which do not appear in the table of core units;

*N ENGG 1804 Introduction to Engineering Disciplines B; and

* such other units of study as may be so designated by the Head of School.

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 including at least 162 credit points made up of units from the table of core units and recommended units of study. The additional 30 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.

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 or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study.

Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM 1101 Chemistry 1A and BIOL 1001 Concepts in Biology.

Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.

Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second faculty concerned.

Electrical Engineering core units of study

First year

ELEC 1103	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
ELEC 1601	Professional Computer Engineering	6	A HSC Mathematics extension 1. NNETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).	Semester 1, Summer
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics C Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) N PHYS (1002 or 1901)	Semester 1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. C Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. N PHYS (1004 or 1902)	Semester 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)	Semester 1, Semester 2
SOFT 1002	Software Development 2	6	P SOFT (1001 or 1901) or COMP (1001 or 1901) N May not be counted with SOFT 1902 or COMP (1002 or 1902) or DECO2011 NB: Students with Credit or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 1, Semester 2, Summer

Second year

ELEC **2103**	Simulation & Numerical Solutions in Eng.	6	A 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. N ELEC2102 Engineering Computing, COSC1001 Computational Science in Matlab, COSC1901 Computational Science in Matlab (Advanced).	Semester 1
ELEC 2104	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
ELEC **2302**	Signals and Systems	6	A MATH 1001 Differential Calculus and MATH 1002 Linear Algebra and MATH 1003 Integral Calculus and Modelling. N ELEC2301 Signals & Systems, MATH3019 Signal Processing, MATH3919 Signal Processing (Adv).	Semester 2
ELEC 2602	Digital System Design	6	A ELEC1101 Foundations of Computer Systems or ELEC 1601 Professional Computer Engineering. N ELEC3601 Digital Systems Design, ELEC3608 Digital Systems Design.	Semester 2
MATH 2061	Linear Mathematics and Vector Calculus	6	**P** MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
PHYS 2213	Physics 2EE	6	A MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful PPHYS (1001 or 1901) and PHYS (1003 or 1902) N PHYS (2203 or 2001 or 2901 or 2011 or 2911 or 2002 or 2902 or 2012 or 2912)	Semester 2
SOFT 2130	Software Construction 1	6	P SOFT (1002 or 1902) or COMP (1002 or 1902) N COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830). NB: Students with Distinction or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 2, Summer

Third year

At least 5 of the following 8 units of study:				
ELEC 3104	Engineering Electromagnetics	6	A PHYS2213 Physics 2EE (or PHYS2203 Physics 2EE) and MATH2061 Linear Algebra and Vector Calculus (or MATH2001 Vector Calculus and Complex Variables) and ELEC1103 Professional Electronic Engineering (or ELEC1102 Foundations of Electronic Circuits). N ELEC3102 Engineering Electromagnetics.	Semester 1
ELEC 3203	Power Engineering	6	A ELEC2101 Circuit Analysis or ELEC2104 Electronics and Basic Circuits. N ELEC3201 Electrical Energy Systems.	Semester 1
ELEC 3304	Control	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3302 Fundamentals of Feedback Control, MECH3800 Systems Control, AMME3500 System Dynamics and Control, CHNG3302 Process Control.	Semester 2
ELEC 3305	Digital Signal Processing	6	A ELEC2301 Signals & Systems or ELEC 2302 Signals & Systems. N ELEC 3303 Digital Signal Processing.	Semester 1
ELEC 3404	Electronic Circuit Design	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3401 Electronic Devices and Circuits.	Semester 1
ELEC 3505	Communications	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3503 Introduction to Digital Communications.	Semester 1
ELEC 3607	Embedded Computing	6	A ELEC1101 Foundations of Computer Systems or ELEC2602 Digital System Design. N ELEC2601 Microcomputer Systems.	Semester 2
ELEC 3702	Management for Engineers	6	N ELEC3701 Management for Engineers, ENGG2003 Introduction to Engineering Management	Semester 1

Fourth year

ELEC 4702	Practical Experience	0	P 24 credit points of level 3 or 4 units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
ELEC 4707	Engineering Project	12	P 36 credit points of third and fourth year units of study. N ELEC4703 Thesis, ELEC4705 Interdisciplinary Project	Semester 1, Semester 2

Notes:

1. The Mathematics, Physics and Information Technology[7] units of study offered by the Faculty of Science may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

2. Candidates for the BE/BMedSc in the combined degree course shall replace ELEC 4707 Engineering Project with ELEC 4705 Interdisciplinary Project.

Software Engineering

Unit of Study	*CP A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

All candidates for the Bachelor of Engineering degree in Software Engineering (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.

Candidates will also need to choose a number of recommended units of study for Software Engineering, which consist of:

* all level 3, 4 and 5 ELEC and EBUS units which do not appear in the table of core units;

*N all level 3 and 4 COMP, INFO, ISYS, MULT, NETS and SOFT units of study listed in the Faculty of Science handbook;

* ENGG 1804 Introduction to Engineering Disciplines B; and

*N such other units of study as may be so designated by the Head of School.

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 including at least 162 credit points made up of units from the table of core units and recommended units of study. The additional 30 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.

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 or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study.

Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM 1101 Chemistry 1A and BIOL 1001 Concepts in Biology.

Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.

Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second faculty concerned.

Software Engineering core units of study

First year

ELEC **1103**	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
ELEC **1601**	Professional Computer Engineering	6	A HSC Mathematics extension 1. NNETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).	Semester 1, Summer
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics C Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) N PHYS (1002 or 1901)	Semester 1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. C Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. N PHYS (1004 or 1902)	Semester 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)	Semester 1, Semester 2
SOFT 1002	Software Development 2	6	**P** SOFT (1001 or 1901) or COMP (1001 or 1901) N May not be counted with SOFT 1902 or COMP (1002 or 1902) or DECO2011 NB: Students with Credit or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 1, Semester 2, Summer

Second year

ELEC **2103**	Simulation & Numerical Solutions in Eng.	6	A 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. N ELEC2102 Engineering Computing, COSC1001 Computational Science in Matlab, COSC1901 Computational Science in Matlab (Advanced).	Semester 1
INFO 2110	Systems Analysis and Modelling	6	A Simple data modelling and simple SQL knowledge covered at ISYS 1003 or INFO 1000 level P (INFO(1003 or 1903 or 1000) or ISYS 1003 or INFS1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or 6 credit points of COSC units of study of DECO2011. N INFO (2000 or 2810 or 2900)	Semester 1, Summer
INFO 2120	Database Systems 1	6	P INFO(1003 or 1903 or 1000) or ISYS1003 or INFS1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or (6 credit points of COSC) or DECO2011 N INFO (2005 or 2820 or 2905).	Semester 2
MATH 2061	Linear Mathematics and Vector Calculus	6	P MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
SOFT 2130	Software Construction 1	6	P SOFT (1002 or 1902) or COMP (1002 or 1902) N COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830). NB: Students with Distinction or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 2, Summer
At least 1 of the following 2 units of study:				
ELEC **2302**	Signals and Systems	6	A MATH 1001 Differential Calculus and MATH 1002 Linear Algebra and MATH 1003 Integral Calculus and Modelling. N ELEC2301 Signals & Systems, MATH3019 Signal Processing, MATH3919 Signal Processing (Adv).	Semester 2
ELEC 2602	Digital System Design	6	A ELEC1101 Foundations of Computer Systems or ELEC 1601 Professional Computer Engineering. N ELEC3601 Digital Systems Design, ELEC3608 Digital Systems Design.	Semester 2

Third year

ELEC **3605**	Engineering Software Requirements	6	A SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. N ELEC4604 Engineering Software Requirements.	Semester 1
ELEC 3606	Software Project Management	6	A SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. N ELEC4704 Software Project Management.	Semester 2
NETS 3304	Operating System Internals	6	P(ELEC1601 orNETS(2008 or2908) or COMP(2001 or2901) orELEC2601) and(SOFT(2130 or2830) or SOFT(2004 or 2904) or COMP(2004 or 2904)). N May not counted with NETS(3009 or 3909 or 3604), COMP(3009 or 3909). NB: Students who were not able to do ELEC 1601, but have the remaining prerequisites, are encouraged to apply for special permission to enrol in this unit.	Semester2
SOFT 3302	Software Quality Assurance	6	P (INFO(2110 or 2810) or INFO(2000 or 2900)) and ((COMP(2160 or 2860) or COMP(2111 or 2811) or COMP(2002 or 2902)) or (SOFT(2130 or 2830) or SOFT(2004 or 2904) or COMP(2004 or 2904))). N May not be counted with SOFT(3602 or 3103 or 3803)	Semester 2
SOFT 3301	Software Construction 2	6	P SOFT(2130 or 2830 or 2004 or 2904) or COMP (2004 or COMP2904) N May not be counted with SOFT(3601, 3104, 3804) or COMP(3008 or COMP3908)	Semester 1
At least 2 of the following 7 units of study:				
EBUS 3003	e-Business System Design	6	A SOFT 1002 Software Development 2 and (ISYS 1003 Foundations of Information Technology or ELEC 1601 Professional Computer Engineering or ELEC1101 Foundations of Computer Systems). N EBUS3001 Introduction to E-Commerce Systems.	Semester 1
EBUS 3004	e-Business Programming	6	A EBUS3001 Introduction to E-Commerce Systems or EBUS3003 E-Business System Design. N EBUS3002 E-Commerce Website Programming.	Semester 2
ELEC 3304	Control	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3302 Fundamentals of Feedback Control, MECH3800 Systems Control, AMME3500 System Dynamics and Control, CHNG3302 Process Control.	Semester 2
ELEC 3305	Digital Signal Processing	6	A ELEC2301 Signals & Systems or ELEC 2302 Signals & Systems. N ELEC 3303 Digital Signal Processing.	Semester 1
ELEC **3506**	Data Comunications and the Internet	6	A SOFT2004 Software Development Methods 1 or COMP2004 Programming Practice or SOFT2130 Software Construction. N NETS2150 Fundamentals of Networking, NETS2009 Network Organisation, NETS2909 Network Organisation (Adv), NETS3007 Network Protocols, NETS3907 Network Protocols (Advanced), ELEC3504 Data Communications and the Internet, ELEC4501 Data Communication Networks.	Semester 2
ELEC 3607	Embedded Computing	6	A ELEC1101 Foundations of Computer Systems or ELEC2602 Digital System Design. N ELEC2601 Microcomputer Systems.	Semester 2
ELEC 3702	Management for Engineers	6	N ELEC3701 Management for Engineers, ENGG2003 Introduction to Engineering Management	Semester 1

Fourth year

ELEC 4702	Practical Experience	0	P 24 credit points of level 3 or 4 units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
ELEC 4707	Engineering Project	12	P 36 credit points of third and fourth year units of study. N ELEC4703 Thesis, ELEC4705 Interdisciplinary Project	Semester 1, Semester 2

Notes:

1. The Mathematics, Physics and Information Technology units of study offered by the Faculty of Science may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

2. Candidates for the BE/BMedSc in the combined degree course shall replace ELEC 4707 Engineering Project with ELEC 4705 Interdisciplinary Project.

Telecommunications Engineering

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*

All candidates for the Bachelor of Engineering degree in Telecommunications Engineering (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.

Candidates will also need to choose a number of recommended units of study for Telecommunications Engineering, which consist of:

* all level 3, 4 and 5 ELEC and EBUS units which do not appear in the table of core units;

*N ENGG 1804 Introduction to Engineering Disciplines B; and

* such other units of study as may be so designated by the Head of School.

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 including at least 162 credit points made up of units from the table of core units and recommended units of study. The additional 30 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.

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 or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study.

Candidates in the combined degree course of Bachelor of Engineering in Telecommunications Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM 1101 Chemistry 1A and BIOL 1001 Concepts in Biology.

Candidates in the combined degree course of Bachelor of Engineering in Telecommunications Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.

Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and the second faculty concerned.

Telecommunications Engineering core units of study

First year

ELEC 1103	Professional Electronic Engineering	6	A HSC Physics, HSC Mathematics extension 1. N ELEC1102 Foundations of Electronic Circuits.	Semester 2
ELEC 1601	Professional Computer Engineering	6	A HSC Mathematics extension 1. NNETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).	Semester 1, Summer
MATH 1001	Differential Calculus	3	A HSC Mathematics Extension 1 N MATH 1011 or 1901 or 1906 or 1111	Semester 1, Summer
MATH 1002	Linear Algebra	3	A HSC Mathematics Extension 1 N MATH 1902 or 1012 or 1014	Semester 1, Summer
MATH 1003	Integral Calculus and Modelling	3	A HSC Mathematics Extension 2 or MATH 1001 or MATH 1111 NMATH 1013 or 1903 or 1907	Summer, Semester 2
MATH 1005	Statistics	3	A HSC Mathematics N MATH (1905 or 1015) or ECMT Junior units of study or STAT (1021 or 1022)	Summer, Semester 2
PHYS 1001	Physics 1 (Regular)	6	A HSC Physics C Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) N PHYS (1002 or 1901)	Semester 1
PHYS 1003	Physics 1 (Technological)	6	A HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. C Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. N PHYS (1004 or 1902)	Semester 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)	Semester 1, Semester 2
SOFT 1002	Software Development 2	6	P SOFT (1001 or 1901) or COMP (1001 or 1901) N May not be counted with SOFT 1902 or COMP (1002 or 1902) or DECO2011 NB: Students with Credit or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 1, Semester 2, Summer

Second year

ELEC **2103**	Simulation & Numerical Solutions in Eng.	6	A 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. N ELEC2102 Engineering Computing, COSC1001 Computational Science in Matlab, COSC1901 Computational Science in Matlab (Advanced).	Semester 1
ELEC 2104	Electronic Devices and Basic Circuits	6	A ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. N ELEC2401 Introductory Electronics.	Semester 1
ELEC **2302**	Signals and Systems	6	A MATH 1001 Differential Calculus and MATH 1002 Linear Algebra and MATH 1003 Integral Calculus and Modelling. N ELEC2301 Signals & Systems, MATH3019 Signal Processing, MATH3919 Signal Processing (Adv).	Semester 2
ELEC 2602	Digital System Design	6	A ELEC1101 Foundations of Computer Systems or ELEC 1601 Professional Computer Engineering. N ELEC3601 Digital Systems Design, ELEC3608 Digital Systems Design.	Semester 2
MATH 2061	Linear Mathematics and Vector Calculus	6	**P** MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907) N MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067)	Semester 1, Summer

Unit of Study		*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
PHYS 2213	Physics 2EE	6	A MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful PPHYS (1001 or 1901) and PHYS (1003 or 1902) N PHYS (2203 or 2001 or 2901 or 2011 or 2911 or 2002 or 2902 or 2012 or 2912)	Semester 2
SOFT 2130	Software Construction 1	6	P SOFT (1002 or 1902) or COMP (1002 or 1902) N COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830). NB: Students with Distinction or above in INFO 1903 are encouraged to request special permission to enter this unit.	Semester 2, Summer

Third year

ELEC 3305	Digital Signal Processing	6	A ELEC2301 Signals & Systems or ELEC 2302 Signals & Systems. N ELEC 3303 Digital Signal Processing.	Semester 1
ELEC 3405	Comunications Electronics and Photonics	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3402 Communications Electronics.	Semester 2
ELEC 3505	Communications	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3503 Introduction to Digital Communications.	Semester 1
ELEC **3506**	Data Comunications and the Internet	6	A SOFT2004 Software Development Methods 1 or COMP2004 Programming Practice or SOFT2130 Software Construction. N NETS2150 Fundamentals of Networking, NETS2009 Network Organisation, NETS2909 Network Organisation (Adv), NETS3007 Network Protocols, NETS3907 Network Protocols (Advanced), ELEC3504 Data Communications and the Internet, ELEC4501 Data Communication Networks.	Semester 2
At least 1 of the following 5 units of study:				
ELEC 3104	Engineering Electromagnetics	6	A PHYS2213 Physics 2EE (or PHYS2203 Physics 2EE) and MATH2061 Linear Algebra and Vector Calculus (or MATH2001 Vector Calculus and Complex Variables) and ELEC1103 Professional Electronic Engineering (or ELEC1102 Foundations of Electronic Circuits). N ELEC3102 Engineering Electromagnetics.	Semester 1
ELEC 3304	Control	6	A ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. N ELEC3302 Fundamentals of Feedback Control, MECH3800 Systems Control, AMME3500 System Dynamics and Control, CHNG3302 Process Control.	Semester 2
ELEC 3404	Electronic Circuit Design	6	A ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. N ELEC3401 Electronic Devices and Circuits.	Semester 1
ELEC 3607	Embedded Computing	6	A ELEC1101 Foundations of Computer Systems or ELEC2602 Digital System Design. N ELEC2601 Microcomputer Systems.	Semester 2
ELEC 3702	Management for Engineers	6	N ELEC3701 Management for Engineers, ENGG2003 Introduction to Engineering Management	Semester 1

Fourth year

ELEC 4505	Digital Communication Systems	6	A ELEC3505 Communications or ELEC3503 Introduction to Digital Communications. N ELEC4502 Digital Communication Systems.	Semester 1
ELEC 4702	Practical Experience	0	P 24 credit points of level 3 or 4 units of study NB: Department permission required for enrolment.	Semester 1, Semester 2
ELEC 4707	Engineering Project	12	P 36 credit points of third and fourth year units of study. N ELEC4703 Thesis, ELEC4705 Interdisciplinary Project	Semester 1, Semester 2

Note:

1. The Mathematics, Physics and Information Technolog}[7] units of study offered by the Faculty of Science may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met

2. Candidates for the BE/BMedSc in the combined degree course shall replace ELEC 4707 Engineering Project with ELEC 4705 Interdisciplinary Project.

Faculty-wide electives and Advanced Engineering

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Unit	*of*	*Study*	*CP*	*A: Assumed knowledge P: Prerequisites Q: Qualifying C: Corequisites N: Prohibition*	*Session*
Faculty-wide elective subjects and Advanced Engineering					
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. **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.	Semester 1
ENGG 1800	Engineering Disciplines (Intro) Stream A		6		Semester 1
ENGG 1801	Engineering Computing		6	N MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C	Semester 1
ENGG 1802	Engineering Mechanics		6		Semester 2
ENGG 1803	Professional Engineering 1		6		Semester 2, Semester 1
ENGG 1804	Engineering Disciplines (Intro) Stream B		6	NB: Flexible first year core unit of study.	Semester 1
ENGG 2004	Engineering Studies B		4	NB: Department permission required for enrolment. Permisson required for enrolment	Semester 1, Summer, Semester 2, Winter
ENGG 2005	Engineering Studies C		6	NB: Department permission required for enrolment. Permission required for enrolment	Semester 2, Semester 1, Summer
ENGG 2008	Engineering Studies A		2	NB: Department permission required for enrolment. Permission required for enrolment	Semester 1, Summer, Semester 2
ENGG 2062	Engineering Project: Business Plan 2 Adv		6	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.	Semester 1, Semester 2
ENGG 3005	Engineering & Industrial Management Fund		6	N ELEC3702, MECH3661	Semester 2
ENGG 3062	Technology Education (Advanced)		6	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.	Semester 2
ENGG 4005	Industrial & Engineering Management Adv		4	P ENGG3005 NMECH4610	Semester 1
ENGG 4064	Advanced Engineering Design A		6	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.	Semester 2
ENGG 4065	Advanced Engineering Design B		6	P This unit is an extension module for students in ENGG4064. So 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.	Semester 2

4. Undergraduate units of study

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Aeronautical Engineering

AERO 1400 **Intro to Aircraft Construction & Design**
6 credit points. B E. **Session:** Semester 2. Classes: (two 1hr lee & one 3hr prac session) per week. **Assessment:** In-course involvement, practical assignments and quizzes.
NB: Department permission required for enrolment. Enrolment subject to number of places available.
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. B E. **Session:** Semester 1. Classes: (Two 1hr lee, one 1hr tut, one 3hr lab) per week. **Prohibitions:** MECH1560 Introduction to Mechanical Engineering, MECH1751 Introduction to Mechatronics Engineering, MECH1600 Manufacturing Technology.. **Assessment:** Assignments, practical work.
NB: Unit of Study Web Page: www.aeromech.usyd.edu.au/AERO1560
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.
Textbooks
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 2703 **Aerospace Technology 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: (Three 1hr lee & one 2hr lab/tut/demo session) per week. **Assumed Knowledge:** AERO 1560. **Assessment:** Assignment/reports and 2hr exam.
Syllabus
Survey of current practice in aviation measurement and instrumentation. Introduction to pressure, velocity and force measurement devices; anemometers; transducers and accelerometers.
Use of computer data acquisition systems; filtering; signal processing; A/D conversion. Signal post processing; mean; standard deviation; analysis using FFT's. Calibration of measurement devices.
Civil Aviation regulations and airworthiness standards. Certification procedures. Standards.
Weight and Balance control. Aircraft performance; take-off, climb; cruise; descent; landing; range and endurance.
Manoeuvre performance.
Aims and Objectives
To develop in students an understanding of the background technologies and processes that are involved in the design, construction and operation of Aerospace vehicles.
Learning Outcomes
Students will be able to select and use appropriate instrumentation to suit measurement and analysis needs for a wide range of Aerospace problems.
Students will be able to design and carry out calibration and validity checking experiments for such equipment.
Students will become aware of the reglulatory and liability requirements relating to all aspects of the Aerospace industry.
Students will be able to carry out weight and balance checks on aircraft configurations, estimate performance parameters for the operation of aircraft and specify optimum flight conditions for any particular configuration.

AERO 2705 **Space Engineering 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: (Three 1hr lee & one 2hr lab/tut/demo session) per week. **Prerequisites:** AERO 1560, MATH 1001, MATH 1002, MATH 1003 and either MATH 1004 or MATH 1005 (or the advanced versions of the MATH units). **Assessment:** Assignments/reports and 2hr exam.
Syllabus
Survey of current practice in space engineering. Introduction to the technology required to enable successful operation of space vehicles. Launch system basics; 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.
Basic properties of the electro-magnetic environment in space. Introduction to Maxwell's equations. Application to analogue electronics, data acquisition systems; filtering; signal processing, amplification and signal transmission. Digital systems, A/D conversion, signal post processing; mean; standard deviation; analysis using FFT's. Encoding and decoding, error detection and correction.
Basic Space Law and legislative issues; The Outer Space Treaty, The Space Activities Act. Standards.
Aims and Objectives
To introduce students to the terminology, technology and current practice in the field of Space Engineering.
Learning Outcomes

Students will be able to identify and predict various orbits and trajectories for space craft.
Use appropriate instrumentation to suit measurement and analysis needs for a wide range of satellite operational problems.
Students will become aware of the regulatory and liability requirements relating to all aspects of the Space industry.

AERO 3260 **Aerodynamics 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Three 1hr lee & one 2hr tut/lab/demo session) per week. **Prerequisites:** AERO2201 or MECH2202 or AMME2200. **Assessment:** Assignments, lab reports and 2hr exam.
Syllabus
Construction and designation of two dimensional aerofoil sections.
Point vortex model of aerofoil.
Joukowski transformation theory.
Thin aerofoil theory.
Linear lift properties for sections. Limiting effects such as stall.
Calcualtion of pitching moment coefficient.
Methods for estimation of boundary flow and friction drag calcs.
Viscous-inviscid panel method numerical solutions.
Modelling of three dimension wing flows. Lifting line theory and vortex lattice method.
Effects of downwash, aspect ratio, sweep angle and a=symmetry.
Aims and Objectives
To develop in students a knowledge of the complex behaviour of airflow in the case of two dimensional aerofoil sections and three dimensional wings. To encourage hands-on experimentation with wind-tunnel tests to allow an understanding of these concepts and their range of applicability.
Learning Outcomes
Students will be able to:
- Predict flow properties for general aircraft wing sections to obtain lift,drag and pitching moment.
- Extrapolate section results to predict full three dimensional wing behaviour.
- Undertake experiments and analyse data to verify theoretical predictions.
- Construct simple computer algorithms that will allow more complex geometries to be solved.
- Understand the limitations of theory and the effect of second order parameters (Reynolds number, Mach Number) to the primary flow properties.

AERO 3261 **Propulsion**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Three 1hr lee & one 2hr tut) per week. **Prerequisites:** AMME2200 or (MECH2201 and (AERO2201 or MECH2202)). **Assessment:** Oral examination covering report.
Syllabus
- 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.
Aims and Objectives
- This UoS teaches the students the techniques used to propel aircraft and rockets.
- The students will learn to analyse various propulsion systems in use - propellers, gas turbines, Rocket Motors.
Learning 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.

AERO 3360 **Aerospace Structures 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (Four 1hr lee & one 1hr tut) per week. **Prerequisites:** AMME2301 or AERO2300; (MATH2061 or MATH2067 or (MATH2001 and MATH2005)). **Assessment:** Assignments and 2hr exam.
Syllabus
- 2-D and 3-D elasticity: general equations and solution techniques
- Energy methods in structural analysis, including the principles of virtual work and total potential and complimentary enrgies.
- Fundamental theory of plates, including in-plane and bending loads as well as buckling and shear instabilities.
- Solution techniques for plate problems.
- Bending of beams with unsymmetrical cross-sections.
- Basic principals and theory of stressed-skin structural analysis.
- Determination of direct stresses and shear flows in arbitrary thin-walled beams under arbitrary loading conditions.
- The analysis of common aircraft components including fuselages, wings, skin-panels, stringers, ribs, frames and cut-outs.
- The effects of end constraints and shear-lag on the solutions developed as well as an overall appreciation of the limitations of the solution methods presented.
Aims and Objectives
- To develop student's understanding of the theoretical basis of advanced aerospace structural analysis; and
- To introduce students to the solution of real-world aircraft structural problems.
Learning Outcomes
An understanding of the basic equations of 2-D and 3-D elasticity as well as solution methods particularly for 2-D elasticity problems.
An understanding of the use and application of energy methods in structural analysis.
An understanding of the plate theory including combined in-plane and bending problems and plate-buckling.
Solution techniques for plate problems including:
An understanding of bending of beams with unsymmetrical cross-sections.
An understanding of the basic principals and theory of stressed-skin structural analysis.
The ability to determine direct stresses and shear flows in arbitrary thin-walled beams under arbitrary loading conditions.
An ability to analyse common aircraft components including fuselages, wings, skin-panels, stringers, ribs, frames.
The ability to account for special structural considerations such as cut-outs and end-constraints.
An appreciation of the limitations of the solution methods presented.

AERO 3460 **Aerospace Design 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (One 2hr lee and three 1hr tut) per week. **Prerequisites:** AMME2301 or AERO2300; MATH 1001; MATH 1002; MATH 1003. **Assessment:** Assignments and quizzes.
Syllabus
- Review of Free-Body diagrams, structural idealization and how this relates to load-paths in complicated structures.
- The basic design process, including modern design-team approaches verses linear discipline based ones.
- The practice of aircraft design, including definitions of inertial loads, load-factors, limit and ultimate loads and the relation of this to regulatory requirements.
- The development of flight-envelopes and operating load-factors for aircraft.
- The design process as applied to structural component design.
- Designs involving multiple load-cases and multiple failure conditions and how different failure conditions impact on design decisions. Critical load and failure conditions and ranking via Margins of Safety.
- Combined failure conditions via stress ratio methods.
- Effect of material choice in the design process and particularly how this relates to the critical failure modes of a structural element.
- Considerations for the design of different types of structure including beams, pin-jointed frames and others. Redundant and non-redundant structures.
- Bolted joint and lug design. Load share in a general 2-D bolt-pattern under arbitrary in-plane loading.
- Fatigue effects and analysis and its impacts on structural component design.
- The use of formal and informal optimisation methods to improve designs with respect to cost and weight.
Aims and Objectives
To introduce students to the theory and practice of aircraft structural component design. In doing so it will emphasize all the considerations, trade-offs and decisions inherent in this process and thus enable students to gain an understanding of why aircraft structures are designed in the way they are with respect to structural, manufacturing and cost considerations.
Learning Outcomes
- An understanding of the design process, especially as it applies to aircraft structural component design.
- A familiarity with some of the practice of aircraft component structural design.

- An increasing familiarity with typical aircraft structural paradigms and how they work and can be analysed along with the primary failure modes that need to be considered.
- An understanding of the importance of different failure modes for different components and how these relate to load-conditions and An understanding of some off the legal and ethical requirements of aircraft design engineers.
- A basic understanding of the regulatory framework in which aircraft design is conducted.

AERO 3465 **Aerospace Technology 2**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: (One 4hr session of lee, tut and prac, and one 2hr tut session) per week. **Assumed Knowledge:** AERO1400; AMME2302. **Prerequisites:** AERO1560 or AERO 1701; MECH2400; AMME2301 orAERO2300. **Assessment:** Reports, structural component test performance, class and peer assessment, and assignments.
Syllabus
Design methods, internal loads calculations, stress analysis, design for manufacture; joints and fasteners; test procedures; fatigue and damage tolerance; composites; the art of design.
Aims and Objectives
- To develop an understanding of the aerospace industry procedures for design, analysis, and testing of aircraft and aerospace vehicle components.
- To provide a Design-Build-Test experience in putting into practice learning outcomes from this and other previously completed UoS by working on a small structure which is representative of a typical light metal aircraft;
- To provides an introduction to composite materials and structures for aerospace vehicles; - To provide an introduction to fatigue and damaged tolerance analysis of metallic aircraft structures: and
- To provide skills and knowledge in structural testing methods, procedures, techniques, and equipment.
Learning Outcomes
Students will gain practical skills relevant to working on typical modern aircraft and aerospace vehicle components. They will learn from methods, techniques, and experiences from the modern aerospace industry. Experiential learning outcomes through verifying analyses with actual testing of fabricated component - the experience of a full design-build-test cycle of a typical aircraft structural component.

AERO 3560 **Flight Mechanics 1**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: (Three 1hr lee & 2 lhr tut) per week. **Prerequisites:** MECH2500 or AMME2500. **Assessment:** Assignments; 3hr exam.
Syllabus
Static longitudinal aircraft stability: 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 power plants. Trailing edge aerodynamic controls. Trimmed equilibrium condition. Static margin. Effect on static stability of free and reversible controls.
Aims and Objectives
To develop an understanding of aircraft longitudinal equilibrium, static stability, dynamic stability and response. Students will develop an understanding of the importance and significance of flight stability, will gain skills in dynamic system analysis and will learn mathematical tools used for prediction of aircraft flight behaviour. Students will gain skills in problem solving in the area of flight vehicle motion, and learn the fundamentals of flight simulation.
Learning Outcomes
- To understand aircraft flight conditions and equilibrium.
- To understand the effects of aerodynamic and propulsive controls on equilibrium conditions
- To understand the significance of flight stability and its impact of aircraft operations and pilot workload.
- To analyse the aircraft equations of rigid-body motion and to extract stability characteristics.
- To understand the meaning of aerodynamic stability derivatives and their sources.
- To understand the effects of aerodynamic derivatives on flight stability.
- To model aircraft flight characteristics using computational techniques.
- To understand the impact of flight stability and trim on all atmospheric flight vehicles, including launch and re-entry of space vehicles.

AERO 3660 **Aerospace Management**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: (One 3hr lab/tut/demo session) per week. **Assessment:** 4 assignments/reports during semester. No final exam.
Syllabus
Principles and practice of aviation and airline management. Discussion and analysis of airline operations. Flight safety and airworthiness standards. Risk and reliability management.
Aims and Objectives
To develop an understanding of the current state of aerospace manufacturing for the Australian aviation industry. Students will gain skills in aerospace engineering management.
Learning Outcomes
Students will be able to apply risk management skills to a variety of industy situations and use appropriate methodology to manage these situations.

AERO 3760 **Space Engineering 2**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: (One 2-hr lee & one 2-3hr tut) per week. **Prerequisites:** AERO2705 or AERO2702. **Assessment:** Assignments.
Syllabus
- Fundamentals of Systems Engineering
- Satellite Subsystems
- Systems Design
Aims and Objectives
To provide students with an environment upon which they can learn Systems Engineering techniques as applied to the Space Engineering discipline.
Learning Outcomes
- To understand the concepts of Systems Engineering and its application to the Space Engineering environment.
- To be able to conduct functional and technical analysis and determine design drivers in a system.
- To manage the use of a log book and its application in engineering design.
- To develop technical skills in the design and development of satellite subsystems.
- To understand appropriate interaction processes between team members for the successful achievement of goals.

AERO 4260 **Aerodynamics 2**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: (Three 1hr lee & two 1hr tut) per week. **Assumed Knowledge:** MECH3261 or AERO3260. **Prerequisites:** Mandatory: AMME2200 or (MECH2201 and (AERO2201 or MECH2202)). **Assessment:** 2hr exam.
Syllabus
- Review of Equations of Gasdynamics.
- One-Dimensional Gas Flow, Isentropic Flows, Normal Shock, Flow in A converging and a Converging-Diverging Nozzle.
- Steady two-dimensional supersonic flow; shock waves; normal and oblique; method of characteristics. Two-dimensional supersonic aerofoils. Introduction to three-dimensional effects.
- Unsteady Flows, Moving Shock,Shock Tube Flow.
Transonic Flow, Compressible Boundary Layers, Approximate Techniques
Hypersonic Flow.
Aims and Objectives
- The course introduces the student to elementary and advanced topics in Gasdynamics (i.e., High Speed Flows).
- Physical aspects of gas flows at subsonic and supersonic flows will be brought out. Formation and propagation of shocks and other features will be explained. Equations for shock, expansion waves and other phenomena of high speed flow will be developed.
- Advanced topics covered include Method of Characteristics, Unsteady Flows, Transonic and Hypersonic Flows.
Learning Outcomes
- At the end of the course, the student will be able to calculate a high speed flow about an aerofoil and compressible flow through a duct of varying cross section.
- The student will have a good appreciation of Transonic and Hypersonic Flows.

AERO 4296 **Rotary Wing Aircraft**
3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: (lhr lee and lhr tut) per week. **Prerequisites:** AERO3260 Aerodynamics 1. **Assessment:** Assignment submission.
Syllabus
Introduction to rotary wing aircraft; vertical flight performance; forward flight performance; blade motion and control; dynamics of rotors; rotor-craft stability; rotor blade design.
Aims and Objectives

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

Learning Outcomes

Students will be able to identify and predict the various flow states of a generic lift producing rotor. Use appropriate methods to determine the forces and torques associated with the rotor. Estimate values for typical stability derivatives for helicopters and be able to construct a simple set of stability analysis equations for the vehicle. Students will become aware of the regulatory and liability requirements relating to all aspects of commercial helicopter operation and maintenance

Textbooks

Reference Books:
Bramwell Helicopter Dynamics (Arnold)
Gessow and Myers Aerodynamics of the Helicopter (McMillan)

AERO 4360 **Aerospace Structures 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: (One 2hr lee, one lhr lec/tut & one 3hr lab session) per week. **Assumed Knowledge:** An understanding of aerospace structural designs (AERO 3465). **Prerequisites:** (AMME2301 or AERO2300) and (AERO3360orAERO3301). **Assessment:** Assignments, major project, quizzes, hands on class and 2hr exam.

Syllabus

Introduction to Finite Element Method for modern structural and stress analysis; One-dimensional rod elements; Generalization of FEM for elasticity; Two- and three-dimensional trusses; FEA for beams and frames in 2D and 3D; Two-dimensional problems using constant strain triangular elements; The two-dimensional isoparametric elements; Plates and shells elements and their applications; FEA for axisymmetric shells and pressure vessels, shells of revolution; FEA for axisymmetric solids subjected to axisymmetric loading; FEA for structural dynamics, eigenvalue analysis, modal response, transient response; Finite element analysis for stress stiffening and buckling of beams, plates and shells; Three-dimensional problems in stress analysis; Extensions to the element library, higher order elements, special elements; Constraints; FEA modeling strategy; FEA for heat conduction; FEA for non-linear material and geometric analysis.

Aims and Objectives

- To be able to develop correct modeling strategy for structural problems;
- To be able to use finite element methods to solve practical structural problems, in particular static, dynamic and buckling problems;
- To be able to interpret, use and communicate the numerical results with confidence in structural analysis and design; and
- To be able to work with a team member.

Learning Outcomes

- To understand fundamental concepts of finite element methods;
- To understand and be able to derive shape functions, stiffness matrices and equivalent load vectors for selected element;
- To be able to assemble the global stiffness matrix and global equivalent load vector;
- To understand the difference of elements and their application scopes and limitations;
- To be able to use selected commercial FEA package and to gain hands-on experience, including developing modeling strategy and debugging;
- To be able to use different solvers to solve different types of aerospace structure problems;
- To be able to interpret, justify and communicate the numerical results in a professional manner
- To be able to work on a project with a team member, this includes rationally selecting a project, developing modeling details, interpreting results and writing professional report.

AERO 4460 **Aerospace Design 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Two 3-hour session comprising lee, tut, design meetings and presentations. **Assumed Knowledge:** AERO 1400 Introduction to Aircraft Construction and Design and AER03465. **Prerequisites:** Mandatory: MECH2400;AERO3460or(AERO3450and (AERO3400 or AERO3401)). **Assessment:** Design reports and presentations.

Syllabus

Design requirements.
- Sources 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

Aims and Objectives

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 tasks.

A "big-picture" approach of creating a new aircraft to suit a set of given mission requirements and specifications;
providing students experience in the complete process of initial aircraft configuration design.

Textbooks

Torenbeek, "Synthesis of Subsonic Airplane Design" (Delft UP)
Roskam, "Airplane Design Parts 1 to 8" (DA Rcopr)
Raymer, "Aircraft Design: A Conceptual Approach" (AIAA Edu)
Jenkinson & Marchman, "Aircraft Design Projects for Engineering Students" (Butterworth-Heinemann)
Fielding, "Introduction to Aircraft Design" (Cambridge).

AERO 4491 **Advanced Aircraft Design**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: Two 3hr design classes per week. **Assumed Knowledge:** AERO 1400 Introduction to Aircraft Construction and DesignAERO2703 Aerospace Technology 1AERO3260 Aerodynamics 1AER03261 PropulsionAERO3360 Aerospace Structures 1AER03465 Aerospace Technology 2AERO3560 Flight Mechanics 1. **Prerequisites:** MECH2400 Mechanical Design 1AERO3460 Aerospace Design 1AERO4460 Aerospace Design 2. **Assessment:** Design reports and presentations.

Syllabus

Design requirements:
Sources 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.
Design data analyses:
Computational tools
Experimental facilities
System design:
Requirements and specification.
System design procedures
Systems integration.

Aims and Objectives

To develop an understanding of the application of design to the modern aerospace industry. Students will gain an overview of how to manage a project and its associated design team and will also gain skills in setting design specifications and carrying out detailed design analysis.

Learning Outcomes

Confidence in taking the design process from specifications to prototype and production
Experience with practical optimisation techniques
Knowledge of analytical and experimental tools for aircraft design

Textbooks

Reference books:
Torenbeek Synthesis of Subsonic Airplane Design (Delft UP) Roskam, "Airplane Design Parts 1 to 8" (DA Rcopr)
Raymer, "Aircraft Design: A Conceptual Approach" (AIAA Edu)
Jenkinson & Marchman, "Aircraft Design Projects for Engineering Students" (Butterworth-Heinemann)
Fielding, "Introduction to Aircraft Design" (Cambridge).

AERO 4560 **Flight Mechanics 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 3 lee and 2 tut per week. **Prerequisites:** AERO3500 or AERO3560; (MECH3500 and MECH3800) or AMME3500. **Assessment:** Assignments and exam.

Syllabud

Review of nonlinear and linear aircraft dynamic equations of motion. Review of longitudinal and lateral-directional aircraft modes of motion. Dynamic systems analysis techniques. Modelling and analysis of aircraft dynamic motions. Aircraft response to deterministic inputs. Handling Qualities. Extended aircraft models. Sources of stochastic inputs and their characteristics. Aircraft response to stochastic inputs (wind gusts). 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. Transfer functions for complete aircraft and control systems; stability and response characteristics of the closed loop system.

Learning Outcomes

1. To understand the nature of an aircraft's response to control inputs and atmospheric disturbances, including the roles of the various modes of motion,
2. To analyse an aircraft's response to control inputs in the frequency domain using Laplace Transforms and Transfer Function representations,

3. To be able to represent and model wind gust distributions using stochastic methods (Power Spectral Density)
4. To analyse an aircraft's response to disturbances (wind gust inputs) by combining Transfer Function representations with gust PSD's,
5. To understand the principles of stability augmentation systems and autopilot control systems in aircraft operation, their functions and purposes,
6. To understand basic feedback control systems and classical frequency domain loop analysis.
7. To understand the characteristics of closed loop system responses,
8. To understand the characteristics of PID, Lead, Lag and Lead-Lag compensators, and to be competent in designing suitable compensators using Bode and Root-locus design techniques.
9. To be able to design multi-loop control and guidance systems and the reasons for their structures.

Textbooks

Franklin, G. R, Powell, J. D., and Emami-Naeni, A., Feedback Control of Dynamic Systems, 4th Ed, Prentice-Hall, 2002.
D'Azzo, J. J. and Houpis, C. H., Linear Control System Analysisand Design, Conventional and Modern, 4th Ed, McGraw-Hill, 1995.
Hoak, D. E., Finck, R. D., et a1, USAF Stability and Control Datcom, Flight Control Division, Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio, 1978. Reprinted by Global Engineering Documents, 1992.
Engineering Sciences Data Sheets, Aeronautical Series, Engineering Sciences Data Unit, various dates.
Etkin, B., Dynamics of Atmospheric Flight, John Wiley & Sons, 1972.
Nelson, R. C, Flight Stability and Automatic Control, McGraw-Hill, 1989.
Roskam, J., Airplane Flight Dynamics and Automatic Flight Controls, Roskam Aviation and Engineering Corporation, 1982.

AERO 4591 **Advanced Flight Mechanics**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (3 lee & 2 tut) per week. **Prerequisites:** AERO3500 or AERO3560; (MECH3500 and MECH3800) orAMME3500; AERO4501 orAERO4560. **Assessment:** Major project.

Syllabus

Review aircraft dynamic system modeling. Controllability and observability.
Identification of dynamic systems. Dynamics model structure. Introduction to parameter estimation techniques.
Application to estimation of aircraft static, dynamic and control derivatives from flight data. Flight test techniques. Design of flight manoeuvres for optimal estimation of flight dynamic derivatives.
Aircraft state estimation. Application of Extended Kalman Filter estimation to the estimation of aircraft state in body axes. Observers and the separation principle.
Fault detection, isolation, recovery and reconfiguration. Redundancy based and analytical fault detection principles. Fault detection techniques in state-space. Innovations and parity space techniques for fault detection.
Overview of applications of digital flight control systems, z-transforms and digital implementation. Flight control system design using classical frequency domain and modern state space control techniques. Introduction to nonlinear control techniques and their application to aircraft control problems. Integration of time and frequency domain control strategies. Flight control system constraints and design limitations. Design and development of guidance systems. Flight planning and flight path optimisation techniques for flight guidance.
Integration of Guidance, control, estimation and navigation system components.

Learning Outcomes

1. To understand the principles of stability augmentation systems and autopilot control systems in aircraft operation, their functions and purposes,
2. To understand the characteristics of closed loop system responses,
3. To understand advanced feedback control systems and state-space design techniques,
4. To understand the concepts of parameter and state estimation,
5. To be able to design observers in the state space and to implement a Kalman Filter,
6. To be comfortable with multi-loop control and guidance systems and the reasons for their structures.
7. To appreciate flight test principles and procedures and to be capable of implementing a flight test programme.

Textbooks

Stevens and Lewis, Aircraft Control and Simulation (McGraw-Hill, 1995)
Blakelock, Automatic Control of Aircraft and Missiles - 2nd Edn. (Wiley 1991)
Franklin, G. E, Powell, J. D., and Emami-Naeni, A., Feedback Control of Dynamic Systems, 4th Ed, Prentice-Hall, 2002.
Franklin, G.F., Powell, J. D., and Workman, M. L., Digital Control of Dynamic Systems, 2nd Ed, Addison-Wesley, 1990.
DAzzo, J. J. and Houpis, C. H., Linear Control System Analysisand Design, Conventional and Modern, 4th Ed, McGraw-Hill, 1995.
Etkin, B., Dynamics of Atmospheric Flight, John Wiley & Sons, 1972.

AERO 4701 Space Engineering 3

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (One 2hr lee and one 2-3hr tut) per week. **Prerequisites:** (AERO3560 or AERO3500) and (AERO3760 orAERO3700) and(AMME3500 orMECH3800). **Assessment:** 3 assignments. No final exam.

Syllabus

The fundamentals of Inertial Navigation and the Global Positioning System (GPS) including algorithm development and sensor technology-
Errors associated with inertial navigation systems and their technology.
The fundamental concepts of data fusion.

Aims and Objectives

Understanding of:
Inertial navigation and GPS equations which provide information about the position, velocity and attitude of aerospace vehicles; Inertial sensors, their function, and how errors in the sensors and the algorithm impact on the navigation solutions.

Learning Outcomes

To be able to derive the fundamental inertial navigation equations;
To understand the dynamics of the inertial navigation equations and how the various components within the algorithm interact with one another;
To be able to implement the inertial navigation equations both with simulated and real data.
To understand what errors are commonly associated with inertial navigation and how they impact on navigation performance;
To appreciate that other external sensors are normally used to constrain errors associated with inertial navigation and the use of GPS as an aiding source.;

Aeromech Engineering

AMME 1060 **Engineering Applications**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (2 lee, one 3hr workstation lab)/wk. **Assessment:** Course tasks and Assignments.
NB: Unit of study web page:http://problemsolvers. aeromech.usyd.edu.au/

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 nonlinear 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

Engineering Mechanics, J.L. Meriam and L.G. Kraige, SI version, 5th Edition

Reference

TEngineering Problem Solving with Matlab, D.M. Ettre, Prentice Hall
Mastering MATLAB 5.0, D.Hanselman and B.Littlefield, Prentice Hall

AMME 2200 **Thermodynamics and Fluids**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: (Three lhr lee, two lhr tut and one 3hr lab) per week. **Assumed Knowledge:** MATH 1001; MATH 1002; MATH 1003. **Assessment:** Quizzes, assignments, lab reports and 3hr exam.
Syllabus
Concepts of heat and work, properties of substances, first law of thermodynamics, control mass and control volume analysis, thermal efficiency, entropy, second law of thermodynamics, reversible and irreversible processes, isentropic efficiency, power and refrigeration cycles.
Basic concepts of pressure, force, acceleration, continuity, streamline and stream function, viscosity, non-dimensional parameters.
Fluid statics: governing hydrostatic equations, buoyancy.
Fluid dynamics: governing conservation equations. Potential flow, vorticity and circulation. Bernouilli and Euler equations. A brief introduction to flow measuring devices, pipe flow, flow over surfaces, lift and drag.
Aims and Objectives
An ability to perform a thermodynamic analysis on open and closed thermal systems.
An understanding of the conservation equations for static fluid as well as fluid in motion.
Skills in analyzing thermodynamic and fluid mechanical properties of simple engineering problems.
Learning Outcomes
- An understanding of the basic laws of thermodynamics
- An understanding of some of the basic equations governing the statics and dynamics of fluids.
- An ability to analyze the thermodynamics of a simple open or closed engineering system.
- An ability to analyze and determine the forces governing static fluid
- An ability to evaluate the relevant flow parameters for fluid flow in internal engineering systems such as pipes and pumps (velocities, losses, etc...), and external systems such as flow over wings and airfoils (lift and drag).

AMME 2301 **Mechanics of Solids**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: (Three lhr lee and two lhr tut) per week. **Prerequisites:** MATH 1001 or 1901, MATH 1002 or 1902, MATH 1003 or 1903, ENGG1802 or PHYS1001 or 1901. **Assessment:** Assignments; lab reports; quizzes and 2hr Final Exam.
Syllabus
Equilibrium of deformable structures; basic concept of deformation compatibility; stress and strain in bars, beams and their structures subjected to tension, compression, bending, torsion and combined loading; statically determinate and indeterminate structures; energy methods for bar and beam structures; simple buckling; simple vibration; deformation of simple frames and cell box beams; simple two-dimensional stress and Mohr's circle; problem-based applications in aerospace, mechanical and biomedical engineering.
Aims and Objectives
To understand the fundamental principles of elementary solid mechanics and basic methods for stress and deformation analysis of a simple solid structure/element in the above mentioned engineering areas;
To gain the ability to analyze problems in terms of strength and deformation in relation to the design, manufacturing and maintenance of simple solid structures in the above mentioned engineering areas.
Learning Outcomes
Applicability of the theories and why so;
How and why to do simple stress analysis;
Equations of equilibrium for simple structures;
How and why to do deformation analysis;
How and why to do mechanics modeling of structures composed of bars and beams;
How to describe boundary conditions for simple structural problems;
How and why to use energy methods for structural analysis;
Why and how to do fundamental buckling analysis;
Why and how to do fundamental vibration analysis;
The ultimate outcome is that the students have the ability to solve simple structural problems by comprehensively using the skills attained above.

AMME 2302 **Materials 1**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: (Three lhr lee, one lhr tut & one lhr lab) per week. **Assessment:** Assignments, lab reports, quizzes and 2hr exam.
Syllabus
-Atomic Structure/Crystallography (AMME 2302)
- Micro structure - Composites/Monolithics (AMME 2302)
- Dislocation Theory (AMME 2302)
- Diffusion (AMME 2302)
- Phase Equilibrium and Heat Treatment (AMME 2302)
- Suspension Rheology (AMME 2302)
- Physical Properties
Aims and Objectives
- Understanding of materials classification (ceramics, polymers and metals)
- Understanding of atomic structures and microstructures of materials
- Understanding of defects and dislocation in materials
- Understanding of materials properties and their relation to structure as a function of forming methods and heat treatment processes
- Understand of basic physical and chemical properties of materials
- Understanding of basic thermal, magnetic, electrical and optical properties of materials
- Understanding materials behaviour in service and selection criteria for engineering applications
Learning Outcomes
- Be able to identify the main crystal structures in metal and ceramics (cubic, hexagonal, tetragonal, etc) and understand the relationship between atomic structure and macroscopic properties
- Understand the effects of grain size and grain boundary on physical and mechanical properties of a polycrystalline material, and main commercially relevant polymer-fibre composites and ceramic-metal composites
- Be able to explain the significance of alloying, cold working and recrystallisation and their applications based on the understanding of dislocation theory
- Understand the commercial applications of diffusion phenomenon, such as carburization and nitridation; be able to calculate diffusion rate in a crystalline structure.
- Be able to determine the phase structure for a given binary system; understand the relationship between phase structure and mechanical properties in the iron-carbon binary system.
- Be able to select materials in terms of physical and mechanical properties for engineering applications and understand the general ways to manipulate materials properties, such as cold working, nitridation, and heat treatment.
Textbooks
William D. Gallister, Jr., Materials Science and Engineering-An Introduction, 6th edition, John Wiley & Sons, 2003.
Reference books
Michael F. Ashby and David R.H. Jones, Engineering materials 1: an introduction to their properties and applications, 2nd edition, Butterworth-Heinemann, 1996.
Michael F. Ashby and David R.H. Jones, Engineering materials 2: an introduction to microstructures, processing and design, 2nd edition, Butterworth Heinemann, 1998.
Alan R. Bailey, The Role of Microstructure in Metal, Metallurgical Services, 1966.
Alan R. Bailey, Introductory Practical Metallography, Metallurgical Services, 2nd edition, Metallurgical Services, 1966.
Alan R. Bailey, The Structure and Strength of Metal, Metallurgical Services, 1967.
Vernon B. John, Understanding Phase Diagrams, Macmillan, 1974.

AMME 2500 **Engineering Dynamics**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: (Two lhr lee; ten 2hr tut; two 3hr lab) per week. **Prerequisites:** MATH1001; MATH 1002; ENGG1802 or PHYS1001. **Assessment:** Assignments; lab and tutorial attendance; 3hr exam.
Syllabus
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.
Aims and Objectives
Dynamics of rigid bodies: Analysis of planar mechanisms; Kinematics of rigid bodies; Kinetics of rigid bodies.
Learning Outcomes
Students will develop skill in modeling and analysing planar mechanisms and rigid body dynamic systems.

AMME 2630 **International Exchange Program 2A**
12 credit points. B E. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all first year core units of study. Endorsement by Head of School of Aerospace, Mechanical & Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School. **Assessment:** Individual approved subjects at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated.

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

Objectives

The objective of this exchange program is to give students an opportunity to study in a different cultural environment. Students will gain an understanding of the differences in techniques applied in aeronautical, mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree discipline of the School. The course work completed at the exchange university is to be equivalent to one semester at the University of Sydney. The specific units of study must be approved by the Heads of School/Department at both institutions.

AMME 2631 **International Exchange Program 2B**

12 credit points. B E. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all first year core units of study. Endorsement by Head of School of Aerospace, Mechanical & Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School.
NB: Department permission required for enrolment. NB: Departmental permission required for enrolment.

Objectives

The objective of this exchange program is to give students an opportunity to study in a different cultural environment. Students will gain an understanding of the differences in techniques applied in aeronautical, mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree discipline of the School. The course work completed at the exchange university is to be equivalent to one semester at the University of Sydney. The specific units of study must be approved by the Heads of School/Department at both institutions.

AMME 3500 **System Dynamics and Control**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: (One 2hr lee and three lhr lab/tut) per week. **Assumed Knowledge:** AMME2500, MATH2061. **Prerequisites:** AMME2500 or MECH2500; MATH2061 or MATH2067 or (MATH2001 and MATH2005). **Assessment:** Assignments; 3hr exam.

Syllabus

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. Labs will be undertaken using a variety of physical plants to highlight the nature of control systems engineering. A number of case studies based on practical examples will also be presented.

Aims and Objectives

An understanding of how mechanical systems respond to control inputs and disturbances, and how one can analyse and interpret these responses mathematically and graphically;

To be able to represent these mechanical systems in a feedback control system as well as being able to determine what desired specifications of the system would be achievable, practical and important when the system is under control;

An understanding of how different theoretical and practical techniques help engineers in designing control systems, and which technique best helps in solving a given problem.

Learning Outcomes

To be able to mathematically model mechanical systems and determine their response characteristics based on the physical properties of the system;

To be able to critically analyse the response characteristic and attribute it to the physical properties of the system;

To understand what responses are considered stable and unstable, and how this affects the performance of the system;

To understand how desired specifications of a mechanical system such as overshoot, rise time, the time constant of a system, natural frequency and damping ratio can be represented mathematically;

To be able to determine what is required of the mechanical system in order to meet these desired specifications;

To understand what is meant by a "feedback control system" and a "feedback controller";

To understand the conceptual and mathematical differences between a PID, Lead and Lag controller;

To be able to mathematically model a controller and describe how its' response affects the performance of the mechanical system;

To be able to implement, understand and appreciate mathematical tools such as Root Locus techniques and Bode diagrams which assist in designing controllers that control the mechanical system to the desired specifications given external disturbances;

To be able to design a feedback control system given only a description of the physical properties of the mechanical system, desired specifications and the likely disturbances.

AMME 4100 **Practical Experience**

0 credit points. B E. **Session:** Semester 1, Semester 2. **Classes:** nil. **Prerequisites:** 28 credit points of second year units of study. **Assessment:** Evaluation of an industrial experience report.

Syllabus

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.

Aims and 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 and the maintenance of a log book during work.

Learning Outcomes

A better appreciation of the role of engineers in the workplace; the ability to present structured observations and reflections in the mode of a formal written report.

AMME 4101 **Thesis A**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: It is expected that students will spend at least one full day per week undertaking background research work, organising their plan of work and preparing their experimental or developmental program. **Prerequisites:** 34 credit points of senior units of study. **Assessment:** Assessment for this Unit of Study will be based on the evaluation of the formal proposal, the progress report submitted to the supervisor and an appraisal of actual progress as verified by the supervisor. The final grade for thesis is based on the work done in both Thesis A and Thesis B. As such, student progress will be evaluated based on the progress report (10%) at the end of Thesis A.

Syllabus

Students are asked to plan and begin working on a research or major design 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. 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. Similar arrangements will be made for those starting Thesis A in Semester 2 with topic availability published during first semester. Each prospective Thesis A student is expected to consult with prospective supervisors and to select a topic of interest to them from the supplied list. Availability of topics is limited and students should undertake to speak with prospective supervisors as soon as possible.

In undertaking the project, students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The progress at the end of Thesis A will be evaluated based on the thoroughness of the proposed program and the progress achieved during the semester.

Aims and Objectives

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

Learning Outcomes

Ability to plan a research or major design project;

Proposal for the intended work including setting objectives, organization of a program of work and devising an experimental or developmental program;

Preparation a Progress Report at the end of semester detailing the context of the problem, relevant background research and progress to date.

AMME 4102 **Thesis B**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: It is expected that students will spend at least one to two full days per week undertaking background research work, organizing their program of work, preparing and analysing results and writing the thesis document itself. **Prerequisites:** AMME4101. **Assessment:** Assessment for this Unit of Study will be based on the evaluation of the

progress report (10%) submitted at the end of Thesis A, the presentation of a seminar relating to their chosen topic (10%) and the thesis document itself (80%). The final grade for thesis is based on the work done in both Thesis A and Thesis B.

Syllabus

Students are asked to write a thesis based on a research or major design 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 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 and content of the thesis itself.

In undertaking the project, students will learn how to examine published and experimental data, set objectives, organize a program of work and analyse results. They will also be expected to evaluate these results in relation to existing knowledge. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

Aims and Objectives

To obtain an understanding of how to define, plan, undertake and report on an open-ended piece of supervised research work or major design project.

Learning Outcomes

Ability to plan and undertake a research or major design project;

The implementation of the design plan conceived and begun during Thesis A;

An ability to design and conduct experiments and to analyse and interpret data from those experiments or design;

Preparation and submission of a Thesis at the end of semester detailing the context of the problem, relevant background research and results of the investigation.

AMME 4210 **Computational Fluid Dynamics**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (1hr lee, 1hr tut, 2hrs lab)/week. **Assumed Knowledge:** Partial differental equations.finite difference methods,linear algebra,matrix methods,pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **Prerequisites:** MECH3261 or AERO3260. **Assessment:** Tutorials/laboratoriesAssignmentsMajor project.

Syllabus:

Navier-Stokes equations; finite difference methods,; accuracy and stability for the advection and diffusion equations; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; cartesian tensors; turbulence models.

Aims and Objectives:

Provide students with an understanding of the theoretical basis of computational fluid dynamics, the ability to write a simple Navier-Stokes solver and the skills to use a state of the art commercial computational fluid dynamics package.

Learning Outcomes:

The ability to assess fluid mechanics problems commonly encountered in industrial and environmental settings, construct and apply computational models, determine critical control parameters and relate them to desired outcomes and write reports.

Knowledge skills, thinking skills, personal skills, personal attributes and practical skills.

Textbooks

Reference books:

Fletcher Computational Techniques for Fluid Dynamics, vols 1 and 2 (Springer, 1988)
Patankar Numerical Heat Transfer and Fluid Flow (Hemisphere, 1983)

AMME 4970 **Principles of Tissue Engineering**

3 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2hrs lec/week. **Assumed Knowledge:** MECH3921 or both of MECH3910 andMECH3920. **Prerequisites:** 6 credit points of junior biology6 credit points of junior chemistry-MECH2900 or MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** One group report One group seminar Final 2 hour closed-book exam.

Syllabus:

Introduction to tissue engineering and the limitations of biomaterials and donor transplants
Cell culturing principles and procedures
Stem cells: totipotency, multipotency, pluripotency, and differentiation
Engineered tissue scaffolds
Scaffold seeding
Scaffold vascularisation
Ethical considerations
Specific biomedical engineering applications

Aims:

This UoS will provide an introduction to the principles of tissue engineering, as well as an up to date overview of recent progress in the field of tissue engineering is and where it is going. This UoS assumes prior knowledge of cell biology and chemistry and builds on that foundation to elaborate on the important aspects of tissue engineering.

Objectives:

To gain a basic understanding of the major areas of interest in tissue engineering
To learn to apply basic engineering principles to tissue engineering systems
To understand the challenges and difficulties of tissue engineering.

Learning Outcomes:

A theoretical understanding of the basic concepts of tissue engineering:
Cell culturing
Stem cells and engineering cell differentiation.
Engineering scaffolds, seeding, and vascularising them.
Clinical applications of tissue engineering

AMME 4980 **Applied Biomaterials**

3 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hr lees or seminars. **Assumed Knowledge:** MECH2400, MECH3921 or MECH3920, MECH3300 or MECH3362, MECH4960. **Prerequisites:** 6 credit points of junior biology6 credit points of junior chemistryMECH2300 or AMME2302. **Assessment:** 1 group report; 3 group seminars.

Aims and Objectives:

This UoS will take a project-based-learning approach to the topic of design with Biomaterials. Through facilitated design work and group seminars. It is anticipated that students will gain detailed knowledge not only in the design topic assigned to them, but also in the topics assigned to their peers.

Learning Outcomes:

a) Knowledge of all aspects involved in design with biomaterials:
Materials selection
Biological response - immunology and wound healing
Biomechanical issues
Regulatory issues
Commercialisation strategies and IP protection

Mechanical Engineering

MECH 1400 **Mechanical Construction**

6 credit points. B E. **Session:** Semester 2. **Classes:** (Two 1hr lee & two 2hr workshop sessions) per week. **Prerequisites:** MECH1560. **Assessment:** Reports, workshop skills/attendance; machine operation.

Syllabus

This is a project based subject where the students will build their own designs. Historical developments in the area of the project selected. Research into the necessary fields to fully understand and analyse the project. Review and improve workshop skills. Students design their own version of the project. Build the project in the workshop. Test the completed machine.

Aims and Objectives

Selected historical events;
Research methods;
Analysis techniques;
Application of theory and analysis to real machinery;
Use of machine and hand tools;

Learning Outcomes

Improved research techniques;
Improved analysis methods;
Connecting history to Mechanical Engineering;
Seeing that they can engineer and build something that works;
The opportunity to do real engineering.

MECH 3260 **Thermal Engineering**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Three 1hr lee & one 2hr tut) per week. **Assumed Knowledge:** Fundamentals of thermodynamics are needed to begin this more advanced course. **Prerequisites:** (AMME2200 or MECH2200 or MECH2201). **Assessment:** Lab experiments; quizzes; exam.

Syllabus

-Thermodynamics:
Exergy and entropy
Power: spark ignition
Power: diesel
Power: gas turbine
Power: Stirling
Power: steam

Gas mixtures, Clausius-Clapeyron
Humidity, psychrometry
Air-conditioning
Combustion: stoichiometry, gas analysis
Combustion, thermochemistry, adiabatic flame temperature
Combustion, 2nd Law of Thermo., equilibrium, exergy
-Heat Transfer:
Conduction, thermal circuits
General conduction equation, cylindrical fins
Heat Exchangers
Numerical solutions
Unsteady conduction
Convection, analytical
Forced convection correlations
Natural convection, boiling
Radiation, spectrum, blackbody
Radiation, properties and laws.
Radiation, environmental, solar
Aims and Objectives
-To develop an understanding of the principles of thermodynamic cycles, gas mixtures, combustion and thermochemistry applied to engineering processes, power and refrigeration systems.
-To understand heat transfer equipment design. To classify heat transfer situations as conduction, convection, radiation, forced or natural convection. To determine the appropriate approach to problems, the type of solution needed, analytical or numerical. To be able to arrive at a solution and predict heat transfer rates and be able to design and size heat transfer equipment.
Learning Outcomes
To be able to apply the principles of thermodynamics and heat transfer to real engineering situations. Ability to tackle and solve a range of complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures. Ability to tackle and solve a range of heat transfer problems including finned heat exchangers, cooling by fluids, quenching, insulation and solar radiation.
Textbooks
Cengel & Boles, Thermodynamics, an Engineering Approach (Mc-Graw-Hill)
Incropera & De Witt, Fundamentals of Heat Transfer (Wiley)

MECH 1560 **Introduction to Mechanical Engineering**
6 credit points. B E. **Session:** Semester 1. **Classes:** (Two 1 hour lee & one 3hr lab) per week. **Prohibitions:** AERO1560; MECH 1751; MECH 1600. **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 2400 **Mechanical Design 1**
6 credit points. B E, B S T, B Sc, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (2 lee & two 2hr drawing office sessions) per week. **Assessment:** Assignments and quizzes.
Syllabus
(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 2901 **Anatomy and Physiology for Engineers**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (One 3hr lee; plus tut & lab session) per week. **Assumed Knowledge:** A basic understanding of biology. **Prerequisites:** Recommended: BIOL 1003 (or equivalent). **Assessment:** Oral presnetation and a 1-page report; lhr mid semester exam; 2hr final exam.
Syllabus
Bone tissue;
Skeletal system;
Joints;
Muscle Tissue;
Bones & joints anatomy;
Muscle Mechanics;
Nerve Tissue;
Muscles & nerves prac;
CVS Heart;
Blood vessels;
Respiratory System 1;
Respiratory System 2 ;
Homeostasis ;
CVS and Respiratory anatomy (prac);
Physiology;
Respiratory Physiology;
Cardiorespiratory physiology (prac); Sleep Physiology
Renal Anatomy;
Renal Physiology;
Oral Presentation.
Aims and 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.

Learning Outcomes
Identify the gross anatomical features of the human body;
Describe the normal function of the major body systems (nervous, circulatory, respiratory, musculoskeletal, digestive and renal);
Determine how these functions relate to cellular function;
Determine how a biomedical engineering device affects the normal anatomy and function of the body.
Textbooks
RR Seeley, TD Stephens, R Tate, Essentials of Anatomy and Physiology, 5th Ed. Mc-Graw-Hill 2004.

MECH 3260 **Thermal Engineering**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Three 1hr lee & one 2hr tut) per week. **Assumed Knowledge:** Fundamentals of thermodynamics are needed to begin this more advanced course. **Prerequisites:** (AMME2200 or MECH2200 or MECH2201). **Assessment:** Lab experiments; quizzes; exam.
Syllabus
-Thermodynamics:
Exergy and entropy
Power: spark ignition
Power: diesel
Power: gas turbine
Power: Stirling
Power: steam
Gas mixtures, Clausius-Clapeyron
Humidity, psychrometry
Air-conditioning
Combustion: stoichiometry, gas analysis
Combustion, thermochemistry, adiabatic flame temperature
Combustion, 2nd Law of Thermo., equilibrium, exergy
Heat Transfer:
Conduction, thermal circuits
General conduction equation, cylindrical fins
Heat Exchangers
Numerical solutions
Unsteady conduction
Convection, analytical
Forced convection correlations
Natural convection, boiling
Radiation, spectrum, blackbody
Radiation, properties and laws.
Radiation, environmental, solar
Aims and Objectives
-To develop an understanding of the principles of thermodynamic cycles, gas mixtures, combustion and thermochemistry applied to engineering processes, power and refrigeration systems.
-To understand heat transfer equipment design. To classify heat transfer situations as conduction, convection, radiation, forced or natural convection. To determine the appropriate approach to problems, the type of solution needed, analytical or numerical. To be able to arrive at a solution and predict heat transfer rates and be able to design and size heat transfer equipment.
Learning Outcomes
To be able to apply the principles of thermodynamics and heat transfer to real engineering situations. Ability to tackle and solve a range of complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures. Ability to tackle and solve a range of heat transfer problems including finned heat exchangers, cooling by fluids, quenching, insulation and solar radiation.
Textbooks
Cengel & Boles, Thermodynamics, an Engineering Approach (Mc-Graw-Hill)
Incropera & De Witt, Fundamentals of Heat Transfer (Wiley)

MECH 3261 **Fluid Mechanics**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (Two 1hr lee; two 1hr tut) per week. Prac work one 3hr lab session. **Prerequisites:** (AMME2200 or AERO2201 or MECH2202) and (MATH2061 or MATH2067 or (MATH2001 andMATH2005). **Assessment:** Lab quiz, report, assignments, 2hr exam.
Syllabus
Navier-Stokes equations - derivation, significance and fundamental importance.
Pipe flow - Bernoulli, shear losses, minor losses, networks.
Pumps - pump types, characteristics, applications.
Flow around a submersed bodies- lift and drag
Boundary layers - derivation of equations, laminar and turbulent, transition, momentum integral method, law of the wall, velocity profiles.
Turbulence - concept, properties of turbulent flow, eddy viscosity models,more advanced approaches.
Channel flow - flow in a channel, weir, hydraulic jump
Gas dynamics - steady one-dimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube.
Aims and Objectives
The aim of this unit is to provide students with a detailed understanding of the theory and practice of fluid mechanics in an engineering context..
Learning Outcomes
This course will provide students with the ability to critically assess and solve problems commonly found in fluid mechanics practice, such as sizing pumps and piping systems, designing channels, and determing the lift and drag characteristics of submerged bodies. Additionally they will be encouraged to develop a structured and systematic approach to problem solving.
Textbooks
Fox & McDonald, Intro to Fluid Mechanics (Wiley)

MECH 3361 **Mechanics of Solids 2**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (3 lee & one 2hr tut) per week and 6hr lab work per semester. **Assumed Knowledge:** MATH1001, MATH1002, MATH1003, ENGG1802. **Prerequisites:** AMME2301 or AERO2300 or MECH2300; MATH2061 or MATH2067 or MATH2005. **Assessment:** Assignments, group lab report, quizzes, examination.
Syllabus
Stress and strain; linear elasticity and basic plasticity; introduction to energy methods; Airy stress function method and stress concentration; primary mechanics modeling skills and solution methods for stress and deformation analysis of engineering problems; stress, deformation and buckling of plates and shells; introduction to the finite element method; case studies.
Aims and Objectives
The UoS aims to teach the fundamentals of analyzing stress and deformation in a solid under complex loading associated with the elemental structures/components in aerospace, mechanical and biomedical engineering.

This UoS aims to develop the following attributes:

- to understand the fundamental principles of solid mechanics and basic methods for stress and deformation analysis of a solid structure/element in the above mentioned engineering areas.
- to gain the ability to analyze problems in terms of strength and deformation in relation to the design, manufacturing and maintenance of machines, structures, devices and elements in the above mentioned engineering areas.
Learning Outcomes
The outcome will be a good understanding of the following:
1. applicability of the theories and why so
2. how and why to do stress analysis
3. why do we need equations of motion/equilibrium
4. how and why to do strain analysis
5. why do we need compatibility equations
6. why Hooke's law, why plasticity and how to do elastic and plastic analysis
7. how and why to do mechanics modeling
8. how to describe boundary conditions for complex engineering problems
9. how to solve a mechanics model based on a practical problem
10. how and why to use energy methods for stress and deformation analysis
11. how and why to introduce plates and shells and how to do analysis for plate and shell structures
12. why and how to do stress concentration analysis and its relation to fracture and service life of a component/structure
13. why and how to do fundamental plastic deformation analysis
14. how and why the finite element method is introduced and used for stress and deformation analysis

The ultimate outcome is that the students have the ability to solve engineering problems by comprehensively using the skills attained above.

MECH 3362 **Materials 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Three 1hr lee & two 1hr tut) per week. **Prerequisites:** (AMME 2302 or MECH2300) and (AMME 2301 or AERO2300). **Assessment:** Assignments, quizzes and examination.
Syllabus
1. Deformation Mechanisms
2. Fatigue
3. Fracture
4. Creep
5. Damage Tolerance
6. Damage Resistance

7. Tribology
Aims and Objectives
There are six key focus areas:
1. Understand mechanical property profiles of materials
2. Understand the procedures of diagnostic and prognostic analyses of materials and structures
3. Understand the mechanisms of crack propagation in ductile and brittle materials and conditions under which fatigue occurs
4. Understand the principles and approach in damage tolerance design
5. Understand the conditions under which creep occurs and be able to identify steady-state creep rate and rupture lifetime for a given creep plot
6. Understand the basic law of friction (Amontons' law), surface roughness and mechanisms of wear
In order to attain these key understandings the aims of this subject are to
1. Identify yield strength, tensile strength, elongation of failure in an engineering stress-strain diagram
2. Calculate principal stresses and apply major yield/failure criteria under combined stresses.
3. Understand the concept of critical strain energy release rate, stress intensity factor and fracture toughness and how to diagnoses failure and evaluate fracture behavior of engineering materials
4. Be able to determine fatigue lifetime at a specified stress level and fatigue strength corresponding to a specified number of cycles
5. Be able to apply the concept of damage tolerance design in diagnostic prognostic analysis
6. Understand the basic forms of mechanical wear, such as adhesive and abrasive wear and their dependence on external load, temperature and material properties
7. Be able to estimate the temperature at which creep becomes important for a given material and understand steady-state creep and its dependence on applied stress and temperature
Learning Outcomes
1. Understand how to characterize the elasticity and plasticity of materials via engineering stress-strain diagrams and be able to describe plastic deformation by motion of dislocations
2. Understand how to characterize fracture toughness and how to design a simple engineering structure by applying fracture mechanics
3. Understand how to evaluate fatigue crack growth in terms fatigue plot (S-N curve) and fracture mechanics approach (stress intensity factor)
4. Understand how to analyze rupture life of stead-state creep as a function of stress and temperature
5. Understand the general relationship between mechanical wear and applied load, temperature, and mechanical properties (hardness, yield strength and fracture toughness)
6. Be able to design simple engineering structural elements such as beams and thin-walled structures against yielding, creep rupture and brittle fracture and fatigue with the concept of damage tolerance
Textbooks
William D. Gallister, Jr., Materials Science and Engineering-An Introduction, 6th edition, John Wiley & Sons, 2003.
Norman E. Dowling, Mechanical Behaviour of Materials, 2nd edition, Prentice Hall, 1999.
Reference books
Thomas H. Courtney, Mechanical Behavior of Materials, McGraw Hill, 2000.
Michael F. Ashby and David R.H. Jones, Engineering materials 1: an introduction to their properties and applications, 2nd edition, Butterworth-Heinemann, 1996.
Michael F. Ashby and David R.H. Jones, Engineering materials 2 : an introduction to microstructures, processing and design, 2nd edition, Butterworth Heinemann, 1998.
Michael F. Ashby, Materials selection in mechanical design, 2nd edition, Butterworth-Heinemann, 1999.

MECH 3460 **Mechanical Design 2**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (Two lhr lee and two lhr tut) per week. **Assumed Knowledge:** ENGG1802; AMME2301; AMME2500. **Prerequisites:** MECH2400. **Assessment:** Assignments and quiz.
Syllabus
Stress and strain in engineering materials, deflections, linear and angular, due to moments, forces and torque. Wear, stiffness, spatial framework, welding practices.
Aims and Objectives
1. This UoS utilises existing theoretical skills to elucidate the stresses and strains that exit in individual categories of machine parts. It aims to makes the student aware of the simplifications that are necessary to arrive at the analytic expression commonly used in this field. These simplifications result in deviations from real stress levels. It is possible to have different degrees of simplifications, requiring more or less work, and resulting in more or less deviation. The focus is to make the student practiced in a range of modern techniques and be made aware of their strengths and limitations.
2. Teaches the student how to recognise where and how their theoretical skills can be applied to practical situations encounters in the field of Machine design.
Learning Outcomes
1 Calculate weld thickness for a nominated joint outline, subjected to combined loads.
2 To apply modern fatigue life predictions in general to component parts.
3 Design a bolted joint to carry shear loads.
4 Calculate a pre tensioned bolted joint properties and dimensions to meet a required fatigue loading.
5 Use a numerical solver to arrive at an optimal design for a fully defined bolted joint, shaft diameters, nested springs and other machine part.
6 Design a shaft to carry steady and alternating torsions and bending loads in a real world assembly.
7 Select a belt drive and other power transmission device to suit loads and conditions.
8 Design and construct a space frame that meets requirements of rigidity, strength and simplicity.
9 Design or select a coupling that has the appropriate attributes with respect to power and misalignments.
10 Calculate the parameters that define a matched pair of spur gears.
11 Using modern FEA packages that are integral with a CAD system.
Textbooks
R.L. Norton, Machine Design, An Integrated Approach, 2nd Ed. (Prentice Hall)

MECH 3630 **International Exchange Program 3A**
12 credit points. B E. **Session:** Semester 2, Semester 1. **Prerequisites:** Completion of all first and second year core units of study and at least 96 credit points toward the degree. Endorsement by Head of School of Aerospace, Mechanical & Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School. **Assessment:** Individual approved subjects at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated.
NB: Department permission required for enrolment.
Objectives
The objective of this exchange program is to give students an opportunity to study in a different cultural
environment. Students will gain an understanding of the differences in techniques applied in aeronautical,
mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree
disciplines of the School. The course work completed at the exchange university is to be equivalent to one
semester at the University of Sydney. The specific units of study must be approved by the Heads of
School/Department at both institutions.

MECH 3631 **International Exchange Program 3B**
12 credit points. B E. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all first and second year core units of study and at least 96 credit points toward the degree. Endorsement by Head of School of Aerospace, Mechanical & Mechatronic Engineering and the host institution is required. The units of study chosen to fulfil the 12 credit points must be approved by the School. **Assessment:** Individual approved subjects at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated.
NB: Department permission required for enrolment.
Objectives
The objective of this exchange program is to give students an opportunity to study in a different cultural
environment. Students will gain an understanding of the differences in techniques applied in aeronautical,
mechanical, mechatronic, space or biomedical engineering overseas.

Exchange program summary

Students spend a semester at an overseas university that is part of the approved exchange program in the degree
disciplines of the School. The course work completed at the exchange university is to be equivalent to one
semester at the University of Sydney. The specific units of study must be approved by the Heads of
School/Department at both institutions.

MECH 3660 **Manufacturing Engineering**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Lee: 2 hours per week Tut: 2 hours per week. **Assumed Knowledge:** AMME2200, AMME2301,AMME2302,(MATH2061 orMATH2067). **Prerequisites:** MECH 1560

and ENGG1802. **Assessment:** Assignments, group lab report, quizzes, industrial visit attendance.
Syllabus
Manufacturing Processes: Common processes and their science (machining, casting, powder metallurgy, metal working, welding, polymer processing and composite manufacture); merits and limitations; NC and CAM; Introduction to advanced processes (sensor and actuator, IC, intelligent robots and biomedical and nano-technological device).
Manufacturing Systems: Economics in manufacturing; flexible manufacturing; just-in-time manufacturing; group technology; materials selection and requirements planning; quality control; introduction to new technology; introduction to e-manufacturing; human factors; plant layout.
Aims and Objectives
The UoS aims to teach the fundamentals of manufacturing processes and systems in mechanical, mechatronic and biomedical engineering, including traditional and advanced manufacturing technologies.
This UoS aims to develop the following attributes:
- to understand the fundamental principles of manufacturing technologies for the above mentioned engineering areas
- to gain the ability to select existing manufacturing processes and systems for direct engineering applications
- to develop ability to create innovative new manufacturing technologies for advanced industrial applications.To develop - ability to invent new manufacturing systems
Learning Outcomes
The outcome will be a good understanding of the following:
1. merits and advantages of individual manufacturing processes and systems
2. principles of developing new technologies
3. comprehensive applications and strategic selection of manufacturing processes and systems

MECH 3661 **Engineering Management**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (One 2hr lee and one 2hr tut) per week. **Assumed Knowledge:** ENGG1803. **Assessment:** Assignments, one group assignment, oral presentation and examination.
Syllabus
The concepts covered in this UoS are from the following management areas:
Engineers and Management - including ethics,Communication and People in Organisations, Economics, Leadership, Strategic Management, Managerial Decision Analysis, Marketing, Business Planning, Legal Environment of Business, Industrial Hazard Management, Human Resource Management, Project Management, Quality Assurance and Management, Operations Management, and Financial Management.
This broad range of topics is covered so as to familarise students with the fundamental areas of managerial practice that they can be expected to become professionally proficient in.
Aims and Objectives
The objectives of this Unit of Study (UoS) are to:
- develop an understanding of the principles and practices of industrial and engineering management
- provide an understanding of the theoretical and practical issues facing an industrial organisation, and the fundamental approaches to their management
- understand the ethical, social, economic and environmental contexts of professional engineering within an industrial organization.
The attributes that will be developed in this UoS are consistent with the development of scholarship, global citizenship and lifelong learning. This is outlined in a section below.
Learning Outcomes
- Understand the fundamental approaches to industrial management
- Apply a range of these approaches in class experiences and assessment tasks
- Practice and appreciate the effective management of workgroups
- Understand the importance of effective design and management of human systems in managing organisational and professional issues
- Develop an ethical approach to dealing with professional issues of an economic, social or environmental nature
- Enhance competence and confidence in oral and written communication.
Textbooks
D Samson, Management for Engineers 2001 (4th ed) Prentice Hall

MECH 3921 **Biomedical Design and Technology**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (One 2hr lee & one lhr tut) per week, desigin group meetings and site visits. **Assumed Knowledge:** BIOL1003; MECH2901; MECH2400; MECH2900. **Assessment:**Assignments, quizzes, design project and exam.
Syllabus
Medical Devices:
Overview of the wide spectrum of devices used in medical and paramedical fields
Clinical devices
Rehabilitation/assistive devices
Implants
Medical Supplies
Surgical equipment
Regulation of Medical Devices:
Electrodes and Electrical Signals
Blood Pressure Monitoring
Blood Flow Monitoring
Respiratory Flow Monitoring
Pulse Oximetry
ECG and Cardiac Function
EEG
FES
Eye Surgery and Technology
Dialysis
Electrical Safety
Biomaterials

Industrial and Hospital Visits.
Team biomedical design project and preparation of a detailed design brief.
Aims and Objectives
Students will gain an understanding of the development, manufacture and 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.
Students will design a biomedical device including the preparation of a detailed design brief.
Learning Outcomes
By the end of this unit of study, students will have an understanding of:
1. Marketing and regulation of biomedical products,
2. Biomedical ethics,
3. Development and testing protocols for biomedical devices,
4. Rehabilitation engineering,
5. The uses of biomedical products in hospitals.
6. Planning of clinical trials.
7. Regulatory submissions.

MECH 4060 **Professional Engineering 2**
3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (One 2hr lee & one lhr tut) per week. **Assumed Knowledge:** MECH3661, ENGG1803, AMME4100. **Prerequisites:** MECH3660. **Assessment:** Assignments, one presentation, attendance at lectures.
Syllabus
Principles of Project Management
Management of large projects or a portfolio of small projects - including
Planning techniques
Organisation
Control
Design Management
Management of Commissioning and Start up of process /mining plant
Management of Plant Maintenance
Preparation and Delivery of Oral Presentations on technical subjects
Introduction to:
Occupational safety,
Safety Management systems,
Management of environmental performance,
Engineering as an element in the cost of production
Quality Assurance and
Principles of Total Quality Management
The concept of completed staff work
Production Engineering Management
Industrial Relations
Individual and team approaches to solving standard and open ended problems
Aims and Objectives

This UoS aims to create an awareness of the issues surrounding management of projects and in general management in engineering plants.
To impart knowledge resulting in a more global approach to the practice of engineering and engineering management.
To provide a vehicle for improving communication skills.
The course also aims, when taken together with other courses offered by the Department, to substantially meet the requirement of the Institution of Engineers, Australia, for undergraduate training in management theory.
To introduce the range of topics related to engineering project management and project work which a project engineer needs to be aware of.
To provide sufficient understanding of them for you to be able to recognise the need for them in any project you may be engaged in, and to be able to make more detailed enquiries yourself or seek specialist help.
To develop a number of specific skills that a project engineer will need to use.
Learning Outcomes
On completion of this course, students should be able to:
Plan small projects, and contribute effectively to planning of larger projects
Understand what is required of you in your role in the conduct and management of an engineering project
Perform well in that role from the outset, with your performance limited only by your experience
Prepare an interesting presentation on aspects of your work for your peers or senior managers
Recognise the range of expertise you may need to call on in your role as an engineer working on a project (e.g in the safety and environmental fields)
Understand what the experts are saying, and to be able to contribute effectively to that discussion, so making effective use of that expertise.
The course also aims, when taken together with other courses offered by the Department, to substantially meet the requirement of the Institution of Engineers, Australia, for undergraduate training in management theory.

MECH 4105 **International Exchange Program**

24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all first, second and at least 24 third year core units of study. Approval by Head of School of Aerospace, Mechanical and Mechatronic Engineering. **Assessment:** Individual units of study at an overseas university participating in an international exchange program are assessed and a weighted average mark will be calculated.
NB: Department permission required for enrolment.
Objectives
To give students an opportunity to study in a different cultural environment for a semester. Students will gain an understanding of the
differences in techniques applied in aeronautical, mechanical, mechatronics, space or biomedical engineering overseas.

Exchange program summary
Students spend a semester at an overseas university that is part of the approved exchange program in the degree
disciplines of the School. The course work completed at the exchange university is to be equivalent to one
semester at the University of Sydney. The specific units of study must be approved by the Heads of
School/Department at both institutions. A recommended subject is Thesis and students are encouraged to
undertake work experience in overseas industry.

For details of overseas institutions participating in this exchange program, contact the Head of of the School of
Aerospace, Mechanical and Mechatronic Engineering.

MECH 4231 **Environmental Acoustics & Noise Control**

3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2hrs lec/tut/lab per week. **Prerequisites:** 24 credit points of third year units of study. **Assessment:** Assignments, reports, in-class quizzes and final examination.
Syllabus:
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 acoustics.
Aims and Objectives:
The course aims to develop knowledge skills, thinking skills and practical skills in acoustics and to develop engineering judgment, ability to work and communicate with others and to generate capacity for further learning in this field.
To acquaint students with the methods engineers use to assess and deal with the environmental noise due to industry and other human activities.
Learning 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 toake recommendations as to how best to reduce them.
Textbooks
Reference books:
Bies and Hansen, Engineering Noise Control, 2nd Edn, (E & FN Swan, 1996)
L L Beranek & I L Ver (Eds): Noise and Vibration Control Engineering; (Wiley, 1992)

MECH 4241 **Energy and the Environment**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (2hrs lee, 3hrs tut)/week. **Prerequisites:** 24 credit points of third year units of study,. **Assessment:** Two Quizzes Draft Project Report Final Project Report Final Examination Attendance and Cooperation.
Syllabus:
This unit provides an introduction to the technical, economic and environmental analysis of large energy systems and infrastructure. Issues covered include:
a. Renewable energy power generation technology.
b. Conventional and advanced fossil fuel power generation technology.
c. Economic analysis of power plant and gas pipeline projects.
d. Local, regional and global environmental issues.
e. Sustainability and global warming.
f. Low carbon energy technologies.
Aims and Objectives:
To provide a basic understanding of the technical, economic and environmental impacts of large electric energy systems and infrastructure projects and of the approaches used by engineers to analyse and assess such projects.
Attributes:
The course will draw on previous and current learning in thermodynamics, management, design and general engineering to introduce students to the methods engineers use to assess and deal with the environmental consequences of industry and other human activities, with particular emphasis on the impacts of large scale electric energy production.
In addition to the basic knowledge and skills required to pass this subject, the development of a confidence and understanding sufficient to enable the student to tackle new open ended and unfamiliar problems will be emphasised.
Learning Outcomes:
a. Students will become familiar with the basic engineering principles underlying the application, selection and evaluation of energy systems.
b. Will be aware of the environmental issues associated with energy production systems and how these issues are identified, addressed and managed to reduce impacts.
c. Will have performed simple calculations to estimate the technical and economic implications of the construction of gas pipelines and power stations.
d. Will have applied basic knowledge and research skills to tackle a new and unfamiliar problem.
e. Will have worked cooperatively in a largely self managed team to complete an analysis of a large energy project.
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. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 1 lee and 1 tut per week. **Prerequisites:** (MECH3260 and MECH3261) or MECH3201; (MECH3202 or MECH3203). **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. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 lec/tuts per week. **Prerequisites:** (MECH3260 and MECH3261) or MECH3362. **Assessment:** Group Project and 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.
Textbooks
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. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 lee & 3 tut/lab per week. **Prerequisites:** MECH3300 Materials 2 or MECH3362. **Prohibitions:** MECH4315 Advanced Aerospace Materials.. **Assessment:** Quiz, log book, presentation and final report.
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 micro structure 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. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hrs/week. **Prerequisites:** (MECH 3400 and MECH 3410) or MECH 3460. **Assessment:** 3 assignments.
Learning Outcomes
a) To develop an understanding of the complete mechanical design processes and actions, from initial concept to design iteration to final design, and including specifications, fabrication inspections including ndt, commissioning procesess and strain gauging.
b) To be able to work invidividually as well as in teams in order to complete a design task or sub-task.
c) To be able to use a top-end industrial computational stress analysis program, based on finite element methods, to assess stress and fatigue characteristics or characteristics of mechanical designs.
d) To be familiar with the form and design basis of typical machine designs present in widespread industrial use.
e) To compile a suitable design report, including specifications, drafted drawings and computational stress analysis outputs.
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 4611 **Industrial and Engineering Management**

3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2hrs lec/tut per week. **Assumed Knowledge:** MECH 3661, ENGG1803. **Assessment:** 100% course work consisting of written assignments and oral presentation.
Syllabus:
Reflective personal and management practice, Globalisation and International Competitiveness, Strategic Management, Technology Management & Strategy, Workplace Relations and Work Organisation, Innovation, Environmental Management, Intellectual Property, Organisational Change, The Role of Government.
Aims and Objectives:
a. provide an understanding of the theoretical and practical issues facing an industrial organisation, and the fundamental approaches to their management
b. understand the ethical, social, economic and environmental contexts of professional engineering within an industrial organization.
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.
Learning Outcomes:
Understand the fundamental approaches to industrial management
Apply a range of these approaches in class experiences and assessment tasks
Practice and appreciate the effective management of workgroups
Understand the importance of effective design and management of human systems in managing organisational and professional issues
Develop an ethical approach to dealing with professional issues of an economic, social or environmental nature
Enhance competence and confidence in oral and written communication.
Textbooks
D Samson, Management for Engineers (4th ed) Prentice Hall 2001

MECH 4621 **Industrial Ergonomics**

3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: One 2 hr class per week. **Assumed Knowledge:** It is assumed that students have a sound understanding of engineering concepts within their chosen specific discipline. **Assessment:** Assignment and exam.
Syllabus:
Introduction to ergonomics:
- The human body: anatomy, anthropometry, muscle performance and work physiology, and human cognition
- The environment: heat and humidity, vibration, noise/acoustics and lighting
- Integrating: Occupational task demands and human responses, job/task analysis, workplace design, manual handling, product design, and human computer interfaces.
- Case studies are provided throughout.

Aims and Objectives:
The aim is for students to acquire an understanding of relationships between humans and the physical and psychological aspects of their occupations and develop basic competence in ergonomics principles and assessment.
Learning Outcomes:
By the end of this UoS, students should be have a basic understanding of ergonomics principles and be able to undertake a basic ergonomics assessment with a measure of confidence. Students should be able to identify real and potential ergonomics issues, source information and call in specialist expertise appropriately.
Textbooks
"Notes on the Principles of Ergonomics" (available from the Uni Copy Centre); Reference to many other materials is expected.

MECH 4636 **Introduction to Operations Research**
3 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 3hrs lec/tut per week. **Prerequisites:** MATH 1005, [(MATH2061, MATH2065) or MATH2067]. **Assessment:** Assignments; Two hour open book exam.
Syllabus:
History and methods of operations research. Linear programming; simplex method; transportation models. Network models; project scheduling; critical path methods. Deterministic and probabilistic inventory control models. Simulation modeling. Optimization. Introduction to reliability analysis. Component and system reliability; effect of maintenance and repair.
Aims and 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
Learning 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
References:
An introduction to Operations Research, 1997, Taha, Publisher Prentice Hall
Introduction to Reliability Engineering, 1987 or 1994, Lewis, Publisher Wiley.

MECH 4641 **Product Life Cycle Design**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2hrs lee, 2hrs tut/week. **Prerequisites:** MECH 3660. **Assessment:** Presentation and written report.
Syllabus:
Lectures and case studies focusing on the business potential with reference to product strategy; product portfolio; lifecycle costing; outsourcing and contract manufacturing.
Lectures and case studies focusing on the integrated nature of product and process design with reference to enabling technologies (CAx); product and process data modeling; design process management; the concurrent engineering practice, and the tools and the methodologies.
Lectures and case studies focusing on product in the market place with reference to the service strategy; the market sustainability; product disposability, and environmental constraints.
Aims and Objectives
The interfaces between product's functional requirements and the product design structures with a particular reference to the environmental and business constraints;
Mapping of the product design attributes into the manufacturing process attributes with reference to the cost;
The overall process of bringing new products into the market place and the life cycle requirements.
Learning Outcomes:
1. Designing products with environment in mind;
2. Understanding the business aspects involved;
3. Appreciation of the product life cycle management issues;
4. Learn to differentiate between science, technology and business;
5. Appreciate the process involved in bringing new products to marketplace.

MECH 4651 **Workplace Industrial Relations in Aust**
3 credit points. B E. **Session:** Semester 2. **Classes:** Session of 3 consecutive days. **Assessment:** Individual and group participation, and role play exercise.
NB: Department permission required for enrolment.
Syllabus:
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, and negotiation skills.
Aims and Objectives:
To give students an understanding of industrial relations issues in Australia and their responsibilities as managers.
Learning Outcomes:
Students will develop skills to handle industrial relations in the workplace.

MECH 4720 **Sensors and Signals**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 3hrs lee per week; 2hr tut per week. **Prerequisites:** A Strong Matlab skillsP MTRX 3700. **Assessment:** Tutorials, Design Assignment and Open book exam.
Syllabus summary
This course starts by looking at signal characteristics, modulation, filtering and convolution before examining some passive sensors. It goes on to provide an overview of the workings of typical active sensors with a strong emphasis on optical systems and image processing (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 AND MODULATION: Examines typical signals, looks at modulation, filtering and convolution
b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging
c) OPTICAL SYSTEMS AND IMAGE PROCESSING: Fundamentals of optics and electronics imaging, Introduction to Digital Image Processing including morphological operations, image segmentation, the Fourier transform, edge detection and optical flow.
d) ACTIVE SENSOR BASICS: Operational Principles, Time of Flight (TOF) Measurement & Imaging.
e) SENSORS AND THE ENVIRONMENT: Propagation Effects, Target and Clutter Characteristics.
f) ACTIVE SENSORS: ADVANCED TECHNIQUES: Probability of Detection, High Range Resolution, Doppler Measurement, Range and Angle Tracking, Phased Arrays, Synthetic Aperture Methods (SAR), 3D Imaging and Tomography. *Aims and 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. MECH4720 is the last in a series of practical Mechatronic and Electrical courses taken over three years. It takes these practical engineering concepts, along with the associated mathematical, electronic and mechanical theory and applies this knowledge to a series of practical, albeit specialized applications that will be encountered by most Mechatronic Engineers at sometime during their careers.
The areas of focus are:
1. Some signal theory, modulation, filtering and convolution
2. A comprehensive introduction to optics and image processing
3. To engender a good understanding of the fundamental measurement processes involved in these sensor types
4. The ability to select an appropriate sensor technology for a specific application
5. A structured approach to the design of complex engineering systems such as radar systems
6. A good grasp of the engineering trade-offs that must be made during this design process
Learning Outcomes
A good understanding of passive and 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. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (one 2hr lee and one 2hr lab)/week. **Prerequisites:** MTRX3700 or MECH3701 or MECH3700. **Prohibitions:** ELEC 4602 Real Time Computing. **Assessment:** Lab work and 2hr exam.
Syllabus
Overview of the IBM PC architecture and I/O Interfaces. System Software Design Concepts. Programming for interactive control using C Programming Language. Multitasking systems. Timers, Interrupts, Process and Threads, Interprocess Communication, Asynchronous tasks, data communication. Structured data, use of structures in C for RT control. High Performance Real time operating systems: QNX Neutrino and Windows Real time Extensions.
Aims and Objectives
There are three key focus areas:
1. An understanding of embedded system software system design.

2. An understanding of the modern Developing tools for Real time embedded systems;
3. An understating of how to organize, design and implement a complex Real time system.
In order to attain these key understandings the aims of this subject are
1. To learn the fundamental principles and requirements of real time software design
2. To understand the basic components of an embedded systems,
3. To learn, appreciate and understand the various stages that need to be completed in a large software system implementation
4. To learn the capabilities of a typical high performance real time operating system
Learning Outcomes:
There are three key focus areas:
1. An understanding of embedded system software system design.
2. An understanding of the modern Developing tools for Real time embedded systems;
3. An understating of how to organize, design and implement a complex Real time system.
In order to attain these key understandings the aims of this subject are
1. To learn the fundamental principles and requirements of real time software design
2. To understand the basic components of an embedded systems,
3. To learn, appreciate and understand the various stages that need to be completed in a large software system implementation
4. To learn the capabilities of a typical high performance real time operating system
Textbooks
Auslander DM & Tham CH, Real Time Software for Control, Prentice Hall, 1990.
Library Classification: 629.8102, 629.8955133.

MECH4901 **Orthopaedic Engineering**
3 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** (One 3hr lee) per week. **Assumed Knowledge:** MECH3300 or MECH3362; MECH3310 or MECH3361. **Prerequisites:** MECH2300 or AMME2302; BIOL1003; MECH2900 or MECH2901. **Assessment:** Lecture attendance; class presentation; literature review and 2hr exam.
Syllabus
Course overview, anatomy review, bone and joints;
Principles of artificial joint replacement, specifics of knee and hip implants;
Implant design and manufacturing;
Design control and regulatory aspects of Orthopaedic Innovation;
Statics, principles of biocompatibility, biomaterials, metals, polymers, ceramics;
Joint loads, muscles and gait analysis. Fixation with bone cement, biological fixation, implant stiffness, stress shielding, bone remodeling;
Casting technologies in orthopaedics;
Class presentations;
Ceramics in orthopaedics, coatings - DLC and HA;
FEA in orthopaedics;
Review of course, discussion of class presentations and assignments.
Aims and Objectives
To introduce the student to the details and practice of orthopaedic engineering;
To give students an overview of the diverse knowledge necessary for the design and evaluation of implants used in orthopaedic surgery;
To enable students to learn the language and concepts necessary for interaction with orthopaedic surgeons and the orthopaedic implant industry.
Learning Outcomes
Be acquainted with the physical properties of human bones and joints;
Understand how the skeleton functions as an engineering structure.
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 or to other devices used for replacement and repair of bones and joints.
Learn the language of orthopaedics and obtain a glimpse into the world of the orthopaedic surgeon.

MECH 4961 **Biomechanics and Biomaterials**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (2 lee &1 lab/tut) per week. AssumedKnowledge:MECH3300orMECH3362. **Prerequisites:** MECH2300 or AMME2302; MECH2900 or MECH2901. **Prohibitions:** MECH4960. **Assessment:** Group seminars, group reports and participation mark.
Syllabus
1. Biocompatibility and the immune system
2. Introduction to biomaterials
3. Metallic implants
4. Polymeric implants
5. Ceramic implants
6. Dental materials
7. Introduction to biomechanics
8. Tissue mechanics
9. Modelling of motion
10. Biofluid mechanics
11. Injury biomechanics
Aims and Objectives
1. To gain a basic understanding of the major areas of interest in both the biomaterials and biomechanics fields.
2. To learn to apply basic engineering principles to biomedical systems
3. To understand the challenges and difficulties of biomedical systems.
Learning Outcomes
By the end of this UoS, students will be able to:
1. Apply static and dynamic mechanical analyses to the human body to describe motion.
2. Understand the mechanical behaviour of biological tissues and the types of models used to describe this behaviour.
3. Understand all the factors involved in the selection of a biomaterial for tissue replacement, including mechanical, biocompatibility, material property and fixation factors.
4. Improve their written and oral communication skills in a technical setting.
5. Demonstrate 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.

Mechatronic Engineering

MTRX 1701 **Mechatronics Engineering Introductory**
6 credit points. B E. **Session:** Semester 1. **Classes:** One lhr lee and one lhr tutorial per week. **Assessment:** Attendance, assignments and a major assignment.
Syllabus
Introduction
System Modelling and Control
Design Process
Actuators
Sensors
Computers - Hardware
Computers - Software
Advanced Topics
Aims and Objectives
This unit of study aims to introduce students to the fundamental principals that underlie the study of Mechatronic Engineering. Students will appreciate the fundamental components that make up a Mechatronic system, including actuators, sensors, electronic and computing systems. This course lays the foundation for later studies, including advanced Mechatronic Engineering, computing, control and system design courses.
Learning Outcomes
On completion of this unit of study, students should be able to:
Understand the general principles involved in computer controlled machinery
Apply a systematic approach to the design process for Mechatronic systems
Analyze and formulate requirements for a Mechatronic system based on a specification
Demonstrate a basic understanding of system modelling and approaches to control
Understand the practical application of mechatronic systems in applications such as manufacturing, automobile systems and robotics
Develop the capacity to think creatively and independently about new design problems
Undertake independent research and analysis and to think creatively about engineering problems

MTRX 1702 **Mechatronics 1**
6 credit points. B E. **Session:** Semester 2. **Classes:** Two lhr lee & two 2hr lab/tut per week. **Prohibitions:** ELEC1101 Foundations of Computer Systems, MECH1802 C Programming, COSC1902 Computational Science in C (Advance), COSC1002 Computational Science in C. **Assessment:** Assignments, quizzes and exam.
Aims & 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
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; sequential circuits, designs of synchronous, cascadable counters (BCD and binary). Integrated circuit logic families and interfacing; practical issues including, fan out, pull-up/down, grounds, power supplies and decoupling; timing issues, race conditions. Tri-state signals and buses; MSI logic circuits, 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, debugging and testing in the context of C programming language. Problem definition and decomposition; the design process; designing for testing and defensive coding methods; modular code structure and abstract data types; best practice in programming. 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. Dynamic memory. Functions and parameter passing. Derived storage classes: structures and unions. File I/O.
Learning Outcomes
-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.
-Design, code, debug, and test programs written in the C programming language.
-Understand the principles for designing large-scale modular software systems.
Textbooks
Wakerly, Introduction to Digital Design, 3ed., Prentice-Hall, 2000.
Library Classification: 621.3819, 621.39
Reference Books
Kernighan & Ritchie The C Programming Language 2nd ed (Prentice Hall, 1988)
Deitel & Deitel, C How to Program, 3ed, Prentice-Hall, 2001

MTRX 2700 **Mechatronics 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Three 1hr lees and one 3hr lab per week. **Prerequisites:** MECH1760 or MTRX 1702 or (MECH1701 andMECH1702). **Prohibitions:** ELEC2601. **Assessment:** 3 lab assignments, 1 major assignment and a 2hr examination.
Syllabus
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. In particular, the following subjects are addressed;
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.
Learning Outcomes
1. A low-level understanding of microcontrollers;
2. The use of both low and high level programming languages for developing microcontroller based applications;
3. Practical applications and implementation of the knowledge listed above;
4. A thorough knowledge of the interaction between microprocessor hardware and software at the assembly language level;
5. They will be able to implement a microcontroller-based system involving both hardware and software design.

MTRX 3700 **Mechatronics 3**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** (one 2hr lecture and one 3hr lab/tut) /week. **Prerequisites:** MECH2701 or MTRX2700. **Prohibitions:** MECH4710. **Assessment:** Project and assignment work plus one 2 hr exam.
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.
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.
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.

MTRX 4700 **Experimental Robotics**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hrs of lees and 4 hrs of lab time per week. **Prerequisites:** AMME3500 or (MECH3500 and MECH3800); MTRX3700 or MECH3700. **Assessment:** Lab experiments and examination.
Syllabus
1. History and philosophy of robotics
2. Hardware components and subsystems
3. Robot kinematics and dynamics
4. Sensors, measurements and perception
5. Robotic architectures, multiple robot systems
6. Localization, navigation and obstacle avoidance, robot planning
7. Robot learning
8. Robot vision and vision processing.
Aims and Objectives
This Unit of Study presents a broad overview of the technologies associated with industrial and mobile robots. Major topics covered are sensing, mapping, navigation and control of mobile robots and kinematics and control of industrial robots. The subject consists of a series of lectures on robot fundamentals and case studies on practical robot systems. Material covered in lectures is illustrated through experimental laboratory assignments. The objective of the course is to provide students with the essential skills necessary to be able to develop robotic systems for practical applications.
Learning Outcomes
Following completion of this UoS students will:
1. Be familiar with sensor technologies relevant to robotic systems
2. Understand conventions used in robot kinematics and dynamics
3. Understand the dynamics of mobile robotic systems and how they are modelled
4. Have implemented navigation, sensing and control algorithms on a practical robotic system
5. Apply a systematic approach to the design process for robotic systems
6. Understand the practical application of robotic systems in applications such as manufacturing, automobile systems and assembly systems
7. Develop the capacity to think creatively and independently about new design problems

8. Undertake independent research and analysis and to think creatively about engineering problems

Chemical Engineering

CHNG 1006 **Professional Communication for Engineers**
2 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Classes:** 2 hours of lectures/tutorials per week for 1 semester. **Corequisites:** CHNG1103. **Assessment:** Tutorials and assignments (pass/fail course): participation (attendance and contribution) 10%; individual written exercises 4 x 10%; individual written assignment 50%.
NB: Department permission required for enrolment.
Aim: To improve students' written communication for academic and professional purposes.

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

Description: This course will address the need for engineers to have adequate literacy skills. The course will cover aspects of information retrieval and processing, construction and development of an answer, control of academic writing, grammatical correctness and quality of presentation. There will be a focus on improving the structure, academic style and grammatical correctness of students' writing.

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

CHNG 1103 **Material & Energy Transformations Intro**
6 credit points. B E, B Sc (Molecular Biotechnology), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 4 hours of lectures/tutorials per week for one semester. **Assumed Knowledge:** Mathematics Extension 1; 2 unit Physics; 2 unit Chemistry. **Assessment:** Continuous assessment by assignments 50%; final examination 50%.
NB: This unit of study replaces CHNG1101, CHNG1102, CHNG1001, CHNG1201.
This unit of study is an introduction to chemical engineering processes and calculations. 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. 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. 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. 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. 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. Outcomes: by the end of the unit of study, students will be able to: set up and calculate energy and material balances for a variety of commonly encountered engineering scenarios; appreciate key aspects of processes carried out in today's chemical and process industries; work as an effective memeber of an engineering team; be able to outline a logical approach for solving a variety of complex engineering problems.

CHNG 2801 **Conservation and Transport Processes**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 lectures per week for 1 semester, 1 hour tutorial per week for 1 semester and projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** CalculusComputations (Matlab, Excel) Mass and Energy Balances. **Prerequisites:** All core 1 st year engineering units of study. **Assessment:** Competency based assessment, assessment weighting: Tutorials (20%) Quizzes (30%) Final examination and/or individual projects (30%o) Group work and presentations (20%o).
Learning Outcomes:
By the end of the course the students should be able to be proficient at:
1) Understanding fluid properties and defining a fluid.
2) Demonstrating an understanding of conservation of mass and energy.
3) Understanding the basic principles of mass, energy and momentum balances.
4) Applying these principles and solving simple fluid flow, heat and mass transfer problems. In particular, the concept of a rate as a driving force divided by a resistance should be clear in the process of forming a solution to problems in this area;
5) Deriving the differential and integral forms of the continuity and momentum equations for steady/unsteady, compressible/incompressible, viscous and inviscid flows.
6) Demonstrating the use of dimensional analysis (friction factors, heat and mass-transfer correlations) in order to generalise the understanding of all these rate processes.
7) Demonstrating an understanding of the difference between random molecular movement (diffusion and conduction) and bulk flow (convection), and where these different types of transport occur, why, and how to analyse them.

CHNG 2802 **Applied Maths for Chemical Engineers**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Lectures (2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all core science and engineering UoS in first-year have been successfully completed. **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG 2803 (Analysis Practice 1)CHNG 2801 (Conservation and Transport Processes)CHEM 2404 (Forensic and Environmental Chemistry). **Assessment:** Competency based assessment, assessment weighting: Tutorials (20%)Quizzes (30%)Final examination and/or individual projects (30%) Group work and presentations (20%).
Aims and Objectives

Virtually every aspect of a chemical engineer's professional life will involve some use of mathematical techniques. Not only is the modern chemical engineer expected to be proficient in the use of these techniques, they are also expected to be able to utilise computer-based solutions when analytical solutions are unfeasible. This UoS aims to expose students to an appropriate suite of techniques and enable them to become proficient in the use of mathematics as a tool for the solution of a diversity of chemical engineering problems.
Learning Outcomes
By the end of this UoS a student should have acceptable competence in the following:
1) Ability to 'translate' real-world chemical engineering problems into an equivalent mathematical description.
2) Ability to apply the appropriate techniques to extract meaningful information from a mathematical description of a wide range of chemical engineering problems.
- Data Manipulation and Analysis
- Statistical analysis (extensions from first-year);
- Techniques for data fitting and parameter estimation;
- Introduction to data reconciliation methods.

Equation Solving Techniques
Linear algebraic systems (including techniques for system characterisation - such as eigenvector/eigenvalue decomposition);
Nonlinear algebraic systems;
Ordinary differential equations (single and coupled; first and higher order);
Partial differential equations (classification and solution methods both analytical and numerical).

Flowsheet Solution
- identification and application of appropriate equation solving techniques for a diversity of chemical engineering situations and unit operations.
- techniques for the solution of process flowsheets by sequential modular approaches. Impact of recycle streams and heat integration will be introduced, as well as the need for stream-tearing and convergence blocks.

- techniques for the solution of the large (and sparse) equation sets obtained when process flowsheets are solved by equation-oriented approaches.

Computer-Based Solutions
The emphasis will be on analysis options (within Excel) and toolboxes (within Matlab) for data manipulation and equation solving, with Hysys being introduced as a means of carrying out unit operation and flowsheet calculations.

CHNG 2803 **Energy and Fluid Systems Practice**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Projects and self assisted learning (8 hours per week). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbilify to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information. **Prerequisites:** All core engineering 1st year units of study. **Corequisites:** CHNG 2801 (Conservation and Transport Processes)CHNG 2802 (Applied Mathematics for Chemical Engineers)CHEM 2404 (Forensic and Environmental Chemistry). **Assessment:** Projects (50%); Final examinations (50%).
Aims and Objectives

To recognise that chemical engineers are involved in creation of products and processes, in manipulating complex systems, and in managing technical operations

To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged.

To consider this through three project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy and fluid systems.

This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester.
Learning Outcomes
By the end of this UoS a student should be proficient in the following:
1) Being able to decompose fluid and energy networks into their component parts, understanding the functionality of each of these components, and characterising the performance of the network in terms of both component and system-wide variables.
2) Being able to interrogate such networks in search of optimum operating conditions
3) Understanding the tools of process analysis pertinent to such systems
4) Being able to suggest design improvements to the component parts of such networks as part of process improvement
The three projects offered in this course module cover traditional and non-traditional domains of chemical engineering, and cover the energy, chemical and bio-medical sectors.

CHNG 2804 **Chemical & Biological Systems Behaviour**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Lectures (1 hour per week for 1 semester), tutorials (2 hours per week for 1 semester). Projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. **Prerequisites:** All core 1 st year engineering units of study. **Corequisites:** CHNG 2805 (Industrial Systems and Sustainability)CHNG 2806 (Analysis Practice 2 - Treatment, Purification and Recovery Systems)CHEM 2403 (Chemistry of Biological Molecules). **Assessment:** Competency based assessment; assessment weighting: Tutorials (10%)Quizzes (30%)Final examination and/or individual projects (30%)Group work and presentations (30%).
Aims and Objectives

Chemical Engineering requires an understanding of material and energy transformations and how these are driven by molecular interactions. The rate of such transformations is dependent on driving forces and resistances, and these need to be defined in terms of fundamental physical and chemical properties of systems.

This course seeks to provide students with a sound basis of the thermodynamics of chemical and biological systems, and how these, in turn, define limits of behaviour for such real systems. The thermodynamic basis for rate processes is explored, and the role of energy transfer processes in these highlighted, along with criteria for equilibrium and stability. Emphasis is placed on the prediction of physical properties of chemical and biological systems in terms of state variables. The course delivery mechanism is problem-based, and examples from thermal, chemical and biological processes will be considered, covering molecular to macro-systems scale.

The course builds naturally from the second year first semester course in conservation and transport processes, and prepares students fundamentally for the third year course in design of chemical and biological processes, which deals fundamentally with reaction / separation systems, and considers phase and chemical equilibria.
Learning Outcomes
By the end of this UoS a student should be competent in the following:
1) Understanding the thermodynamic basis of rate processes
2) Predicting equilibrium and stability of chemical and biological systems from thermodynamic information
3) Predicting physical properties of such systems in terms of state variables
4) Using thermodynamic property information to analyse energy and material transfer processes in real systems

CHNG 2805 **Industrial Systems and Sustainability**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Lectures (1 hour per week for 1 semester), tutorials (2 hours per week for 1 semester). Projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL.Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative information. **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG 2804 (Chemical and Biological Systems Behaviour)CHNG 2806 (Analysis Practice 2 - Treatment, Purification & Recovery Systems)CHEM 2403 (Chemistry of Biological Molecules). **Assessment:** Competency based assessment; assessment weighting: Tutorials (10%)Quizzes (30%)Final examination and/or individual projects (30%)Group work and presentations (30%).
Aims and Objectives

To develop an awareness of the various concepts which underpin Sustainable Development, including technical and economic efficiency, stewardship of the bio-physical environment, and social acceptability.
To examine the material economy from the perspective of open and closed thermodynamic systems, and the implications of this for resource consumption and waste generation
To explore governing frameworks for Sustainability, and engagement of chemical engineers with these.
To explore tools and approaches for quantifying industry's environmental performance and how this can be examined within a Sustainability framework.
To consider process design and operation, and product design, from a Sustainability perspective, how these can be informed by Green Engineering principles, and to suggest how this combination of perspectives could lead to a re-defined industry sector.
Learning Outcomes
By the end of this UoS a student should be competent in the following:
1) Understanding the thermodynamic basis of the material economy in terms of resource consumption and waste generation
2) Understanding the philosophical, social and political bases for sustainability, in addition to the technical, economic and environmental ones
3) Understanding the role of technology in promoting sustainability
4) Understanding corporate responsibilities with respect to sustainability
5) Quantifying the environmental performance of industry (with specific reference to the resource and processing sectors) using appropriate tools
6) Interrogating governing frameworks for sustainability do support actions within industry
7) Understanding the trade-offs in decisions which impact on sustainability
8) Being effective communicators of sustainability arguments to all stakeholders, and interpreters of social and environmental concerns in ways which can help shape industry practice

CHNG 2806 **Materials Purification and Recovery**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Projects and self assisted learning (8 hours per week for 1 semester.). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL.Ability to read widely outside of the technical literature, and to syn-

thesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information. **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG 2804 (Chemical and Biological Systems Behaviour)CHNG 2805 (Industrial Systems and Sustainability)CHEM 2403 (Chemistry of Biological Molecules). **Assessment:** Projects (50%); Final Examination (50%).

Aims and Objectives

To recognise that chemical engineers are involved in creation of products and processes, in manipulating complex systems, and in managing technical operations

To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged.

To consider this through three project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy and fluid systems.

This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester

Learning Outcomes

By the end of this UoS a student should be proficient in the following:

1) Being able to characterise process systems in which there is simultaneous transport of mass and energy, and optimise such systems around product quality objectives

2) Being able to characterise wastes and by-products in terms of their subsequent processing potential

3) Understanding biological processes to a level of being able to exploit them as reactive systems for product recovery

4) Understanding the tools of process analysis pertinent to such systems

5) Being able to suggest design improvements to the component parts of such systems as part of process improvement

The three projects offered in this course module cover traditional and non-traditional domains of chemical engineering, and cover chemical and bio-chemical processing.

CHNG 3801 **Process Design**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Lectures (2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **Prerequisites:** All 1st and 2nd year units of study in the Chemical Engineering degree program. **Corequisites:** CHNG 3803 (Design Practice 1 - Chemical & Biological Processes)CHNG 3802 (Operation, Analysis and Improvement of Industrial Systems). **Assessment:** Competency based assessment; assessment weighting: Tutorials (20%) Quizzes (30%) Final examination and/or individual projects (30%)Group work and presentations (20%).

NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.

Aims and Objectives

In the design and analysis of diverse processes, chemical engineers must understand the (often complex) interactions that occur between mass and energy conservation, fluid flow, rate-driven processes and thermodynamic equilibria. This course builds on introductory concepts in each of these areas introduced in second year units of study.

This unit of study will commence with a study of the thermodynamic criteria that define equilibrium conditions with an emphasis on vapour-liquid and reactive systems. A unified treatment of rate-driven processes will then be provided with examples taken from a number of fields. A classification system (steady-state or dynamic; rates based on bulk conditions or a population balance approach; homogeneous or heterogeneous) will be developed. Kinetic rate laws and their determination from experimental data will be presented.

The second component will concentrate on (i) using the above to model a range of process equipment, and (ii) the solution of such models (both steady-state and dynamic) using the appropriate software tools.

The final component will focus on how unit operations are integrated into a process flowsheet. Software tools for flowsheet solution will be introduced. The impact of heat integration and recycle streams will be considered. Examples will cover a diversity of process industries.

The overall aims of this unit of study are (i) to demonstrate the Vertical integration' that exists from engineering concepts through unit operations to complete flowsheets, (ii) to demonstrate that a unified approach allows a diversity of fields to be handled via a consistent, common approach, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

Learning Outcomes

By the end of this UoS a student should have acceptable competence in the following:

1) Using thermodynamic criteria to calculate equilibrium conditions in vapour-liquid and reactive systems.

2) Appreciate that a diversity of rate-driven processes can be analysed and classified in a unified way.

3) Develop appropriate kinetic rate laws from experimental data.

4) Applying the above concepts to the development of models for a range of reaction and separation equipment.

5) Solving the resultant steady-state and dynamic models using the appropriate software.

6) Analysing model results and appreciating the limits of such modelling.

7) Developing a suitable process flowsheet that integrates unit operations to achieve a given objective.

8) Solving such process flowsheets using appropriate software, analysing the results, and appreciating the limitations of such calculations.

9) Appreciating the operational trade-offs that exist in complex flowsheets.

CHNG 3802 **Operating/Improving Industrial Systems**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Lectures (2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **Prerequisites:** All 1st and 2nd year units of study relating to the Chemical Engineering degree program. **Corequisites:** CHNG 3801 (Process Design) CHNG 3803 (Design Practice 1 - Chemical & Biological Processes). **Assessment:** Competency based assessment; assessment weighting: Tutorials (10%) Quizzes (30%) Final examination and/or individual projects (30%o) Group work and presentations (30%).

NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.

Aims and Objectives

Whatever its purpose, any process requires some process monitoring and control to allow it to operate satisfactorily. Once a process is under control, the option exists to further improve performance via the implementation of some level of optimisation.

This UoS will commence with a component on process data management that will review relevant statistics before moving on to empirical (data-based) modelling and data reconciliation techniques.

The second component will concentrate on the role of process control in modern manufacturing covering (i) the development of linear models, (ii) aspects of control system analysis, (iii) the design and performance of feedback control systems, (iv) advanced control systems, and (v) the use of control related software.

The final component will focus on the forms of process optimisation that can be employed in modern manufacturing, with applications considered for both batch and continuous processes.

The overall aims of this UoS are (i) to demonstrate that process control and optimisation are integral concepts in the overall consideration of any modern plant, (ii) to demonstrate that a unified approach allows a diversity of application fields to be readily handled via a consistent approach that is Vertically integrated' from data analysis, though process control to process optimisation, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

Learning Outcomes

By the end of this UoS a student should have acceptable competence in the following:

1) Process data management skills relevant to engineering (statistical analysis, data-based modelling and data reconciliation techniques).

2) Appreciation of the role of process control in modern manufacturing.

3) Designing an appropriate feedback control system and analysing its performance for a range of process applications using both traditional and software-based techniques.
4) Appreciation of the limitations of feedback control and be able to design a range of common enhancements.
5) Appreciation of the role of process optimisation in modern manufacturing.
6) Use of both traditional and software-based techniques to design optimisation schemes for a range of process applications. Analyse the performance of such schemes.
7) Appreciate the limitations that exist whenever mathematical models are used as the basis for process control and/or optimisation.
8) Appreciate the Vertical integration' that exists from process modelling, through process control, to process optimisation.

CHNG 3803 **Chemical/Biological Process Design**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Projects and self assisted learning (8 hours per week.). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbilify to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information. **Prerequisites:** All 1st and 2nd year units of study relating to the Chemical Engineering degree program. **Corequisites:** CHNG 3801 (Process Design)CHNG 3802 (Operation, Analysis and Improvement of Industrial Systems). **Assessment:** Projects (50%); Final Examination (50%).
NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.

Aims and Objectives

To recognise that chemical engineers are involved in the creation of products and processes, in manipulating complex systems, and in managing technical operations.

To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged.

To consider this through three project-driven case studies covering a range of design scenarios, from the domain of chemical and biological processes.

This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester.

Learning Outcomes

By the end of this UoS a student should be proficient in the following:
1) Developing a design strategy for integrated production of a liquid chemical product from a variety of raw materials, to specified purity, using a mix of chemical and biological synthesis techniques- and demonstrating this in project mode.
2) Applying design and analysis tools for control and optimisation of the above process- and demonstrating this in project mode
3) Developing a strategy for chemical or biological product design, with a focus on characterisation of physical properties and functionality- and demonstrating this in project mode.
These three projects address the fundamentals of design of continuous processes, and the challenges inherent in them regarding their operation and optimisation

CHNG 3804 **Biochemical Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** l x l hour lecture per week for 1 semester, 2 x 1 hr self directed group learning sessions per week for 1 semester. **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **Prerequisites:** All 1st and 2nd year units of study relating to the Chemical Engineering degree program. **Assessment:** Tutorials (10%)Quizzes (30%)Final examination and/or individual projects (30%)Group work and presentations (30%).
NB: This UoS is a third year elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries. Students with an interest in bio-engineering will find the background provided by this UoS particularly useful in their fourth year research thesis.

Biochemical engineering is playing an increasingly important role in technology. In modern society, engineers with an understanding of biochemical issues are tremendously valuable. This course will examine cutting edge examples of biochemical technologies across a broad range of applications relevant to chemical engineering.

The specific objectives of the UoS are:

- Understand the history and scope of the biotechnology industry
- Examine the role of biochemical engineering in the industrial application of biotechnology and its development.
- Provide an understanding of the major fundamental aspects of biochemical engineering.
- Use this fundamental understanding to study some selected industrial applications.

At the completion of this Unit of Study students should have developed:

1. An appreciation of the underlying principles of biochemical engineering.
2. The ability to apply these skills to new and novel situations.
3. The ability to critically analyse different types of biochemical engineering processes and to improve these processes consistent with the principles of biochemical engineering.
4. The development of an integrated suite of problem-solving skills needed to successfully handle novel (and previously unseen) engineering situations.
5. An ability to independently research new areas and be critical of what is found.
6. An ability to cope with experimental data, change and uncertainty through critical thinking.
7. Interpersonal, group and teamwork skills including the ability to communicate clearly and concisely.
8. Professionalism in terms of taking responsibility for the results of their calculations and recommendations.
9. Lifetime or self-directed learning skills including the ability to critically assess one's own performance in a constructive fashion.

CHNG 3805 **Product Formulation and Design**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** lectures (2 hours per week for 1 semester), tutorials (1 hour per week for 1 semester) and projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Mass and Energy Balances Conservation and Transport Phenomena Applied Mathematics (for Chemical Engineering) Process Design ConceptsProcess Control and Optimisation Concepts. **Prerequisites:** All 1 st and 2nd year units of study relating to the Chemical Engineering degree program. **Corequisites:** CHNG 3806 (Management of Industrial Systems) CHNG 3807 (Design Practice 2 - Products and Value Chains). **Assessment:** Competency based assessment; assessment weighting: Tutorials (20%) Quizzes (30%) Final examination and/or individual projects (30%) Group work and presentations (20%).
NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.

Aims and Objectives

Many products emerge from their processing not as a continuous stream, but as discrete entities. There are many examples of discrete systems in chemical engineering, such as particulate systems (eg powders, solid particles in fluids), as well as polymeric and biological systems (eg emulsions and cells, respectively). Indeed, on a larger scale, a batch processing system itself can be thought of as a series of discrete but connected entities. This course is an introduction to the basic concepts in discrete systems necessary for a chemical engineer to be able to formulate and design discrete products which have desired properties. In essence it is a course on product formulation and design.

This module will provide students with a working knowledge of the types of discrete systems available, the ways in which particulate systems can be characterized and their applications in industry. These aspects will form the foundation for an introduction of the modelling techniques used for discrete systems, such as population balances and batch scheduling.

Learning Outcomes

By the end of the course the students should be able to be proficient at:
1) Understanding the types of discrete systems available.
2) Demonstrating an understanding of the techniques used to characterise particulate systems.
3) Understanding the basic principles of particle-fluid systems
4) Applying these principles and solving simple problems involving slurries, fluidized bed reactors and particle-liquid separation systems.
5) Demonstrating the use of modelling techniques, such as population balances and batch scheduling.

CHNG 3806 **Management of Industrial Systems**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Lectures (1 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). Projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (in-

eluding vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL.Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative information. **Prerequisites:** All 1st and 2nd year units of study relating to the Chemical Engineering degree. **Corequisites:** CFfNG 3805 (Product Formulation and Design) CFfNG 3807 (Design Practice 2 - Products and Value Chains). **Assessment:** Competency based assessment; assessment weighting: Tutorials (10%) Quizzes (30%) Final examination and/or individual projects (30%) Group work and presentations (30%).
NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.
Aims and Objectives

To develop an appreciation of management practice in process-led and product-driven industries; considering project management, economic evaluation of processes, risk assessment and decision making with multiple objectives and uncertainty.

To develop the requisite tools to support above

To consider approaches to innovation and entrepreneurship

To consider all this in the context of different scales of operation - from single process, to business unit, to enterprise, and across supply and value chains.

To support this analysis through real-problem case studies and projects.
Learning Outcomes
By the end of this UoS a student should be competent in the following:
1) Developing project work plans in conjunction with project management schedules
2) Performing economic evaluations of projects, plans and processes
3) Performing quantitative and qualitative risk assessments of projects, plans and processes
4) Exploring optimisation of complex processes under risk and uncertainty, covering unit operations, business units, enterprises and value chains.

CHNG 3807 **Products and Value Chains**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Projects and self assisted learning (8 hours per week for 1 semester.). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problemsAbility to understand basic principles of physical chemistry, physics and mechanicsAbility to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL.Ability to read widely outside of the technical literature, and to synthesise arguments based on such literatureAbility to write coherent reports and essays based on qualitative and quantitative information. **Prerequisites:** All 1 st and 2nd year units of study relating to the Chemical Engineering degree. **Corequisites:** CHNG 3805 (Product Formulation and Design)CHNG 3806 (Management of Industrial Systems). **Assessment:** Projects (50%); Final examinations (50%).
NB: This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the fourth year.
Aims and Objectives

To recognise that chemical engineers are involved in the creation of products and processes, the manipulation of complex systems, and the management of technical operations.

To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged.

To consider this through three project-driven case studies covering a range of design scenarios, from the domain of particulate products, entrepreneurial ventures (business 'start ups'), and product value chains.

This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester.
Learning Outcomes
By the end of this UoS a student should be proficient in the following:
1) Developing a strategy for taking a product development idea from concept to commercial artefact, with a comprehensive appreciation of economic arguments, underlying uncertainties (and mitigation of these), and consideration of trade-offs inherent in this development - and demonstrating this in project mode.
2) Applying design and analysis tools for synthesis of particulate products leading to manufacture of a preferred product at pilot scale - and demonstrating this in project mode
3) Developing a strategy for design and analysis of extended business enterprises, with a focus on value chain optimisation - and demonstrating this in project mode.
These three projects address "issues of scale" of chemical engineering, from molecular to macro-systems levels, and are underpinned by a critical commitment to best practice in management.

CHNG 3808 **Polymer Engineering**

6 credit points. B E, UG Study Abroad Program. Dr Vincent Gomes,Department of Chemical Engineering, Room 452,9351 4868, vgomes@chem.eng.usyd.edu.au. **Session:** Semester 1. **Classes:** Lectures (2 hours per week for 1 semester), tutorials and laboratory sessions (2 hours per week for 1 semester). **Assumed Knowledge:** All core chemical engineering UoS in third year have been successfully completed or are currently being completed. **Prerequisites:** All 1st and 2nd year units of study relating to the Chemical Engineering degree. **Assessment:** Tutorials (10%)Quizzes (30%)Final examination and/or individual projects (35%)Group work and presentations (25%).
Polymers are ubiquitous and a significant number of scientists and engineers are employed by the Polymer Industry. This Unit of Study will facilitate engagement with a broad spectrum of engineering knowledge base that range from polymer synthesis to design of polymer products to developing sustainable technology in polymer synthesis and applications. The industrial applications range from biomedical to electronics and semiconductors to nanotechnology, in addition to usual consumer products. Technical knowledge relating to polymer chemistry, mathematics, fluid and solid mechanics, heat transfer, mass transfer and reaction engineering will be applied for the planned outcomes of this course.
The specific objectives are:
- To analyse molecular structures and their relations with material properties.
- To investigate the variety of thermal and thermo-mechanical properties relevant for probing polymer structure as well as understanding material behaviour in the context of applications.-
- To engage with rheological characterization of polymers to probe polymer structural as well as to understand material behaviour in the context of applications.
- To understand the principles of polymer synthesis and to design polymerization reactors for producing polymer resins.
- To understand the principles of polymer processing in order to design polymeric products for consumer and specialty applications.
- To critically analyze production of polymeric goods from the sustainability point of view.
- To engage with examples of cutting-edge engineering product and process designs and applications that encompass biomedical, nanotechnology, electronics and other emerging technologies.
At the completion of this Unit of Study students should have developed:

1. An appreciation of the underlying principles of polymer engineering.
2. The ability to apply these skills to new and novel situations.
3. The ability to critically analyse the methods of manufacture of different products and processes and to improve these processes.
4. The development of an integrated suite of problem-solving skills needed to successfully handle new engineering applications.
5. An ability to independently research and be critical of the findings.
6. An ability to analyze experimental data
7. An ability to carry out process and product design through critical thinking.
8. Interpersonal, group and teamwork skills including the ability to communicate clearly and concisely.
9. Professionalism in terms of taking responsibility for the results of their calculations and recommendations.
10. Lifetime or self-directed learning skills including the ability to critically assess one's own performance in a constructive manner.

CHNG 3041 **Exchange Program 3A**

24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. **Assessment:** Individual approved subjects at the host institution are assessed according to their standard procedures and a grade of "R" satisfied requirements is recorded on their academic transcript from this institution.
NB: Department permission required for enrolment.
Year 3 elective unit of study for the degree in Chemical Engineering.
Objectives/Outcomes
The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.
Upon completion of the full year-long exchange (ie both CHNG 3041 and 3042), students will have completed work at least equival-

ent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 units of study.

CHNG 3042 **Exchange Program 3B**
24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and the host institution. **Assessment:** Individual approved subjects at the host institution are assessed according to their standard procedures and a grade of "R" satisfied requirements is recorded on their academic transcript from this institution.
NB: Department permission required for enrolment.
Year 3 elective unit of study for the degree in Chemical Engineering.
Objectives/Outcomes
The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.
Upon completion of the full year-long exchange (ie both CHNG 3041 and 3042), students will have completed work at least equivalent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 units of study.

CHNG 4001 **Practical Experience**
0 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: There are no formal classes. Students are required to obtain a minimum of 10 weeks practical work experience before entering their 4th Year. **Prerequisites:** Advisory prerequisite: 28 credit points of 3rd year units. **Assessment:** By submission of a report of approximately 2500 words on the industrial experience undertaken. The report will cover the nature of the industry, the company's organisational relationships both internally and externally and a technical section devoted to the work performed by the student. The report is to be submitted before the end of the first week of the 4th academic year.
Fourth year core unit of study for the degree in Chemical Engineering.
Objectives/Outcomes
To obtain first-hand experience of the way chemical engineering skills are employed in an industrial context.
Syllabus Summary
Each student is required to work as an employee of an approved organisation and to submit a report on that work. The employment undertaken must be relevant to Chemical Engineering and should be discussed, before acceptance, with a member of the Department of Chemical Engineering. While the responsibility for obtaining satisfactory employment rests with the student, the Department, through the Chemical Engineering Foundation, and the Careers and Appointments Service will assist wherever possible.

CHNG 4006 **Professional Option**
2 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: There are no formal classes for this course. **Prerequisites:** advisory prerequisites: Passed at least 144 credit points. **Assessment:** See Syllabus description.
NB: Department permission required for enrolment. Student must be in the final semester of their degree program.
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 4203 **Major Industrial Project**
24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Prerequisites:** 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. **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 4801 Thesis A, 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: Case Studies in Process Design and Simulation
(in lieu of CHNG 4802 Chemical Engineering Design A)

CHNG 4041 **Exchange Program 4A**
24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all Year 1,2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. **Assessment:** Students spend either one academic year or semester at the host institution where they take a normal load. Their specific course choices are approved by the Heads of Department of the two institutions. Individual approved subjects at the host institution are assessed according to their standard procedures and a grade of "R" satisfied requirements will be recorded on their academic transcript from this institution.
NB: Department permission required for enrolment.
Year 4 elective unit of study for the degree in Chemical Engineering.
Objectives/Outcomes
The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.
Upon completion of the full year-long exchange (ie both CHNG 4041 and 4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree, including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

CHNG 4042 **Exchange Program 4B**
24 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Prerequisites:** Completion of all Year 1,2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of Department of Chemical Engineering at the University of Sydney and at the participating exchange institution. **Assessment:** Students spend either one academic year or semester at the host institution where they take a normal load. Their specific course choices are approved by the Heads of Department of the two institutions. Individual approved subjects at the host institution are assessed according to their standard procedures and a grade of "R" (satisfied requirements) is recorded on their academic transcript at this institution.
NB: Department permission required for enrolment.
Year 4 elective unit of study for the degree in Chemical Engineering.
Objectives/Outcomes
The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program.
Upon completion of the full year-long exchange (ie both CHNG 4041 and 4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree, including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

CHNG 4801 **Chemical Engineering Thesis A**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week. **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Prerequisites:** CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains. **Prohibitions:** CHNG4002 Thesis. **Assessment:** Research proposal document (20%)Progress Report (including literature review) (60%)Oral presentation (20%).
Aims and Objectives

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This UoS builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed.

The research activity is spread over two UoS (Chemical Engineering Thesis A and B) run in first and second semester. The primary aim in the first UoS is to obtain an understanding of how to define, plan and conduct a supervised piece of research work, and compile a detailed progress report.
The primary emphasis in the subsequent UoS is on the execution of a comprehensive and systemic series of investigations, and the reporting of the study in a major thesis document.
Learning Outcomes

By the end of this UoS a student should have acceptable competence in the following:
1) Ability to develop a plan for a series of studies, experimental or computational, to illuminate an area of research
2) Ability to evaluate alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation
3) Ability to search the literature for guidance of the studies and to place them in context
4) Ability to clearly present the background and results in a written format.

CHNG 4802 **Chemical Engineering Design A**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Lectures (2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Prerequisites:** CHNG3 801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and Design CHNG3806 Management of Industrial SystemsCHNG3 807 Design Practice 2 - Products and Value Chains. **Prohibitions:** CFING4201 Chemical Engineering Design 1. **Assessment:** Tutorials and quizzes (20%) Final examination and/or individual projects (30%) Group work and presentations (50%).
NB: This UoS is part of an integrated (two semester) fourth year program in chemical engineering design whose overarching aim is to complete the 'vertical integration of knowledge - one of the pillars on which this degree program is based. This unit of study will be offered for the 1st time in 2006.

Aims and Objectives

In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This UoS builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity.

This design activity is spread over two UoS (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first UoS is to consider the technical issues -with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in the subsequent UoS is on evaluating how non-technical considerations affect the final process design and its operation.
Learning Outcomes
By the end of this UoS a student should have acceptable competence in the following:
1) Ability to develop a wide range of alternative conceptual designs for a given product specification and market analysis.
2) Ability to evaluate process alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation.
3) Ability to use process flowsheeting software to compare alternative designs - including the potential benefits of both process modification (eg by heat integration) and process optimisation and factorial cost estimation.
4) Appreciation of the technical and financial trade-offs that exist in complex flowsheets.
5) Appreciation of the fact that technical considerations are only one component in an overall successful design project.
6)Theory of Hazard assessment and hazard operability studies.
6)
7) Environmental Impact Statement - process selection aspects
8) Ability to clearly present the results from both individual and group work in oral/written formats.

CHNG 4805 **Chemical Engineering Thesis B**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week. **Assumed Knowledge:** Enrolment in this unit of study assumes that Chemical Engineering Thesis A and all (six) core chemical engineering UoS in third year have been successfully completed. **Prerequisites:** CHNG 4801 Chemical Engineering Thesis A. **Assessment:** Progress Report (10%) Thesis (75%) Oral presentation (15%).
NB: This UoS is part of an integrated (two semester) fourth year program involving a chemical engineering research project and thesis. It has the overarching aim of completing the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. This unit of study will be offered for the first time in 2006.

Aims and Objectives

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This UoS builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed.

The research activity is spread over two UoS (Chemical Engineering Thesis A and B) run in first and second semester. The primary aim in the first UoS is to obtain an understanding of how to define, plan and conduct a supervised piece of research work, and compile a detailed progress report.
The primary emphasis in the subsequent UoS is on the execution of a comprehensive and systemic series of investigations, and the reporting of the study in a major thesis document and an oral presentation.
Learning Outcomes
By the end of this UoS a student should have acceptable competence in the following:
1) Ability to develop a plan for a series of studies, experimental or computational, to illuminate an area of research
2) Ability to evaluate alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation
3) Ability to search the literature for guidance of the studies and to place them in context
4) Ability to clearly present the background and results in a written format and in an oral presentation to a general engineering audience

CHNG 4806 **Chemical Engineering Design B**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: Lectures (Average 1-2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all core chemical engineering UoS in third-year have been successfully completed, as well as the related first semester UoS Chemical Engineering Design A. **Prerequisites:** CHNG4802 Chemical Engineering Design A Or CHNG4203 MIPPS. **Prohibitions:** CHNG4202 Chemical Engineering Design 2. **Assessment:** Group work contribution, Group Report and presentations (80%) Individual projects (20%).
NB: This UoS is part of an integrated (two semester) fourth year program in chemical engineering design whose overarching aim is to complete the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. This unit of study will commence in 2006.

Aims and Objectives

In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This UoS builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity.

This design activity is spread over two UoS (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first UoS is to consider the technical issues -with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in this UoS is on evaluating how non-technical considerations affect the final process design and its operation.
Learning Outcomes
By the end of this UoS a student should have acceptable competence in carrying out the following activities:
1) Ability to evaluate process alternatives at the specific level including improvement and optimisation
2) Application of Hhazard assessment and hazard operability studies.
3) Environmental impact assessment (including Site specific analysis).
4) Project financial analysis.
5) Detailed chemical engineering equipment design and costing by factorial estimating.
6) Impact of process control on flowsheet operation.
7) Overall economic assessment of alternatives.
8) Ability to clearly present the results from both individual and group work in oral/written formats.
9) Opportunity for Group Leaders to develop skills and for team members to develop skills in team assignments.

CHNG 5001 **Process Systems Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Lectures (1 hour per week for 1 semester), tutorials (2 hours per week for 1 semester). Projects and self assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Prerequisites:** CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains. **Assessment:** Tutorials and quizzes (20%)Individual projects (30%)Group work and presentations (50%).
NB: This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries.

Aims and Objectives

Whatever its purpose, any process requires some level of process monitoring and control to allow it to operate satisfactorily. Once a process is under control, the option exists to further improve performance via the implementation of some level of optimisation.

This UoS will develop skills in integrating process modelling, simulation, design, optimisation and control concepts.

The aims of this UoS are (i) to demonstrate that modelling, process control and optimisation are integral concepts in the overall consideration of industrial plants, (ii) to demonstrate that a unified approach allows a diversity of application fields to be readily handled, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

Learning Outcomes

By the end of this UoS a student should have acceptable competence in the following:

1. Process data management skills relevant to systems engineering (statistical analysis, data-based modelling and data reconciliation techniques).
2. Appreciation of the role of process systems engineering in modern manufacturing.
3. Modelling a process and designing an appropriate control system, as well as analysing its performance for a range of process applications using both traditional and software-based techniques.
4. Appreciation of the role of process optimisation in modern manufacturing.
5. Use of both traditional and software-based techniques to design optimisation schemes for a range of process applications. Analyse the performance of such schemes.
6. Appreciate the limitations that exist whenever mathematical models are used as the basis for process control and/or optimisation of a real system.
7. Appreciate the Vertical integration' that exists from process modelling, through process control, to process optimisation.

CHNG 5002 **Environmental Decision Making**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Lectures (1 hour per week for 1 semester), tutorials (2 hours per week for 1 semester). Projects and self-assisted learning (4 hours per week for 1 semester). **Assumed Knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems.Ability to understand basic principles of physical chemistry, physics and mechanics.Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel.Ability to read widely outside of the technical literature and to synthesise arguments based on such literature.Ability to write coherent reports and essays based on information from diverse sources. **Prerequisites:** CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3 803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3807 Design Practice 2 - Products and Value Chains. **Assessment:** Individual and group-based projects (60%)Individual and group-based presentations (20%)Tutorials and quizzes (20%).

NB: This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries.

Aims and Objectives

To acquaint students with issues in environmental decision making, including those with a wide range of consequences and stakeholders, and uncertainties in the information available to support the decisions. To familiarise students with approaches and tools available to support such complex decision making, including those for the identification of decision objectives and criteria for assessment, and for determining and critically assessing the preferred outcome(s) of the decision process.

Learning Outcomes

By the end of this UoS a student should be competent in the following:

1) Understand the range of issues involved when making complex decisions.
2) Identify and understand the various tools which are available to support a structured decision making process.

CHNG 5003 **Green Engineering**

6 credit points. B E, UG Study Abroad Program. Dr Andrew Harris Department of Chemical EngineeringRoom 450 9351 2926aharris@chem.eng.usyd.edu.au. **Session:** Semester 2. **Classes:** l x l hour lecture per week,2 x 1 hr self directed group learning sessions per week, andl x 3 hour laboratory session per week for 1 semester. **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Prerequisites:** CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and Design CHNG3806 Management of Industrial Systems CHNG3807 Design Practice 2 - Products and Value Chains. **Assessment:** Students will be assessed upon their performance in five case studies. Students will work in groups to solve real world engineering problems. They will document and report their findings using technical reports and oral presentation sessions.

Green engineering, eco-technology and sustainable technology are all interchangeable terms for the design of products and processes that maximise resource and energy efficiency, minimise (or preferably eliminate) waste and cause no harm to the environment. In modern society, engineers equipped with the skills to develop sustainable technologies are tremendously valuable. This course will examine cutting edge examples of sustainable technologies across a broad range of applications relevant to chemical engineering.

The specific objectives of the UoS are:

To provide examples of cutting-edge engineering design that embodies the principles of sustainable technology, green engineering and eco-design.
To critically analyse modern chemical engineering processes and improve them, from the ground up if necessary, so that they satisfy the criteria of eco-design.
At the completion of this Unit of Study students should have developed:

1. An appreciation of the underlying principles of green engineering.
2. The ability to apply these skills to new and novel situations.
3. The ability to critically analyse the methods of manufacture of different products and processes and to improve these processes consistent with the principles of green engineering.
4. The development of an integrated suite of problem-solving skills needed to successfully handle novel (and previously unseen) engineering situations.
5. An ability to independently research new areas and be critical of what is found.
6. An ability to cope with experimental data, change and uncertainty through critical thinking.
7. Interpersonal, group and teamwork skills including the ability to communicate clearly and concisely.
8. Professionalism in terms of taking responsibility for the results of their calculations and recommendations.
9. Lifetime or self-directed learning skills including the ability to critically assess one's own performance in a constructive fashion.

CHNG 5004 **Particle and Surfaces**

6 credit points. B E, UG Study Abroad Program. Dr. Marjorie ValixDr. Peter Linkson. **Session:** Semester 1. **Classes:** Lectures (2 hours per week for 1 semester), tutorials (2 hours per week for 1 semester), practicals (10 hours per semester). **Assumed Knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year and all unit operations have been successfully completed. **Prerequisites:** CHNG3801 Process Design CHNG3802 Operation, Analysis and Improvement of Industrial SystemsCHNG3803 Design Practice 1 - Chemical & Biological ProcessesCHNG3805 Product Formulation and DesignCHNG3806 Management of Industrial SystemsCHNG3 807 Design Practice 2 - Products and Value Chains. **Assessment:** Tutorials (10%)Quizzes (30%)Final examination and/or individual projects (30%)Group work and presentations (30%).

NB: This UoS is an advanced Chemical Engineering elective.

Aims and Objectives

Solid-solid and solid-liquid interactions are an important aspect in mineral processing. The aim of any mineral processing operation is the efficient extraction of the valuable metals or minerals (concentrate) from the waste materials in the ore (gangue). The goal of this course is to understand the various key steps and the corresponding principles required to achieve metal extraction from the ores. In achieving this, the course will include elucidation of the principles in size reduction or comminution of the ore in liberating the valuable minerals, and the examination of the microscopic details of solid-liquid, solid-gas and solid-solid interactions in mineral processing and their roles in macroscopic phenomena such as adhesion, wetting, adsorption, and mineral reactions such as reduction roasting and leaching. The general understanding of these factors will allow manipulation and improvement of performance in mineral beneficiation, dewatering of mineral slurries and extractive metallurgy

Learning Outcomes

By the end of this course the students should be able to be proficient at:

1. Characterisation of physical and surface chemical properties of solids and metal aqueous streams.
2. Devising strategies to achieve extraction process objectives, within the constraints imposed by social, economic and physical environments.
3. Developing management strategies for treating liquid and solid effluents.

4. Use of computer software packages in modeling aqueous and solid systems.
5. Working in groups
6. Verbal and written communications

Civil Engineering

CIVL 0011 **Civil Exchange A**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Departmental permission required, Students must have a WAM >65 and to have completed one full year of study, that is 48 credit points. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0012 **Civil Exchange B**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0013 **Civil Exchange C**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0014 **Civil Exchange D**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0015 **Civil Exchange E**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0016 **Civil Exchange F**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0017 **Civil Exchange G**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 0018 **Civil Exchange H**

6 credit points. B E. Assoc Prof Stuart Reid, Civil Engineering, PNR 336, 9351 2121, Fax 9351 3343, s.reid@civil.usyd.edu.au. **Session:** Semester 1, Semester 2. **Prerequisites:** Department permission required. **Assessment:** As set out by the exchange university. A Pass/Fail mark will be recorded for this subject. The mark obtained from the exchange university will be not be included in University of Sydney WAM calculations.
NB: Department permission required for enrolment. Student must have WAM > 65 and to have completed one full year of study that is 48 credit points.
Equivalent syllabus of Civil Engineering unit of study/studies. To be approved by relevant unit of study coordinators.

CIVL 2110 **Materials**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CHEM1001 Fundamentals of Chemistry 1A, ENGG1802 Engineering Mechanics. **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. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** lee: 39hrs, tut: 26hrs. **Assumed Knowledge:** ENGG1802 Engineering Mechanics. **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. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 26 hours lectures, 39 hours design and tutorials. **Assumed Knowledge:** ENGG1802 Engineering Mechanics, CIVL2110 Materials CIVL2201 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 &FNSponl998)
Timber Design Handbook, SAA HB108-1998

CIVL 2410 **Soil Mechanics**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 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.
Textbooks
(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 2511 **Instrumentation & Measurement**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assumed Knowledge:** CIVL2201 Structural Mechanics, ENGG1802 Engineering Mechanics.
Objectives The UoS aims to introduce students to the philosophy and principles of measurement, and its uses in Civil Engineering practice and research. The instrumentation used in practice, the underlying physical principles and the basic electrical/electronic and signal processing issues. It will introduce students to issues in the planning and construction of experiments. Give experience working in groups and in producing reports.
Learning Outcomes Students should gain an understanding of the importance of measurement, of the methods and application of measurement. Ability to conduct experiments and interpret measurements. The course will reinforce key concepts in Structural Mechanics, Fluid Mechanics, Soil Mechanics and Surveying.
Syllabus summary Principles of measurement, presentation of data, error analysis, stress and strain, sensor types and technologies wave based techniques and wave analysis, photographic techniques, signal processing, electric circuit basics, electronics basics

CIVL 2611 **Fluid Mechanics**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 26 hrs lectures, 42 hours laboratory & tutorial. **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. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: 39 hrs lectures, 42 hours fieldwork & tutorial. **Assumed Knowledge:** MATH1001, 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 3010 **Engineering and Society**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** ENGG1803 Professional Engineering.
UoS Aims and Objectives The UoS aims to introduce students to concepts of sustainability and ethics and show the role of civil engineers in these issues.The UoS will develop an appreciation for the impact of (civil) engineering decisions within the broader economic, environmental and socio-cultural context. The UoS will develop communication skills through participation in group discussions, oral presentations, and written report writing.
Learning Outcomes An understanding of the role civil engineers play in society, its historical development, and the responsibilities associated with that role. An understanding of current societal concerns with sustainability, and the role of civil engineers in developing a sustainable future. A greater social awareness and a strengthening of the students capabilities in ethical, moral and social reasoning.An improved ability to make decisions
Syllabus summary Role(s) of Civil Engineers, Historical development of profession, history of the sustainability concept; definitions ofsustainability; environment as an economic externality and polluterpayprinciple; environmental impacts of large-scale projects (e.g. dams,railways, etc.); levels of decision-making at which environmentalsustainability can be impacted (e.g., national planning, research anddevelopment, corporate action, municipal decision-making, project impactassessment); engineering social and political biases. Why ethics? Theories of ethical behavior - Deontology, utilitarianism, virtue ethics, Codes of ethics, Public Interest disclosures, People, Leadership & Integrity - Building an ethical climate

CIVL 3205 **Concrete Structures 1**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design.
Objectives: To provide a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis and design of reinforced concrete behaviour (including an understanding of capabilities and

limitations); to provide basic design training in a simulated professional engineering environment.
Expected Outcomes: Proficiency in basic methods of reinforced concrete analysis and design.
Syllabus summary: The behaviour of reinforced concrete members and structures, including: material properties, 'elastic' analysis (stresses/deformations/time-dependence), ultimate strengths of beams (flexure), ultimate strength of columns (short and slender), behaviour or reinforced concrete slabs. The reinforced concrete truss analogy (shear/torsion/and detailing implications). Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings.

CIVL 3206 **Steel Structures 1**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: Lectures: 39 hrs; tut/lab/drawing office: 39hrs, lab 6 hrs. **Assumed Knowledge:** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design. **Prohibitions:** CIVL3227. **Assessment:** Tutorial submissions, integrated design exercise, laboratory reports, mid-semester quiz, and end of semester examination.
Objectives: To provide a basic understanding of behaviour and design of steel members, connections and structures.
Outcomes: At the end of this course students should: be familiar with the behaviour of steel structures, in particular the various forms of buckling and failure, particularly those associated with tension, bending, shear, compression, combined actions and connections; have a working knowledge of AS 4100, and be competent in designing a simple structure to AS 4100
Syllabus summary: The behaviour of steel members and structures -properties of cross-sections, local buckling, elastic beams, plastic beams, tension members, compression members, effective lengths and elastic in-plane frame buckling, local and lateral buckling of beams, in-plane bending of beam columns, lateral buckling of beam-columns, biaxial bending of beam-columns, bolted and welded connections.
Textbooks
G. J. Hancock, M. J. Clarke and T. J. Wilkinson Steel Structures 1 lecture notes, Dept of Civil Engineering, The University of Sydney
Standards Australia Specification - current editions
AS 1170 Parts 1 and 2 Loading Code, and
AS 4100 Steel Structures; or
AS HB2.2 Structural Engineering Standards for Civil Engineering Students (preferred alternative to above standards).
(AISC) Economic Structural Steelwork
Steel sections product literature

Reference Books:
AISC Design Capacity Tables for Structural Steel.
Trahair and Bradford, Behaviour and Design of Steel Structures
Internet resources will also be given

CIVL 3235 **Structural Analysis**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assumed Knowledge:** CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design, MATH2061 Linear Mathematics and Vector Calculus. **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.

CIVL 3411 **Foundation Engineering**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 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 summary: 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
Textbooks
(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 3612 **Environmental and Fluids Engineering**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 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. B E, UG Study Abroad Program. **Session:** Semester 2. **Assumed Knowledge:** CIVL 2611 Fluid Mechanics CIVL3612 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 3805 **Project Scope, Time and Cost Management**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assessment:** Tests and assignments completed and submitted by students in stages. Details will be advised at the commencement of the course.
Senior core course for the Bachelor of Project Engineering & Management (Civil), fourth year elective for Civil Engineering degree, elective for all other branches of engineering and faculties.
Course objectives:
- To develop underpinning knowledge of scope, time and cost management as applied to projects
- To provide practical examples and opportunities to apply scope, time and cost management to projects
- To initiate process of reflective learning and evidence development for competencies in the areas of scope, time and cost management

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

Syllabus summary:
Scope management including project authorisation, scope definition, control and finalisation. Cost management including project costing, resource planning, budgeting and controlling financial completion. Time management including activity sequencing, duration estimating, scheduling, progress control, monitoring and forecasting.
Textbooks
Gray and Larson, Project Management - The Managerial Process (McGraw Hill, 2000)

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

CIVL 3812 **Project Appraisal**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hrs lecture/wk and 2 hr tutorial/wk. **Prohibitions:** CIVL 4803 Engineering Management. **Assessment:** a series of quizzes, participations, and the final exam.

This UoS is a third-year core unit for students enrolled in any of the undergraduate streams in the Department of Civil Engineering, University of Sydney. The aim of this UoS is to develop students' ability to critically analyse issues involved in project appraisal and to equip students with the concepts, tools and analytical processes to effectively carry out project appraisal tasks for businesses, non-profit organisations, and governments.

By the end of this UoS, students should be able to:

1. Comprehend and relate to real-life examples the fundamental concepts in project appraisal (e.g. the meaning of time value for money, equivalence).
2. Calculate common financial indicators for a given project and explain the relevance of each to the appraisal of the project.
3. Rank projects by combining both financial and non-financial indicators (e.g. environmental and social).
4. Understand how risks and uncertainties affect evaluation outcomes and be able to deal with uncertainties and risks in analysis.
5. Apply techniques to account for the effects of inflation/deflation and exchange rates in analysis.
6. Understand the concept and mechanisms for depreciation and carry out pre-tax as well as post-tax analysis.
7. Understand the assumptions, pros and cons of each evaluation method and be able to explain why a particular method is appropriate/not appropriate for a given project.

Syllabus summary: Time value of money, cost of capital, simple/compound interest, nominal/effective interest, cost/benefit analysis of projects; equivalence, net present worth (value), future worth (value), annual worth (value), internal rate of return, external rate of return, payback period, cost-benefit analysis, cost-utility analysis, identifying and quantifying non-financial benefits/externalities, price changes and exchange rates, techniques for multi-criteria group decision-making, economic analysis of business investment projects, depreciation, capitalisation and valuation studies, replacement of assets, real option, project risk analysis, decision-tree analysis, binomial method.

Textbooks

W. G. Sullivan, E. M. Wicks and J. T. Luxhoj (2006) Engineering Economy. 13th ed, Pearson Education.

CIVL 3813 **Contracts Formulation and Management**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 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^y-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 4008 **Practical Experience**

0 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 12wks practical work experience (375hrs minimum). **Prerequisites:** 30 credit points of third year 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.

Textbooks

Reference bookEagleson Writing in Plain English (Aust. Govt Publishing Service)

CIVL 4020 **Thesis 1**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Classes:** One introductory lecture by the course coordinator to explain the purpose of this unit of study, the methodology to be adopted and the expected outcomes.Essential for experimental thesis topics. **Prerequisites:** 30 credit points of third year units of study.

NB: Department permission required for enrolment.

UoS Aims and Objectives This unit of study provides an opportunity for students to conduct an original investigation or research or major project work in a discipline relevant to civil engineering. Students will gain skills in design, analysis and management by undertaking a research project.This particular unit of study, which must precede or be conducted concurrently with Thesis - Part 2, should cover approximately half the work required for successful completion of a complete "final year" thesis project. In particular, it should include almost all planning of a research or investigation project, a major proportion of the necessary literature review (unless the entire project is based on a literature review and critical analysis), and a significant proportion of the experimental or analytical work required of the project.

Learning Outcomes Students should develop the ability to plan an original study, to conduct a critical review of existing literature relevant to the topic and to prepare a progress report describing these activities.

Syllabus summary Independent inquiry and research. The particular engineering concepts depend on the sub -discipline in which the thesis project is conducted.

CIVL 4021 **Thesis 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Classes:** One introductory lecture by the course coordinator to explain the purpose of this unit of study, the methodology to be adopted and the expected outcomes.Essential for experimental thesis topics. **Prerequisites:** 30 credit points of third year units of study and successful completion of Thesis - Part 1.

UoS Aims and Objectives This unit of study provides an opportunity for students to conduct an original investigation or research or major project work in a discipline relevant to civil engineering. Students will gain skills in design, analysis and management by undertaking a research project.This particular unit of study, which must be preceded by or be conducted concurrently with Thesis - Part 1, should cover approximately half the work required for successful completion of a complete "final year" thesis project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in Thesis - Part 1.

Learning OutcomesStudents should develop the ability to plan an original study, to conduct a critical review of existing literature relevant to the topic and to prepare a progress report describing these activities.

Independent inquiry and research. The particular engineering concepts depend on the sub -discipline in which the thesis project is conducted.

CIVL 4240 **Concrete Structures 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assumed Knowledge:** ENGG1802 Engineering Mechanics; CIVL2201 Structural Mechanics; CIVL3235 Structural Analysis. **Prerequisites:** CIVL3205 Concrete Structures 1.

UoS Aims and Objectives Aim: to develop a deep understanding of the fundamental behaviour and design of reinforced and prestressed concrete and concrete-steel composite members and structures. Attributes: Students will develop sufficient understanding of fundamental concepts and acquire sufficient knowledge and skills to assess strain-softening effects in concrete structures, the effects of prestressing and the effects of interaction of composite materials.

Learning Outcomes Students will develop sufficient understanding of fundamental concepts and acquire sufficient knowledge and skills

to assess strain-softening effects in concrete structures, the effects of prestressing and the effects of interaction of composite materials. Students will be able to apply the relevant design requirements, in accordance with Australian design standards
Syllabus summary Reinforced concrete: strain-softening effects; moment redistribution; ultimate plastic strength of concrete slabs (yield-line analysis and strip equilibrium analysis); effects of concrete creep and shrinkage. Prestressed concrete: serviceability and strength of prestressed concrete beams in flexure and shear; anchorage zones; prestress losses; load-balancing. Composite structures: analysis and design of composite beams in flexure and shear; analysis and design of composite slabs incorporating profiled steel sheeting; analysis and design of composite columns.

CIVL 4241 **Steel Structures 2**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hours of lectures per week.2 hours of tutorials per week where students work on practical problems and assignments.2 computer laboratory sessions per semester. **Assumed Knowledge:** CIVL2201 Structural Mechanics, CIVL3235 Structural Analysis, CIVL3206 Steel Structures 1.
UoS Aims and Objectives The primary objectives are: to provide fundamental understanding at advanced level of behaviour and design steel members and connections, to provide fundamental understanding of methods for determining buckling loads of structural members and elements, and to reinforce and complement the content of related units of study. Emphasis will be placed on understanding structural behaviour and solving problems rather than remembering formulae.
Learning Outcomes It is anticipated that at the end of this unit of study students should: Be familiar with the behaviour of steel structures at advanced level in selected areas, including connection design, design for local buckling and design for flexural-torsional buckling of columns and beams. Have a sound knowledge of AS 4100 in the areas of connection design, section capacity determination of slender cross-sections, and flexural-torsional buckling of beams. Have a sound knowledge of AS/NZS 4600 in the areas of section capacity determination of slender cross-sections, and flexural-torsional buckling of columns and beams. Have knowledge of the use of software in the design of connections and slender cross-sections. The unit of study seeks to utilise and improve the following generic skills of students: problem solving, neat and logical setting out of solutions, and interpretation and understanding of technical drawings and specifications.
Syllabus summary Local buckling behaviour and design Stability behaviour and design including flexural-torsional buckling behaviour Advanced connections - behaviour, analysis and design

CIVL 4242 **Bridge Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CIVL3206 Steel Structures 1 CIVL3205 Concrete Structures 1.
UoS Aims and Objectives To develop an understanding of the key issues in the design, construction and maintenance of bridges of all types. It is expected that students will be able to appreciate the broad range of considerations that impinge on these key issues, such as the choice of structure type, all types of loading, provision for structure movements of all types, choice of structural materials, use of appropriate techniques for construction etc.
Learning Outcomes Students will recognise the relevance to bridge engineering of all previous studies in structural, construction and materials engineering. They will be able to examine the drawings of a bridge and understand the reasons for the decisions that the designers have made. They will be ready, themselves, to step confidently into the role of designer, materials supplier or constructor.
Syllabus summary The object here is to contextualise in the field of bridge engineering all previous study.Highway and railway bridge loading; influence lines; structure 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.

CIVL 4412 **Geo technical Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CIVL2410 Soil Mechanics; CIVL3411 Foundation Engineering.
UoS Aims and Objectives The UoS aims to teach students practical design skills through problem based learning. Students are asked to design foundations using real data for foundation problems. It also develops communication skills through the writing of engineering reports.
Learning 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 laboratory and field data to design simple foundations, and develop an appreciation of the interaction between soils, the foundation system and the supported structure.
Syllabus summary Field testing; site characterisation; interpretation of field data; design of pile, raft and surface footings; Geotechnical report writing.

CIVL 4413 **Environmental Geotechnics**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assumed Knowledge:** CIVL2410 Soil Mechanics, CIVL3411 Foundation Engineering.
UoS Aims and Objectives This course provides an introduction to Geo-environmental Engineering. It gives an introduction to geotechnical and related problems concerned with the disposal of wastes in landfills and mine tailings impoundments, and to the analytical and numerical techniques available to solve these problems.
Learning Outcomes Describe and evaluate the different strategies available for landfill management and waste containment Understand the processes controlling contaminant migration Calculate rates of contaminant migration through the ground using analytical and numerical methods Design effective barriers for waste containment on flat and sloping ground Select appropriate geomembrane and geotextile materials for use in engineered barriers Understand issues related to tailing dams, and carry out basic design work
Syllabus summary Landfills, waste quantities and composition Waste management
Processes occurring in waste, leachate Leachate control Site selection Processes controlling pollutant migration through soil Advection, diffusion, dispersion, sorption Mathematical description of pollutant migration Analytical solutions for pollutant migration Numerical solutions for pollutant migration
Technologies for remediation of contaminated ground Engineered clay liners, barriers and covers Clay mineralogy and properties Compaction-permeability relations Barrier systems Stability of liners and slopes Geosynthetics in waste containment Geomembranes Geofilters Composite barrier systemsTailings disposal Properties of hazardous wastes, dispersive soils. Disposal techniques, embankment design, filters, seepage barriersOperational control and rehabilitation

CIVL 4414 **Finite Element Analysis**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Prerequisites:** ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics.
This elective unit of study provides an opportunity for students to develop an understanding of finite element analysis and how to apply this to the solution of civil engineering problems.
Students should acquire 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 software packages.
Introduction to finite element theory, analysis of bars, beams and columns, and assemblages of these structural elements. Analysis of elastic continua. Problems of plane strain, plane stress and axial symmetry. Use, testing and validation of finite element software packages.

CIVL 4614 **Hydrology and Wind Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CIVL 2611 Fluid Mechanics; CIVL 3612 Fluids and Environmental Engineering; CIVL 2230 Introduction to Structural Concepts and Design; CIVL3235 Structural Analysis.
UoS Aims and Objectives To develop further understanding of the hydrological process: watershed characteristics, flood routing, and stormwater management.To provide an understanding of the structure of the wind and the wind loading on structures.
Learning Outcomes Assess surface runoff and infiltration in catchments to calculate peak flows; determine runoff hydrographs for various storm durations and intensities; state the principles of flood routing and perform flood routing calculations;; list and utilise design procedures for storage and service reservoirs; calculate reservoir safe yield; determine evaporation from reservoirs and evapo-transpiration from catchments.Explain theory of vibration, understand the structure of the wind and its importance for the design of dynamically sensitive structures; perform calculations using the current Australian wind loading standard; familiarization with wind tunnel testing techniques and simple analysis; design of dampers
Syllabus Basic meteorology; infiltration and groundwater; evaporation and transpiration; surface runoff; synthetic hydrographs; flood routing; reservoir design; theory of vibration; structure of the wind; wind induced vibration of tall buildings and structures; Australian

wind loading standard; wind tunnel testing techniques; acceleration criteria for human comfort; damping of structures

CIVL 4615 **Water Resources Engineering**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Assumed Knowledge:** CIVL 2611 Fluid Mechanics, CIVL 3612 Fluids and Environmental Engineering.
UoS Aims and Objectives This UoS aims to teach students the fundamentals of water storage, treatment and distribution for a variety of applications including domestic, industrial, and agricultural.
Learning 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 wastewater reuse techniques and their applications; describe various irrigation methods and associated hydraulic design; discuss recycled water storage options and applications.
Syllabus summary Water quality for various purposeswater and wastewater treatment techniquesmulti-node water distribution networks principles of water supply for high-rise buildings water conservation methods and management principles for water usewastewater reuse techniques and their applications irrigation methods and associated hydraulic designsmall scale hydro-power installation design.

CIVL 4810 **Project Quality Risk and Procurement Mgt**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. **Assessment:** based on both coursework and tests, including a final examination, details of which will be advised at the commencement of the unit.
Fourth year core unit of study for the Bachelor of Project Engineering & Management (Civil), elective for all other branches of engineering and other faculties.
Course objectives: To provide underpinning knowledge and application skills in the project environment for:
- quality management
- risk management
- procurement management

Expected outcomes: Participants will be able to design and implement plans for quality, risk and procurement management on a range of simple generic projects and provide input to these plans for more complex projects. They will also be able to apply reflective learning to production of evidence towards satisfaction of competencies for recommission as project managers.
Syllabus summary: Introduction to Modern Quality Management Principles, seven quality tools, quality assurance, preparation of quality plans. Introduction to risk analysis, planning and risk management through the project life cycle. Introduction to principles of procurement management. Purchasing, contracts, partnerships and alliancing. Setting up procurement plans, administration and closure of contracts for project delivery.
Textbooks
Gray and Larson, Project Management - The Managerial Process (McGraw Hill, 2000). Turner, Handbook of Project-based Management (McGraw-Hill)Reference books; PMI A Guide to the Project Management Body of Knowledge (www.pmi.org).

CIVL 4811 **Engineering Design and Construction**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Lectures/ Seminars/PresentationsSubject matter is presented in up to 4 hours of lectures/presentations per week. Presentations are based on actual past and present project experience of the presenter(s). Presentations on specific projects may be given by visiting professionals. Tutorials/Workshops Approximately 2 hours of contact time per week may be used as tutorial time for design workshops. E-learning The course website facility will be used for limited communication with students but the emphasis is strongly oriented towards learning and discussion in class. **Assumed Knowledge:** CIVL2810 Engineering Construction and Survey. **Prohibitions:** CIVL3802 Engineering Construction 2.
UoS Aims and Objectives To develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities
Learning Outcomes At the end of this course, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.
Syllabus summary The construction topics covered in this course have not been previously addressed in CIV2810 (Engineering Construction and Survey). The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are; Hard rock tunnelling and general hard rock underground excavation Soft ground tunnelling Underground construction Micro tunnelling Cut and cover (cover and cut) tunnelling Earth retaining systems Piling- Formwork and Falsework, (incl Tilt up, Ultrafloor, Sacrificial form) Dewatering Pavement Construction - Rigid and Flexible (incl and pavement construction materials) Marine construction Civil construction in Environmentally sensitive areas Contract administration for construction engineers General engineering in remote localities (project based) Construction methods in Bridge Engineering QA documentation on a typical project Insurance in the Construction Industry Occupational Health and Safety issues in the construction industry

CIVL 4814 **Project Planning and Tendering**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: Lectures, tutorials and consultations to work through a set of assignments on a real life case project in order to develop complete pre-tender documents in a progressive approach. The final deliverable is to present the analysis, winning strategies and results in groups to a board comprised of academics and industry professionals. **Assumed Knowledge:** CIVL2810 Engineering Construction and Surveying, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal.
The UoS is a fourth year core unit of study for the Bachelor of Project Engineering and Management (Civil), elective for all other branches of engineering and other faculties.
UoS Aims and 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.

CIVL 4815 **Project Formulation**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hrs lecture/wk and a team project. **Assumed Knowledge:** MATH2061, CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal. **Assessment:** a series of team assignments and presentations moderated by peer evaluations.
This UoS is a fourth-year core unit for PEM students and a final year elective for other streams in the Department of Civil Engineering, University of Sydney. Knowledge of project appraisal (CIVL3812) or finance will be advantageous for undertaking the UoS. The aim of this UoS is to develop students' ability to develop project proposals through carrying out a feasibility study and developing a project plan for a real-life engineering project. This course is relevant for students who intend to pursue a career related to project management.
By the end of this UoS, students should have developed understanding of the fundamentals of project conceptualisation, appraisal and planning plus the abilities to: model and analyse basic financing and cash flow requirements, risk and management plan, marketing and sales plan, and design of professional documentation and presentation to a board of review.
In addition, this UoS also develops students' abilities in problem solving, working with other students, conducting independent re-

search, communication in team environment, information need identification and collection, and understanding social and environmental issues.

CIVL 4903 **Civil Engineering Design**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 13hrs lee & 39hrs of drawing office work. **Assumed Knowledge:** CIVL3205 Concrete Structures 1 and CIVL3206 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.
Textbooks
Reference booksThe 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, particularlyAS4100 - Steel Structures CodeAS3600 - Concrete Structures CodeAS1554 - Manual Welding, Part IAS 1170 - Loading Code, Parts I and IIAS1511 - High Strength Structural Bolting CodeMAI Steel StructuresAustroads Bridge Design SpecificationAS 1720 - Timber Engineering Code(Purchase of separate codes is recommended)

Electrical Engineering

EBUS 3003 **e-Business System Design**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and a 2 hour tutorial per week. **Assumed Knowledge:** SOFT 1002 Software Development 2 and (ISYS 1003 Foundations of Information Technology or ELEC1601 Professional Computer Engineering or ELEC1101 Foundations of Computer Systems). **Prohibitions:** EBUS3001 Introduction to E-Commerce Systems.. **Assessment:** Online Activities and Project Document (Hardcopy): 30%, Website Prototype: 10%, Final Exam: 60%.
This unit of study aims to examine the main issues involved in designing successful Internet services. The unit is designed around the idea that electronic commerce systems are new communication channels between entities. E-commerce systems are then classified from the communication perspective, depending on what kind of entities they communicate, thereby defining the main user requirements. The unit examines basic concepts that an e-commerce project manager should be aware of, including
- Successful Internet projects come out of good methodological practices.
- User needs, technological challenges and business goals.
- Innovation and the value of ideas in a knowledge based economy.

Specific topics covered include
- Electronic Commerce Technology Fundamentals.
- Business to Consumer Electronic Commerce.
- Business to Business Electronic Commerce.
- Business to Employee Electronic Commerce.

EBUS 3004 **e-Business Programming**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour lab per week. **Assumed Knowledge:** EBUS3001 Introduction to E-Commerce Systems or EBUS3003 E-Business System Design. **Prohibitions:** EBUS3002 E-Commerce Website Programming.. **Assessment:** Lab 20%, project 20%, end of semester exam 60%.
This unit provides the technical skills to implement dynamic database-driven web sites. It covers an introduction to Linux and web-based systems, client side programming, mark-up languages, scripting and tools, server-side scripting, scripting languages such as Perl or PHP, website database programming with SQL, Web security, integration and data warehousing, designing and building a database-driven website, introduction to human factors and design for usability.

EBUS 5003 e-**Commerce Systems**
6 credit points. BE, UG Study Abroad Program. **Session:** Semester 2. Classes: 1 hours of lectures and a 3 hour tutorial per week. **Assumed Knowledge:** EBUS4001 E-Business Engineering or EBUS5001 E-Commerce Application Programming. **Prohibitions:** EBUS5002 E-Commerce Systems.. **Assessment:** Tutorial work 10%, assignments 40%, end of semester exam 50%.
Large Internet systems are built using application frameworks. They allow great reuse so developers do not have to design and implement applications from scratch, as students have done in EBUS3004 and EBUS4001. The unit lays down the basic concepts and hands on experience on the design and development of enterprise systems, emphasizing the development of systems using design patterns and application frameworks.

A project-based approach will introduce the problems often found when building such systems, and will require students to take control of their learning. The OpenACS application framework is used. It uses the postgresql database used in previous EBUS units and the TCL programming language, similar to the ones also learned in those units.

ELEC 1103 **Professional Electronic Engineering**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and an average of 1 hour lab, 1 hour tutorial per week. **Assumed Knowledge:** HSC Physics, HSC Mathematics extension 1. **Prohibitions:** ELEC1102 Foundations of Electronic Circuits.. **Assessment:** Tutorial participation 6%, laboratory performance and notebook 6%, laboratory exam 10%, assignment 3%, end of semester closed book exam 75%.
This unit of study aims to develop knowledge of the fundamental concepts and building blocks of electrical and electronics circuits. The following specific topics are covered. Basic electrical and electronic circuit concepts. Circuits, circuit elements, circuit laws, node and mesh analysis, circuit theorems, energy storage, capacitors and inductors, circuits with switches, transient response, sine waves and complex analysis, phasors, impedance, ac power.

The unit also aims to develop basic research skills and understanding of engineering principles; information literacy; personal and intellectual autonomy; ethical, social and professional understanding; communication, project management and teamwork skills. Safety issues will also be considered.

ELEC 1601 **Professional Computer Engineering**
6 credit points. B E, B S T, UG Study Abroad Program, UG Summer/Winter School. **Session:** Summer, Semester 1. Classes: 2 hours of lectures, a 2 hour tutorial and a 2 hour lab per week. **Assumed Knowledge:** HSC Mathematics extension 1. **Prohibitions:** NETS2008 Computer System Organisation, NETS2908 Computer System Organisation (Adv), COMP2001 Computer Systems, COMP2901 Computer Systems (Adv).. **Assessment:** Laboratory performance and laboratory exam 20%, tutorial attendance, performance and report 5%, end of semester examination (closed book) 75%.
This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

The unit covers the fundamental digital concepts upon which the design and operation of modern digital computers are based. Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC 2004 **Electrical Engineering: Foundations**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and an average of 1 hour of tutorial and 1 hour of lab per week. **Prerequisites:** 36 credit points. **Prohibitions:** ELEC 1001 Introductory Electrical Engineering, ELEC1101 Foundations of Computer Systems, ELEC 1102 Foundations of Electronic Circuits, ELEC2001 Electrical and Electronic Engineering, ELEC2003 Electrical and Electronic Engineering A, ELEC1103 Professional Electronic Engineering, ELEC 1601 Professional Computer Engineering.. **Assessment:** Tutorials and quizzes 10%, lab performance and notebook 10%, assignment 5%, closed book exam 75%.
This unit of study assumes a degree of basic research skills and ability to grasp engineering principles; information literacy; personal and intellectual autonomy; communication skills.

The following topics are covered. Introduction to circuits: current and voltage, power, Kirchhoff s Laws, sources and resistors, Ohm's Law, series and parallel connections, voltage divider, equivalent circuits. Inductors and capacitors: capacitance, inductance, inductors in series/parallel, RC circuits, RL circuits, transient and steady state, introduction to RLC circuits. Power transmission: sinusoidal signals, phasors, power in ac circuits, balanced 3-phase circuits. Transformers: characteristics of ideal transformers, introduction to magnetisation and non-ideal behaviour. Electromechanical energy conversion: machine types, DC machines, field connections, introduction

to ac and induction machines. Operational amplifiers: ideal op amp, inverting amplifier, noninverting amplifier, design and gain-bandwidth product, simple filters. Logic circuits: basic concepts, number representations, combinatorial logic circuits, sequential logic circuits, introduction to CMOS digital circuits. Introduction to microprocessors: organization, memory, process control, instruction sets, addressing and interfacing.

ELEC 2103 **Simulation & Numerical Solutions in Eng.**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: A 1 hour lecture, 3 hours of computer lab per week. **Assumed Knowledge:** 36 credit points including ELEC1102 Foundations of Electronic Engineering or ELEC1103 Professional Electronic Engineering. **Prohibitions:** ELEC2102 Engineering Computing, COSC1001 Computational Science inMatlab, COSC1901 Computational Science in Matlab (Advanced).. **Assessment:** Mid-semester test 12%, lab performance and notebook 8%, assignment 8%, end of semester closed book exam 72%.

This unit assumes an understanding of the fundamental concepts and building blocks of electrical and electronics circuits. As well as covering the specific topics described in the following paragraphs, it aims to develop skills in professional project management and teamwork and promote an understanding of ethics.

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. Investigation of the steady state and transient behaviour of LCR circuits.

Matlab based numerical solutions applicable to numerical optimization, ordinary differential equations, and data fitting. 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 2104 **Electronic Devices and Basic Circuits**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures per week, and a 2 hour tutorial and 2 hour lab per fortnight. **Assumed Knowledge:** ELEC1102 Foundations of Electronic Circuits or ELEC 1103 Professional Electronic Engineering. **Prohibitions:** ELEC2401 Introductory Electronics.. **Assessment:** Laboratory work 15%, on-line exercises 5%, mid-semester quiz 10%, end of semester exam 70%.

The purpose of this unit of study is to provide a working knowledge of fundamental principles of electrical engineering by cultivating the prime attributes like research inquiry and information literacy. The topics covered include circuit theory, magnetic circuits and basic electronics. A background in intoductory circuit theory is assumed. Completion of this unit is essential to specialise in Electrical, Telecommunication or Computer Engineering.

The following specific topics are covered. Circuit principles: circuit laws, network theorems. Steady-state ac circuits: power calculations, phasor diagrams, three-phase circuits. Magnetic fields and circuits: magnetic fields and circuits. Transformers: ac excitation, transformer operation, circuit models,performance. Semiconductor diodes: junction diodes, special purpose diodes. Transistors: field effect and bipolar transistors. Large signal amplifiers: practical amplifiers, biasing circuits. Operational amplifiers: circuit applications.

ELEC 2602 **Digital System Design**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 1 hour of lectures per week and 9 three hour labs. **Assumed Knowledge:** ELEC1101 Foundations of Computer Systems or ELEC 1601 Professional Computer Engineering. **Prohibitions:** ELEC3601 Digital Systems Design, ELEC3608 Digital Systems Design.. **Assessment:** Laboratory 10%, a 2 hour end of semester exam 90%.

This unit of study assumes some knowledge of digital data representation, basic computer organisation, the CPU, elementary gates and logic, and peripheral devices.

The following topics are covered. Logic operations, theorems and Boolean algebra, Number operations (binary, hex, integers and fp), combinational logic analysis and synthesis, sequential logic, registers, counters, bus systems, state machines, CAD tools for logic design, design languages such as VHDL or Verilog, design of a simple computer.

ELEC 3104 **Engineering Electromagnetics**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and a 2 hours tutorial per week. **Assumed Knowledge:** PHYS2213 Physics 2EE (or PHYS2203 Physics 2EE) and MATH2061 Linear Algebra and Vector Calculus (or MATH2001 Vector Calculus and Complex Variables) and ELEC1103 Professional Electronic Engineering (or ELEC 1102 Foundations of Electronic Circuits). **Prohibitions:** ELEC3102 Engineering Electromagnetics.. **Assessment:** Tutorials 10%, mid semester quiz 20%, end of semester exam 70%.

This unit builds upon the knowledge of differential calculus, integral calculus, vector integral calculus (line integrals and surface integrals); electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. It introduces students to the broad spectrum of engineering electromagnetics and helps students to develop theoretical and analytical skills in the area of electrical and telecommunications engineering and develop understanding of the basic electromagnetic theory underpinning optical communications, wireless communications and electrical engineering.

Topic areas include: static electric fields; static magnetic fields; time-varying fields and Maxwell's equations; plane electromagnetic waves; transmission lines; antennas and arrays.

ELEC 3105 **Circuit Theory and Design**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: Two hours of lectures and a two hour laboratory/tutorial per week. **Assumed Knowledge:** (ELEC2101 Circuit Analysis or ELEC2104 Electronic Devices and Basic Circuits) and (ELEC2301 Signals and Systems or ELEC2302 Signals and Systems). **Prohibitions:** ELEC3101 Circuit Theory and Design.. **Assessment:** Assignments 3 0%, a 2 hour exam at end of semester 70%.

This unit of study assumes a basic knowledge of elementary circuit theory and operational amplifiers provided by earlier units. One aim of the unit is to enhance understanding of key aspects of the theory of electric circuits. The main goal, however, is to equip students with the specialist knowledge to design active analog filters, to have an understanding of passive network design and to be in a good position to undertake further self study as required.

The specific topics covered include the following. Fundamental concepts in circuit theory: network functions, characteristic frequencies. Types of filter: lowpass, bandpass, etc. Review of operational amplifiers. Design of first and second order filters using operational amplifiers. Cascade design. Filter characteristics: Butterworth, Chebyshev Frequency transformations in design. Sensitivity. Design of passive LC ladder filters. A brief introduction to switched capacitor filters.

Matlab and a Spice simulator will be used extensively.

ELEC 3203 **Power Engineering**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** ELEC2101 Circuit Analysis or ELEC2104 Electronics and Basic Circuits. **Prohibitions:** ELEC3201 Electrical Energy Systems.. **Assessment:** Tutorial and laboratory work 20%, mid semester quiz 10%, and a 2 hour end of semester examination 70%.

This unit of study provides an introduction to electrical power engineering and lays the groundwork for more specialised units. It assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in elements of introductory physics.

A sustained revision of the use of phasors in steady state ac circuit analysis will be made and will be extended to power factor, active and reactive powers.

Topics covered include the following. An overview of a modern power system. Types of energy sources, conventional and alternative renewable/non-renewable energy sources. The nature of loads. Transmission and distribution. Plant operation limitations. Energy management and markets. System reliability and operation problems. The role of power engineers. Professional and ethical problems in the power industry.

Detailed study will be carried out of the following. The use of three phase systems and their analysis under balanced conditions. Transmission lines: calculation of parameters, modelling, analysis. Transformers: construction, equivalent circuits. Generators: construction, modelling for steady state operation. The use of per unit systems. The analysis of systems with a number of voltage levels. The control of active and reactive power. An introduction to the load flow problem.

ELEC 3204 **Power Electronics and Drives**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures per week, and a 2 hour tutorial and 3 hour lab per fortnight. **Assumed Knowledge:** ELEC2401 Introductory Electronics or ELEC2104 Electronic devices and basic circuits or ELEC2001 Electrical and Electronic Engineering or ELEC2003 Electrical and Electronic Engineering A. **Prohibitions:** ELEC3202 Power Electronics and Drives.. **Assessment:** Laboratory work 15%, on-line exercises 5%, mid-semester quiz 10%, end of semester exam 70 %.

This unit of study is concerned with the operating principles of DC machines and DC power control techniques with particular reference to DC machine drives. A background in basic electrical and magnetic circuit theory is assumed. Completion of this unit will facilitate progression to advanced study or work in electrical power engineering.

The following topics are covered. Electrical characteristics of separately excited, series, shunt and compound generators. Voltage control of generators. Electrical characteristics of separately excited, series, shunt and compound motors. Starting and speed control of DC motors. Static switches, diode rectifiers, AC-DC converters, displacement power factor; DC-DC switching converters. Buck, Boost and Buck-boost converters, flyback converters, push pull converters. First quadrant, two quadrant and four quadrant drives; DC traction; brushless DC drives.

ELEC 3304 **Control**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. **Prohibitions:** ELEC3302 Fundamentals of Feedback Control, MECH3800 Systems Control, AMME3 500 System Dynamics and Control, CFING3302 Process Control. **Assessment:** Tutorial and laboratory work 30%, end of semester examination 70%.

This unit is concerned with the application of feedback control to continuous-time, linear time-invariant systems. The emphasis is on fundamental theory rather than applications. Some background in linear systems theory and the Laplace transform is assumed. The prime aim of this unit of study is to develop a sound understanding of basics and a capacity for research and inquiry. Completion of the unit will facilitate progression to advanced study in the area and to work in industrial control.

The following topics are covered. History of control. Modelling of physical processes; state variables and differential equations. Dynamic response; review of Laplace transform, transfer functions and block diagrams, poles and zeroes. 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; the Nyquist stability criterion; gain and phase margins; compensator design in the frequency domain. An introduction to state space design for single input single-output systems; eigenvalues, zeroes and transfer functions; state variable feedback and design of estimators.

ELEC 3305 **Digital Signal Processing**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: 2hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** ELEC2301 Signals & Systems or ELEC 2302 Signals & Systems. **Prohibitions:** ELEC 3303 Digital Signal Processing.. **Assessment:** Quizzes & Lab 10%, assignment 10%, midterm exam 25%o, end of semester exam 55%o.

This unit aims to teach how signals are processed by computers. It describes the key concepts of digital signal processing, including details of various transforms and filter design. Students are expected to implement and test some of these ideas on a digital signal processor (DSP). Completion of the unit will facilitate progression to advanced study in the area and to work in the industrial use of DSP. This unit assumes a basic knowledge of differentiation and integration, differential & difference equations and linear algebra, plus various time and frequency domain representations of continuous time signals and systems.

The following topics are covered. Review of analog and digital signals. Analog to digital and digital to analog conversion. Some useful digital signals. Difference equations and filtering. Impulse and step response of filters. Convolution representation of filters. The Z-transform. Transfer functions and stability. Discrete time Fourier transform (DTFT) and frequency response of filters. Finite impulse response (FIR) filter design: windowing method. Infinite impulse response (IIR) filter design: Butterworth filters, Chebyshev filters, Elliptic filters and impulse invariant design. Discrete Fourier Transform (DFT): windowing effects. Fast Fourier Transform (FFT): decimation in time algorithm. DSP hardware.

ELEC 3404 **Electronic Circuit Design**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures per week, and a 1 hour tutorial and 3 hour lab per fortnight. **Assumed Knowledge:** ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. **Prohibitions:** ELEC3401 Electronic Devices and Circuits.. **Assessment:** Laboratory work 15%, on-line exercises 5%, mid-semester quiz 10%, end of semester exam 70 %.

This unit of study aims to teach students analysis and design techniques for electronic systems such as signal amplifiers, differential amplifiers and power amplifiers. A background in basic electronics and circuit theory is assumed. Completion of this unit will allow progression to advanced studies or to work in electronics and telecommunication engineering.

Topics covered are as follows. The BJT as an amplifier. Biasing in BJT amplifier circuits. Small signal operation and models. Single stage BJT amplifiers. BJT internal capacitances and high frequency models. The frequency response of the common-emitter amplifier. BJT current sources and current mirrors. Differential amplifiers. Output stages and power amplifiers:class A, class B and class AB.

ELEC 3405 **Comunications Electronics and Photonics**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. **Prohibitions:** ELEC3402 Communications Electronics.. **Assessment:** Labs and assignments 20%, end of semester exam 80%.

This unit of study provides an introduction to the modelling and design of transmitters and receivers for electronic and optical communication subsystems. Students are expected to have a grasp of basic concepts related to electronics and circuits.

The following topics are covered. Electronic oscillators, RC, LC, crystal oscillators. Tuned electronic amplifiers, frequency selectivity. Feedback amplifiers. Electronic modulation and demodulation circuits, amplitude, frequency and phase modulation and demodulation, phase locked loops. Electronic mixers. High frequency RF and microwave communication amplifiers. Photonic devices and models, semiconductor optical properties. Semiconductor lasers and light emitting diodes, laser modes, output spectra, single-mode selection, distributed feedback lasers. Electro-optic modulation of light. Optical amplifiers. Photodetectors, PIN photodiodes, avalanche photodiodes. Optical receiver front-end circuit design. Basic opto-electronic link.

ELEC 3505 **Communications**

6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 1. Classes: Two hours of lectures and a three hour lab and/or tutorial per week. **Assumed Knowledge:** ELEC2301 Signals and Systems or ELEC2302 Signals and Systems. **Prohibitions:** ELEC3503 Introduction to Digital Communications.. **Assessment:** Tutorial work 10%, laboratory 10%, in class quiz 10%, end of semester exam 70%.

This is an intermediate unit of study in telecommunications following on the general concepts studied in earlier units such as Signal and Systems and leading on to more advanced units such as Digital Communication Systems. Student will learn how to critically design and evaluate digital communication systems including the elements of a digital transmission system, understand the limitations of communications channels, different analog and digital modulation schemes and reasons to use digital techniques instead of analog, and the effect of noise and interference in performance of the digital communication systems. On completion of this unit, studentss will have sufficient knowledge of the physical channel of a telecommunications network to approach the study of higher layers of the network stack.

The following topics are covered. Introduction to communications systems, random signals and stochastic process, components, signals and channels, sampling, quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), quantization 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 3506 **Data Comunications and the Internet**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** SOFT2004 Software Development Methods 1 or COMP2004 Programming Practice or SOFT2130 Software Construction. **Prohibitions:** NETS2150 Fundamentals of Networking, NETS2009 Network Organisation, NETS2909 Network Organisation (Adv), NETS3007 Network Protocols, NETS3907 Network Protocols (Advanced), ELEC3504 Data Communications and the Internet, ELEC4501 Data Communication Networks.. **Assessment:** Mid-semester exam 20%, assignment 10%, lab exercises 10%, end of semester exam 60%.

Students undertaking this unit should be familiar with fundamental digital technologies and representations such as bit complement and internal word representation. Students should also have a basic understanding of the physical properties of communication channels, techniques and limitations. Furthermore, students should be able to apply fundamental mathematical skills.

The unit will cover the following specific material: Communication reference models (TCP/IP, ATM and OSI). Circuit switched and packet switched communication. Network node functions and building blocks. LAN, MAN and WAN technologies. ATM systems. Protocols fundamental mechanisms. The TCP/IP core protocols (IP, ICMP, DHCP, ARP, TCP, UDP etc.). Applications and protocols (FTP, Telnet, SMTP, HTTP etc.).

ELEC 3605 **Engineering Software Requirements**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures, a 2 hour lab/tutorial per week. **Assumed Knowledge:** SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. **Prohibitions:** ELEC4604 Engineering Software Requirements.. **Assessment:** Lab 25%, end of semester exam 75%.
The objective of this unit is for students to become aware of issues, tools and techniques involved in the engineering of large software systems 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: Problems stemming from Requirements Engineering. How RE fits in the Software Engineering processes (definitions, lifecycle activities, ensuring performance, security, safety). RE management and analysing the problem (groundwork, feasibility, domain, risk analysis). Requirements Elicitation (user needs). Use cases, Scenarios, UML, and activity diagrams. Requirements Analysis and Modelling. Non-Functional Requirements (NFRs), Quality requirements, Reliability requirements, Patterns for safety and security requirements. Survivability requirements. Requirements negotiation and agreement, prioritisation. Satisfying stakeholders. Requirements documentation, Software Requirements Specifications (SRS). Requirements validation and traceability. Requirements evolution and change management.

ELEC 3606 **Software Project Management**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 1 hour tutorial per week. **Assumed Knowledge:** SOFT2004 Software Development Methods 1 or SOFT2130 Software Construction. **Prohibitions:** ELEC4704 Software Project Management.. **Assessment:** Project and tutorial assessment 25%, end of semester exam 75%.
This unit of study assumes a familiarity with some modern programming languages and an understanding of the software development life cycle.

The objective of the unit is for students to understand the issues involved in software project management and the factors that affect software quality; to understand the context of software development in the commercial world and the tradeoffs involved; 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; costing; 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 3607 **Embedded Computing**
6 credit points. B E, B S T, UG Study Abroad Program. **Session:** Semester 2. Classes: 1 hour of lectures per week and 9 three hour labs. **Assumed Knowledge:** ELEC1101 Foundations of Computer Systems or ELEC2602 Digital System Design. **Prohibitions:** ELEC2601 Microcomputer Systems.. **Assessment:** Lab 10%, end of semester exam 90%.
Students undertaking this unit of study are assumed to have a basic understanding of digital concepts, and combinational and sequential devices, together with an introduction to computers.

The aim of this unit of study is to teach students about microprocessors and their use. This includes architecture, programming and interfacing of microcomputers, peripheral devices and chips, data acquisition, device monitoring and control and other communications. The interfacing problem is considered at all levels including computer architecture, logic using VHDL extending to a behavioural programming style, simulation, timing, loading and protocols.

ELEC 3702 **Management for Engineers**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures plus a 1 hour visiting professional or team-based interaction exercise per week. **Prohibitions:** ELEC3701 Management for Engineers, ENGG2003 Introduction to Engineering Management. **Assessment:** Take-home tasks during semester 10%, assignments 40%, end of semester exam 50%.
This unit of study aims to introduce to the developing engineer an understanding of the professional engineering workplace and its management processes. It does this through exposure to the key aspects of the corporate world and through focus on skills and knowledge which underpin the decisions and processes of the workplace. A background in general engineering technology is assumed.

The following topics are covered. 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 3901 **Electrical Exchange Unit 1A**
6 credit points. B E. Dr. Yash Shrivastava. **Session:** Semester 1. **Prohibitions:** None.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

ELEC 3902 **Electrical Exchange Unit IB**
12 credit points. B E. Dr. Yash Shrivastava. **Session:** Semester 1.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to one half of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

ELEC 3903 **Electrical Exchange Unit 1C**
24 credit points. B E. Dr Yash Shrivastava. **Session:** Semester 1.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

ELEC 3904 **Electrical Exchange Unit 2A**
6 credit points. B E. Dr. Yash Shrivastava. **Session:** Semester 2.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

ELEC 3905 **Electrical Exchange Unit 2B**
12 credit points. B E. Dr. Yash Shrivastava. **Session:** Semester 2.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to one half of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

ELEC 3906 **Electrical Exchange Unit 2C**
24 credit points. B E. Dr. Yash Shrivastava. **Session:** Semester 2.
NB: Department permission required for enrolment.
School approval required to enroll in this unit. The unit will have a workload that is equivalent to that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in WAM calculations.

(Above exchange units will make it possible for a student in an exchange program to do 6, 12, 18, 24, 30, 36, 42 credit points in each semester)

ELEC 4702 **Practical Experience**
0 credit points. B E, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: not applicable. **Prerequisites:** 24 credit points of level 3 or 4 units of study. **Assessment:** submission of a written report.
NB: Department permission required for enrolment.
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 4705 **Interdisciplinary Project**
12 credit points. B E, UG Study Abroad Program. **Session:** Semester 2, Semester 1. Classes: 12 hours of project work per week (not timetabled). **Prerequisites:** 36 credit points of 3rd and 4th year units of study. **Prohibitions:** ELEC4703 Thesis, ELEC4707 Engineering Project. **Assessment:** Treatise 60%, presentation 20%, management 20%.
NB: Department permission required for enrolment.
This unit is available only to students enrolled for the BE/BMedSc combined degree. It is managed in the same way as ELEC4707 Engineering Project.

This is a diverse subject like no other you have tackled before. You will be able to choose a project that you are interested in. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy. You will be required to show significant self motivation and initiative, and bring together all your wealth of knowledge gained over the past 3 years in Electrical and Information Engineering. Most students find it to be one of the most rewarding experiences of their time at University. I hope you do too!

ELEC 4706 **Project Management**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures per week. **Prohibitions:** ELEC4701 Project Management.. **Assessment:** Class work 10%, end of semester exam 90%.
The various aspects of the design process, namely the following. Engineering design. The design process. Understanding the client's problem. Functions and specifications. Finding answers to the problem. Reporting the outcome. Managing the design process. Design for manufacture, cost, reliability, quality and sustainability. Ethics in design.

ELEC 4707 **Engineering Project**
12 credit points. B E, UG Study Abroad Program. **Session:** Semester 2, Semester 1. Classes: 12 hours of project work per week (not timetabled). **Prerequisites:** 36 credit points of third and fourth year units of study. **Prohibitions:** ELEC4703 Thesis, ELEC4705 Interdisciplinary Project. **Assessment:** Treatise 60%, presentation 20%, management 20%.
NB: Department permission required for enrolment.
This is a diverse subject like no other you have tackled before. You will be able to choose a project that you are interested in. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy. You will be required to show significant self motivation and initiative, and bring together all your wealth of knowledge gained over the past 3 years in Electrical and Information Engineering. Most students find it to be one of the most rewarding experiences of their time at University. I hope you do too!

ELEC 5101 **Antennas and Propagation**
6 credit points. B E, M E S, M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a lhour tutorial each week. **Assumed Knowledge:** (MATH2001 Complex Variables or MATH2061 Linear Algebra and Vector Calculus) and (ELEC3102 Engineering Electromagnetics or ELEC3104 Engineering Electromagnetics). **Prohibitions:** ELEC5522 Antennas and Propagation.. **Assessment:** Assignments 30%, end of semester exam 70%.
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.

The third part of the unit describes signal processing for multi-antenna arrays. Topics include Space-time coding, Multi-input Multi-output (MIMO) capacity, MIMO transmission, and the effects of antenna correlation.

ELEC 5203 **Topics in Power Engineering**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour tutorial per week. **Assumed Knowledge:** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives). **Assessment:** Assignments 30%, end of semester exam 70%.
This unit of study aims to give students a good understanding of some specialised areas in electrical power engineering. The unit assumes familiarity with basic mathematics and physics, a competence with basic circuit theory and some understanding of power plant such as transformers, transmission lines, etc, and of power electronics. Successful completion of this unit will lead to confidence in addressing practical industry problems.

The specific topics covered may vary somewhat from year to year. Possible topics include the following.

Electromagnetic Transients. Causes of electromagnetic transients - lightning, switching, faults; impact on insulation levels for high-voltage equipment; approaches to analysis - sources, switches, distributed and lumped components; using the transients-analysis program ATP; current research; typical examples, including demonstration of mitigation methods.

High Voltage Engineering. The design, operation, testing and condition monitoring of high voltage electrical power system equipment; current research in high voltage; causes and effects of overcurrent and overvoltage events; overcurrent protection and circuit interrupters; propagation of overvoltages on transmission lines and cables; overvoltage protection; design and limitations of insulation systems; voltage and thermal rating of major equipment; power and instrument transformers; on-line condition monitoring methods; insulation assessment of major electrical plant; earthing systems for equipment and personnel protection.

Stability Problems. Stability problems of electrical transmission systems; modelling of electrical plant and control equipment for stability studies, two axis theory of synchronous generators; stability analysis and system operation, the use of relevant software packages; dynamic stability, automatic voltage regulators and stabilisers; transient stability, the equal area criterion, digital simulation of large multi-machine systems, direct methods of analysis; current research into power system stability problems.

AC Power Control. DC- AC inverters: single phase and three-phase topology, voltage and frequency control, switching schemes, harmonics, rectifier mode of operation; applications of inverters: induction motor, synchronous motor and stepper-motor drives; static VAR control; active power filters; interconnection of renewable energy sources: photovoltaic array interconnection, wind and small hydro interconnection; load leveling with energy storage system

Power System Harmonics. Sources of harmonics; Fourier analysis; three-phase concepts of balanced harmonics - symmetrical compon-

ents, different sequences for different harmonic orders; special features of zero-sequence harmonics; a three-phase rectifier load as a source of harmonics; adverse effects of harmonics - the need for limits; calculations of harmonic voltages produced by non-linear loads; modelling of power system elements for harmonic calculations; example involving a non-linear load and a capacitor bank, occurrence of resonance; possible mitigation measures.

ELEC 5204 **Power Systems**

6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a 2 hour tutorial per week. **Assumed Knowledge:** ELEC3203 Power Engineering or ELEC3201 Electrical Energy Systems. **Prohibitions:** ELEC4201 Electrical Power Systems.. **Assessment:** Tutorial assignments 22%, end of semester exam 78%.

This unit provides an introduction to generation and transmission systems and the role played by professional power engineers in their operation. It assumes familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines, etc. Students who complete this unit are in a good position to undertake more specialised studies or undertake a career in the power industry.

Some aspects of power system operation will be covered in detail. The topics may vary somewhat from year to year. Possible topics include:

Load flow analysis. The analysis of power systems under normal, steady state operating conditions; a statement of the problem and the constraints on possible solutions; the role of admittance and impedance matrices in analysis. Generator, load and slack buses; the Gauss iteration and Newton Raphson solution methods; case studies of the Eastern Australian system; an introduction to software application packages.

Fault analysis. The types and causes of power system faults; balanced faults and short circuit levels; an introduction to fault current transients in machines; symmetric components, sequence impedances and networks; the analysis of unsymmetrical faults.

Protection. Review of the impact of faults on power system behaviour; issues affecting protection scheme characteristics and clearance times; the security and reliability of protection schemes; the need for protection redundancy and its implementation as local or remote backup; zones of protection and the need for zones to overlap; the analysis and application of over-current and distance relay protection schemes with particular reference to the protection of transmission lines.

Introduction to stability. The role of stability considerations in limiting the operation of power systems; transient stability and dynamic stability, and the modelling of power system plant for stability analysis; voltage and long-term stability.

ELEC 5303 **Computer Control System Design**

6 credit points. B E, M E S, M E S (Net Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a 2 hour lab/tutorial per week. **Prohibitions:** ELEC4301 Computer Controlled System Design.. **Assessment:** Weekly quiz 10%, lab exam 10%, mid semester exam 25%, end of semester exam 55%.

NB: Department permission required for enrolment.

This unit aims to teach the basic issues involved in the analysis and design of computer-controlled systems. The emphasis is on theory rather than technological application or industrial practice.

However, students are expected to test some of these ideas on a few benchmark control problems in the laboratory. Completion of the unit will facilitate progression to advanced study in the area and to work in industrial control. This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.

The following topics are covered. Sampled data systems: aliasing. Zero order hold equivalent: inverse of sampling, sampling system with time delay. Properties of difference equations: solution, stability, change of co-ordinates, Z transform. Input output models: pulse response, pulse transfer operator, pulse transfer function, interpretation of poles and zeros.

Analysis of discrete time system: stability (Jury's test, Nyquist criterion, Lyapunov method), sensitivity and robustness, observability (observers, reduced order observers), reachability and controllers, loss of reachability/observability through sampling, output feedback, the Separation theorem. Optimal control: Kalman filter, linear quadratic regulator, output feedback, the Separation theorem.

Approximating continuous time controllers. Finite word length mplementations.

ELEC 5402 **Digital Integrated Circuit Design**

6 credit points. B E, M E S, UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a 2 hour lab per week. **Assumed Knowledge:** (ELEC3401 Electronic Devices and Circuits or ELEC3404 Electronic Circuit Design), and (ELEC2601 Microcomputer Systems or ELEC3607 Embedded Computing). **Prohibitions:** ELEC4402 Integrated Circuit Design.. **Assessment:** Lab work 75%, end of semester exam 25%.

This unit of study explores CMOS technology and integrated circuit design and fabrication. The fundamental theory and techniques behind digital integrated circuit design are introduced. A primary focus of this unit is providing the student with practical laboratory design experience using a professional VLSI CAD tool to design digital integrated circuits. This unit provides a foundation for more advanced digital integrated circuit design techniques and also analogue integrated circuit design.

Topics covered in this unit are: IC manufacturing process and CMOS technology, CMOS static logic design, CMOS dynamic logic design, arithmetic building block design, sequential logic design, VLSI interconnection and wiring issues, timing issues, digital memory design, digital system design methodologies.

ELEC 5403 **Radio Frequency Engineering**

6 credit points. B E, M E S, M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a 1 hour lab/tutorial per week. **Assumed Knowledge:** ELEC3401 Electronic Devices and Circuits or ELEC3404 Electronic Circuit Design. **Prohibitions:** ELEC5521 Radio Frequency Engineering.. **Assessment:** Assignments 30%, end of semester exam 70%.

This unit of study builds upon earlier work and provides an introduction to radio frequency components and systems used in wireless and satellite communications as well as in other high frequency applications. It assumes some knowledge of: basic circuit analysis; semiconductor device models and behaviour; transistor operation as switches and amplifiers; transistor operation as current sources and current mirrors; differential amplifiers.

The following topics are covered: RF circuit element models, high-frequency effects and biasing in active devices, transmission lines and the Smith Chart, RF system characteristics, RF amplifiers, oscillators, mixers, power amplifiers, microwave measurements.

ELEC 5617 **Topics in Software Engineering**

6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** two hours of lectures, two hours of labs and one hour of tutorial per week. **Assumed Knowledge:** SOFT2130 Software Construction 1 (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microcomputer Systems). **Assessment:** Project and lab 25%, end of semester exam 75%.

This unit of study aims to give students a good understanding of some specialized areas in software engineering and software technology. The unit assumes familiarity with basic mathematics and physics and competence with programming and computer systems.

The specific topics covered may vary somewhat from year to year. Possible topics include the following, inter alia.

Machine learning, pattern recognition, artificial intelligence, advanced software methods for engineering applications including data mining, soft sensors, advanced real-time systems, advanced software design methods.

ELEC 5507 **Error Control Coding**

6 credit points. B E, M E S, M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a lhour tutorial per week. **Assumed Knowledge:** ELEC3503 Introduction to Digital Communications or ELEC3505 Communications. **Prohibitions:** ELEC4503 Error Control Coding.. **Assessment:** Quizzes 30%, end of semester exam 70%.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, 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. Turbo codes and applications to space and mobile communications.

ELEC 5508 **Wireless Engineering**

6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hours of lectures and a 1 hour tutorial per week. **Assumed Knowledge:** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3504 Data Communications and the Internet or ELEC3506 Data Communications and the Internet or NETS2150 Fundamentals of Networking). **Prohibitions:** ELEC5504 Cellular Radio Engineering, ELEC4504 Wireless Networks.. **Assessment:** Assignment 30%, end of semester exam 70%.

This unit will introduce the key ideas in modern wireless telecommunications networks. It will address both physical layer issues such as propagation and modulation, plus network layer issues such as capacity, radio resource management and mobility management issues.

The following topics are covered. Mobile radio channel: Multipath fading, diversity, log-normal fading, mean propagation loss, propagation models. Cellular technologies: Cell types, coverage, frequency reuse, spectral efficiency, link budget, power budget, traffic capacity. Omnidirectional and sectorised antennas. Handover, interaction with the fixed network. Microcells and macrocells, Medium access control: Near-far effect and the hidden terminal problem. Multiple access schemes: FDMA, TDMA, CDMA. 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 cdma2000. Wireless LANs: IEEE802.11, Hiperlan, Bluetooth. Convergence: GSM evolution to data services via GPRS and EDGE. Issues with TCP over wireless. Mobility management in MobilelP.

ELEC 5509 **Advanced Communication Networks**

6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lecture and a 2 hour tutorial per week. **Assumed Knowledge:** ELEC3504 Data Communications and the Internet or ELEC3506 Data Communications and the Internet or NETS3007 Network Protocols. **Prohibitions:** ELEC5501 Advanced Communication Networks.. **Assessment:** Report and seminar 25%, end of semester exam 75%.

This unit of study serves as an introduction to communications network research. The unit relies on a solid understanding of data communications and mobile networks. It introduces some of the currently most debated research topics in mobile networking and presents an overview of different technical solutions. Students are expected to critically evaluate these solutions in their context and produce an objective analysis of the advantages/disadvantages of the different research proposals. The general areas covered are wireless Internet, mobility management, quality of service in mobile and IP networks, ad hoc networks, and cellular network architectures.

The following topics are covered. Introduction to wireless and mobile Internet. Wireless cellular data networks. Cellular mobile networks. Mobile networks of the future. Quality of service in a mobile environment. Traffic modelling for wireless Internet. Traffic management for wireless Internet. Mobility management in mobile networks. Transport protocols for mobile networks. Internet protocols for mobile networks.

ELEC 5510 **Satellite Communication Systems**

6 credit points. B E, M E S, M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hours of lectures and a 1 hour tutorial per week. **Assumed Knowledge:** ELEC3505 Communications (or ELEC3503 Introduction to Digital Communications) and ELEC4505 Digital Communication Systems (or ELEC4502 Digital Communication Systems). **Prohibitions:** ELEC5502 Satellite Communications Systems.. **Assessment:** Class performance 5%, tutorial attendance 5%, assignment 20%, end of semester exam 70%.

Satellite communication systems provide fixed and mobile communication services over very large areas of land, sea and air. This unit presents the fundamental knowledge and skills in the analysis and design of such systems. It introduces students to the broad spectrum of satellite communications and its position in the entire telecommunications network; helps students to develop awareness of the key factors affecting a good satellite communications system and theoretical and practical skills in the design of a satellite communications link.

Topic areas include: satellite orbits and their properties; satellite subsystems; communications link design; satellite antenna; modulation and multiplexing techniques; multiple access techniques; error control for digital satellite links; propagation effects and their impact and satellite-earth links; satellite applications.

ELEC 5511 **Optical Communication Systems**

6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics). **Prohibitions:** ELEC5503 Optical Communication Systems.. **Assessment:** Assignments and labs 25%, end of semester exam 75%.

Ilntroduction to optical fibre communications. Optical fibre transmission characteristics; fibre modes, multi-mode fibres, single-mode fibres, dispersion, loss. Semiconductor and fibre laser signal sources; dynamic laser models, switching, chirp, noise, optical transmitters. Optical modulation techniques. Optical amplifiers and repeaters, noise characteristics. Fibre devices, gratings, multiplexers. Optical detectors, shot noise and avalanche noise. Optical receiver and regenerator structures; sensitivity and error rate performance. Photonic switching and processing. Optical local area networks. Multi-channel multiplexing techniques. Design of optical fibre communication systems.

ELEC 5512 **Optical Networks**

6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hours of lectures and a 1 hour lab/tutorial per week. **Assumed Knowledge:** ELEC3503 Introduction to Digital Communications orELEC3505 Communications. **Prohibitions:** ELEC5506 Optical Networks.. **Assessment:** Two assignments totalling 20%, end of semester exam 80%.

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 5513 **Network Management and Queuing Theory**

6 credit points. B E, M E S, M E S (Net Eng), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2 hours of lecture and a 2 hours tutorial per week. **Assumed Knowledge:** ELEC3506 Data Communications and the Internet (or ELEC3504 Data Communications and the Internet) and ELEC3505 Communications (or ELEC3503 Introduction to Digital Communications). **Assessment:** Tutorial attendance 5%, assignments and group projects 25%, 2 hour end of semester exam 70%.

This unit presents the fundamental knowledge and skills in the design, planning and management of telecommunications networks. Upon successful completion, students will be able to understand the legal and social framework of network management; understand and appreciate key aspects of network design, planning and management; understand and apply techniques to solve real problems in network design, implementation and management.

Topic areas include: data communications and network management overview; review of computer network technology (LAN and WAN); simple network management protocol (SNMP) management; remote network monitoring (RMON); broadband network management. introduction to queuing theory and its application in network planning and design.

ELEC 5613 **Image Processing and Computer Vision**

6 credit points. B E, M E S, M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2 hours of lectures, a 2 hour lab/tutorial per week. **Assumed Knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. **Prohibitions:** ELEC4302 Image Processing and Computer Vision.. **Assessment:** Project and lab 25%, end of semester exam 75%.

This unit is concerned with the computer analysis and processing of images. The emphasis is on fundamental theory with discussion of some applications. A reasonable background in engineering mathematics and a modern programming language is assumed. The prime aim of this unit of study is to develop a sound understanding of the basic theory of image processing and a capacity for research and inquiry. Completion of the unit will facilitate progression to advanced study in the area and to work in the image processing field.

Topics covered include Image perception and representation; Enhancements - histogram & pixelwise transforms; Transforms - FFT, Laplace, Z, Hough; Filtering; Compression and image coding; Texture analysis - Modelling, classification, segmentation; Geometry - Transforms, matching; Mathematical Morphology - non-linear filtering, distances, residues, HMT; Segmentation - Thresholding, split & merge, snakes, watershed, SRG, recent PDE methods. The unit will conclude by discussing some applications in fields such as medical image processing and automation.

ELEC 5614 **Real Time Computing**
6 credit points. B E, M E S, M E S (Net Eng), UG Study Abroad Program. **Session:** Semester 2. Classes: 2hours of lectures, 2hours of labs and a lhour tutorial per week. **Assumed Knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). **Prohibitions:** ELEC4602 Real Time Computing.. **Assessment:** Project and lab 25%, end of semester exam 75%.
This unit is concerned with the theory and practice of real time computer systems as applied to the design of embedded systems and computer control systems in engineering, manufacturing and automation. Some background in programming, object oriented design and system architecture is assumed. A prime aim of this unit of study is to develop a capacity for research and inquiry in the field of real-time and embedded systems. Completion of this unit will facilitate progression to advanced study or to work in embedded systems and industrial real-time computer systems.

The following topics are covered. Hard real time and embedded systems, as applied to engineering, manufacturing and automation. Timing and scheduling: periodic vs aperiodic processes, deadlines, rate monotonic, deadline monotonic and earliest deadline scheduling. Management of shared resources. 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 5615 **Advanced Computer Engineering**
6 credit points. B E, M E S, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and a 2 hour tutorial per week. **Assumed Knowledge:** ELEC4605 Computer Engineering or ELEC4601 Computer Design. **Prohibitions:** ELEC5611 Advanced Computer Engineering.. **Assessment:** Assignments 30%, end of semester exam 70%.
NB: Department permission required for enrolment.
This unit of study is comprised of a selection of topics covering advanced computer architecture, advanced digital engineering and embedded systems. They may be chosen from the following:

Advanced Computer Architecture: Processor organisation, parallelism, scalability, language and application driven architectures, design tools and methodologies.

Advanced Digital Engineering: Advanced hardware description language skills for ASIC and FPGA design; CAD methodologies; designing for low power, high speed, small area, low cost and testability; advanced printed circuit board design, system design exercises.

Advanced Embedded systems: System on chip design and associated hardware description languages and CAD tools; embedded system internetworking; real time design constraints; case studies and laboratory exercises in communications and industrial control applications.

ELEC 5616 **Computer and Network Security**
6 credit points. B E, M E S, M E S (Net Eng), M E S (Wireless Eng), UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and a 2 hour lab/tutorial per week. **Assumed Knowledge:** ELEC3607 Embedded Computing (or ELEC2601 Microprocesor Systems) or ELEC3506 Data Communications and the Internet (or ELEC3504 Data Communications and the Internet) or EBUS3004 E-Business Programming (or EBUS3002 E-Commerce Website Programming). **Prohibitions:** ELEC5611 Computer and Network Security, NETS3016 Computer and Network Security, NETS3916 Computer and Network Security (Adv).. **Assessment:** Lab 20%, tutorial 5%, project 15%, end of semester exam 60%.
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, including models for integrity, authentication, electronic cash, viruses, firewalls, electronic voting, risk assessment, secure web browsers and electronic warfare. Practical cryptosystems are analysed with regard to the assumptions with which they were designed, their limitations, failure modes and ultimately why most end up broken.

ELEC 5701 **Commercial Engineering Practice**
6 credit points. B E, M E S, UG Study Abroad Program. **Session:** Semester 2. Classes: 2 hours of lectures and 1 hour visiting professional or team-based interaction exercise per week. **Prohibitions:** ENGG4003 Commercial Engineering Practice.. **Assessment:** Take-home tasks 10%, Assignments 40%, end of semester exam 50%.
This unit of study prepares graduating students for the professional engineering workplace by developing awareness of the obligations, expectations and performance expected of a new graduate employee. It does this through exposure to the key aspects of the work environment and through focus on skills and knowledge which will enhance their performance and value to the employer. The unit assumes a knowledge of general engineering technology.

The following topics are covered. The commercial working environment. Managing and being managed. Workplace, workforce and commercial ethics. What the Marketing Department wants. What the Production Department wants. Communication: language and form. Conflict resolution and working relationships. Time management. Report writing and documentation. Project planning and resource management. Budgets and costings. Intellectual property: inventions, patents and copyright. Legal issues, employment contracts, technology contracts.

Interdisciplinary

ENGG 1061 **Advanced Engineering 1A**
6 credit points. B E. **Session:** Semester 1. **Prerequisites:** UAI score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **Prohibitions:** 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 **Engineering Disciplines (Intro) Stream A**
6 credit points. B E, B S T. **Session:** Semester 1. Classes: 1 hours of lecture and one 3 hour laboratory session per week. **Assessment:** Technical assignments and laboratory reports. 3 hour examination.
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)
An overview of the degree requirements in each stream. The roles of the engineer in each stream (employments, skills, etc). How each of the subjects taught relate to the skills/knowledge and applications required of the engineers. Basically make sure students 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, and this topic will be the focus of the laboratory.

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. B E. **Session:** Semester 1. Classes: 2 hour of lectures and 3 hours of computer laboratory sessions per week. Components: The course is made of 2 components: computer programming with MatLab and computer-aided design (CAD). For MatLab there will be one lecture and one 2-hour computer laboratory session per week. For CAD there will be one lecture and one 1-hour computer laboratory session per week. **Prohibitions:** MECH1800 Computational Engineering 1A, MECH1801 Computational Engineering 1C, INFO 1000 Information Technology Tools, DESC9101 Introduction to Autocad, DECO1003 CAD Modelling, DESC9100 Introduction to Archicad, ISYS1003 Foundations of Information Technology, COSC1001 Computational Science in Matlab, COSC1002 Computational Science in C. **Assessment:** For the MatLab component, there will be one 1 hr examination at the end of the semester plus 3 quizzes during the semester. Assessment for the CAD component will be based on assignments only, to be submitted during the 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 computer fundamentals. By the end of the semester, students must achieve 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 essential tools of numerical analysis and engineering problem solving.
-To provide an introduction to a programming language and to the logic of programming.
-To examine the development over the ages of engineering drawing practice, up until the time when computers emerged.
-To analyse the concepts and techniques that have been implemented in CAD programs and their outcomes when applied to the various engineering disciplines.
-To provide training in the operation and application of a modern CAD package.
-To prepare the graduate to a continually evolving CAD capabilities in the engineering environment, where new concepts and computer hardware will provide increasingly effective CAD systems.

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. Students attending this unit are expected to satisfy the following criteria:

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 computer programs to solve simple engineering problems.
6. Skills in the generation and manipulation of graphic images and the use of these to convey precise information in engineering applications.
7. Reasonable competence in the use of CAD software for the preparation of design models and workshop drawings.
8. The ability to adapt to different CAD systems, including significant changes in their methods and capabilities in the future.

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 graphics.
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.
Techniques for the formulation of computer scripts that can be used to represent physical applications in the field of Engineering. Methodologies for problem solving.
Review of the historical development of drawing practices to record and graphically specify engineering operations and projects. Review of the evolution of CAD from experimental graphic concepts, to their implementation as usable packages. Overview of the range of CAD systems currently available, with different capabilities and different uses. Practice with a modern system to define a wide range of objects, from simple prisms to those with complex surfaces and multiple parts. This component will be taught using the SolidWorks CAD software system.

Online Course Material www.civil.usyd.edu.au/course/enggl801

Textbooks

Lecture Notes:
N.P. Balaam and J.P. Carter. (2006). ENGG 1801 Engineering Computing - Lecture Notes.
A. Lozzi (ed.) (2006). Learning to Use SolidWorks.

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. E. Giesecke et al. Principles of Engineering Graphics, Maxwell Mac Millan, any editon.
A. W. Boundy, Engineering Drawing, Mc GrawHill any editions.
J. D. Foley et al. Computer Graphics Principles and Practice. Addison Wesley, 2nd edition.

Reference Websites:
www. mathworks .com

ENGG 1802 **Engineering Mechanics**

6 credit points. B E. **Session:** Semester 2. Classes: Two one hour lectures each week, Tutorials: 3 hours per week. Some tutorials will include experiments. **Assessment:** Quizzes and assignments. Assessment marks for assignments and quizzws 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 engineer-

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. B E, B S T. **Session:** Semester 1, Semester 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 1804 **Engineering Disciplines (Intro) Stream B**
6 credit points. B E, UG Study Abroad Program. **Session:** Semester 1. Classes: 2 hours of lectures and a 2 hour laboratory/workshop per week. **Assessment:** Workshop performance during the semester, attendance/involvement, an assignment on a technical topic, and a 2 hour exam at the end of the semester.
NB: Flexible first year core unit of study.
The unit is an introduction to the scope, methodologies and applications of the engineering disciplines of mechatronics, space, electrical, software, computer and telecommunications. The unit develops an understanding of the inter-relationship of underlying physical and mathematical principles to the application role of engineering. This is to synthesise (i.e. design) a solution to a real problem and then implement it in a cost-effective and responsible way. The management aspects of design, teamwork and projects will become clearly an important aspect of this process. The students will be able to make an informed choice about which stream of engineering of those covered that they wish to specialise in and to have a sufficient grounding of the principles to make relevant and more interesting the rest of their chosen program.

Topics covered include system design, product design manufacture and marketing, modelling and control, digital systems, actuators and sensors, electronics, computer and communication networks, power systems and networks, computer hardware, computer software, active sensing systems, signals and signal processing, case studies.

ENGG 2004 **Engineering Studies B**
4 credit points. B E, UG Summer/Winter School. **Session:** Semester 1, Semester 2, Summer, Winter.
NB: Department permission required for enrolment. Permisson required for enrolment

Special project specified for individual requirement

ENGG 2005 **Engineering Studies C**
6 credit points. B E, UG Summer/Winter School. **Session:** Semester 2, Semester 1, Summer.
NB: Department permission required for enrolment. Permission required for enrolment

ENGG 2008 **Engineering Studies A**
2 credit points. B E, UG Summer/Winter School. **Session:** Semester 1, Semester 2, Summer.
NB: Department permission required for enrolment. Permission required for enrolment

ENGG 2062 **Engineering Project: Business Plan 2 Adv**
6 credit points. B E. **Session:** Semester 1, Semester 2. Classes: 2 hours tutorials per week for one semester. This Unit of study will be offered in either February or July Semesters. **Prerequisites:** 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 3005 **Engineering & Industrial Management Fund**
6 credit points. B E, B S T. **Session:** Semester 2. Classes: 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. **Prohibitions:** ELEC3702, MECH3661. **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 3062 **Technology Education (Advanced)**
6 credit points. B E. **Session:** Semester 2. Classes: 2 hours tutorials per week for one semester. This unit of study will be offered in the July Semester. **Prerequisites:** 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 toTnvestigate, 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 4005 **Industrial & Engineering Management Adv**
4 credit points. B E. **Session:** Semester 1. Classes: 2 (1 hr) lectures and 1 (1 hr) tutorial per week one semester. **Prerequisites:** ENGG3005. **Prohibitions:** 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 4061 **Innovation/Technology Commercialisation**
6 credit points. B E, B S T. **Session:** Semester 1. Classes: 1.5 hour lecture/1.5 hour seminar per wk. **Assessment:** Profile of an innovation, case studies of innovative companies, mid-term quiz, launching a start-up company project, final exam project.
Syllabus Summary: This course is designed as a 'Master Class' for final year Engineering students to grapple with the challenges of engaging in, facilitating and managing innovation and technology commercialisation. Key learning outcomes are: developing an understanding of the processes of management, and in particular of innovation, dealing with uncertain and inadequate information, how to communicate effectively to and motivate a group of people to work out what to do, and how to do it.

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; IP recognition and management; starting a high-tech company.

ENGG 4064 **Advanced Engineering Design A**
6 credit points. B E. **Session:** Semester 2. Classes: Literature Survey, project formulation and detailed design of a major integrated facility to be carried out in interdisciplinary groups in Semester 2. **Prerequisites:** 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, oral presentations and peer review. 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 project in a multi-disciplinary team comprising students from across the faculty. Each student will be required to work in a team to produce an integrated design in greater detail than is possible in ordinary classes and to write a significant design report presenting the results of the process. The ability to work in a team of engineers from different disciplines will be assessed as part of this design project which will be centred around a major industrial facility.

Syllabus: Introduction to the design process. Design philosophy. Use of computer packages in design. Design optimisation. Detailed equipment design and costing. Hazard assessment. Environmental Impact Assessment. Project Financial Analysis.

ENGG 4065 **Advanced Engineering Design B**
6 credit points. B E. **Session:** Semester 2. Classes: Literature Survey, project formulation and detailed design of a major integrated facility to be carried out in interdisciplinary groups in Semester 2. **Prerequisites:** This unit is an extension module for students in ENGG4064. So 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 by negotiation for all engineering degrees.
NB: Department permission required for enrolment.
Objectives/Outcomes: To extend and deepen the 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.

Units from Other Faculties

ACCT 1001 **Accounting IA**
6 credit points. B Agr Ec, B Com, B Ec, B Ec Soc Sc, B Res Ec, UG Study Abroad Program. **Session:** Semester 1, Semester 2. Classes: Three hours of lectures/tutorials. **Assumed Knowledge:** HSC Mathematics. **Prohibitions:** ACCT 1003, ACCT 1004. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
NB: Restricted entry
Introduces accounting and the double entry system of financial recording. Students are introduced to the skills necessary to prepare, interpret and analyse financial statements. Examines assumptions underlying the preparation of financial statements for external users. Development of skills necessary to understand, discuss, analyse and write about accounting-related topics. Designed as an introduction to accounting. No prior knowledge of accounting assumed.

ACCT 1002 **Accounting IB**
6 credit points. B Agr Ec, B Com, B Ec, B Ec Soc Sc, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Semester 2, Summer. Classes: Three hours of lectures/tutorials. **Prerequisites:** ACCT 1001. **Prohibitions:** ACCT 1003, ACCT 1004. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
NB: Restricted entry
Accounting is about the recording, classification, reporting and interpretation of information to help make economic decisions. Accounting 1A introduces accounting and the double entry system for financial recording. Accounting IB develops themes and competen-

cies learnt in Accounting 1 A. The primary focus of this unit of study is on conceptual and technical issues relating to management accounting and the information required by internal users to make strategic and operational decisions relating to managing a business. A second theme is the financial accounting information businesses are required to produce to assess a firm's financial state and performance. Students examine how commercial and ethical issues affect business decisions and how there are present and future consequences that will affect different groups of interest

ACCT 1003 **Financial Accounting Concepts**

6 credit points. B Agr Ec, B E, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B Res Ec, B S T, UG Study Abroad Program. **Session:** Semester 1. **Classes:** Three hours of lectures/tutorials. **Prohibitions:** Terminating unit. Cannot be counted with ACCT 1001 and ACCT 1002.. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.

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. B Agr Ec, B Com (Liberal Studies), B E, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B S T, UG Study Abroad Program. **Session:** Semester 2. **Classes:** Three hours of lectures/tutorials. **Prohibitions:** Terminating unit. Cannot be counted with ACCT 1001 and ACCT1002.. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.

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.

BIOL 1001 **Concepts in Biology**

6 credit points. B A, B Agr Ec, B An Vet Bio Sc, B Anim Sc, B E, B Hort Sc, B L W Sc, B Med Sc, B N, B N (I A H), B N, B A, B N, B Sc, B Pharm, B Pharm (Rural), B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Gene. **Session:** Semester 1, Summer. **Classes:** 3 lee & 3 hrs prac/wk. **Assumed Knowledge:** No previous knowledge required. Students are encouraged to take the Biology Bridging Course. Students who have completed HSC Biology are advised to enrol in BIOL1101 Ecosystems to Genes rather than BIOL 1001. **Prohibitions:** BIOL (1101 or 1901). **Assessment:** One 2.5hr exam, assignments, quizzes.

NB: It is recommended that BIOL (1001 or 1101 or 1901) be taken before all Semester 2 Junior units of study in Biology.

Concepts in Biology is an introduction to the major themes of modern biology. We start with introductory cell biology, which particularly emphasises how cells obtain and use energy. We then discuss the structure and function of microorganisms. The significance of molecular biology is covered, working from the role of DNA in protein synthesis and development through to modern techniques and their uses. The genetics of organisms is then discussed, leading to consideration of theories of evolution and the origins of the diversity of modern organisms. We bring all the abovementioned concepts together to develop an understanding of interactions between organisms in biological communities or ecosystems. Finally we discuss the significance of human impact on other living organisms, with particular reference to finding solutions to problems in areas such as global warming, introduced pests, and extinctions. The unit is designed so that lab classes and the field trip integrate with the lectures. Lab activities are carried out in groups so that team work skills are developed. This unit also incorporates a number of key generic skills such as written communication skills, discussion and data interpretation, and experimental design and hypothesis testing skills.

Textbooks

Knox R B, Ladiges P and Evans B, (2005) Biology, 3rd Ed. McGraw-Hill

A Unit of Study Manual will be available for purchase from the Copy Centre during the first week of semester.

BIOL 1003 **Human Biology**

6 credit points. B A, B Agr Ec, B E, B Med Sc, B N, B N (I A H), B N, B A, B N, B Sc, B Pharm, B Pharm (Rural), B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 2, Summer. **Classes:** Two or three, one hour lectures per week (3 lectures in weeks 1 and 13) plus 1 hour per lecture of independent study. Two 3 hour laboratory sessions every three weeks, plus 6-9 hours HBOnline work every three weeks covering online practical activities, prework and homework. **Assumed Knowledge:** HSC 2-unit Biology. **Prohibitions:** BIOL 1903 or EDUH1016. **Assessment:** One 2.5hr exam, assignment, poster and quizzes.

This Unit of Study has three main components: lectures, practicals and HBOnline activities. The 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 cells, control of body functions and defence mechanisms. After discussion of reproduction and development, it concludes with modern studies and research prospects 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 or 1101 or 1901), provides entry to Intermediate units of study in Biology, but the content of BIOL (1002 or 1902) is assumed knowledge for BIOL (2011 or 2012) and PLNT (2002 or 2003) and students entering from BIOL (1003 or 1903) will need to do some preparatory reading.

Textbooks

Seeley, R., Stephens, T.D. & Tate, P. (2005) Essentials of Human Anatomy and Physiology, McGraw Hill which comes with a custom publication of Mader, SS (2004) Human Biology, 8th Ed., McGraw-Hill.

The Course Reader will be available for purchase from the Copy Centre during the first week of Semester.

CHEM 1101 **Chemistry 1A**

6 credit points. B A, B App Sc (Ex &Sp Sc), B Sc (Nutr), B E, B Ed, B Sc (Psych), B L W Sc, B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Wint. **Session:** Semester 1, Semester 2, Summer. **Classes:** 3 lee & 1 tut/wk & 3hrs prac/wk for 10 wks. **Assumed Knowledge:** HSC Chemistry and Mathematics. **Corequisites:** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **Prohibitions:** CHEM (1001 or 1901 or 1903 or 1909). **Assessment:** Theory examination (75%), laboratory exercises and continuous assessment quizzes (25%).

Chemistry 1A is built on a satisfactory prior knowledge of the HSC 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.

Textbooks

A booklist is contained in the booklet Junior Chemistry distributed at enrolment. Further information can be obtained from the School.

CHEM 1102 **Chemistry IB**

6 credit points. B A, B App Sc (Ex &Sp Sc), B Sc (Nutr), B E, B Ed, B Sc (Psych), B L W Sc, B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Summer, Semester 2. **Classes:** 3 lee & 1 tut/wk & 3hrs prac/wk for 10 wks. **Prerequisites:** CHEM (1101 or 1901) or a Distinction in CHEM 1001 or equivalent. **Corequisites:** Recommended concurrent units of study: 6 credit points of Junior Mathematics. **Prohibitions:** CHEM (1002 or 1902 or 1904 or 1908). **Assessment:** Theory examination (75%), laboratory exercises and continuous assessment quizzes (25%).

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

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

Textbooks

A booklist is contained in the booklet Junior Chemistry distributed at enrolment. Further information can be obtained from the School.

CLAW 2206 **Legal Issues for e-Commerce**

6 credit points. B A S, B Agr Ec, B C S T, B Com, B E, B Ec, B Ec Soc Sc, B I T, B Res Ec, UG Study Abroad Program. **Session:** Semester 1, Semester 2. **Classes:** Two hours of lectures and one tutorial per week. **Prerequisites:** Any 8 full semester first year units of study. **Prohibitions:** CLAW2006. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.

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 of the electronic media. The unit also covers basic introductory legal skills such as legal research, writing and citation as well as an introduction to electronic commerce, the history and operation of the Internet and major tools used in electronic commerce.

ECMT 1010 **Business and Economic Statistics A**

6 credit points. B A, B Agr Ec, B C S T, B Com, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B I T, B Res Ec, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Semester 2. **Prohibitions:** ECMT1011, ECMT1012, ECMT1013, MATH1015, MATH1005, MATH1905, STAT1021. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.

This unit provides an introduction to basic statistics and its applications in economics and business disciplines. Topics include: methods for data management; analysis and interpretation of data; probability; the normal distribution; an introduction to sampling theory and hypothesis testing; and the concepts of regression analysis. 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. Students are expected to use data resources on the World Wide Web, retrieve data and analyse this data using Excel.

ECMT 1020 **Business and Economic Statistics B**
6 credit points. B A, B Agr Ec, B C S T, B Com, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B I T, B Res Ec, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 2. **Corequisites:** ECMT1010. **Prohibitions:** ECMT 1021, ECMT1022 and ECMT 1023. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
NB: Other than in exceptional circumstances, it is strongly recommended that students do not undertake Business and Economic Statistics B before attempting Business and Economic Statistics A.
This unit broadens the knowledge gained in the unit, ECMT1010 Business and Economic Statistics A by introducing further tools (and their applications) for use in economics, finance, marketing and accounting. This unit features practical applications. Possible topics include: further aspects of hypothesis testing including goodness-of-fit models; regression analysis including a brief introduction to logit models, time series and its applications to economics and finance; input-output analysis; index numbers and mathematics of finance. The material is further complemented by mathematical topics including matrices and partial differentiation. In addition, students are expected to use data resources on the World Wide Web, retrieve data and analyse this data using Excel.

ECON 1001 **Introductory Microeconomics**
6 credit points. B A, B Agr Ec, B Com, B E, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B Res Ec, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Summer. **Classes:** Two lectures and one tutorial per week. **Assumed Knowledge:** Mathematics. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
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. B A, B Agr Ec, B Com, B E, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B Res Ec, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 2, Summer. **Classes:** Two lectures and one tutorial per week. **Assumed Knowledge:** Mathematics. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
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. B E. **Session:** Semester 2. **Classes:** 39 hrs lee, 26 hrs lab. Field excursions in the Sydney region, as appropriate. **Assumed Knowledge:** No previous knowledge of Geology assumed. **Prohibitions:** GEOL 1002. **Assessment:** Practical laboratory work, assignment, and a combined theory and practical exam.
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.

INFO 2110 **Systems Analysis and Modelling**
6 credit points. B A, B Com, B Des Comp, B E, B Sc, B Sc (Bioinformatics), UG Study Abroad Program, UG Summer/Winter School. Mr Simon Poon and Dr Geoffrey Kennedy. **Session:** Semester 1, Summer. **Classes:** 2 hrs lee, 1 hr tut & 1 hr prac/wk. **Assumed Knowledge:** Simple data modelling and simple SQL knowledge covered at ISYS1003 orINFO1000 level. **Prerequisites:** (INFO(1003 or 1903 or 1000) or ISYS1003 or INFS1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or 6 credit points of COSC units of study or DECO2011. **Prohibitions:** INFO (2000 or 2810 or 2900). **Assessment:** Written and practical assignments, exam.
This unit provides a comprehensive introduction to the analysis of complex systems, and the representation of models of the system in widely-understood notations. It addresses the roles a systems analyst plays in different stages in the systems lifecycle. It covers a collection of methodologies, models, tools, and techniques that can be used to model systems. The major topics are requirements elicitation and representation, data models, process models, and project planning. We will cover both the traditional structured approach which includes process modelling using data flow diagrams (DFDs) and conceptual data modelling using Entity-Relationship Diagram (ERDs), and the object-oriented approach using class diagrams, sequence diagrams, collaboration diagrams, and statechart diagrams, expressed in UML. Tools such as Microsoft Access will be used to produce simple system prototypes, based on models.

INFO 2120 **Database Systems 1**
6 credit points. B A, B Com, B Des Comp, B E, B Sc, B Sc (Bioinformatics), UG Study Abroad Program. DrUweRoehm, A/Prof Joseph Davis. **Session:** Semester 2. **Classes:** 2 hrs lee, 2hr tut /wk. **Prerequisites:** INFO(1003 or 1903 or 1000) or ISYS1003 or INFS1000 or SOFT(1001 or 1901) or COMP(1001 or 1901) or (6 credit points of COSC) or DECO2011. **Prohibitions:** INFO (2005 or 2820 or 2905).. **Assessment:** written and practical assignments plus a written exam.
This unit of study will provide a comprehensive introduction to database management, SQL query language, and application development using databases. The fundamentals of relational database technology will be covered.
Contents: data modelling, relational data model, data normalisation, logical and physical database design, SQL query language, Form-based application development, client server and web-enabled transactions processing systems, and distributed database systems.

INFS 1000 **Business Information Systems Foundations**
6 credit points. B Com, B Ec, B Ec (Soc Sc), B Ec Soc Sc, B I T, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 2, Semester 1, Summer. **Classes:** 3 hours per week. **Prohibitions:** ISYS1003 or INFO 1000 or INFO 1003 or INFO 1903. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
The Information Age, with its focus on information as a key business resource, has changed the way Business Information Systems (BIS) are viewed in organisations. In previous years, people approached BIS primarily as a tool to increase fficiency, either by cutting costs, time or energy spent. In the information age, however, the role of BIS is different it is an
enabler of innovation and a tool for getting the right information into the hands of the right people at the right time. This unit focuses on how businesses operate and shows how business information systems support business operations and management. Students are provided with an introduction to BIS theories, frameworks and models to assist in understanding the nature and contribution of BIS in a range of organisational contexts including private, public and not for profit.

MATH 1001 **Differential Calculus**
3 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Summer. **Classes:** 2 lee & 1 tut/wk. **Assumed Knowledge:** HSC Mathematics Extension 1. **Prohibitions:** MATH 1011 or 1901 or 1906 or 1111. **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.
Textbooks
As set out in the Junior Mathematics Handbook.

MATH 1002 **Linear Algebra**
3 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Summer. Classes: 2 lee & 1 tut/wk. **Assumed Knowledge:** HSC Mathematics Extension 1. **Prohibitions:** MATH 1902 or 1012 or 1014. **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.
Textbooks
As set out in the Junior Mathematics Handbook

MATH 1003 **Integral Calculus and Modelling**
3 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Summer, Semester 2. **Classes:** 2 lee & 1 tut/wk. **Assumed Knowledge:** HSC Mathematics Extension 2 or MATH 1001 or MATH 1111. **Prohibitions:** 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.
Textbooks
As set out in the Junior Mathematics Handbook

MATH 1004 **Discrete Mathematics**
3 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Med Sc, B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Summer, Semester 2. **Classes:** 2 lee & 1 tut/wk. **Assumed Knowledge:** HSC Mathematics Extension 1. **Prohibitions:** MATH 1904 or MATH2011. **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 requirement 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.
Textbooks
As set out in the Junior Mathematics Handbook

MATH 1005 **Statistics**
3 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Med Sc, B Pharm (Rural), B Res Ec, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 2, Summer. Classes: 2 lee & 1 tut/wk. **Assumed Knowledge:** HSC Mathematics. **Prohibitions:** 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.
Textbooks
As set out in the Junior Mathematics Handbook

MATH 2061 **Linear Mathematics and Vector Calculus**
6 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Res Ec, B S T, B Sc, UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Summer. Classes: 3 lee, 1 tut and 1 practice class/wk. **Prerequisites:** MATH (1111 or 1001 or 1901 or 1906) and MATH (1014 or 1002 or 1902) and MATH (1003 or 1903 or 1907). **Prohibitions:** MATH (2001 or 2901 or 2002 or 2902 or 2961 or 2067). **Assessment:** 3 hour exam, assignments, quizzes.
This unit starts with an investigation of linearity: linear functions, general principles relating to the solution sets of homogeneous and inhomogeneous linear equations (including differential equations), linear independence and the dimension of a linear space. The study of eigenvalues and eigenvectors, begun in junior level linear algebra, is extended and developed. Linear operators on two-dimensional real space are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors. The unit then moves on to topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals; polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, though cylinders, spheres and parametrised surfaces), Gauss' Divergence Theorem and Stokes' Theorem.

MATH 2065 **Partial Differential Equations (Intro)**
6 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Res Ec, B Sc, UG Study Abroad Program. **Session:** Semester 2. **Classes:** 3 lee, 1 tut, 1 example class/week. **Prerequisites:** MATH (1001 or 1901 or 1906) and MATH (1002 or 1902) and MATH (1003 or 1903 or 1907). **Prohibitions:** MATH (2005 or 2905 or 2965 or 2067). **Assessment:** 3 hr exam, mid-semester test, assignments.
This is an introductory course in the analytical solutions of PDEs (partial differential equations) and boundary value problems. The techniques covered include separation of variables, Fourier series, Fourier transforms and Laplace transforms.

MATH 2069 **Discrete Mathematics and Graph Theory**
6 credit points. B A, B Com, B E, B Ed, B Sc (Psych), B Sc, UG Study Abroad Program. **Session:** Semester 1. Classes: 3 lec,l tut & 1 practice class/wk. **Prerequisites:** 6 credit points of Junior level Mathematics. **Prohibitions:** MATH (2011 or 2009 or 2969). **Assessment:** Two 1.5 hour exams, assignments, quizzes.
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 to be covered in the first part of the unit include recursion and induction, generating functions and recurrences, combinatorics, including connections with probability theory, asymptotics and analysis of algorithms, set theory and logic. Topics covered in the second part of the unit include Eulerian and Hamiltonian graphs, the theory of trees (used in the study of data structures), planar graphs, the study of chromatic polynomials (important in scheduling problems), maximal flows in networks, matching theory.

MKTG 3110 **Electronic Marketing**
6 credit points. B Agr Ec, B Com, B E, B Ec, B Ec (Soc Sc), B Ec Soc Sc, UG Study Abroad Program. Jeffrey Lim. **Session:** Semester 2. Classes: One lecture and one tutorial per week. **Prerequisites:** MKTG 1001 (or MKTG2001). **Prohibitions:** MKTG3010. **Assessment:** May include one or more of the following: Mid-semester examination; Tutorial work/participation; Case study; Group/individual project; Presentation; Assignment; Report; Essay; Final examination.
This unit explores how new technologies can be embraced effectively for marketing purposes. The unit builds upon the principles and concepts of traditional marketing studied in MKTG 1001 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 evolving 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 3304 **Operating System Internals**
6 credit points. B A, B C S T, B E, B I T, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), UG Study Abroad Program. **Session:** Semester 2. Classes: 2hr lectures, 2hr tutorials/wk. **Prerequisites:** (ELEC1601 orNETS(2008 or 2908) or COMP(2001 or 2901) orELEC2601) and (SOFT(2130 or 2830) or SOFT(2004 or 2904) or COMP(2004 or 2904)). **Prohibitions:** May not counted with NETS(3009 or 3909 or 3604), COMP(3009 or 3909).. **Assessment:** Assignments, written exam.
NB: Students who were not able to do ELEC1601, but have the remaining prerequisites, are encouraged to apply for special permission to enrol in this unit.
This unit will provide a comprehensive discussion of relevant OS issues and principles and discuss how those principles are put into practice in real operating systems. The contents include internal structure of OS; several ways each major aspect (process scheduling, inter-process communication, memory management, device management, file systems) can be implemented; the performance impact of design choices; case studies of common OS (Linux, MS Windows NT, etc). The contents also include concepts of distributed systems: naming and binding, time in distributed systems, resource sharing,

synchronization models (distributed shared memory, message passing), fault-tolerance, and case study of distributed file systems.

PHYS 1001 **Physics 1 (Regular)**

6 credit points. B A, B E, B Ed, B Sc (Psych), B Med Sc, B Sc, B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Molecular Biotechnology), B Sc (Nutrition), UG Study Abroad Program. **Session:** Semester 1. **Classes:** Three 1hr lectures, one 3hr laboratory, one 1hr tutorial. **Assumed Knowledge:** HSC Physics. **Corequisites:** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902). **Prohibitions:** PHYS (1002 or 1901). **Assessment:** Laboratory (20%), assignments (10%), progressive test (5%), skills test (5%), examination (60%).

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. 11th edition, Addison-Wesley. 2004
Experimental Physics Laboratory Manual - School of Physics Publication.

PHYS 1003 **Physics 1 (Technological)**

6 credit points. B A, B E, B Ed, B Sc (Psych), B Med Sc, B Sc, B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), B Sc (Molecular Biotechnology), B Sc (Nutrition), UG Study Abroad Program. **Session:** Semester 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. **Corequisites:** Recommended concurrent Units of Study: MATH (1003/1903). MATH (1005/1905) would also be useful. **Prohibitions:** PHYS (1004 or 1902). **Assessment:** Laboratory (25%), assignments (10%), examination (65%).

NB: It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit

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.

Textbooks

Young & Freedman. University Physics, 11th edition, Addison-Wesley. 2004
Experimental Physics Laboratory Manual - School of Physics Publication.

PHYS 2213 **Physics 2EE**

6 credit points. B E. **Session:** Semester 2. **Classes:** 3 lee x 13wks, 2hr computational lab x 10 wks. **Assumed Knowledge:** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful. **Prerequisites:** PHYS (1001 or 1901) and PHYS (1003 or 1902). **Prohibitions:** PHYS (2203 or 2001 or 2901 or 2011 or 2911 or 2002 or 2902 or 2012 or 2912). **Assessment:** One 3 hr exam, one 1 hr computational test.

This unit of study is designed to build on the knowledge gained in Junior Physics, to provide Electrical Engineering students with the knowledge of relevant topics of Physics at the Intermediate level, and with associated skills. Completion of the unit provides a solid foundation for further studies in Electrical Engineering and related engineering areas. The aims of this unit are linked to the generic attributes required of graduates of the University in knowledge skills, thinking skills, personal skills and attributes, and practical skills.

By the end of this unit of study, students will be able to describe and apply concepts in optics, electromagnetism and basic solid state physics and technology at the intermediate level. They will be able to use computational techniques to analyze optics problems.

The major topics in this unit of study are:

Optics (13 lectures): The wave nature of light, optical phenomena and the interaction of light with matter: interference and diffraction effects; fundamental limits to resolution of optical instruments; polarisation; dispersion; coherence; These are presented within the context of several key optical technologies including lasers, CD/DVD players, optical fibre communication systems, gratings and Mach Zehnder modulation.

Electromagnetic properties of matter (12 lectures): Electric and magnetic effects in materials; the combination of electric and magnetic fields to produce light and other electromagnetic waves in vacuum and matter.

Solid State and Device Physics (13 lectures): Introduction to quantum mechanics, Fermi-Dirac statistics, electronic properties of solids (metal, semiconductors & insulators), doping and the semiconductor PN junction;

Introduction to nanotechnology; fabrication technologies, nano-imaging technologies, nanoelectronics.

Computational Physics (10 sessions of 2 hours each): In a computing laboratory students use Matlab-based simulation software to conduct virtual experiments in optics, which illustrate and extend the relevant lectures. Students also gain experience in the use of computers to solve problems in physics.

Textbooks

Notes published by the School of Physics:
- Physics 2EE Computational Physics Optics Notes
- Physics 2EE Electromagnetic Properties of Matter Notes
- Physics 2EE Solid State and Device Physics Notes

Other texts to be announced

SOFT 1001 **Software Development 1**

6 credit points. B A, B Com, B Des Comp, B E, B Med Sc, B S T, B Sc, B Sc (Bioinformatics), B Sc (Molecular Biology & Genetics), B Sc (Molecular Biotechnology), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Semester 2. **Classes:** One 1hr lecture, one 2 hr tutorial, one 3hr practical. **Assumed Knowledge:** HSC Mathematics Extension 1. **Prohibitions:** 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. B A, B Com, B Des Comp, B E, B Med Sc, B S T, B Sc, B Sc (Bioinformatics), B Sc (Molecular Biology & Genetics), B Sc (Molecular Biotechnology), B Sc (Nutrition), UG Study Abroad Program, UG Summer/Winter School. **Session:** Semester 1, Semester 2, Summer. **Classes:** One 1hr lecture, one 2hr tutorial, one 3 hr practical. **Prerequisites:** SOFT (1001 or 1901) or COMP (1001 or 1901). **Prohibitions:** May not be counted with SOFT 1902 or COMP (1002 or 1902)orDECO2011. **Assessment:** Written and practical assignments, quizzes, exam.

NB: Students with Credit or above in INFO1903 are encouraged to request special permission to enter this unit.

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 2130 **Software Construction 1**

6 credit points. B A, B Com, B E, B Sc, B Sc (Bioinformatics), UG Study Abroad Program, UG Summer/Winter School. A/Prof Kummerfeld, A/Prof Kay. **Session:** Semester 2, Summer. **Classes:** 2 hrs lecture per week, 3 hrs lab (structured as 2 hrs plus 1 hr) per week. **Prerequisites:** SOFT (1002 or 1902) or COMP (1002 or 1902). **Prohibitions:** COMP (2004 or 2904) or SOFT (2904 or 2004 or 2830).. **Assessment:** Programming assignments, in-lab quizzes, 2 hr written exam.

NB: Students with Credit or above in INFO1903 are encouraged to request special permission to enter this unit.

In this unit of study we cover elementary methods for developing robust, efficient, and re-usable software. The unit is taught in C, in a Unix environment. Specific coding topics include memory management, the pragmatic aspects of implementing data structures such as lists and hash tables, and managing concurrent threads. Debugging tools and techniques are discussed and common programming errors are considered along with defensive programming techniques to avoid such errors. Emphasis is placed on using common Unix tools to manage aspects of the software construction process, such as version control and regression testing. 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. The unit discusses professionalism issues relevant to a career in software development, including intellectual property in software and employment conditions for programmers

Textbooks

TBA

SOFT 3302 **Software Quality Assurance**

6 credit points. B A, B C S T, B E, B I T, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), UG Study Abroad Program. **Session:** Semester 2. **Classes:** 2hrs lecture, 2hrs tutorial per week. **Prerequisites:** (INFO(2110 or 2810) or INFO(2000 or 2900)) and ((COMP(2160 or 2860) or COMP(2111 or 2811) or COMP(2002 or 2902)) or (SOFT(2130 or 2830) or SOFT(2004 or 2904) or COMP(2004 or 2904))). **Prohibitions:** May not be counted with SOFT(3602 or 3103 or 3803). **Assessment:** Programming assignments, in-lab quizzes, written exam.

This unit will discuss ways in which the quality of software systems can be enhanced through processes that occur within the Software Development Life Cycle (SDLC). We cover both agile methodologies such as extreme programming (XP), and heavier methodologies such as Rational's RUP. We deal with ways to enhance quality of designs and of code construction, and we particularly emphasize the role of testing, for functionality and also for nonfunctional issues such as performance, usability, conformance to policy). You will learn to

produce a testing strategy, starting from a careful analysis of the risks faced by the system; this strategy is elaborated into a detailed test plan. You will evaluate test plans in terms of coverage and contribution to system reliability. Emphasis is also placed on the management of the testing activity, especially on tracing from test results back to the aspect of the requirements being tested. You will have experience using some automated tools for managing the testing process.

SOFT 3301 **Software Construction 2**

6 credit points. B A, B C S T, B E, B I T, B Sc, B Sc (Bioinformatics), B Sc (Environmental), B Sc (Marine Science), B Sc (Molecular Biology & Genetics), UG Study Abroad Program. **Session:** Semester 1. **Classes:** 2hrs lecture, 2hrs tutorial per week. **Prerequisites:** SOFT(2130 or 2830 or 2004 or 2904) or COMP (2004 or COMP2904). **Prohibitions:** May not be counted with SOFT(3601, 3104, 3804) or COMP(3008 or COMP3908). **Assessment:** Programming assignments, in-lab quizzes, written 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. You will know many of the recognized Design Patterns, and be able to use them appropriately to evaluate and improve (refactor) existing code. You will have experience with coding using an Integrated Development Environment.

5. Other Faculty information

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

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,
+612 93512416.

President of the Students' Representative Council,
+61 2 9660 5222.

JN Ellis Memorial Fund

The JN Ellis Memorial Fund was established in 1969 following an appeal made to all graduates in engineering to honour the memory of Neil Ellis, who as Sub-Dean and later as Administrative Assistant to the Dean over a considerable period of years was able, by sympathetic counselling, to help many students who were having difficulties in completing their studies.

The object of the fund is to provide financial assistance to students in the Faculty of Engineering who are in such a position that without assistance they would not be able to continue their studies. Students seeking such assistance should apply to Financial Assistance, Student Services, phone +612 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 +612 9351 3853.

List of staff by departments

Dean

Professor Gregory J Hancock, BE BSc PhD DEng, FTSE FIEAust Bluescope Steel Professor of Steel Structures

Executive Assistant to the Dean
Ms Kay Fielding

Pro Dean
Professor John C Small, BSc *Lond* PhD, FIE Aust MASCE

Associate Dean (Postgraduate)
Professor Liangchi Zhang, BSc MEng *Zhejiang* PhD *Peking* DEng, MASME
MASPE MJSPE MJSME

Associate Dean (Undergraduate)
Dr Douglass J Auld, BSc BE MEngSc PhD

Associate Dean (Research)
Professor Brian S Haynes, BE PhD *UNSW*, FIChemE FIEAust CPEng

Associate Dean (Teaching and Learning)
John Currie, BA DipEd MA(Hons) *Wollongong*

Associate Dean (First Year)
Dr Craig Jin, BSc *Stan* MS *Caltech* PhD

Associate Dean (International)
Professor Liyong Tong, BSc MEngSc *Dalian* PhD *BUAA* , FIEAust MAIAA

Associate Dean (ICT and T&L)
Dr Rafael Calvo, Licenciado in Physics PhD *Universidad Nacional de Rosario*

Executive Officer
Mr Eric van Wijk, BSc *(ANU*) DipEd DipAppEcon *(UCan*)

Secretary to the Faculty and Finance Officer
Mr Michael Whitley, BA(Hons) *EastAnglia* MCom *UNSW*, ASA CIA FCIS FICD Dip

Student Administration Staff

Postgraduate Adviser - Ms Josephine Harty, BA *Macq*

Undergraduate Adviser - Ms Annamaria Brancato

Administrative Assistant - Lee Levsen, BE

External Relations and Scholarships
Ms Myra Koureas, BEd MEd M Int Bus & Law

Engineering Sydney
Ms Susanna Smith, BSocSc *UNSW* MA *UNSW*

Faculty Librarian
Irene Rossendell, BA *(Qld*) Dip Lib *UNSW*, ALIA

Advisers to undergraduate students

Aerospace,Mechanical and Mechatronic Engineering

Aeronautical
1 st Year-DrKC Wong
2nd Year - Dr Hugh Stone
3rd Year - Prof Liyong Tong
4th Year - Dr Peter Gibbens

Biomedical
All Years - Dr Andrew Ruys

Mechanical
1st Year - Prof Lin Ye
2nd Year - Sem 1 Prof J Kent; Sem 2 Prof Assaad Masri
3rd Year - A/Prof Steve Armfield
4th Year - Sem 1 Prof John Kent; Sem 2 A/Prof Steve Armfield

Mechatronic
1st and 3rd Years - Dr David Rye
2nd and 4th Years - Dr Steve Scheding

Space
1st and 2nd Years - Dr Doug Auld
3rd and 4th Years - Dr Salah Sukkarieh

Chemical Engineering
First Year - Dr M Valix
Second Year - Prof J G Petrie
Third Year - Dr V Gomes
Fourth Year - Dr H See

Civil Engineering
First Year - Professor Kim Rasmussen
Second Year - Dr Abbas El-Zein
Third Year - Associate Professor David W Airey
Fourth Year - Dr Tim Wilkinson
Combined degree students - Associate Professor David Airey
PEM (Civil) lst-4th yr Advisor - Dr Li Liu

Electrical and Information Engineering
First Yr - Dr Xiheng Hu
Second Yr - Dr Swamidoss Sathiakumar
Third Yr - Dr Iain Collings
Fourth Yr - Dr Jim Rathmell
Combined degree courses - Dr Jim Rathmell
International students - Dr Xiheng Hu

Aerospace, Mechanical and Mechatronic Engineering

Head of School
LinYQ,BS Harbin MS PhD *BUAA*

PNRussell Professor
Roger I Tanner, BSc *Brist* MS *Calif* PhD *Mane* , FRS FAA FTSE FIEAust FASME Appointed 1975

Lawrence Hargrave Professor
Vacant

Professors
Robert W Bilger, BSc BE *NZ* DPhil *Oxf*, FAA FTSE FIEAust Personal Chair in Mechanical Engineering. Appointed 1976
Hugh F Durrant-Whyte, BSc(Eng) *Lond* MSE PhD *Penn* , FTSE ARC Federation Fellow, Professor of Mechatronic Engineering. Appointed 1995
John H Kent, BE MEngSc PhD, FIEAust. Appointed 2001
Yiu-Wing Mai, BSc (Eng) PhD DSc *HK* DEng *Syd* , FAA FTSE FHK Eng FWIF FIE Aust FASME FHKIE ARC Federation Fellow, Personal Chair in Mechanical Eng. Appointed 1987. University Chair. Appointed 2004
Assaad R Masri, BE PhD Appointed 2002
Eduardo M Nebot, BS *Bahia Blanca* MS PhD *Colorado State* . Appointed 2003
Liyong Tong, BSc MEngSc *Dalian* PhD *BUAA* , FIEAust MAIAA. Appointed 2004
Lin Ye, BS *Harbin* MS PhD *BUAA* . Appointed 2003
Liangchi Zhang, BSc MEng *Zhejiang* PhD *Peking* DEng *USyd*, MASME MASPE MJSPE MJSME. Appointed 2003

Associate Professors
Steven W Armfield, BSc *Flinders* PhD

Senior Lecturers
Douglass J Auld, BSc BE MEngSc PhD
Peter W Gibbens, BE PhD *N'cle (NSW)*, MAIAA
Paul J McHugh, BSc BE
David C Rye, BE *Adel* PhD
Karkenahalli Srinivas, BE *Bangalore* ME PhD *IISc*
Salah Sukkarieh, BE PhD
Kee Choon Wong, BE PhD, MAIAA
Steven Scheding, BE PhD

Lecturers
Hugh Stone, BSc BE PhD
Stefan Williams, BASc *Wat* PhD

Visiting Professors
Brian Cotterell, BSc (Eng) *London* PhD Cantab
Gordon Williams, BSc (Eng) PhD DSc *Lond*, FRS FCGI FREng FIMechE FIM

Adjunct Professors
Brian Cox, BSc PhD *Monash*
Francis Rose, BSc (Hons) PhD *Sheff*, FTSE

Adjunct Associate Professors
Allen Lowe, BE ME *UNSW* PhD *N'cle (NSW)*
Greg Roger, MBBS MEng(Res)

Adjunct Senior Lecturer
Rob Widders, BE MEngSc *UNSW*

Adjunct Lecturer
Captain Peter L Bates, BE
Elizabeth Jean Nightingale, BAppSc MBiomedE Phd *UNSW*

Chemical Engineering

Head of Department
Associate Professor Geoffrey W Barton, BE PhD

Professors
Brian S Haynes, BE PhD *UNSW*, FIChemE FIEAust CPEng
Emeritus Professor Rolf G H Prince, AO BE BSc *NZ* PhD, FIChemE HonFIEAust FTSE FREng
James G Petrie, BSc PhD *Capetown*

Associate Professors
Geoffrey W Barton, BE PhD
Timothy AG Langrish, BE *NZ* DPhil *Oxf* CPEng EIChemE, FIEAust
Fariba Dehghani PhD *UNSW*

Senior Lecturers
Vincent G. Gomes, BTech MEng PhD *McGill*
Marjorie Valix, BSc PhD *UNSW*
Howard See, BSc BE MSc *Tokyo* PhD *Nagoya*

Lecturer
Andrew Harris, BSc BE (Hons) *Qld* PhD *Cambridge*

Associate Lecturer
John Kavanagh, BE (Hons) PhD

Honorary Appointments

Honorary Professor
Professor Judy Raper, BE (Hons) PhD *UNSW*
Jose Romagnoli, BE *NdelSurArg* PhD *Minn*

Adjunct Associate Professors
David Fletcher, BSc PhD *Exeter*
Donald O White, BE *Liverpool*

Visiting Appointments
Professor Hans Coster, MSc PhD *USyd* MinstP Cphys FAIP
Professor David Glasser, BSc *Capetown* PhD DIC *ICLondon*
Assoc Prof Stephanie Burton, BE (Hons) MSc PhD *Rhodes*
Dr Terry Chilcott, BE *UQ* BESc *PKDUNSW*
Prof Guo Lin Huang, PhD *East China IT*

Honorary Associates
Peter B. Linkson, BE PhD, FIEChemE FAusIMM FGAA CEng
Denis Nobbs, BSc *UNSW*

Civil Engineering

Head of Department
Kim JR Rasmussen, MEngSc TU Denmark PhD

Challis Professor of Civil Engineering
John P Carter, BE PhD DEng, MASCE FIEAust CPEng

Professors
Gregory J Hancock, BE BSc PhD DEng, FTSE FIE. Aust Bluescope Steel Professor of Steel Structures
Kim J R Rasmussen, MEngSc *TU Denmark* PhD
John C Small, BSc *Lond* PhD, FIEAust MASCE

Adjunct Professor
Jim Forbes, BE, FIEAust MCIA MACIMPWI CPEng
Ian SF Jones, BE *UNSW* PhD *Wat*, MIEAust

Associate Professors
David W Airey, BA MPhil PhD *Camb*
Stuart G Reid, BE (Hons) *(Cant)* ME *Cant* PhD McG
Chris Stevens BSc(Hons) PhD, FIAP

Adjunct Associate Professor
PJ Mulhearn, BE PhD

Emeritus Professors
Harry G Poulos, AM BE PhD DScEng, FIEAust FASCE FAA
Nicholas S Trahair, BSc BE MEngSc PhD DEng, FIEAust

Senior Lecturers
Abbas El-Zein, BE MSc PhD, MIEAust MASCE
Dong-Sheng Jeng, BE MEng PhD, MASCE MAGU
Timothy Finnigan, BASc MASc PhD CPEng
Itai Einav BSc PhD

Lecturers
Li Liu, BE *(NUTD)* MBA *(AIT)* MTax *(USyd)* PhD *(AGSM)*
Gianluca Ranzi, BE MScEng PhD
Tim Wilkinson, BSc BE MA, PhD
Graeme Wood, BEng(Hons) PhD Edin

Professional Officers
Nigel P Balaam, BE PhD
Timothy S Hull, BE PhD
John P Papangelis, BE PhD, MIEAust

Honorary Professor
AH Ja'afari, BSc ME *Tehr* MSc PhD *Sur*

Honorary Associate Professors
Andrew Abel, Dipl Ing *TU Bud* MSc McM PhD *UNSW* CEng, FIM
Peter Ansourian, BSc BE PhD
Robert J Wheen, BSc BE MEngSc, FIEAust MASCE

Honorary Associate
Professor YK Cheung, OBE BSc PhD DSc DE FEng CEng, FICE FIStructE FIEAust FHKIE(Hon)

Honorary Research Associates
Russell Q Bridge, BE (Hons) *UNSW* PhD, FIEAust
Howard B Harrison, BE PhD, MIEAust
Harold Roper, BSc PhD *Witw* MEngSc, MAIMM
Richard D Watkins, BE *Qld* PhD *Aberd* , MIEAust

Honorary Teaching Associate
Ian G Bowie, MSc *Mane* , MASCE, MIEAust
Noel L Ings, BE MEngSc *UNSW*, MASCE MIEAust

Electrical and Information Engineering

Head of School
Associate Professor David Levy, MScEng PhD *Natal*, MIEEE MACM

PNRussell Professor
vacant

Professors
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
Iain Collings, BE *Melb* PhD *ANU* SMIEEE
Abbas Jamalipour, BSc *Isfahan* MSc *Sharif* PhD *Nagoya*, SMIEEE FIEAust MURSIMIEICE MSITA MAAEE
David Levy, MScEng PhD *Natal*, MIEEE MACM
Stephen W Simpson, BSc PhD

Reader
Andre van Schaik, MSc *Twente* PhD *EPFL* , SMIEEE

Senior Lecturers
Javid Atai, BSc(Hons) *WAust* PhD ANU, SMIEEE
Rafael Calvo, Licenciado in Physics PhD *Universidad Nacional de Rosario*
Xiheng Hu, MEng *Chongqing* PhD
Craig Jin, BSc *Stan* MS *Caltech* PhD
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
Guoqiang Mao, BE *Hubei PolyUni*, ME *Southeast China* PhD *Edith Cowan* , MIEEE
Peter Stepien, BE *N'cle (UNSW)*, MIEEE

Professional Officers
Rui Hong Chu, MElecEng *XVan Jiao Tong* PhD
William Fong, BE *WAust* MEngSc

Ross Hutton, BE *QIT* ME(Res)
Van Pham, BE *SAust* MEngSc PhD *UNSW*, MIEEE
Michael Rados, BSc BE MEngSc
Robert G Sutton, ME *UNSW*

Manager, Academic Support Office
Raymond Patman

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

Honorary Professors
David Hill, BE BSc *Qld* PhD *N'cle (NSW)*, FIEAust FIEEE
SYR Hui, BSc *Birm* PhD *Lond*
Godfrey Lucas, BEng PhD *Belf*, FIEE

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
Anthony S Stokes BSc BE PhD, FIEAust
David G Wong, BSc BE MEngSc PhD
Hansen Yee, BSc BE PhD

Adjunct Senior Lecturer
Tim Scott, BSc BE PhD

Honorary Senior Lecturers
Brian Campbell, ME
David F Gosden, ME *UNSW* MBA *AGSM*, MIEAust

Adjunct Lecturers
Didier Debuf, BE MEngSc PhD *UNSW*
Eric Mousset
Manurajh Thurairajah, BSc BE

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 Quadrangle, phone +61 2 93513250.

Engineering scholarships

The scholarships web site is at www.eng.usyd.edu.au/scholarships.

Scholarships are funded by industry, the Faculty and Departments and Schools. The scholarships website is the most accurate source of information but departmental/school websites also contain scholarship information.

WM Neirous Scholarship

For women enrolling in structural (civil) engineering, valued at $3000 pa for four 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:+61 2 9351 2834/2131
Fax:+61 2 9351 3885
Email: scholarships@eng.usyd.edu.au
The University scholarship website (http://www.usyd.edu.au/fstudent/undergrad/study/shm/scholarships.shtml) provides information on university scholarships.

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 six 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.

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 is $12,000 tax free to the student. Total cost to the sponsor is currently $19,000 - $21,000, depending on the extent of other support by the sponsor to the Department, such as Foundation membership.

Sponsors:

The sponsors for 2006 are BHP Billiton Technology, BOC, Intec Ltd, Sydney Water Corporation, QENOS, Visy Pulp Paper, 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 (http://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 Alumni (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 - e.g. civil, electrical, mechanical, chemical and transportation to name a few.
Any student of an approved School of Engineering can join the Institution as a student member (StudlE Aust).

As a student member you will receive the fortnightly magazine Engineers Australia, containing articles of general engineering interest and advising you of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, and so on.

Student members may freely use the comprehensive library and reference facilities maintained by the Institution - a handy place to obtain a hard-to-get book or periodical.

Within most divisions is a Graduates and Students Section, known as GAS, and all graduates of, or students at, approved engineering schools are eligible for membership.

The Graduates and Students Sections organise film nights, site tours and other activities of general interest. The Malcolm Stanley

Speakers' Competition for public speaking is held each year, usually in September, and prizes are awarded for the best speeches.

For membership information and application forms enquire at the Faculty Office or at the Sydney Division Office:
118 Alfred Street, Milsons Point 2061 (PO Box 138)
Phone+61 2 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 +61 3 9329 3046. Email: melanie.whiteside@icheme.org.au

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 +612 9264 9500.

A short history of the Faculty

One hundred and seventeen years of engineering education

In 1983 the Faculty of Engineering celebrated 100 years of engineering education at the University of Sydney.

At the beginning of March 1883 the first classes in engineering were held in the Main Building. Engineering then formed part of the newly created Faculty of Science (1882). The classes were attended at the opening by three matriculated students who were candidates for the engineering certificate and by seven non-matriculated students.

The lecturer in engineering was Mr W H Warren, who had been appointed in December 1882 following a decision by the University Senate to carry out significant revisions to the teaching of the University. These revisions, which provided for the establishment of Schools of Medicine, Science and Engineering, were unable to be implemented in 1881 for lack of staff, accommodation, and facilities.

In 1883, when the new engineering curriculum was introduced, the Senate reported that "great inconvenience [had] been felt during the year, both by the lecturers and the students, through the deficiency in accommodation for lecturing purpose ... the room occupied by the Lecturer in Engineering [was] much too small to contain the apparatus required for the illustration of his lectures ..." A temporary structure was erected at the rear of the Main Building, and in 1885 classes moved to a fairly commodious low white building with a verandah facing Parramatta Road, on a site now partly occupied by the Holme Building.

In 1909 the new building for the PN Russell School of Engineering was sufficiently completed early in the year for the work of the school to be conducted within its walls. This building - an outcome of the extraordinary benefaction of Peter Nicol Russell - was formally opened by the Governor on 20 September 1909 at the same time as he opened the new Fisher Library building (now MacLaurin Hall). During the course of the next few decades extensions were made to the PNR Building until, with the expansion in student numbers in the 1950s and early 1960s, new facilities were constructed in the Darlington extension area across City Road. Since the mid-70s 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 Chemical Engineering 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, BHP Billiton, Huntsman Chemicals 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: +61 2 9351 2455, Fax: +61 2 9351 2854, email: espinner@chem. eng.usyd. edu.au

The Civil Engineering Foundation

The Civil Engineering Foundation was founded in 1968 to assist civil engineering postgraduate and undergraduate students to achieve their goals in the civil engineering industry. The Foundation acts in all non-academic areas and is a conduit between academic staff, parents and industry. In addition, the Foundation supports the department activities and is an integral part of the whole department's function.

The Foundation is the arm of the civil engineering industry within the University and received all of its funds from the civil engineering industry by way of Foundation membership. In addition, the Foundation organises seminars and courses and holds a number of fund raising activities which are keenly supported by the industry. The Foundation also takes care of pastoral needs of undergraduate students when required and is active in procuring practical work experience for third year students and full time placements for graduating students.

The Foundation funds are used to provide education and research scholarships and to ensure the department is fully equipped to engage in civil engineering research and development. Many civil engineering consultants, contractors and architects use the department's research knowledge and laboratories before commencing any major works.

The Foundation also promotes Lectures, Seminars, Short Courses, Master's programs and Technical Notes. The Foundation is also active in fostering Research Linkage between the civil engineering industry and the department to ensure the Australian civil engineering industry is kept at the fore front of world practice.

The Foundation can be contacted through the Executive Officer:
Phone:+61 2 9351 2127
Fax:+61 2 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

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

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Approved by: Senate on 4 December 2000
Date of effect: 1 January 2001

Latest amendment approved by: Senate on 3 December 2001
Date of effect: 1 January 2002

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; and

credit points means 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* per cent 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

(i)

(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 subsection (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 50 per cent 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)^{M} 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 re-admission to the award course or re-enrolment in the unit or units of study concerned after at least four 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 Re-admissions).

(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 re-admission to an award course or re-enrolment in a unit of study after a period of exclusion, and who is refused re-admission or re-enrolment may also apply to the Appeals Committee.
(b) The Appeals Committee shall comprise:
(i) three 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) two student Fellows; and
(iv) up to four other Fellows.
(c) The Appeals Committee may meet as one or more subcommittees providing that each subcommittee shall include at least one 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 subcommittee.
(e) The Appeals Committee and its subcommittees have authority to hear and determine all such appeals and must report its decision to the Senate annually.
(f) The Appeals Committee or a subcommittee 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 subcommittee considering the appeal. A student so appearing may be accompanied by a friend or adviser.
(h) The Appeals Committee or subcommittee 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 subcommittee hears the student.
(i) If, due notice having been given, a student fails to attend a meeting of the Appeals Committee or subcommittee scheduled to consider that student's appeal, the Appeals Committee or subcommittee, 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.

General University information

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Accommodation Service

The Accommodation Service helps students find off-campus accommodation. The service maintains an extensive database of accommodation close to the Camperdown and Darlington Campus or within easy access via public transport. Currently enrolled students can access the database online through the MyUni student portal (http://myuni.usyd.edu.au), or the accommodation website via your MyUni student portal or the Services for Students website (http ://www.usyd. edu. au/stuserv).

Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 29351 3312
Fax:+61 2 9351 8262
Email: accomm@stuserv.usyd.edu.au
Web: www.usyd.edu.au/accom

Admissions Office

The Admissions Office, located in the Student Centre, is responsible for overseeing the distribution of offers to undergraduate applicants through the Universities Admission Centre (UAC). They can advise prospective local undergraduate students on 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 +61 2 9351 4118 for more information. For enquiries regarding special admissions (including mature-age entry) phone +61 2 9351 3615. Applicants without Australian citizenship or permanent residency should contact the International Office (see International Student Centre entry).

Student Centre
Ground Floor, Carslaw Building F07
The University of Sydney
NSW 2006 Australia

Phone: +61 2 9351 4117 or +61 2 9351 4118
Fax:+61 2 9351 4869
Email: admissions@records.usyd.edu.au
Web: www.usyd.edu.au/su/studentcentre

Applying for a course

Local applicants for undergraduate courses and programs of study

For the purpose of admission and enrolment "local applicant" refers to citizens and permanent residents of Australia and citizens of New Zealand. If you are in this group and wish to apply for admission into an undergraduate course, you would generally apply through the Universities Admissions Centre (UAC). The deadline for application is the last working day of September in the year before enrolment. Go to the UAC website (http://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

For the purpose of admission and enrolment "local applicant" refers to citizens and permanent residents of Australia and citizens of New Zealand. Application is direct to the faculty which offers the course that you are interested in. Application forms for postgraduate coursework, postgraduate research and the Master's qualifying or preliminary program and for non-award postgraduate study can be found at www.usyd.edu.au/su/studentcentre/applications/applications.html.

Please note that some faculties use their own specially tailored application forms for admission into their courses. Please contact the relevant faculty.

International applicants for all course types (undergraduate and postgraduate)

"International applicants" refers to all applicants other than Australian citizens, Australian permanent residents and citizens of New Zealand. In the majority of cases international applicants apply for admission through the University's International Office (10) (see International Student Centre entry). All the information international applicants need, including application forms, is available from the 10 website.

Assessment

For assessment matters refer to the relevant department or school.

Careers Centre

The Careers Centre will help you with careers preparation and gradutate recruitment.

Careers Centre
Ground Floor, Mackie Building KOI
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 3481
Fax:+6129351 5134
Email: info@careers.usyd.edu.au
Web: www.careers.usyd.edu.au

Casual Employment Service

The Casual Employment Service helps students find casual and part-time work during their studies and during University vacations. The service maintains a database of casual employment vacancies. Currently enrolled students can access the database online through the MyUni student portal, or the casual employment website via your MyUni student portal, or the Services for Students website (http ://www.usy d. edu. au/stuserv).

Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 8714
Fax:+61 2 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.
Centre for Continuing Education
Cnr Missenden Road and Campbell Street
Sydney University Village
Newtown NSW 2042

Postal address:
Locked Bag 20
Glebe NSW 2037

Ph: +61 2 9036 4789
Fax:+61 2 9036 4799
Email: info@cce.usyd.edu.au
Web: www.cce.usyd.edu.au

Subject areas include: history and culture, creative arts, social sciences, languages, IT, business and overseas study tours. Courses are open to everyone.

Centre for English Teaching (CET)

The Centre for English Teaching (CET) offers English language and academic study skills programs to students from overseas and Australian residents from non-English speaking backgrounds who need to develop their English language skills to meet academic entry requirements.

Mallett Street Campus M02

Phone:+61 2 9351 0760
Fax:+61 2 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 child care for students and staff of the University who are parents. For details of centres, vacation and occasional care see the child care website via your MyUni student portal or the Services for Students website (http://www.usyd.edu.au/stuserv)

Child Care Information Officer
Level 7, Education Building A35

Phone:+61 2 9351 5667
Fax:+61 2 9351 7055
Email: childc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/childcare

Client Services, Information and Communications Technology (ICT)

Client Services are responsible for the delivery of many of the computing services provided to students. Students can contact Client Services by phoning the ICT Helpdesk on 9351 6000, through the IT Assist website (www.itassist.usyd.edu.au) or by visiting the staff of the University Access Labs.
The access labs on the Camperdown and Darlington campus are located in:

- Fisher Library (Level 2);
- Carslaw Building (Room 201);
- Education Building (Room 232);
- Christopher Brennan Building (Room 232);
- Engineering Link Building (Room 222); and
- Pharmacy and Bank Building (Room 510).

Other labs are available at the Law, Westmead Hospital and Cumberland campuses.

The labs provide students free access to computers including office productivity and desktop publishing software.

Services available on a fee for service basis include Internet access, printing facilities and the opportunity to host their own non-commercial website.

Each student is supplied with an account, called a "Unikey" account, which allows access to a number of services including:

- free email (www-mail.usyd.edu.au);
- access to the Internet from home or residential colleges (www.itassist.usyd.edu.au/services.html);
- student facilities via the MyUni student portal (http://my-uni.usyd.edu.au), including exam results, enrolment variations and timetabling; and
- free courses in basic computing (such as MS Office; basic html and excel) that are run by Access Lab staff in the week following orientation week. To register contact the Access Lab Supervisor on+61 2 9351 6870.

Client Services, Helpdesk
University Computer Centre, H08
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 6000
Fax:+61 2 9351 6004
Email: support@usyd.edu.au
Web: www.itassist.usyd.edu.au

The Co-op Bookshop

The Co-op Bookshop is a one-stop bookshop for:

- textbooks;
- general books;
- course notes;
- reference books;
- DVDs;
- flash drives; and
- software at academic prices.

Lifetime membership costs $20.00 and gives a ten per cent discount on purchases (conditions apply).

Sports and Aquatic Centre Building G09

Phone:+61 2 9351 3705
Fax: +61 2 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. Counselling is free and confidential. The service provides short-term, problem-focused counselling to promote psychological wellbeing and to help students develop effective and realistic coping strategies. The service runs a program of workshops during each semester. For details of workshops, activities and online resources provided by the service see the Counselling Service website via your MyUni student portal or the Services for Students website www.usyd. edu.au/stuserv.

Camperdown and Darlington

Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 2228
Fax:+61 2 9351 7055
Email: counsell@mail.usyd.edu.au
Web: www.usyd.edu.au/counsel

Cumberland Campus

Ground Floor, A Block, Cumberland Campus C42
The University of Sydney
East Street
Lidcombe
NSW 2141 Australia

Phone:+61 2 9351 9638
Fax:+61 2 9351 9635
Email: CS_Cumberland@fhs.usyd.edu.au
Web: www.usyd.edu.au/counsel

Disability Services

Disability Services is the principal point of contact for 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 their areas of study. Assistance available includes the provision of note taking, interpreters and advocacy with academic staff to negotiate assessment and course requirement modifications where appropriate. For details on registering with the service and online resources see the Disability Services website via your MyUni student portal or the Services for Students website www.usyd.edu.au/stuserv.

Camperdown and Darlington campuses

Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 7040
Fax:+61 2 9351 3320
TTY:+61 2 9351 3412
Email: disserv@stuserv.usyd.edu.au
Web: www.usyd.edu.au/disability

Cumberland Campus

Ground Floor, A Block, Cumberland Campus C42
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East Street
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NSW 2141 Australia
Phone:+61 2 9351 9638
Fax:+61 2 9351 9635
Email: DS_Cumberland@fhs.usyd.edu.au
Web: www.usyd.edu.au/disability

Enrolment

Students entering first year

Details of enrolment procedures will be sent to you with your UAC offer of enrolment. Enrolment takes place at a specific time and date, usually during the last week of January, depending on your surname and the faculty in which you are enrolling. You must attend the University in person or else nominate somebody in writing to act on your behalf. On enrolment day you pay the compulsory fees for joining the Student Union, the Students' Representative Council and sporting bodies. (These are currently subject to Parliamentary Review and may be voluntary in 2006.) You also nominate your preferred payment option, either "up front" or deferred, for your Higher Contribution Scheme (HECS) liability. You will also choose your first-year units of study, so it's important to consult the appropriate faculty 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.

Environmental Policy

The University of Sydney's Environmental Policy promotes sustainable resource and product use; and encourages the practice of environmental stewardship by staff and students. The policy is supported by the University wide Sustainable Campus Program.

Enquiries can be directed to the Manager, Environmental Strategies phone +61 2 93512063, email: janet.broady@usyd.edu.au, or go to www.facilities.usyd.edu.au/projects/environ/about.shtml where you can find out what the University is doing and how you can get involved, make suggestions or receive the Sustainable Campus Newsletter.

Examinations

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

Examinations and Exclusions Office
Student Centre
Level 1, Carslaw Building F07
The University of Sydney
NSW 2006 Australia

Phone: +61 2 9351 4005 or+61 2 9351 4006
Fax:+61 2 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 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:+61 2 9351 5222
Fax:+61 2 9351 4202

Financial Assistance Office

The University of Sydney has a number of loan and bursary funds to assist students experiencing financial difficulties. Loan assistance is available for undergraduate and postgraduate students enrolled in degree and diploma courses at the University. The assistance is not intended to provide the principle means of support but to help enrolled students in financial need with expenses such as housing bonds and rent; phone and electricity bills; medical expenses; buying textbooks and course equipment. Loans are interest free and are repayable usually within one year. Bursaries may be awarded depending on financial need and academic merit and are usually only available to local full-time undergraduate students. Advertised bursaries, including First Year Bursaries, are advertised through the MyUni student portal in January each year. For details of types of assistance and online resources provided by the service see the Financial Assistance website via your MyUni student protal or the Services for Students website www.usyd.edu.au/stuserv

Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 2416
Fax:+61 2 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; and
- 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 freedom of information (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: +61 2 9351 3199, +61 2 9351 4009
Protocol:+61 2 93514612
Fax:+61 2 9351 5072

(Grievances) Appeals

You may consider that a decision affecting your candidature for a degree or other activities at the University has not taken into account all relevant matters.

In some cases the by-laws or resolutions of the Senate (see the University Calendar (http://www.usyd.edu.au/about/publication/pub/calendar.shtml)) 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 policy online website (http://www.usyd.edu.au/policy) (click on "Study at the University", then click on "Appeals" - see the Academic Board and Senate resolutions).

For assistance or advice regarding an appeal contact:

Students' Representative Council
Level 1, Wentworth Building G01
The University of Sydney
NSW 2006 Australia

Phone: +61 2 9660 5222

HECS and Fees Office

Student Centre
Ground Floor, Carslaw Building F07
The University of Sydney
NSW 2006 Australia

Phone: +61 2 9351 5659, +61 2 9351 5062, +61 2 9351 2086
Fax:+61 2 9351 5081

International Student Centre

The International Student Centre consists of the International Office and the Study Abroad and Exchange Office. The IO provides assistance with application, admission and enrolment procedures and administers scholarships for international students. 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:+61 2 9351 4079
Fax:+61 2 9351 4013
Email: info@io.usyd.edu.au
Web: www.usyd. edu.au/international

Study Abroad and Exchange Unit

Study Abroad
Phone:+61 2 9351 3699
Fax:+61 2 9351 2795
Email: studyabroad@io.usyd. edu.au
Web: www.usyd. edu.au/fstudent/studyabroad/index. shtml

Exchange
Phone:+61 2 9351 3699
Fax:+61 2 9351 2795
Email: exchange@io.usyd.edu.au
Web: www.usyd.edu.au/fstudent/studyabroad/partners.shtml

International Student Services Unit

The International Student Services Unit assists international students through the provision of orientation, counselling and welfare services to both students and their families. ISSU aims to help international students cope successfully with the challenges of living and studying in a unfamiliar culture, to achieve success in their studies and to make the experience of being an international student rewarding and enjoyable. For details of orientation activities, counselling and welfare services provided to both students and their families and online resources, see the MyUni student portal or the Services for Students website www.usyd.edu.au/stuserv. International students also have access to all University student support services.

Camperdown and Darlington campuses

Ground Floor, Services Building G12
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 4749
Fax:+61 2 9351 6818
Email: info@issu.usyd.edu.au
Web: www.usyd.edu.au/issu

Cumberland Campus

Ground Floor, A Block, Cumberland Campus C42
The University of Sydney
East Street
Lidcombe
NSW 2141 Australia

Phone:+61 2 9351 9638
Fax:+61 2 9351 9635
Email: ISSU_Cumberland@fhs.usyd.edu.au
Web: www.usyd.edu.au/issu

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 Cadigal Special Entry Program assists Indigenous Australians to enter undergraduate study across all areas of the University.

As well as delivering block-mode courses for Indigenous Australian students, the Koori Centre teaches Aboriginal Studies in various mainstream courses. In addition the Centre provides tutorial assistance, and student facilities such as: computer lab, Indigenous research library and study rooms.
In particular the Koori Centre aims to increase the successful participation of Indigenous Australians 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.

The Koori Centre works in close collaboration with Yooroang Garang: School of Indigenous Health Studies in the Faculty of Health Sciences at the University's Cumberland Campus. Yooroang Garang provides advice, assistance and academic support for Indigenous students in the faculty, as well as preparatory undergraduate and postgraduate courses.

Koori Centre
Ground Floor, Old Teachers College A22
The University of Sydney
NSW 2006 Australia

Phone: +61 2 9351 2046 (general enquiries)
Toll Free: 1800 622 742
Community Liaison Officer: +61 2 9351 7003
Fax:+61 2 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:+61 2 9351 9393
Toll Free: 1800 000 418
Fax:+61 2 9351 9400
Email: yginfo@fhs.usyd.edu.au
Web: www.yg.fhs.usyd.edu.au

Learning Centre

The Learning Centre helps students develop the generic learning and communication skills that 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. For details of programs, activities and online resources provided by the centre see the website via your MyUni student portal or the Services for Students website www.usyd.edu.au/stuserv.

Camperdown and Darlington campuses
Level 7, Education Building A3 5
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 3853
Fax:+61 2 9351 4865
Email: lc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/lc

Cumberland Campus
Ground Floor, A Block, Cumberland Campus C42
The University of Sydney
East Street
Lidcombe
NSW 2141 Australia

Phone:+61 2 9351 9638
Fax:+61 2 9351 9635
Email: LC_Cumberland@fhs.usyd.edu.au
Web: www.usyd.edu.au/lc

Library

The University of Sydney Library, the largest academic library in the Southern Hemisphere, is a network of 18 libraries located on nine campuses. The Library website (http://www.library.usyd.edu.au) provides access to services and resources, anywhere at anytime. The locations, opening hours and subject specialities of the libraries are listed on the website.

Over five million items are available via the Library catalogue, including more than 52,000 electronic journals and 270,000 electronic books. Past exam papers are also available online. Enrolled students are entitled to borrow from any of the University Libraries. More information is available at www.library.usyd.edu.au/borrowing.

Reading list items are available via the reserve service. Increasingly, reading list material is becoming available in electronic form. For details see the reserve service website (http://opac.library.usyd.edu.au/screens/reserve.html).

Library staff are always available to support students in their studies. "Ask a Librarian" in person, by email, or by using an online chat service (http://www.library.usyd. edu. au/contacts/index.html).

A specialist librarian is available for all discipline areas and will provide training in finding high quality information. Courses cover a range of skills including research methodology, database searching, effective use of the Internet and the use of reference management software. See the subject contact page (http://www.library.usyd.edu.au/contacts/subjectcontacts.html).

Library facilities include individual and group study spaces, computers, printers, multimedia equipment, photocopiers and adaptive technologies. Check the "Libraries" link on the home page (http://www.library.usyd.edu.au) to find out about services and facilities in specific libraries.

The *Client Service Charter* describes the Library's commitment to supporting students' learning, including those with special needs. See the *Client Service Charter* online (http://www.library.usyd.edu.au/about/policies/clientcharter.html).

Your comments and suggestions are always welcome.

University of Sydney Library F03
University of Sydney
NSW 2006 Australia

Phone: +61 2 9351 2993 (general enquiries)
Fax: +61 2 9351 2890 (administration), +61 2 9351 7278 (renewals)
Email: loanenq@library.usyd.edu.au (loan enquiries), udd@library.usyd.edu.au (document delivery enquiries)
Web: www.library.usyd.edu.au

Mathematics Learning Centre

The Mathematics Learning Centre assists undergraduate students to develop the mathematical knowledge, skills and confidence that are needed for studying first level mathematics or statistics units at university. The entre runs bridging courses in mathematics at the beginning of the academic year (fees apply). The centre also provides ongoing support to eligible students during the year through individual assistance and small group tutorials. For details of activities and online resources provided by the centre see the website via your MyUni student portal or the Services for Students website www.usyd. edu. au/stuserv.

Level 4, Carslaw Building F07
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 4061
Fax:+61 2 9351 5797
Email: mlc@stuserv.usyd.edu.au
Web: www.usyd.edu.au/mlc

Multimedia and Educational Technologies in Arts (META) Resource Centre (Languages and E-Learning)

The centre provides access to lectures, classwork and interactive self-paced learning materials for students of languages other than English (LOTE) and English as a second language (ESL). The library

holds materials in over 90 LOTE languages. The self study room provides interactive computer assisted learning and access to live multilingual satellite television broadcasts. Computer access labs provide Internet, email and word processing access. The centre also provides teaching rooms with state-of-the-art multimedia equipment, language laboratories and video conferencing facilities for Faculty of Arts courses.

Level 2, Brennan Building (opposite Manning House)
The University of Sydney
NSW 2006 Australia

Phone: For language enquiries +61 2 9351 2371, for all other enquiries+61 2 9351 6781
Fax:+61 2 9351 3626
Email: For language related enquiries language.enquiries@arts.usyd.edu.au, for all other enquiries METAResourceCentre@arts.usyd.edu
Web: www.arts.usyd.edu.au/centres/meta

MyUni Student Portal

Launched in July 2004, the MyUni student portal (http://myuni.usyd.edu.au) is the starting point and "one-stop" environment for students to access all their web-based University information and services. MyUni automatically tailors what a student sees based on thier login-in and offers students the option of further personalising content. Most importantly, MyUni allows students to complete tasks online that would previously have required attendance in person. The following are examples of MyUni services and information:

- support services for students in health, counselling, child care, accommodation, employment and wellbeing;
- student administration systems for obtaining exam results, enrolment and variations, timetabling, email services and links to courses and units of study information;
- links to the University's e-learning systems;
- library services;
- important messages and student alerts;
- information technology and support services;
- information for international students; and
- campus maps, with descriptions of cultural, sporting and campus facilities.

Part-time, full-time

Undergraduate Students

Undergraduate students are usually considered full-time if they have a student load 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)

For postgraduate coursework students part-time or full-time status is determined by credit-point load. Enrolment in units of study which total at least 18 credit points in a semester is classed as full-time. Anything under this amount is a part-time study load. Please note that classes for some coursework programs are held in the evenings (usually 6~9pm).

Postgraduate Students (Research)

Full-time candidates for research degrees do not keep to the normal semester schedule, instead they work continuously throughout the year with a period of four weeks recreation leave. There is no strict definition of what constitutes full-time candidature but 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) you should enrol as a part-time candidate. If in doubt you should consult your faculty or supervisor.

International Students

Student visa regulations require international students to undertake full-time study. International students on visas other than student visas may be permitted to study part-time.

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 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 *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: +61 2 9351 4263, or Anne Picot: +61 2 9351 7262
Email: foi@mail.usyd.edu.au

Scholarships for undergraduates

Scholarships Unit
Room 147, Ground Floor, Mackie Building KOI
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 2717
Fax:+61 2 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: +61 2 9351 3023 (general enquiries)
Academic records: +61 2 9351 4109
Discontinuation of enrolment: +61 2 9351 3023
Handbooks:+61 2 9351 5057
Prizes:+61 2 9351 5060
Fax: +61 2 9351 5081, +61 2 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. 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 of their head and shoulders for lamination on 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 be rejected. New identity cards are required for each year of a student's enrolment.

Student Services

The University provides personal, welfare, administrative and academic support services to facilitate your success at University. Many factors can impact on your wellbeing while studying at university and student services can assist you in managing and handling these more effectively. For details of services and online resources provided see the Student Services website (http ://www.usyd. edu. au/stuserv).

The Sydney Summer School

Most faculties at the University offer units of study from undergraduate degree programs during summer. There are also some units of study available for postgraduate coursework programs from some faculties. As the University uses its entire quota of Commonwealth supported places 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 subjects before they commence their degrees. Units start at various times from late November and run for up to six weeks (followed by an examination week). Notice of the units available is on the Summer School website (http://www.summer.usyd.edu.au) and is usually circulated to students with their results notices. A smaller Winter School is also run from the Summer School office. It commences on 3 July and runs for up to three weeks (followed by an examination week). It offers mainly postgraduate and a few undergraduate units of study. Information can be found on the Summer School website (http://www.summer.usyd.edu.au).

Timetabling Unit

The Timetabling Unit in the Student Centre is responsible for producing students' class and tutorial timetables. Semester One timetables are available from the Wednesday of O Week through the MyUni website (http://myuni.usyd.edu.au).

The Faculty of Health Sciences, The Sydney College of the Arts, The Sydney Conservatorium of Music and the Faculty of Vetinary Science produce their own timetables for all teaching that they deliver. These timetables are available from the faculties.

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:+61 2 9351 3484
Fax:+61 2 9351 4110

University Health Service (Holme)
Science Rd entry, Holme Building A09
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 4095
Fax:+61 2 9351 4338

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

Student organisations

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

Students[1] Representative Council

The Students' Representative Council (SRC) 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: + 612 9660 5222 (editors, *Honi Soit* /Legal Aid, Student Welfare and Centrelink advice, interest free loans)
Second-hand Bookshop: +61 2 9660 4756
Mallet Street: +61 2 9351 0691
Conservatorium: +61 2 9351 1291
Fax:+61 2 9660 4260
Email: info@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:+61 2 9351 3715
Freecall: 1800 249 950
Fax:+61 2 9351 6400
Email: supra@mail.usyd.edu.au
Web: www.supra.usyd.edu.au

Sydney University Sport

Sydney University Sport provides opportunities for participation in a range of sporting and recreational activities along with first class facilities.

University Sports and Aquatic Centre G09
The University of Sydney
NSW 2006 Australia

Phone:+61 2 9351 4960
Fax:+61 2 9351 4962
Email: admin@susport.usyd.edu.au
Web: www.susport.com

University of Sydney Union

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

University of Sydney Union
Level 1, Manning House A23
The University of Sydney
NSW 2006 Australia

Phone: 1800 013 201 (switchboard)
Fax: +61 2 9563 6109
Email: info@usu.usyd.edu.au
Web: www.usydunion.com

Abbreviations

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

For a glossary of terms, describing the terminology in use at the University of Sydney, please see the glossary section.

Listed below are the more commonly used acronyms that appear in University documents and publications.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

AARNet	Australian Academic Research Network
AAUT	Australian Awards for University Teaching
AAM	Annual Average Mark
ABC	Activity Based Costing
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 Cooperation
APF	Australian Postdoctoral Fellowship
AQF	Australian Qualifications Framework
ARC	Australian Research Council
ARTS	Automated Results Transfer System
ASDOT	Assessment Fee Subsidy for Disadvantaged Overseas Students
ATN	Australian Technology Network
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
CEP	Country Education Profile
CEQ	Course Experience Questionnaire
CFO	Chief Financial Officer
CHASS	College of Humanities and Social Sciences
CHESSN	Commonwealth Higher Education System Student Number
CHS	College of Health Sciences
CIO	Chief Information Officer
COE	Confirmation of Enrolment
CPSU	Community and Public Sector Union
CRC	Cooperative Research Centre

C

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
CULT	Combined Universities Language Test
CUTSD	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
DVC	Deputy Vice-Chancellor

E

EB	Enterprise Bargaining
EFTSU	Equivalent Full-Time Student Unit
EFTSL	Equivalent Full-Time Student Load
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

FFT	Fractional Full-Time (Equivalent Staff)
FlexSIS	Flexible Student Information System
FHS	Faculty of Health Sciences
FMO	Facilities Management Office
FOS	Field of Study
FTE	Full-Time Equivalent (Staff)
FRM	Faculty of Rural Management

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
GSG	Graduate School of Government
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
HEIMS	Higher Education Information Management System
HEIP	Higher Education Innovation Program (DEST)
HELP	Higher Education Loan Program

H

HEO	Higher Education Officer
HEP	Higher Education Provider
HERDC	Higher Education Research Data Collection
HESA	Higher Education Support Act
HOD	Head of Department

I

IAF	Institutional Assessment Framework (This is a new name for what was previously the DEST Profile process.)
IAS	Institute of Advanced Studies
ICT	Information and Communication Technology
ICTR	Information and Communication Technology Resources
IELTS	International English Language Testing Scheme
IGS	Institutional Grants Scheme (DEST)
10	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
ITC	Information Technology Committee
ITL	Institute for Teaching and Learning
ITS	Information Technology Services

J

JASON	Joint Academic Scholarships Online 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
NSWVCC	New South Wales Vice-Chancellors' Conference
NTEU	National Tertiary Education Industry Union

O

OECD	Organisation for Economic Cooperation and Development
OLA	Open Learning Australia
OLDPS	Open Learning Deferred Payment Scheme
OPRS	Overseas Postgraduate Research Scholarships

P

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
SEG	Senior Executive Group
SES	Socioeconomic Status
SI	Scholarship Index
SLE	Student Learning Entitlement
SNA	Safety Net Adjustment
SPIRT	Strategic Partnerships with Industry — Research and Training Scheme
SPR	Student Progress Rate
SRC	Students' Representative Council
SSR	Student/Staff Ratio
STABEX	Study Abroad Exchange (database)
SUPRA	Sydney University Postgraduate Students' Representative Association
SUSport	Sydney Univerisity Sport

T

TAFE	Technical and Further Education
TOEFL	Test of English as a foreign language
TPI	Teaching Performance Indicator

u

UAC	Universities Admissions Centre
UMAP	University Mobility in Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UPA	University Postgraduate Awards

V

VCAC	Vice-Chancellor's Advisory Committee
VET	Vocational Education and Training

W

WAM	Weighted Average Mark
WRP	Workplace Reform Program
WTO	World Trade Organization

Y

YFE	Year of First Enrolment

Glossary

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

For a table of the more commonly used acronyms and abbreviations that appear in University documents and publications please see the abbreviations section.

This glossary describes terminology in use at the University of Sydney.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

Annual average mark (AAM)

The average mark over all units of study attempted in a given academic year (equivalent to the calendar year).

The formula for this calculation is:

$$AAM = \frac{\sum (marks \times credit\ point\ value)}{\sum (credit\ point\ value)}$$

(sums over all units of study completed in the selected period)

Where the mark is the actual mark obtained by the student for the unit of study, or in the case of a failing grade with no mark ~ 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.

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 and candidature 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 One through to the completion of the processing of results at the end of Semester Two. (See also Stage.)

Academic dishonesty

Academic dishonesty occurs when a student presents 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. (See also Plagiarism.)

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 and 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

The current calendar year in which a student is enrolled.
(See also Academic cycle, Stage.)

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 UAL 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 criteria 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.

Admission year

The year the student expects to begin the course (see also Commencement date.)

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.)

Aegrotat

In exceptional circumstances involving serious illness or death of a student prior to completion of their course, the award of aegrotat and posthumous degrees and diplomas may be conferred.

Alumni sidneiensis

A searchable database of graduates of the University from 1857 to 30 years prior to the current year.

Annual average mark (AAM)

The average mark over all units of study attempted in a given academic year (equivalent to the calendar year).

The formula for this calculation is:
(mark* credit_pt_value)/ (credit_pt_value)
(sums over all units of study completed in the selected period)

Where the mark is the actual mark obtained by the student for the unit of study, or in the case of a failing grade with no mark ~ 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.

Annual progress report

A form 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 their nominee). The completed form is attached to the student's official file.

Appeals

Students may lodge an appeal against academic or disciplinary decisions. An academic appeal (e.g. against exclusion) is managed by the Student Centre ~ Exclusions Office while it is under consideration and a record of the outcome of the appeal will be retained.

Assessment

The process of measuring the performance of students in units of study and courses. Performance may be assessed by examinations, essays, laboratory projects, assignments, theses, treatises or dissertations. (See also Result processing, Result processing schedule.)

Formative assessment
Formative assessment is used principally to provide students with feedback on their progress in learning. It reinforces successful learning, and is an opportunity for students to expose the limitations in their knowledge and understanding.

Summative assessment
Summative assessment is used to certify competence, or to arrange students in a rank order of merit. It certifies the attainment of a standard, and is used as the basis for progression to the next part of a program, or to graduation.

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 pattern

Attendance pattern is classified as full-time, part-time or external, this is dependant on the student's mode of attendance and the student load.

Attendance mode

A Department of Education, Science and Technology (DEST) classification defining the manner in which a student is undertaking a course, i.e. internal, external, mixed or offshore.

Australian Graduate School of Management (AGSM)

A joint venture with the University of New South Wales. The AGSM is derived from the Graduate School of Business at the University of Sydney and the then AGSM at the University of New South Wales.

Australian Qualifications Framework (AQF)

The framework for recognition and endorsement of qualifications established by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA).

AUSTUDY

Austudy provides financial help to students who are aged 25 years or more who meet the required criteria, and are undertaking an approved full-time course at an approved institution. (See also Youth Allowance.)

Automated Results Transfer System (ARTS)

This system was developed by the Australasian Conference of Tertiary Admissions Centres (ACTAC) to allow the electronic academic record of a student to be accessed, via an admission centre, by tertiary institutions.

Award course
(See Course.)

B

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. (See also Award course.)

Barrier

An instruction placed on a student's 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

Financial award made to a student, based primarily on need. (See also Scholarships.)

C

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 Islander people in degree courses in all faculties at the University of Sydney.

Campus

The grounds on which the University is situated. There are 11 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)
- Surry Hills (Dentistry)

Cancellation

Where enrolment is cancelled for non-payment of fees.

Candidature

Candidature commences when a student is admitted to a course of study leading to the award of a degree, diploma or certificate. There are maximum periods and in some cases minimum periods of can-

didature depending on the award course and whether the candidate is a full-time or part-time student.

Census date

The date at which a student's enrolment, load and HECS liability are finalised before this information is reported to DEST. (See also HECS.)

Ceremony

(See Graduation ceremony.)

Chancellor

The non-executive head of the University. An honorary position, the Chancellor presides over meetings of the University's governing body, the Senate, and important ceremonial occasions such as graduations.

Clinical experience

Students undertake clinical placements in a professional environment as part of their course requirements. Many require University approved supervision. In order to undertake clinical placements a student may be required to fulfil additional requirements.

College of Health Sciences

Consists of the Faculties of Dentistry; Health Sciences; Medicine; Nursing; and Pharmacy.

College of Humanities and Social Sciences (CHASS)

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 (CST)

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

A combined degree is a single program with a single set of course resolutions leading to the award of two degrees (unless otherwise specified in the resolutions). (See also Combined course.)

Commencement date

The date a student commences candidature.

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. There are different organisations for undergraduate and postgraduate students.

The student organisations are specific to different campuses. The organisations at campuses other than Camperdown and Darlington 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 exemption, Joining fee, Life membership.)

Compulsory subscription exemption

Students of a certain age or those with disabilities or medical conditions may be exempt from the subscription to the sports body.

Conscientious objectors 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.)

Confirmation of Enrolment form (COE)

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.

Conjoint ventures

Two or more institutions cooperate 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 the University of New South Wales (UNSW) and the University of Technology Sydney (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 involves the maintenance of a long term relationship between the student and the University.

Convocation

The body comprising all graduates of the University.

Core unit of study

A unit of study that is compulsory for a particular 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 and any overseas university for joint supervision and examination of a PhD student as part of an ongoing cooperative 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 undertaking of study at the University of Sydney

Award course

A formal course of study that will see attainment of a recognised award. Award courses are approved by Senate, on the recommendation of the Academic Board. The University broadly classifies courses as undergraduate, postgraduate coursework or postgraduate research. (See also Bachelor's degree, Course rules, Diploma, Doctorate, Major, Master's degree, Minor, PhD, Stream.)

Non-award course

Studies undertaken by students who are not seeking an award from the University. (See also Cross-institutional enrolment.)

Coursework

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, other forms of instruction and learning normally will be dominant.

Research

A course in which at least *66* per cent of the overall course requirements involve students in undertaking supervised research, leading to the production of a thesis or other piece of written or creative work, over a prescribed period of time.

Course alias
A unique five character alpha-numeric code which identifies a University course.

Course code
(See Course alias.)

Course enrolment status
A student's enrolment status in a course is either "enrolled" or "not enrolled". "Not enrolled" reasons include: cancelled; suspended; under examination; or terminated. (See also Cancellation, Candidature, Course leave, Enrolment, Enrolment variation, Terminated, Under examination.)

Course leave
Students 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. 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 formally reapply for admission. (See also Progression.)

Course rules
Rules which govern the allowable enrolment of a student in a course. Course rules may be expressed in terms of types of units of study taken, length of study, and credit points accumulated, e.g. 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, e.g. a candidate must have completed a minimum of 144 credit points. (See also Award course, Corequisite, Prerequisite.)

Course suspension
See Course leave.

Course transfer
A transfer occurs when a student changes from one course in the University to another course in the University without the requirement for an application and selection process (e.g. from a PhD to a master's program in the same faculty).

Credit
The recognition of previous studies successfully completed at this University, or another university or tertiary institution recognised by the University of Sydney, as contributing to the requirements of the course to which the applicant requesting such recognition has been admitted. Credit may be granted as specified credit or non-specified credit.

Specified credit
The recognition of previously completed studies as directly equivalent to units of study.

Non-specified credit
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.
(See also AAM - Annual average mark, Waiver, Weighted average mark (WAM).)

Credit points
The value of the contribution each unit of study provides towards meeting course completion requirements. Each unit of study will have a credit point value assigned to it. The total number of credit points required for completion of award courses will be specified in the Senate Resolutions relevant to the award course.

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, i.e. the university which will award their degree). (See also Non-award course).

Course enrolment status
A student's enrolment status in a course is either "enrolled" or "not enrolled". "Not enrolled" reasons include: cancelled, suspended, under examination or terminated. (See also Cancellation, Candidature, Course leave, Enrolment, Enrolment variation, Terminated, Under examination.)

D

The Data Audit Committee's role is to oversee the integrity and accuracy of the course and unit of study data as strategic University data. It also advises the Academic Board on suggested policy changes related to course and unit of study data. A sub-committee of the VCAC Enrolment Working Party, it is chaired by the Registrar, with membership including the deans, the Student Centre, FlexSIS and the Planning Support Office.

Deadlines (Enrolment variations)
(See Enrolment variation.)

Deadlines (Fees)
The University has deadlines for the payment of fees (e.g. 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, Cancellation.)

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 (Deferral)
See Admission (deferment), Course leave.

Degree
See also Award course, Bachelor's degree.

Delivery mode
Indicates how students receive the instruction for a unit of study. The delivery mode must be recorded for each unit as distinct from the attendance mode of the student, i.e. an internal student may take one or more units by distance mode and an external student may attend campus for one or more units.

Distance education
Where subject matter is delivered in a more flexible manner, such as correspondence notes, and student may only attend campus if required. (See also Extended semester, Distance education, International -- offshore.)

Intensive on campus
Core content is delivered with support learning in an intensive (one or more days) format on campus. Participation is usually compulsory. Previously this may have been called residential, block mode, or weekend workshop.

On campus (normal)
Attendance of scheduled lectures, tutorials etc at a campus of the University.

Department
(See School.)

Department of Education, Science and Training (DEST)
The Commonwealth Government department responsible for higher education.

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. (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, and considered by the relevant department or faculty body. Decisions are recorded and letters are forwarded to applicants advising them of the outcome. (See also Admission, UAC.)

Disability information
Students may inform the University of any temporary or permanent disability which affects their life as a student. Disability information is recorded but it is only available to particular authorised users because of its sensitive nature.

Disciplinary action
Undertaken as the result of academic or other misconduct, e.g. plagiarism, cheating, security infringement, criminal activity.

Discipline
A defined area of study, for example, chemistry, physics, 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 which 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 education
Where a student does not attend campus on a daily basis for a given course or unit of study. (See also Delivery mode, Extended semester.)

Doctorate
A high-level postgraduate award. 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.)

Domestic Student
A student who is not an international student. See also Local student.)

Double degree
A double degree is a program where students are permitted by participating faculties (and/or by specific resolutions within a single award) to transfer between courses in order to complete two awards.

Downgrade
Where a student enrolled in a PhD reverts to a master's by research, either on the recommendation of the University on the basis that the research they are undertaking is not at an appropriate level for a PhD; or at the student's own request, for personal or academic reasons.

E

Earliest date
(See Research candidature.)

Equivalent full-time student unit (EFTSU)
The equivalent full-time student unit (EFTSU) is a measure of student load based on the workload for a student undertaking a full year of study in a particular course. A student is then recorded as having generated one EFTSU. (See also Load, Stage.)

Equivalent full-time student load (EFTSL)
The equivalent full-time student load (EFTSL) for a year. It is a measure, in respect of a course of study, of the study load for a year of a student undertaking that course of study on a full-time basis. (effective 1 January 2005)

Embedded courses
Award courses in the Graduate Certificate, Graduate Diploma and Master's degree by coursework sequence which allow unit of study credit points to count in more than one of the awards, e.g. the Graduate Certificate in Information Technology, Graduate Diploma in Information Technology and Master of Information Technology.

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.

Commencing
An enrolment is classified as commencing if a student has enrolled in a particular degree or diploma for the first time.

Continuing
Students already in a course at the University re-enrol each year or semester. Most continuing students are required to pre-enrol. (See also Pre-enrolment.)

Enrolment list
A list of all currently enrolled students in a particular unit of study. (See also Unit of study.)

Enrolment status
(See Course 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
A set of questions or exercises evaluating on a given subject given by a department or faculty. (See Examination period, Assessment.)

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 good 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 or faculty. 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 Progression, 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 semester

A distance-learning student may be allowed more time to complete a module or program if circumstances beyond the student's control, e.g. drought, flood or illness, affect the student's ability to complete the module or program in the specified time. (See also Distance education.)

External

(See Attendance mode, Distance education.)

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. It also acknowledges prizes the student has received. Marks can be included or omitted, as required. (See also Academic transcript, Internal transcript.)

F

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.)

Fee-paying students

Students who pay tuition fees to the University and are not liable for HECS.

Flexible learning

(See Delivery mode, Distance education.)

Flexible start date

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

Flexible Student Information System (FlexSIS)

The computer-based Flexible Student Information System at the University of Sydney. 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.

Formative assessment

(See Assessment.)

Full-time student

(See also Attendance pattern, EFTSU.)

G

Grade

The outcome for a unit of study linked with a mark range. For example, a mark in the range 85-100 attracts the grade "high distinction" ("HD"). (See also Mark.)

Grade	Description	Comment
HD	High distinction	A mark of 85-100.
D	Distinction	A mark of 75-84.
CR	Credit	A mark of 65-74.
P	Pass	A mark of 50-64.
R	Satisfied requirements	This is used in pass/fail only outcomes.
UCN	Unit of study continuing	Used at the end of semester for units of study that have been approved to extend into a following semester. This will automatically flag that no final result is required until the end of the last semester of the unit of study.
PCON	Pass (concessional)	A mark of 46-49. Use of this grade is restricted to those courses that allow for a concessional pass of some kind to be awarded. A student may re-enrol in a unit of study for which the result was PCON. Each faculty will determine and state in its course regulations what proportion, if any, may count — e.g. "no more than one sixth of the total credit points for a course can be made up from PCON results".
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	Discontinued — not to count as failure	Recorded on external transcript. This result applies automatically where a student discontinues after the HECS census date but before the end of the seventh week of the semester (or before half of the unit of study has run, in the case of units of study which are not semester-length). A faculty may determine that the result of DNF is warranted after this date if the student has made out a special case based on illness or misadventure.
INC	Incomplete	This result is used when examiners have grounds (such as illness or misadventure) for seeking further information or for considering additional work from the student before confirming the final result. Except in special cases approved by the Academic Board, this result will be converted to a normal permanent passing or failing grade either: by the dean at the review of examination results conducted pursuant to section 2 (4) of the Academic Board policy "Examinations and Assessment Procedures"; or automatically to an AF grade by the third week of the immediately subsequent academic session. Deans are authorised to approve the extension of a MINC grade for individual students having a valid reason for their incomplete status.
UCN	Incomplete	A MINC or INC grade is converted, on the advice of the dean, to UCN when all or many students in a unit of study have not completed the requirements of the unit. The students may be engaged in practicum or clinical placements, or in programs extending beyond the end of semester (e.g. Honours).

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.)

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.

Group work

Means a formally established project to be conducted by a number of students in common, resulting in a single piece of assessment or a number of associated pieces of assessment. (See also Legitimate cooperation.)

H

Head of department (HOD)

The head of the academic unit which has responsibility for the relevant unit of study, or equivalent program leader.

Higher doctorates

See Award course.

HECS (Higher Education Contribution Scheme)

All students, unless they qualify for an exemption, are obliged to contribute towards the cost of their education under the Higher Education Contribution Scheme. These contributions are determined annually by the Commonwealth Government. This scheme will cease in its current form from 1 January, 2005.

Honorary degrees

A degree *honoris causa* (translated from the Latin as "for the purpose of honouring") is conferred on a person whom the University wishes to honour. Long-standing full-time members of the University's academic staff who are not graduates of the University may be considered by Senate, upon their retirement, for admission ad eundem gradum, to an appropriate degree of the University.

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 - which may have two divisions or, Class III).

NSW Higher School Certificate (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.

I

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 mode

(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

Any student who is not an Australian or New Zealand citizen or a permanent resident of Australia is an international student. An international student is required to hold a visa that allows study in Australia and may be liable for international tuition fees.

Fee-paying

A private International Student who is liable to pay tuition fees for their studies with the University.

Fee-paying - Outgoing exchange

An international fee-paying student undertaking short term study at a recognised overseas institution with which the University has a student exchange agreement. Exchange study counts towards the student's University of Sydney award and students remain enrolled in their University of Sydney course during the period of exchange.

International - cross-institutional

An international fee paying student undertaking non-award study at the University on a cross-institutional basis. They are liable to pay fees for the study they undertake at the University, but there is no compliance reporting requirement, which rests with their "home" institution.

International - Sponsored

A private international student who is fully sponsored for his/her tuition; his/her sponsorship may also cover Overseas Health Cover and Compulsory Subscriptions.

Offshore studies

International offshore students undertake their program of study at one of the University's offshore campuses and hence do not enter Australia; therefore they do not require a visa. The are distinct from international students who are on outbound exchange programs as they never enter Australia during their program of study.

Short course

An international fee-paying student undertaking a short course with the University of Sydney comprising such programs as international development programs, executive training or study visits. The study undertaken by these students is non-award and generally a student visa is not required.

Sponsored award

An international student sponsored by the Australian government, undertaking a program of study at the University. Currently Australian Development Scholarships holders, funded by AusAID, are the only students in this category. These students are fully sponsored for their tuition and other costs such as travel and health cover, and are paid a stipend.

Study Abroad

An international student who is undertaking short-term study at the University under the Study Abroad scheme. Study Abroad students must have completed at least one year of study towards a degree at a recognised institution in their home country and are continuing towards the degree of their home institution.

(See also Local student, Student type.)

J

Joining fee

Students enrolling for the first time pay a joining fee in addition to the standard subscription for the University of Sydney Union or equivalent student organisation. (See also Compulsory subscription.)

L

Leave

See Course leave.

Legitimate cooperation

Any constructive educational and intellectual practice that aims to facilitate optimal learning outcomes through interaction between students. (See also Group work.)

Life membership

Under some circumstances (e.g. 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. The weight 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. Student load is measured in terms of Equivalent full-time student units (EFTSU). (See also Equivalent full-time student units (EFTSU).)

Local Student

Either an Australian or New Zealand citizen or Australian permanent resident. New Zealand citizens are required to pay their Higher Education Contribution Scheme (HECS) fees upfront. (See also Domestic student, HECS, International student.)

M

Major

A field of study, chosen by a student, to represent their principal interest this would consist of 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 awarded upon the graduands assessment of study. (See also Award course, Minor, Stream.)

Major timetable clash

The term used 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) from 0 to 100 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 ~ coursework, Course ~ research.)

Minor

Studies undertaken to support a Major. 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 awarded upon the graduand's assessment of study. (See also Award course, Major, Stream.)

Mixed mode

(See Attendance mode.)

Mutually exclusive units of study

(See Prohibited combinations of units of study.)

N

Non-award course

(See Course.)

Non-standard session

A teaching session other than the standard February and August sessions - e.g. Summer School, in which units of study are delivered and assessed in an intensive mode during January. (See also Semester, Session.)

O

Orientation Week

Orientation or "O Week", takes place in the week before lectures begin in Semester One. 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.

P

Part-time student

(See Attendance mode, Attendance pattern, Equivalent full-tme student units (EFTSU).)

Permanent home address

The address used for all official University correspondence with a student, both inside and outside of semester time (e.g. during semester breaks), unless the student provides a different overridden by semester address for use during the semester. (See also Semester 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. (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. (See also Academic dishonesty.)

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. (See also Course - Coursework, Course ~ Research)

Postgraduate Education Loans Scheme (PELS)

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). This scheme will cease in this manner from 1 January, 2005, and will be replaced by the FEE-HELP scheme.

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 ~ also known as provisional re-enrolment ~ takes place in October, when students indicate their choice of unit of study enrolment for the following year. After results are approved, pre-enrolment students are regarded as enrolled in those units of study for which they are qualified. Their status is "enrolled" and remains so provided they pay any money owing and comply with other requirements by the due date. Students who do not successfully pre-enrol 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. (See also Enrolment.)

Prerequisite

A unit of study that is required to be successfully 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 in recognition of outstanding performance, academic achievement or service to the community or University.

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.

Professional practice

Students undertake placement in a professional practice as a part of their course requirements. May require University approved supervision. Professional placements are located in a wide range of professional practices environments, and may not require additional criteria to be fulfilled.

Progression

Satisfactory progression is satisfying all course and faculty rules (normally assessed on an annual basis) to enable the completion of the chosen award within the (maximum) completion time allowed. (See also Exclusion.)

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. (See also unit of study.)

Provisional re-enrolment

See Pre-enrolment.

Q

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.)

R

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.

Registration

In addition to enrolling with the faculty in units of study, students must register with the department responsible for teaching each unit. This is normally done during Orientation Week. Note that unlike enrolment, registration is not a formal record of units attempted by the student.

Research course

See Course - research.

Research supervisor

A supervisor is appointed to each student undertaking a research postgraduate degree. The supervisor will be a full-time member of the academic staff or a person external to the University recognised for 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.)

Result processing

Refers to the processing of assessment results for units of study. For each unit of study, departments tabulate results for all assessment activities and assign preliminary results. (See also Assessment, Formative assessment, Examination period, Summative assessment)

Result processing schedule

The result processing schedule will be determined for each academic cycle. All departments and faculties are expected to comply with this schedule. (See also Assessment, Examination period, Result processing.)

Result

The official statement of a student's performance in each unit of study attempted as recorded on the academic transcript, usually expressed as a mark and grade. (See also Grade, Mark.)

Research Training Scheme (RTS)

The RTS provides Commonwealth-funded higher degree by research (HDR) students with an "entitlement" to a HECS exemption for the duration of an accredited HDR course, up to a maximum period of four years full-time equivalent study for a doctorate by research and two years full-time equivalent study for a master's by research.

S

Scholarships

Financial or other form of support made available to enable students to further their studies. (See also Bursaries.)

School

A school or academic unit shall encourage and facilitate teaching, scholarship and research and coordinate the teaching and examining duties of members of staff in the subjects or courses of study with which it is concerned.

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 session) must be given special permission by the Academic Board. (See also Session, Non-standard session.)

Semester address

The address to which all official University correspondence is sent during semester time, if it is different to the permanent 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, i.e. 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 One or Two 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.)

Short course

A fee paying student undertaking a short course with the University of Sydney comprising professional development, executive training etc. The study undertaken by these students is a non-award course.

Show cause

(See Progression, Exclusion.)

Special consideration

Candidates who suffer serious illness or misadventure which may affect performance in any assessment, may request that they be given special consideration in relation to the determination of their results.

Sponsorship

Financial support of a student by a company or government body.

Stage

A normal full-time course of study taken in a year. (See also Course rules, EFTSU, Progression.)

Stream

A defined award course, which requires the completion of set units of study as specified by the course rules for the particular stream, in addition to the core program specified by the course rules. A stream will appear with the award course name on testamurs, e.g. Bachelor of Engineering in Civil Engineering (Construction Management). (See also Award course, Major, Minor.)

Student

Student means a person enrolled as a candidate for an award course or unit of study.

Student identifier (SID)

A nine-digit number which uniquely identifies a student at the University.

Student ID Card

All students who enrol are issued with an identification card. The card includes the student's name, SID, the course code, a library borrower's bar code and a pas sport-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 progress rate (SPR)

A calculation which measures the rate at which load undertaken is passed annually in each award program.

Student type

Student type identifies whether a student is local or international and the type of study the student is undertaking. (See also International student, Domestic student, Exchange student.)

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. (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, e.g. 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".

Summative assessment

See Assessment.

Summer School

(See Sydney Summer School.)

Supervising faculty

The faculty which has the responsibility for managing the academic administration of a particular course, i.e. 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. Further, in the case where one course is jointly offered by two or more faculties (e.g. the Liberal Studies course), a joint committee may make academic decisions about candidature and the student may be assigned a supervising faculty for administration.

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 role. (See also Advisor, Associate supervisor, Instrumental supervisor/teacher, Research supervisor.)

Suppression of results

Results for a particular student can be suppressed by the University when the student has an outstanding debt to the University; or the student is facing disciplinary action. A student may also request a suppression for personal reasons.

Suspension

(See Course leave.)

Sydney Summer School

A program of accelerated, intensive study running for approximately six 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 attract full fees and enrolled students are also liable for compulsory subscriptions. Some fee-waiver scholarships are available.

T

Teaching department

(See School.)

Teaching end date

Official finish date of formal timetabled classes.

Teaching start date
Official commencement date of formal timetabled classes.

Terminated
Term used when a student's candidature has been officially closed because they are not able to complete the Course requirements. (See also Candidature.)

Testamur
A certificate of award provided to a graduand, usually at a graduation ceremony. The Award conferred will be displayed along with other appropriate detail.

Thesis
A major work that is the product of an extended period of supervised independent research. (See also Course - research.)

Timetable
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.

U

Universities Admissions Centre (UAC)
The UAC receives and processes applications for admission to undergraduate courses at recognised universities in NSW and the ACT. Most commencing, local undergraduate students at the University apply through the UAC.

Universities Admission Index (UAI)
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, and is a number between 0.00 and 100.00 with increments of 0.05.

Under examination
Indicates that a research student has submitted their written work (thesis) for assessment, and is awaiting the finalisation of the examiners' outcome and recommendation.

Undergraduate
A term used to describe both a course leading to a diploma or bachelor's degree and a student enrolled in such a course.

Unit of study
Unit of study or unit means a stand-alone component of an award course. Each unit of study is the responsibility of a department. (See also Prohibited combinations of unit of study.)

Unit of study enrolment status
The enrolment status indicates whether the student is still actively attending the unit of study (i.e. currently enrolled) or is no longer enrolled. (See also Discontinuation or Cancellation.)

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 a student qualified for the award of an undergraduate honours degree (or some master's degrees), whose academic performance is judged to be outstanding.

Upgrade
Where a student enrolled in a Master's by research course is undertaking research 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.

USYDnet
The University of Sydney's intranet system. 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.

V

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.

W

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.)

Winter School
An intensive session offered by the University during the mid-year break.

Weighted average mark (WAM)
This mark uses the unit of study credit point value in conjunction with an agreed "weight". The formula for this calculation is:

$$WAM = \frac{\wedge(W_c x . M_c)}{\sum (W_c)}$$

Where Wc is the weighted credit point value - ie, the product of the credit point value and the level of weighting of 1, 2, 3, or 4 for a first, second, third or fourth year unit of study respectively; and where Mc is the greater of 45 or the mark out of 100 for the unit of study.

The mark is the actual mark obtained by the student for the unit of study, or in the case of a failing grade with no mark - 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.)

In addition, faculties may adopt other average mark formulae for specific progression or entry requirements. If such a formula is not specified in the faculty resolutions, the formula outlined above is used. (See also WAM weight.)

WAM weight

A weight assigned to each unit of study to assist in the calculation ofWAMs.

Y

Year of first enrolment (YFE)

The year in which a student first enrols at the University. (See also Commencement date.)

Youth Allowance

Youth Allowance is payable to a full-time student or trainee aged 16-24 years of age who is 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.

Index

The following information is a printed version of the information available through Handbooks Online, on the University of Sydney website. Please visit "http://www.usyd.edu.au/handbooks/".

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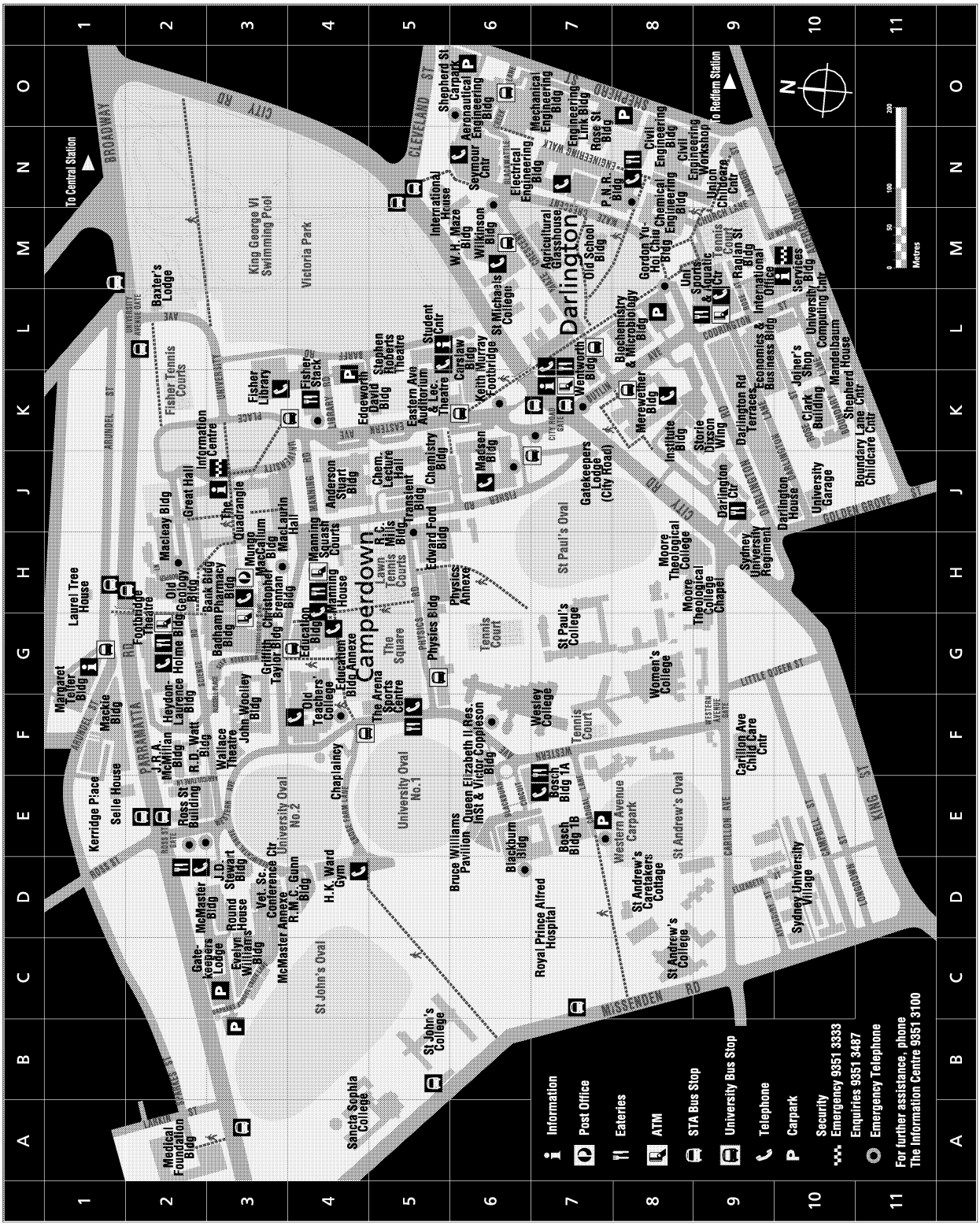
Camperdown / Darlington campus map



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L8 Biochemistry and Microbiology Building
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E7 Bosch Building IB
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J9 Darlington Centre
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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
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F4 Humanities and Social Sciences
N8 Sciences and Technology

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K1l Boundary Lane
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HI Laurel Tree House
N9 Union

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J10 Darlington House
K9 Darlington Road Terraces
N5 International House
L10 Mandelbaum House
A4 Sancta Sophia College
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G3 Brennan
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G2 Footbridge Theatre
H2 Macleay Museum
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H3 Australia Post Office
H3 Bank Building
J9 Darlington Centre
G2 Holme Building
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M9 University Sports and Aquatic Centre
M9 University Co-op Bookshop
D3 Veterinary Hospital and Clinic
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M10 Lost Property
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K2 Fisher Tennis Courts
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M9 Sydney University Sport
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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

The University of Sydney

Faculty of Engineering Handbook 2006

Amendments

Amendments

Please note that the following Handbook amendments should be read in conjunction with the 2006 Handbooks as published at www.usyd.edu.au/handbooks

- All amendments are listed by item number and referenced by the page to which they refer.
- The relevant Handbook and those amendments listed below are binding and final.
- Inquiries and questions relating to the information below should be directed to the relevant faculty.

Item	Amendment	Handbook page number
1	Insert EBUS4001	96
2	Insert ELEC3802	99
3	Insert ELEC4505; ELEC4605	100
4	In the TABLE Aeronautical Engineering First Year insert Note 1	19
5	In the TABLE Aeronautical Engineering Second Year under AMME 2500 insert "see note 6 below"	19
6	In the TABLE Aeronautical Engineering Second year under MATH 2065 change note to say "see note 5 below"	19
7	Below AMME 2200 add "see note 6 below"	20
8	Add note 6. Students enrolled in combined BE/BSc and undertaking e.g full physics second year program are exempt from these units	20
9	Change the following recommended units of study Replace AERO 4290 with AERO 4296 Replace AERO4491 with AERO4491 Replace MECH4210 with AMME4210	21
10	Add note 5 Students enrolled in combined BE/BSc and undertaking e.g full physics second year program are exempt from these units	23
11	Change the following recommended units of study Replace AERO 4290 with AERO 4296 Replace AERO4491 with AERO4491 Replace MECH4210 with AMME4210	23
12	Insert ELEC2302	97
	Authorised by Eric van Wijk 21.02.2006	