Chapter 5

ANU College of Engineering & Computer Science

ANU College of Engineering & Computer Science

Contents

Introduction

The ANU College of Engineering and Computer Science consists of the School of Engineering and School of Computer Science and has over 1,300 students enrolled in undergraduate and graduate degree programs including over 300 international students from more than 40 different countries. Our degrees draw upon the extensive expertise and cutting-edge research activities of our staff and take advantage of the interdisciplinary nature of the University's research strengths in computing, information and communications technology, engineering, and related mathematical and physical sciences.

Engineering and Computer Science are essentially problem-solving disciplines. They develop the solutions to the technological problems of society. They are creative endeavors, based fundamentally on understanding the nature and scope of a problem, and proposing and synthesising effective solutions. They have at their heart the concept of design; given that each problem is different, the design task regularly involves a component of research to identify and realise a solution.

A natural outcome of the design-orientation and discipline-grounding of engineers and computer scientists is that they are in the position to be effective community leaders, able to contribute to the shaping of society and its physical and information infrastructures. In preparing our graduates to meet these demands, our curricula have two broad elements. The first is the domain knowledge relevant to their field of study. That consists of the fundamental principles of the discipline and the advanced knowledge of particular specialisations, in which there is rapid change. Secondly, we inculcate in our students "a way of thinking" relevant to a problem-solving discipline. We do that through design exercises in which staff challenge our students in a manner that engenders in them the confidence to be creative even when the problem domain they encounter may be foreign and outside their comfort zone. We emphasise the importance of teamwork in reaching realisable solutions to technological problems and the importance of clear technical communications.

Because of the rapidity of societal and technological change, it is not possible to know the nature of the problems that will confront engineers and computer scientists in the future, and for which solutions are required. It is therefore essential that we graduate professionals who will not be daunted by new concepts and challenges. They need to be comfortable with meeting new, difficult and contemporary material during their time with us. We achieve this goal by carefully exposing them to the research ethos of our staff and presenting them with material at the forefront of knowledge.

Design courses, already a long-standing part of our undergraduate curricula, contain an element of research, because that is the nature of design and synthesis. This aspect continues to be strengthened to make research methods more explicit and to develop in our students the notion that discovery and creation are the hallmarks of graduates able to meet the unknown challenges of the future, in a manner and style different from their peers who have not had exposure to research as an essential element of successful and innovative design.

For our very best students, our methods of instruction include reading groups, small group mentoring and participation in the laboratories of our researchers in which the principles of research are more readily explored and applied.

Student Advice & Support

The College Student Office can be found on the first floor of the Ian Ross Building (Bldg 31). Opening hours are 9am to 5pm Monday to Friday. A Student Advisor is available to provide information and assistance in person or you can email Student Services student.services@cecs.anu.edu.au

In addition to this support, each School has an Associate Head (Undergraduate) to provide advice on academic matters. Appointments with the Associate Heads can be made at the relevant School office:

School of Engineering
Level 1 Design Studio, Ian Ross Building (Bldg 31)

School of Computer Science
Level 3, Computer Science Building (Bldg 108)

Programs for outstanding students

The College offers the following programs for outstanding students:

- Bachelor of Computer Science (Honours)
- Bachelor of Engineering Research and Development

Further information is available from http://cecs.anu.edu.au/students/future/undergrad

Scholarships

The College offers scholarships to both new and continuing students.

Scholarships are offered to outstanding new students (ATAR 99+) and there are also a number of 'Women in Technology' scholarships for new female students with ATAR 95+. Further information is available from http://cecs.anu.edu.au/students/future/undergrad/scholarships

A number of scholarships are also available to current students and more information can be found at: http://cecs.anu.edu.au/students/future/undergrad/scholarships2

Women in Technology

The College is committed to encouraging more women to enrol in its programs and to ensuring its programs are conducted in a manner that respects and values women's interest, experience and learning styles. The College operates a women's network and offers a number of scholarships to female students. Further information is available from the College Student Office.

Combined degrees

In addition to the programs listed within the College handbook entry, combined degree programs are available in a number of areas – see following list. Over 50 per cent of students in the College study combined programs. For more information about combined program options, please see the Combined Program section at the end of the Handbook.

Accreditation

The Bachelor of Engineering and the Bachelor of Software Engineering programs are accredited to the appropriate level with Engineers Australia (formerly IE Aust). The Bachelor of Engineering (Research and Development) has been submitted for accreditation. The Bachelor of Software Engineering program is also accredited with the Australian Computer Society (ACS). The Bachelor of Computer Science (Honours) and the Bachelor of Information Technology programs are accredited with the Australian Computer Society.

Status

Advanced standing or status towards undergraduate degree programs of the College may be granted for studies completed elsewhere. Requests for status are assessed individually.

Undergraduate programs offered

Program	Usual F/T program duration (yrs)
Bachelor of Computer Science (Honours)	4
Bachelor of Engineering Research & Development	4
Bachelor of Engineering	4
Bachelor of Software Engineering	4
Bachelor of Information Technology	3
Bachelor of Engineering Research & Development/ Bachelor of Science	5
Bachelor of Engineering/Bachelor of Science	5
Bachelor of Engineering/Bachelor of Information Technology	5
Bachelor of Engineering/Bachelor of Arts	5
Bachelor of Asian Studies/Bachelor of Engineering	5
Bachelor of Commerce/Bachelor of Engineering	5
Bachelor of Engineering/Bachelor of Economics	5
Bachelor of Arts/ Bachelor of Information Technology	4
Bachelor of Commerce/Bachelor of Information Technology	4
Bachelor of Economics/Bachelor of Information Technology	4
Bachelor of Information Technology/Bachelor of Laws	5
Bachelor of Software Engineering/Bachelor of Science	5
Bachelor of Software Engineering/Bachelor of Commerce	5

Honours

Honours are included in the Bachelor of Engineering (Research and Development), Bachelor of Engineering, Bachelor of Computer Science (Honours), Bachelor of Software Engineering, and all related combined programs. Honours are generally awarded on the basis of results in the program.

Honours can be gained in Information Technology through the completion of an additional honours year. Admissions to the honours year is by invitation or application and is for students who have achieved at a sufficiently high standard in their bachelor degree.

Graduate Programs

The College offers a range of graduate coursework and research programs including masters and doctorates. Details can be found at:

http://cecs.anu.edu.au/students/future/graduate

Further Information and contact details:

ANU College of Engineering and Computer Science
Ian Ross Building (32a)
The Australian National University
Canberra ACT 0200 Australia

T: 02 6125 0677
F: 02 6125 5476
E: student.services@cecs.anu.edu.au
W: http://cecs.anu.edu.au

School of Engineering

Professor Andres Cuevas,
ME PhD Madrid

Head of School

Engineering is the art of transforming the resources of nature for the benefit of humanity. Its roots are traceable to the tools, huts, pottery and materials of the first humans. Its progress has relied on ingenuity, invention, teamwork and the accumulation of experience — skills which remain essential to this day. Engineering is also vital to the economic well-being of nations and has a responsibility to consider sustainability and solve our environmental problems. These issues are addressed throughout the Bachelor of Engineering (BE) degree program.

A strength of the School of Engineering is its research areas, which are reflected in the majors offered in the BE program. At the forefront is renewable energy research, with a particular interest in photovoltaic solar cells and semiconductor technology. The ANU 'Big Dish' is the largest of its kind in the world. The School's Centre for Sustainable Energy Systems holds several world records for solar cell efficiency. It is also developing a unique thermochemical solar energy system. The Centre has strong links with industry and several technologies are being commercialised.

The School's materials and manufacturing group conducts research in specialised areas of advanced materials, such as fibre-reinforced composites and composite-metal hybrid materials, nanofibres, piezoelectric materials, bulk amorphous metals and theory of materials. Materials research is integrated with manufacturing in order to understand and improve advanced processing technologies for these materials. Many projects are industrially focused with major elements of the work carried out at the collaborating company's site. This provides a healthy cross fertilisation between the School and some of Australia's largest manufacturing companies.

Mechatronic engineering is associated with the analysis and design of electro-mechanical devices that typically include a computer system to provide a level of programmability or `intelligence'. The systems based focus of the School of Engineering provides a strong foundation for a discipline that involves integration of skills in electronics, mechanical and computer engineering tied together by dynamical and control systems analysis.

Communications is at the core of global information exchange. We can keep in touch with events happening on the other side of the world, or in the next street at the touch of a button. We have a multitude of ways of keeping in touch with family and friends, regardless of how far away they are. The School's communications activities involve both practical and theoretical components, focussing on mobile and wireless communications, ad hoc networks, CDMA, MIMO and smart antennas. Researchers in the School are involved in projects focusing on the application of wireless channel characteristics to ad hoc networking protocols, mobility modelling in ad hoc networks and wireless channel modelling. Researchers are also involved in a major project, BushLAN, whose purpose is to bring high-speed internet access to remote areas using VHF frequencies.

The School of Engineering offers a four-year, Engineers Australia accredited Bachelor of Engineering degree program, a four-year Bachelor of Engineering degree program with a Research and Development emphasis (currently being

accredited), one-year and two-year Masters of Engineering (see the College of Engineering and Computer Science entry), as well as Master of Philosophy and PhD degree programs. The School has active collaborations with a wide range of other ANU Schools and Colleges including the College of Physical Sciences, College of Business and Economics, the Fenner School of Environment and Society, as well as CSIRO, NICTA and DSTO. The School has strategic collaborative research relationships with organisations including Ford Australia, Canon, Origin Energy, Rheem, Toll Logistics and Wizard Research. The School also undertakes research as a partner in the Automotive Cooperative Research Centre (AutoCRC). Graduates are employed in a wide range of organisations and companies both in Australia and overseas. Undergraduate scholarship support from ANU Enterprise is gratefully acknowledged. The School is host to the ANU Centre for the Science and Engineering of Materials and to Future Materials, and engages in a number of activities with Engineers Without Borders (EWB).

The School of Engineering buildings are located on the corner of University Avenue and North Road, opposite the ANU Sports Union, with the ANU Union, Library and other facilities all readily accessible.

For further information visit the School's website at http://engn.anu.edu.au

Bachelor of Engineering (Research & Development)

(Academic Program: 4714 | Academic Plan: 4714HBENG)

Duration: 4 years full-time

Minimum: 192 units

CRICOS Code: 060542F

This program is specifically designed for students who have an interest in undertaking research and development in either industry or an academic environment. The program combines the unique systems engineering focus of the ANU Bachelor of Engineering degree with a more project based, research intensive study mode, also unique to ANU. Students undertake a number of research projects in different research groups at ANU or associated industry in order to obtain a flavour of research in the discipline areas and develop independent research skills.

Students also complete an engineering specialisation which will complement the R&D specialisation and produce a Professional Engineering graduate who has the skills, knowledge and capability to go onto advanced research programs.

Scholarships Scholarships valued at a minimum of $20,000 total are available to students with an ATAR 99–100 who enrol in this program.

Bonus points Students may apply to the College of Engineering and Computer Science to be awarded up to two bonus points on the basis of capacity to succeed in a research-based undergraduate degree as demonstrated by success in Olympiads or similar relevant competitions etc.

Program Requirements

The Bachelor of Engineering (Research & Development) is a four year full time program with graduates obtaining a Bachelor of Engineering with Honours. Students will have to complete 192 units including:

1. An Engineering core major consisting of 42 units of the following professional development courses;
   - ENGN1211 Discovering Engineering
   - ENGN2225 Systems Engineering Design
   - ENGN2226 Systems Engineering Analysis
   - ENGN3211 Investment Decision and Financial Systems
   - ENGN3221 Engineering Management
   - ENGN3100 Practical Experience (0 unit value)
   - ENGN4221 Systems Engineering Project
   - ENGN4611 Engineering Law
2. 60 units of engineering discipline courses from the Schedule of Engineering Discipline Courses in the Undergraduate Handbook including ENGN1215 Engineering Science (6 unit), ENGN1217 Introduction to Mechanics (6 unit), ENGN1218 Introduction to Electronics (6 unit), ENGN2217 Mechanical Systems and Design (6 unit) and ENGN2218 Electronic Systems and Design (6 unit). This will include the requirements of at least one major listed under the Engineering Majors section of the Undergraduate Handbook
3. 12 units of mathematics;
   - MATH1115 Mathematics and Applications 1(Honours) and
   - MATH1116 Mathematics and Applications 2(Honours)
4. 6 units of computing;
   - COMP1100 Introduction to Programming and Algorithms
5. 6 units of physics;
   - PHYS1101 Advanced Physics 1
6. 30 units of courses offered by the university (ie university electives). These can include additional engineering courses. The degree program may not contain more than 60 units of 1000-series courses.
7. A 42 unit R&D major made up of ENGN4221 Systems Engineering Project and 36 units of project based courses made up of 6 unit, 12 unit, 18 unit and 24 unit courses listed below and of which one must be at least 12 units. These can be taken in years 2,3 and 4 of the program.
   - ENGN2706 R&D Project (Methods) (6 unit)
   - ENGN3706 R&D Project (6 unit)
   - ENGN3712 R&D Project (12 unit)
   - ENGN4706 R&D Project (6 unit)
   - ENGN4712 R&D Project (12 unit)
   - ENGN4718 R&D Project (18 unit)
   - ENGN4724 R&D Project (24 unit)

   ENGN2706 R&D Project (Methods) is compulsory. The remaining 30 units will be comprised of any combination of the other R&D Project courses, subject to approval from the program convenor.

8. The School of Engineering will determine annually whether the level of performance of a student is sufficient to remain in the program. Generally, the expectation is for performance at, or very near, a high distinction average. Students deemed not to be performing at an appropriate level will be able to transfer to the Bachelor of Engineering program, with appropriate status granted for courses successfully completed.
9. Graduation from the BE (R&D) Program will require the award of 1st class honours.

Degree Structure

Standard Bachelor of Engineering (Research & Development) recommended program pattern

	Semester 1	Semester 2
Year 1 48 units	ENGN1211 Discovering Engineering COMP1100 Introduction to Programming & Algorithms MATH1115 Mathematics & Applications 1 Honours PHYS1101 Advanced Physics I	ENGN1215 Engineering Science ENGN1217 Introduction to Mechanics ENGN1218 Introduction to Electronics MATH1116 Mathematics & Applications 2 Honours
Year 2 48 units	ENGN2225 Systems Engineering Design ENGN2217 Mechanical Systems & Design ENGN2218 Electronic Systems & Design ENGN2706 R&D Project (Methods)	ENGN2226 Systems Engineering Analysis Engineering major University elective (eg ENGN2219 Computing for Engineering Simulation) University Elective
Year 3 48 units	ENGN3211 Investment Decisions & Financial Systems Engineering major R&D Project * University elective	ENGN3221 Engineering Management Engineering major R&D Project * R&D Project *
Year 4 48 units	ENGN4221 Systems Engineering Project Engineering major R&D Project * University elective	ENGN4611 Engineering Law Engineering major R&D Project * University Elective

* R&D Projects: A number of R&D Project offerings are available in unit weighting and semester availability. Students should refer to Program Requirements above and discuss options with the Research & Development Convenor. If a R&D Project is not taken in a semester it may be replaced by an Engineering major or University Elective to meet the Program Requirements above.

Combined Degrees

The BE (Research & Development) can be combined with the Bachelor of Science. This is a 5 year program comprising 240 units.

Bachelor of Engineering

(Academic Program: 4700 | Academic Plan: 4700XBENG)

Duration: 4 years full-time

Minimum: 192 units

CRICOS Code: 001691D

Aims & overview

The ANU Bachelor of Engineering (BE) degree is a four-year undergraduate program accredited by the national professional body, Engineers Australia. Its main aim is to prepare students for successful careers as professional engineering managers, designers, analysts, educators and researchers.

The BE program is characterised by an interdisciplinary systems engineering approach that will enable graduate engineers to solve the complex engineering problems of the future. The traditional areas of electrical and mechanical engineering provide the foundations to this approach, and a compulsory core of courses in the systems engineering provides the skills and techniques for complex problem solving. This is supplement by project work on real-life engineering problems. Courses in engineering management, finance and law are also included to produce well-rounded and multi-skilled engineering professionals.

The ANU Engineering program is also underscored by technological trends that cut across the boundaries that typically exist between the traditional disciplines of engineering. These trends are reflected by the engineering majors. They provide students with an opportunity to specialise in an area of strength or interest. The majors also reflect the research activity in the School of Engineering and are, therefore, an opportunity to engage with the cutting-edge areas that contribute to the University's reputation for research-intensive education. The engineering majors currently offered are in the areas of:

- electronics and communications
- mechanical and materials
- mechatronics
- sustainable energy

A science major in photonics is also available through collaboration with the Department of Physics in the College of Physical Sciences.

The ANU BE program produces graduates that will demonstrate the following generic attributes, as required for professional accreditation:

- a sound and broad knowledge of basic science and engineering;
- the ability to communicate effectively with engineers and the general public;
- in-depth discipline knowledge;
- common sense, scientific and engineering knowledge to identify, formulate and solve problems;
- a systems approach to engineering analysis, design, operation and management;
- the ability to contribute to a multidisciplinary and multicultural team;
- awareness of the social, cultural, global, environmental, legal and business aspects of engineering, including a commitment to the principles of sustainable development;

– an understanding of the responsibilities of an inclusive and socially aware engineering professional, including a commitment to the Engineers Australia Code of Ethics, life-long learning and continuing professional development.

These attributes are engendered by the program structure that includes compulsory courses in basic science, engineering fundamentals, systems engineering, management, finance and law. The program of study is the same for all students in the first year, with specialisation starting in year 2 through the selection of courses from the list of engineering electives towards one or more of the majors. The teaching and assessment processes throughout the program also serve to develop the attributes listed above. There is a significant amount of project and design work, small-group teaching that encourages collaborative learning and problem solving, and practical laboratory work. The importance of written and oral communication is also emphasised.

The final year of the program is characterised by a systems engineering group project and an individual project. The systems engineering group project is a capstone course that addresses a problem relevant to industry. It is an opportunity for students to apply the knowledge gained throughout their BE program and simulates as far as possible the experience of functioning as an engineer after graduation. The individual project is an opportunity for in-depth study in an area of interest with a research supervisor, and will foster individual attributes such as creativity, innovation and the ability to personally manage an engineering project.

Students may specialise through their choice of Engineering majors and electives and other University electives. Students are encouraged to create a diverse program of study from a variety of engineering disciplines to take full advantage of the unique educational opportunities offered by ANU Engineering.

New for 2010 is an Engineering Internship program. This is an opportunity to spend 3 or 6 months full-time in industry and gain real-life experience as an engineer. It is view by the School as an increasingly important part of professional engineering education. A flexible curriculum and assessment scheme has been designed for the internship program so that it can be integrated into the BE program. This means students can receive full credit for their internship and gain valuable experience without delaying their graduation.

The Bachelor of Engineering Homepage: http://cecs.anu.edu.au/students/future/undergrad/BEng

Practical Experience

Engineers Australia specifies that students are required to complete at least 60 days of engineering work experience during the course through approved professional employment taken in the vacation periods. For details, see entry for ENGN3100 Practical Experience.

Program Requirements

The BE degree program requires the completion of at least 192 credit points of courses including:

1. 54 units of the following professional core courses (compulsory);
   - ENGN1211 Discovering Engineering
   - ENGN2225 Systems Engineering Design
   - ENGN2226 Systems Engineering Analysis
   - ENGN3211 Investment Decisions & Financial Systems (or specified equivalent: BUSN1001 or Asian Studies equivalent or Arts equivalent)
   - ENGN3221 Engineering Management
   - ENGN3100 Practical Experience (0 unit)
   - ENGN4200 Individual Project (12 unit)
   - ENGN4221 Systems Engineering Project
   - ENGN4611 Engineering Law (or specified equivalent: BUSN1101 or Asian Studies equivalent or Arts equivalent.)

Note that the courses defined as specific equivalents are only to be taken by students undertaking combined engineering programs with the College of Business and Economics, College of Arts and Social Sciences or College of Asia and the Pacific. Specific equivalent courses in the Colleges of Arts and Social Sciences and Asia and the Pacific are listed in the relevant combined program entries.

2. 36 units of engineering fundamental courses (compulsory);
   - ENGN1215 Engineering Science
   - ENGN1217 Introduction to Mechanics
   - ENGN1218 Introduction to Electronics
   - ENGN2217 Mechanical Systems & Design
   - ENGN2218 Electronic Systems & Design
   - ENGN2219 Computing for Engineering Simulation
3. 42 units of engineering discipline courses listed below in Schedule 1 to complete at least one major;

   Schedule 1: Engineering Discipline Courses
   - ENGN2221 System Dynamics
   - ENGN2222 Thermal Energy Systems
   - ENGN2228 Signal Processing
   - ENGN3213 Digital Systems and Microprocessors
   - ENGN3223 Control Systems
   - ENGN3224 Energy Systems Engineering
   - ENGN3226 Digital Communications
   - ENGN3334 Semiconductors
   - ENGN3601 Engineering Materials
   - ENGN4511 Composite Materials
   - ENGN4513 Fibre Optics Communications Systems
   - ENGN4516 Energy Resources and Renewable Technologies
   - ENGN4520 Special Topics in Engineering 1
   - ENGN4521 Special Topics in Engineering 2
   - ENGN4522 Special Topics in Engineering 3
   - ENGN4523 Special Topics in Engineering 4
   - ENGN4524 Solar Energy Technology
   - ENGN4528 Computer Vision
   - ENGN4536 Wireless Communications
   - ENGN4613 Microphotonics, Biophotonics and Nanophotonics
   - ENGN4615 Finite Element Analysis
   - ENGN4625 Power Electronics
   - ENGN4627 Robotics

4. 12 units mathematics (compulsory);
   - MATH1013 Mathematics & Applications 1 (or MATH1115)
   - MATH1014 Mathematics & Applications 2 (or MATH1116)
5. 6 units computing (compulsory);
   - COMP1100 Introduction to Programming & Algorithms or
   - COMP1730 Model-Drive Software Development
6. 6 units physics (compulsory);
   - PHYS1101 Advanced Physics I
7. 36 units of courses offered by the University.

Note: The degree program may not include more than 60 units of 1000-series courses.

Engineering Majors

Electronics & Communications		
ENGN1218	Introduction to Electronics	6u
ENGN2218	Electronic Systems & Design	6u
ENGN2228	Signal Processing	6u
ENGN3213	Digital Systems & Microprocessors	6u
ENGN3226	Digital Communications	6u
ENGN4536	Wireless Communications	6u
ENGN4625	Power Electronics	6u
TOTAL		42 units

Mechanical & Materials		
ENGN1217	Introduction to Mechanics	6u
ENGN2217	Mechanical Systems & Design	6u
ENGN2222	Thermal Energy Systems	6u
ENGN3212	Manufacturing Technologies	6u
ENGN3601	Engineering Materials	6u
ENGN4511	Composite Materials	6u
ENGN4615	Finite Element Analysis	6u
TOTAL		42 units

Mechatronics		
ENGN2217	Mechanical Systems & Design	6u
ENGN2218	Electronic Systems & Design	6u
ENGN2221	System Dynamics	6u
ENGN3213	Digital Systems & Microprocessors	6u
ENGN3223	Control Systems	6u
ENGN4528	Computer Vision	6u
ENGN4627	Robotics	6u
TOTAL		42 units

Sustainable Energy		
ENGN2217	Mechanical Systems & Design	6u
ENGN2218	Electronic Systems & Design	6u
ENGN2222	Thermal Energy Systems	6u
ENGN3224	Energy Systems Engineering	6u
ENGN3334	Semiconductors	6u
ENGN4516	Energy Resources & Renewable Technologies	6u
ENGN4524	Solar Energy Technology	6u
TOTAL		42 units

The College offers four engineering majors that may be selected in terms of fulfilling item 3 of the BE program requirements. Refer to Majors tab. Students should note that all completed majors will be listed on their academic transcript.

Science & Other majors

The 36 units of courses under item 7 of the BE program requirements may be used by students with an interest in the photonics major. Note that the non-engineering (ENGN) courses in this major cannot be counted towards Item 3 of the BE program requirements.

Photonics		
PHYS1101	Advanced Physics I	6u
PHYS1201	Advanced Physics II	6u
PHYS2016	Electromagnetism	6u
PHYS2017	Waves & Optics	6u
PHYS3057	Contemporary Optics	6u
ENGN4513	Fibre Optic Communication Systems	6u
ENGN4613	Microphotonics, Biophotonics & Nanophotonics	6u
TOTAL		42 units

The Bachelor of Engineering degree with Honours

Honours grades in the BE degree are awarded by the School of Engineering on the basis of a recommendation from the Head of Engineering and may be awarded with first class honours; second class honours, division A; or second class honours, division B.

The awarding of honours in engineering is based on meritorious performance over the entire four-year program. The assessment of meritorious performance includes the calculation of an average percentage mark (APM), together with the consideration of the overall academic progress of the student and the Individual Project result. To determine the global APM, the first year average mark is weighted by a factor 0.1, and the combined average of years 2, 3 and 4 by a factor 0.9.

The first year average mark is the average of the marks awarded in the following courses: ENGN1211 Discovering Engineering, ENGN1215 Engineering Science, ENGN1217 Introduction to Mechanics, ENGN1218 Introduction to Electronics, MATH1013 Mathematics & Applications 1 (or MATH1115), MATH1014 Mathematics & Applications 2 (or MATH1116), PHYS1101 Advanced Physics I, and COMP1100 Introduction to Programming & Algorithms.

The average mark for the remainder years is the average mark awarded in all the additional engineering courses (that is, having an ENGNXXXX code number) completed by the student, excluding ENGN4200 Individual Project, which is considered separately.

ENGN4100 Engineering Honours

In order to be considered for the award of a degree offered by the Department of Engineering, students must formally enrol in ENGN4100 - Engineering Honours, at the commencement of their intended final semester.

Degree Structure

Standard Bachelor of Engineering recommended program pattern

	Semester 1	Semester 2
Year 1 48 units	COMP1100 Introduction to Programming & Algorithms [1] ENGN1211 Discovering Engineering MATH1013 Mathematics & Applications 1 [2] PHYS1101 Advanced Physics [3]	ENGN1215 Engineering Science ENGN1217 Introduction to Mechanics ENGN1218 Introduction to Electronics MATH1014 Mathematics & Applications 2
Year 2 48 units	ENGN2217 Mechanical Systems & Design ENGN2218 Electronic Systems & Design ENGN2225 Systems Engineering Design MATH2305 Calculus & Differential Equations OR University Elective	ENGN2219 Computing for Engineering Simulation ENGN2226 Systems Engineering Analysis Engineering major University elective
Year 3 48 units	ENGN3211 Investment Decisions & Financial Systems Engineering major Engineering elective University elective	ENGN3221 Engineering Management Engineering major Engineering elective University elective
Year 4 48 units	ENGN4200 Individual Project ENGN4221 Systems Engineering Project Engineering major University elective	ENGN4200 Individual Project ENGN4611 Engineering Law Engineering major University elective

[1] COMP1100 may be replaced with COMP1730

[2] Students who have studied ACT Maths Methods or equivalent in Year 11/12 are advised to study MATH1003 prior to studying MATH1013 in S2 and MATH1014 in S1 the following year

[3] Students who have not studied Physics in Year 11/12 are advised to study PHYS1001.

The above pattern is indicative only and may be tailored to suit individual needs.

Combined degrees

All BE combined degrees are 5 EFTSL, 5 year programs comprising 240 units:

Bachelor of Engineering may be combined with a:

- Bachelor of Science
- Bachelor of Information Technology
- Bachelor of Commerce
- Bachelor of Economics
- Bachelor of Asian Studies
- Bachelor of Arts

Again, students are reminded that any completed majors will be listed on their academic transcript.

Associate Degree Specialising in Engineering

(Academic Program: 2700 | Academic Plan: 2700XADENG)

Duration: 2 years full-time

Minimum: 96 units

CRICOS Code: 056477M

The Canberra Institute of Technology and The Australian National University are offering a joint Associate Degree specialising in Engineering. The Associate Degree will provide students with a strong practical base as well as the theoretical foundation required for studying engineering at university level. Two fields of engineering will be offered; mechanical and electronic.

The two year program will see students study university-type subjects while at CIT and provide graduates with the potential to progress to a Bachelor of Engineering degree at ANU. Successful completion of the Associate Degree, with at least a credit average across all courses at CIT and at least passes in ANU courses, will ordinarily guarantee students direct admission to ANU Bachelor of Engineering programs with 72 units of credit (equivalent to about 18 months of study).

For more information go to the CIT Web Site: http://www.cit.act.edu.au/future/courses/engineering_anu_associate_degree/

School of Computer Science

Dr Henry Gardner, BSc(Hons) Melbourne, Dip Comp Stud Melbourne, PhD ANU,

Reader and Head of School

How do people understand and use computers, computer networks, and the information they help us to manage? The subject matter of the computing discipline has many names, including software engineering, computer science, informatics, information systems, information technology, and computer programming. The discipline is only young, and the nature of the subject has been debated many times since the first electronic computers and the foundation of the first professional association in 1947. The nature of the discipline has changed in that time from a focus on computer hardware in a very small number of uniquely-designed computers, and the highly-specialised mathematical algorithms that were programmed into them, to the graphically-interfaced, general-purpose commodity computing of today. The computing discipline has broadened to include the ways in which its professional graduates apply computing to the information needs and creative expression of people and organisations.

Information Technology is the common global term which covers all aspects of computing, data storage, and communications - the generality of equipment, systems and services that involve the use of computers, advanced telecommunications, and digital electronics. The IT industry is now reckoned to be the world's largest. Although our Schoolt's name continues to refer to "Computer Science," it is a centre for the study of wider aspects of IT: software engineering, which is the profession of designing and constructing large and complex software systems; information systems, which involves the ways in which computer systems are meshed with organisations; human-centred computing, understanding and applying technology to human needs of creative expression; computer systems, the creative engineering and science of making advances in the support layers of computer technologies; and computer science, the systematic study of the fundamental algorithms and processes underlying computing. The School provides professional, technical, and service courses in these areas and introductory information technology for students in many areas of the university.

School aims & objectives - programs offered

The School aims to produce graduates with technical, professional and fundamental scientific education via a number of programs, in the Bachelor of Information Technology, the Bachelor of Software Engineering, the Bachelor of Computer Science (Honours), the Bachelor of Science majoring in Computer Science, and the Bachelor of Philosophy. The School also aims to produce graduates with advanced IT literacy skills via the IT in New Media Arts major in the Bachelor of Arts (New Media Arts).

The Bachelor of Computer Science (Honours) is a college-wide four-year, flexible research-focused program for intellectually ambitious students. It engages with fundamental theoretical computer science, including a mathematical understanding of algorithms and models of processes, and fundamental experimental computer science, seen as a disciplined approach to discovering and improving new technologies.

The Bachelor of Software Engineering program offers technical and professional education, communications skills, and individual and group project work supported by a solid basis of computer science. Latter-year courses and capstone projects in this program have a substantial component which is sourced from industry. A pass degree or a degree with Honours can be awarded after four years of study in this program. The program is accredited with both Engineers Australia and the Australian Computer Society.

The School offers a three-year technical and professional program, the Bachelor of Information Technology. This program is accredited with the Australian Computer Society and B Inf Tech students can choose to major in software development, information systems, computer systems or IT for new media arts. The B Inf Tech can also be combined with programs in Commerce and Economics for a four-year combined program that aims to provide a professional, business-oriented education. It can be combined with the Bachelor of Engineering for five years of study that includes substantial computing within a full, multidisciplinary Engineering program. It is also possible to combine the B Inf Tech with the Bachelor of Arts and the Bachelor of Laws.

The School aims to produce graduates with a fundamental scientific education via the Bachelor of Science majoring in Computer Science. Students taking this program can combine a study of a Science subject with as much computing as they wish or take combined Science programs such as Science and Law. The Bachelor of Computational Science (Honours) program combines the study of computing, mathematics, and their application to computer modelling in the sciences. Like the Bachelor of Computer Science (Honours), the Bachelor of Philosophy (Honours) is an innovative, research-focused program but is offered through the College of Science. This program is extremely flexible in its structure and allows students to specialise in many areas of science, including computer science. For more details on these programs see the College of Science entry in the Handbook.

The School aims to produce graduates with a strong IT literacy base in the understanding and use of modern IT tools, especially as applied to new media, via the major in IT in New Media Arts in the Bachelor of Arts (New Media Arts). Details can be found in the ANU College of Arts and Social Sciences entry in the Handbook.

A fourth year of Honours study can be added to the B Inf Tech or BSc and first-class Honours graduates from these programs, and from the Bachelor of Software Engineering, are eligible to enter postgraduate research studies at ANU and other leading computer-science departments worldwide.

The School offers three coursework Masters programs, the Master of Information Technology Studies, the Master of Computing and the Masters of Computing (Honours). These programs are accredited with the Australian Computing Society.

The School has an active research program and educates Master of Philosophy and PhD students by research.

Introductory courses

The School offers several courses that can be taken by students with no previous background in computing or information technology. COMP1710 and COMP2720 are courses that introduce students to the development and generalized use of IT tools in new media. COMP1710 studies tools used for new media and the web, while COMP2720 deals with script-level programming in the context of new media. COMP1710 is also an information technology service course offered to students in other faculties, which provides a university-level introduction

to applied computing for students in any area who wish to use computers in their studies or their careers but do not necessarily need to study computer programming.

COMP1100 provides an introduction to computer programming, both as a service course and as a foundation for all further studies in information technology. It assumes a prior knowledge of secondary college advanced mathematics, but does not require any previous computing experience. COMP1110provides further study of programming and software engineering, with a focus on the construction of larger programs. It leads to further software development and software engineering studies.

COMP2400 can also be taken in first year, following COMP1100. It provides an introduction to the use of databases and to their underlying technology. This course can be used as part of a major in Commerce as well as contributing to Information Technology and Software Engineering programs.

Further information

Further information on the courses offered and the structures of the courses is available from the School's website at http://cs.anu.edu.au

Bachelor of Computer Science (Honours)

(Academic Program: 4710 | Academic Plan: 4710HBCSCI)

Duration: 4 years full-time

Minimum: 192 units

CRICOS Code: 054425F

The Bachelor of Computer Science (Honours) is a four year, flexible, research-focused professional program for exceptional students who would like to pursue postgraduate research in computer science or research-oriented computing careers in commerce and industry. The program is built on strong foundations in computer science and mathematics. It provides ample scope for the student to pursue research in individual areas of interest, working with researchers of great international distinction in the areas of computer science, engineering and mathematics. It is anticipated that the program will have professional accreditation with the Australian Computer Society.

Students are required to maintain a superior distinction average each year to remain in the program. Students who do not meet the performance requirements can transfer to the Bachelor of Science, the Bachelor of Information Technology or the Bachelor of Software Engineering, with transfer credit determined on a case by case basis. Exceptional students from other programs will be considered for transfer into the BCS on a case by case basis.

All students who complete the Bachelor of Computer Science Honours degree are eligible for professional membership of the Australian Computer Society.

The Bachelor of Computer Science Honours homepage: http://cecs.anu.edu.au/students/future/undergrad/BCS

Scholarships Scholarships valued at $20,000 total are available to students with an ATAR of 99–100 who enrol in this program.

Program Requirements

The program requires the completion of 192 units including:

(a) completion of 120 units of prescribed courses as follows:
- COMP1130 Data Structures and Algorithms I
- COMP1140 Data Structures and Algorithms II
- COMP2300 Introduction to Computer Systems
- COMP2310 Concurrent and Distributed Systems
- COMP2600 Formal Methods in Software Engineering
- COMP3006 Computer Science Research Project
- COMP3130 Computer Science Group Project
- COMP3600 Algorithms
- COMP3630 Theory of Computation
- COMP4006 Computer Science Honours
- MATH1115 Mathematics and Applications 1 Honours
- MATH1116 Mathematics and Applications 2 Honours
- MATH2322 Algebra 1 Honours

(b) completion of a further 6 units of 2000/3000/4000-series Maths courses;

(c) completion of a further 18 units of CS courses from Schedule 1, with no more than 6 units being at the 2000-series level. This must include at least 6 units of courses from each of the areas listed under Schedule 1;

(d) completion of a further 12 units of 3000/4000-series CS courses;

(e) completion of a further 36 units of courses, including no more than 12 units of 1000-series courses, from anywhere in the University.

CS courses are:

- COMP courses
- Computer Science relevant courses from other areas of the University that are approved by the Program Convenor

Schedule 1

Applications
- COMP2110 Software Design
- COMP2400 Relational Databases
- COMP3320 High Performance Scientific Computation
- COMP3410 IT in E-Commerce
- COMP3420 Advanced Databases & Data Mining
- COMP3620 Artificial Intelligence
- COMP3720 Advanced Studies in Computer Science (Applications)
- COMP4220 Frontiers of Human Computer Interaction
- COMP4610 Computer Graphics

Programming Languages & Systems
- COMP3300 Operating Systems Implementation
- COMP3310 Computer Networks
- COMP3610 Principles of Programming Languages
- COMP3640 Compiler Construction
- COMP3730 Advanced Studies in Computer Science (Programming Languages and Systems)
- COMP4300 Parallel Systems
- COMP4320 Network Security
- COMP4330 Real-time and Embedded Systems
- ENGN3213 Digital Systems and Microprocessors

Theory
- COMP3740 Advanced Studies in Computer Science (Theory)
- COMP4600 Advanced Algorithms

- COMP4630 Overview of Logic in Computing
- MATH3343 Foundations of Mathematics Honours
- MATH3301 Number Theory and Cryptography Honours

The Bachelor of Computer Science with Honours

The awarding of honours in computer science is based on meritorious performance in the honours year of the program, which consists of 50 per cent coursework and 50 per cent thesis.

Degree Structure

BCS (Honours) possible enrolment pattern

	Semester 1	**Semester 2**
Year 1 (48 units)	COMP1130 Data Structures & Algorithms 1 MATH1115 Mathematics & Applications 1 Honours COMP2300 Introduction to Computer Systems University Elective (6u)	COMP1140 Data Structures & Algorithms 2 MATH1116 Mathematics & Applications 2 Honours COMP2600 Formal Methods in Software Engineering University Elective (6u)
Year 2 (48 units)	COMP3630 Theory of Computation 2000/3000/4000-series Maths University Elective (6u) University Elective (6u)	COMP2310 Concurrent & Distributed Systems COMP3600 Algorithms Schedule 1 CS Elective (6u) MATH2322 Algebra 1 Honours
Year 3 (48 units)	COMP3130 Group Project (6u) Schedule 1 CS Elective (6u) 3000/4000-series CS Elective (6u) University Elective (6u)	COMP3006 Research Project (6u) Schedule 1 CS Elective (6u) 3000/4000-series CS Elective (6u) University Elective (6u)
Year 4 (48 units)	COMP4006 Computer Science Honours	

Bachelor of Software Engineering

(Academic Program: 4708 | Academic Plan: 4708XBSENG)

Duration: 4 years full-time

Minimum: 192 units

CRICOS Code: 029273C

The Bachelor of Software Engineering (BSEng) is a four-year program accredited by Engineers Australia and the Australian Computer Society. The course emphasises the development of professional skills in the technical area of software engineering, that is, the systematic application of analysis, design, and construction techniques for computer systems and applications.

The computing industry has grown very rapidly in the last 40 years, despite a widely acknowledged, continual state of crisis in our abilities to manage reliably the process of developing software. The need for a mixture of technical computing knowledge with the skills of the computer programmer, and the disciplined organisation and judgement of the professional engineer, has been seen as desirable for many years. The introduction of the Bachelor of Software Engineering program in 1999 meets this need.

The BSEng graduate will acquire technical knowledge of the fundamentals of computer systems, programming languages, and the mathematical foundations of algorithms and data structures that are required to establish reliability and safety in software. Technical knowledge is honed by a selection of advanced technical topics. The principles and practices of the design and implementation of software are built up in a sequence of courses combining theoretical study and practical laboratory exercises, individual projects, and group projects. Of no less importance is an introduction to the professional skills of a competent engineer: management, communication with others and teamwork in particular, and ethical and other responsibilities. Graduates will also build their own skills of individual software development in university studies and in practical work experience which is required during the course, and will learn a systems approach developed and exemplified in individual and group project work.

Mathematics is an essential component of the program for developing the ability for abstraction that is the core of the computing discipline, and to allow rigorous formal description of aspects of the software engineering process. Discrete mathematics also has significant applications in the modelling and rigorous description of software properties, computing processes and programming languages.

The best computing professionals are informed by knowledge of a wider field than computing alone. The course includes the choice of a major line of study in another discipline in the university which can broaden the understanding of the social and cultural responsibilities of the software engineer, and strengthen the ability to communicate with others, or may be used to specialise in further fundamental sciences, or in specialised engineering streams. Both develop the capacity for lifelong learning by exposure to a broader range of ways of studying at university level.

The Bachelor of Software Engineering degree is accredited by Engineers Australia and the Australian Computer Society.

The Bachelor of Software Engineering Homepage: http://cecs.anu.edu.au/students/future/undergrad/BSE

Program Requirements

The BSEng degree requires completion of 192 units including

(a) completion of 126 units of prescribed courses as follows:
- COMP1100 Introduction to Programming and Algorithms
- COMP1510 Introduction to Software Engineering
- COMP2300 Introduction to Computer Systems
- COMP2310 Concurrent and Distributed Systems
- COMP2400 Relational Databases
- COMP2500 Software Construction for Software Engineers
- COMP2510 Software Design for Software Engineers
- COMP2600 Formal Methods in Software Engineering
- COMP3110 Software Analysis and Design
- COMP3120 Managing Software Development

- COMP3500 Software Engineering Project
- COMP3600 Algorithms
- COMP4130 Managing Software Quality and Process
- COMP4500 Software Engineering Practice OR
- COMP4540 Software Engineering Research Project (12–24 unit)
- COMP4800 Industrial Experience (0 unit)
- ENGN1211 Discovering Engineering
- ENGN3211 Investment Decisions and Financial Systems
- ENGN4611 Engineering Law
- MATH1013 Mathematics and Applications 1 OR
- MATH1115 Mathematics and Applications 1 Honours
- MATH1014 Mathematics and Applications 2 OR
- MATH1116 Mathematics and Applications 2 Honours

(b) completion of a further 18 units of 3000/4000-series COMP courses, other than those prescribed in (a). Where COMP4540 is taken in (a), this must include completion of a second enrolment in COMP4540 in the following semester.

(c) completion of a further 12 units of Engineering or Science courses, excluding COMP courses;

(d) completion of a further 36 units of courses, including no more than 12 units of 1000-series courses, from anywhere in the university, including courses offered by the Department of Computer Science;

(e) no more than 60 units of 1000-series courses.

Industrial Experience

Engineers Australia specifies that students are required to complete at least 60 days of engineering work experience during the course through approved professional employment taken in the vacation periods. For details, see entry for COMP4800 Industrial Experience.

Degree Structure

BSEng (4708) possible enrolment pattern

	Semester 1	Semester 2
Year 1 (48 units)	COMP1100 Introduction to Programming & Algorithms ENGN1211 Discovering Engineering MATH1013 Mathematics & Applications 1 Science/Engineering Elective (6u)	COMP1510 Introduction to Software Engineering COMP2400 Relational Databases MATH1014 Mathematics & Applications 2 Science/Engineering Elective (6u)
Year 2 (48 units)	COMP2300 Introduction to Computer Systems COMP2500 Software Construction for Software Engineers ENGN3211 Investment Decisions & Financial Systems Elective (6u)[1]	COMP2310 Concurrent & Distributed Systems COMP2510 Software Design for Software Engineers COMP2600 Formal Methods in Software Engineering Elective (6u)[1]
Year 3 (48 units)	COMP3110 Software Analysis & Design COMP3500 Software Engineering Project 3000/4000-series COMP (6u)[2] Elective (6u)[1]	COMP3120 Managing Software Development COMP3500 Software Engineering Project COMP3600 Algorithms Elective (6u)[1]
Year 4 (48 units)	COMP4130 Managing Software Quality & Process COMP4500 Software Engineering Practice 3000/4000-series COMP (6u)[2] Elective (6u)[1]	COMP4500 Software Engineering Practice COMP4800 Industrial Experience ENGN4611 Engineering Law 3000/4000-series COMP (6u)[2] Elective (6u)[1]

BSEng engineering elective options

The Bachelor of Software Engineering (BSEng) program provides for students to choose: (a) 12 units Science or Engineering; (b) 36 units of courses (which must include at least 12 units at 1000-series level). The following suggestions are highlighted for BSEng students who want to consider engineering-related areas:

Mechatronics

ENGN2217, ENGN2218, ENGN2221, ENGN3213, ENGN3223, ENGN4528, ENGN4627 (plus prerequisites ENGN1217 and ENGN1218)

Mechanical & Materials

ENGN1217, ENGN2217, ENGN2222, ENGN3212, ENGN3601, ENGN4511, ENGN4615

Electronics & Communications

ENGN1218, ENGN2218, ENGN2228, ENGN3213, ENGN3226, ENGN4536, ENGN4625

BSEng students who are pursuing elective interests outside the College of Engineering and Computer Science are advised to consult the relevant section of the *ANU Undergraduate Handbook* and the relevant Sub-Dean or School course adviser.

Combined Degrees

The Bachelor of Software Engineering may be combined with a Bachelor of Science or a Bachelor of Commerce. These are 5 year programs.

The Degree with Honours

The awarding of honours in software engineering is based on meritorious performance in the third and fourth year components of the program. The assessment of meritorious performance is based on the marks and grades obtained for all 3000-level and 4000-level courses that the student has undertaken. Students who qualify may be awarded a grade of first class honours or second class honours, division A.

Bachelor of Information Technology

(Academic Program: 3701 | Academic Plan: 3701XBINFT)

Duration: 3 years full-time

Minimum: 144 units

CRICOS Code: 029996A

The Bachelor of Information Technology (BInfTech) is a three-year program that prepares graduates to enter the computing industry work force as novice practitioners to develop software or to apply computing in human organisations. The graduate attains the technical knowledge of fundamentals of computer systems, programming languages, computer applications, and information systems. The computing industry has always been subject to very rapid change, and so we also aim to prepare graduates to meet the changes in practice and in technology that will be met during their working careers. The graduate can enter the fields of software development and support, information systems development and support, or many other broad areas of choice in computing or general industry.

The BInfTech program allows students to approach information technology from either a technical, constructive angle, starting with courses in programming, or from a conceptual, critical or information and organisational management angle. It widens the approach to computing to include the creative and conceptual touch, starting by applying scripting to the application area of new media (video and audio), rather than from learning traditional general purpose programming languages applied to algorithms. The technically oriented student can major in Computer Systems or Software Development; whereas the more conceptually oriented student can major in Information Systems or IT in New Media Arts.

The Computer Systems major focuses on developing a sound knowledge in the area of computer systems, including distributed systems, networks and digital systems; the Software Development major aims to develop the conceptual and practical skills for software development and the technology of computer systems; the Information Systems major focuses on developing an understanding of organisations, the management of computer systems applications in them, and the accompanying systems analysis and design; and the IT in New Media Arts major focuses on the understanding and use of modern IT tools especially as applied to new media.

All of the majors are founded on an introduction to the principles of programming, a broad perspective on the computing discipline and profession, and an introduction to the functional structure of computers. They also require a grounding in mathematics and theoretical computer science, which is a means of developing the ability to work with abstractions, a fundamental requirement for understanding and applying ideas in computing.

All students who complete the BInfTech degree are eligible for professional membership of the Australian Computer Society.

The Bachelor of Information Technology Homepage: http://cecs.anu.edu.au/students/future/undergrad/BIT

Program Requirements

The program requires the completion of 144 units of courses offered, or approved by, the Faculty of Engineering and Information Technology, including:

(a) completion of 90 units of IT courses, of which at least 36 units must be 3000/4000-series courses, and 6 units of maths courses. This must include:
  - all the courses from the core and a major from Schedule 1 or
  - all the courses from the core and a major from Schedule 2

(b) completion of a further 6 units of IT courses or a 6 unit elective chosen from Schedule 3.

(c) completion of a further 42 units of courses from anywhere in the university, including courses offered by the Department of Computer Science, of which no more than 18 units may be 1000-series courses;

(d) no more than 48 units of 1000 series courses.

IT courses are:

COMP courses

- INFS courses that are specified in the major
- NEWM courses that are specified in the major
- ENGN1211 Discovering Engineering
- ENGN2225 Systems Engineering Design
- ENGN3213 Digital Systems and Microprocessors
- ENGN3221 Engineering Management
- ENGN3226 Digital Communications
- ENGN4528 Computer Vision
- MATH3511 Scientific Computing

Schedule 1

Core

- COMP1710 Tools for New Media & the Web or ENGN1211 Discovering Engineering
- COMP2400 Relational Databases
- COMP2410 Networked Information Systems
- COMP3120 Managing Software Development
- MATH1005 Discrete Mathematical Models or MATH1014 Mathematics and Applications 2 or MATH1116 Mathematics and Applications 2 Honours

Majors

IT in New Media Arts

As specified in the requirements for the Bachelor of Arts (New Media Arts) program in the ANU College of Arts and Social Sciences entry.

Information Systems

- COMP1110 Introduction to Software Systems or COMP2750 Java Programming for New Media
- COMP2600 Formal Methods in Software Engineering
- COMP3110 Software Analysis and Design
- COMP3410 IT in eCommerce or COMP3420 Advanced Databases and Data Mining
- INFS2024 Information Systems Analysis
- INFS3024 Information Systems Management
- COMP3760 Project Work in Information Systems or INFS3059 Project Management and Information Systems

Schedule 2

Core

- COMP1100 Introduction to Programming and Algorithms
- COMP1110 Introduction to Software Systems
- COMP1710 Tools for New Media & the Web or ENGN1211 Discovering Engineering
- COMP2100 Software Construction
- COMP2400 Relational Databases
- COMP2600 Formal Methods in Software Engineering
- COMP3120 Managing Software Development
- MATH1005 or MATH1014 Mathematics and Applications 2 or MATH1116 Mathematics and Applications 2 Honours

Majors

Computer Systems

- COMP2300 Introduction to Computer Systems
- COMP2310 Concurrent and Distributed Systems
- COMP3310 Computer Networks

And at least four courses from the following:

- COMP3300 Operating Systems Implementation
- COMP3320 High Performance Scientific Computation
- COMP3750 Project Work in Computer Systems
- COMP4300 Parallel Systems
- COMP4330 Real-Time and Embedded Systems
- ENGN3213 Digital Systems and Microprocessors

Software Development

- COMP2110 Software Design
- COMP2300 Introduction to Computer Systems
- COMP2310 Concurrent and Distributed Systems
- COMP2410 Networked Information Systems or COMP3310 Computer Networks
- COMP3100 Software Engineering Group Project
- COMP3110 Software Analysis and Design

Schedule 3

- BUSN1001 Business Reporting and Analysis
- BUSN1101 Introduction to Commercial Law
- ECON1101 Microeconomics 1
- EMET1001 Foundations of Economic and Financial Models
- FINM1001 Money, Markets and Finance
- MATH1003 Calculus and Matrix Models
- MATH1013 Mathematics and Applications 1
- MATH1115 Mathematics and Applications 1 Honours
- MATH2301 Games, Graphs and Machines
- PSYC1003 Introduction to Psychology 1
- SCOM1001 Science and Public Awareness
- STAT1003 Statistical Techniques
- STAT1008 Quantitative Research Methods

Degree Structure

BInfTech (3701:Computer Systems major) possible enrolment pattern

	Semester 1	Semester 2
Year 1 (48 units)	COMP1100 Introduction to Programming & Algorithms COMP1710 Tools for New Media & the Web IT Elective or Schedule 3 elective (6u) Elective (6u) [1]	COMP1110 Introduction to Software Systems COMP2400 Relational Databases MATH1005 Discrete Mathematical Models Elective (6u) [1]
Year 2 (48 units)	COMP2100 Software Construction COMP2300 Introduction to Computer Systems Elective (6u) [1] Elective (6u) [1]	COMP2310 Concurrent & Distributed Systems COMP2600 Formal Methods in Software Engineering 2000/3000/4000-series IT (6u) Elective (6u) [1]
Year 3 (48 units)	COMP3310 Computer Networks 3000/4000-series IT (12u) [2] Elective (6u) [1]	COMP3120 Managing Software Development 3000/4000-series IT (12u) [2] Elective (6u) [1]

[1] May include no more than 18 units of 1000-series elective courses.

[2] Choose four courses from: COMP3300 Operating Systems Implementation, COMP3320 High Performance Scientific Computation, COMP3750 Project Work in Computer Systems, COMP4300 Parallel Systems, COMP4330 Real-Time and Embedded Systems, and ENGN3213 Digital Systems and Microprocessors.

BInfTech (3701:IT in New Media Arts major) possible enrolment pattern

	Semester 1	Semester 2
Year 1 (48 units)	COMP1710 Tools for New Media & the Web IT Elective or Schedule 3 elective (6u) Elective (12u) [1]	COMP2720 Automating Tools for New Media COMP2400 Relational Databases MATH1005 Discrete Mathematical Models Elective (6u) [1]
Year 2 (48 units)	COMP2410 Networked Information Systems COMP2750 Java Programming for New Media [2] 2000/3000/4000-series IT (6u) Elective (6u) [1]	2000/3000/4000-series IT (6u) 2000/3000/4000-series IT (12u) Elective (6u) [1]
Year 3 (48 units)	3000/4000-series IT [3] 3000/4000-series IT [3] 3000/4000-series IT [3] Elective (6u) [1]	COMP3120 Managing Software Development COMP3900 Human Computer Interface Design & Evaluation COMP4610 Computer Graphics Elective (6u) [1]

[1] May include no more than 18 units of 1000-series elective courses.

[2] Can be replaced with COMP1110 Introduction to Software Systems.

[3] Some 3000/4000-series IT electives may have specific prerequisites that are not covered by the courses specified in the table.

BInfTech (3701:Information Systems major) possible enrolment pattern

	Semester 1	Semester 2
Year 1 (48 units)	COMP1100 Introduction to Programming & Algorithms COMP1710 Tools for New Media & the Web IT Elective or Schedule 3 elective (6u) Elective (6u) [1]	COMP1110 Introduction to Software Systems [2] or Elective (6u) [1] COMP2400 Relational Databases MATH1005 Discrete Mathematical Models Elective (6u) [1]
Year 2 (48 units)	INFS2024 Information Systems Analysis COMP2410 Networked Information Systems COMP2750 Java Programming for New Media [2] or 2000/3000/4000-series IT (6u) Elective (6u) [1]	COMP2600 Formal Methods in Software Engineering 2000/3000/4000-series IT (6u) Elective (6u) [1] Elective (6u) [1]
Year 3 (48 units)	INFS3024 Information Systems Management COMP3110 Software Analysis & Design 3000/4000-series IT [3][4] Elective (6u) [1]	COMP3120 Managing Software Development COMP3760 Project Work in Information Systems or INFS3059 Project Management & Information Systems 3000/4000-series IT (6u) [3][4] Elective (6u) [1]

[1] May include no more than 18 units of 1000-series elective courses.

[2] Must include either COMP1110 Introduction to Software Systems or COMP2750 Java Programming for New Media, but not both.

[3] Must include one of COMP3410 IT in E-Commerce or COMP3420 Advanced Databases & Data Mining.

[4] Some 3000/4000-series IT electives may have specific prerequisites that are not covered by the courses specified in the table.

BInfTech (3701:Software Development major) possible enrolment pattern

	Semester 1	Semester 2
Year 1 (48 units)	COMP1100 Introduction to Programming & Algorithms COMP1710 Tools for New Media & the Web IT Elective or Schedule 3 elective (6u) Elective (6u) [1]	COMP1110 Introduction to Software Systems COMP2400 Relational Databases MATH1005 Discrete Mathematical Models Elective (6u) [1]
Year 2 (48 units)	COMP2100 Software Construction COMP2300 Introduction to Computer Systems Elective (6u) [1][2] Elective (6u) [1]	COMP2110 Software Design COMP2310 Concurrent & Distributed Systems COMP2600 Formal Methods in Software Engineering Elective (6u) [1]
Year 3 (48 units)	COMP3100 Software Engineering Group Project COMP3110 Software Analysis & Design 3000/4000-series IT (6u) [3] Elective (6u) [1]	COMP3100 Software Engineering Group Project COMP3120 Managing Software Development 3000/4000-series IT (6u) [2][3] Elective (6u) [1]

[1] May include no more than 18 units of 1000-series elective courses.

[2] Must include one of COMP2410 Networked Information Systems or COMP3310 Computer Networks.

[3] Some 3000/4000-series IT electives may have specific prerequisites that are not covered by the courses specified in the table.

Bachelor of Information Technology (Bachelor of Information Technology (Honours))

(Academic Program: 3701 | Academic Plan: 3701HBINFT)

Duration: 1 year full-time

Minimum: 48 units

CRICOS Code: 029996A

The BInfTech program with honours requires an additional year of study after the pass degree of Bachelor of Information Technology. Admission is by invitation based on performance in the best 48 units of 2000 and 3000 series Information Technology and Mathematics courses and generally requires an average performance at better than Credit level. The honours program includes advanced coursework and a major individual project worth 50 per cent of the year. Honours grades are awarded on the result of the whole year's work. For more details refer to http://cs.anu.edu.au/honours

Course Descriptions

Introduction to Programming & Algorithms COMP1100 (6 units) A

First Year Course

First Semester, 2010

Workload: Thirty one-hour lectures, ten two-hour tutorial/laboratory sessions.

Assumed Knowledge and Required Skills: Students are assumed to have achieved a level of knowledge of mathematics comparable to at least ACT Maths Methods major or NSW 2 unit maths or equivalent.

Course Description: In general terms, an algorithm is a precise computational process for producing a specific result from some given input data. A program is a formal definition of an algorithm, in a notation that can be mechanically translated and then executed by a modern computer.

The core unifying theme of the course is data-directed design. The course introduces fundamental algorithmic structures such as composition (sequence), choice and repetition,

predominantly using a functional programming language as the vehicle of expression. The course introduces fundamental data types and structures such as products (tuples), lists, and unions. A key aim is to illustrate the interdependancy of algorithms and data structures - significantly, that data structures largely determine algorithms, for example, that products are processed by projections, unions by alternatives, and that recursive data structures such as lists are processed by recursive algorithms.

For all but the simplest programs, some means of abstraction and structuring is required to manage the complexities faced by programmers, as individuals and as groups. The course introduces modularisation techniques such as libraries and abstract data types, as a means of managing such complexity. Good modular design is of fundamental and practical importance for program development - adhering to the theme of data-directed design adopted in this course leads to elegant and maintainable programs.

The final section of the course revisits the most important aspects covered in the course, but now in the context of an object-oriented programming language. The aim is to thereby emphasise the concepts, rather than any particular implementation, and to provide a springboard to subsequent programming courses.

Indicative Assessment: Continuous Assessment (40 per cent); Examinations (60 per cent)

Introduction to Software Systems COMP1110 (6 units) A

First Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and nine two-hour tutorial/laboratory sessions

Prerequisites: COMP1100

Incompatibility: COMP1510 and COMP2750

Course Description: This course introduces students to the tools and techniques for developing software systems of a size and quality of an industrially relevant nature. The course teaches the fundamental strategies of abstraction, decomposition and reuse as methods for constructing such systems. Verification and validation techniques, with an emphasis on testing, are taught as a means to ensure that students are able to deliver software products of the quality required.
In particular, the course will cover: recursive data structures and algorithms; structured data types, abstract data types and their applications; object-oriented programming; and software life-cycle. The course will also introduce some of the theoretical fundamentals that underpins software engineering, including: reasoning about software and its application to specifications, and verification and validation.

Indicative Assessment: Assignment (30 per cent); Lab Tests (20 per cent); Final Exam (50 per cent)

Data Structures & Algorithms I COMP1130 (6 units)

First Year Course

First Semester, 2010

Prerequisites: Enrolment in the Bachelor of Computer Science (Honours) or permission from Head of Computer Science.

Course Description: This course, and its sequel, COMP1140 Data Structures and Algorithms II, will study problem solving using programming languages, data structures and algorithms. The mode of delivery will be via problem seminars which will be seeded by an academic who will introduce a problem, typically associated with his/her research area. Each problem will be worked on by the students who will report in class on their solutions. The problems will be selected to be appropriate vehicles for the students to use to learn about various syllabus topics.

After the completion of both courses, student will have improved their problem solving abilities and have implemented algorithms in at least two languages, including a functional one and an object-oriented one.

Indicative Assessment: Assignments (30 per cent); Final exam (70 per cent)

Data Structures & Algorithms II COMP1140 (6 units)

First Year Course

Second Semester, 2010

Workload: Approximately 2 hours per week

Prerequisites: Enrolment in BCS (Honours) or permission from Head of Computer Science.

Course Description: This course, and its prequel, COMP1130 Data Structures and Algorithms I, will study problem solving using programming languages, data structures and algorithms. The mode of delivery will be via problem seminars which will be seeded by an academic who will introduce a problem, typically associated with his/her research area. Each problem will be worked on by the students who will report in class on their solutions. The problems will be selected to be appropriate vehicles for the students to use to learn about various syllabus topics.

After the completion of both courses, students will have improved their problem solving abilities and have implemented algorithms in at least two languages, including a functional one and an object-oriented one.

Indicative Assessment: Assignments (30 per cent); Final exam (70 per cent)

Introduction to Software Engineering COMP1510 (6 units)

First Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures, nine two-hour tutorial/laboratory sessions and three two-hour seminars.

Prerequisites: Enrolment in BSEng; COMP1100

Incompatibility: COMP1110 and COMP2750

Course Description: This course introduces students to the tools and techniques for developing software systems of a size and quality of an industrially relevant nature. The course teaches the fundamental strategies of abstraction, decomposition and reuse as methods for constructing such systems. Verification and validation techniques, with an emphasis on testing, are taught as a means to ensure that students are able to deliver software products of the quality required. It also introduces students to the principles and practices of software engineering.

In particular, the course will cover: recursive data structures and algorithms; structured data types, abstract data types and their applications; object-oriented programming; and software life-cycle. The course will also introduce some of the theoretical fundamentals that underpins software engineering, including:

reasoning about software and its application to specifications, and verification and validation.

Indicative Assessment: Assignment (30 per cent); Lab Tests (20 per cent); Final Exam (50 per cent)

Tools for New Media & the Web COMP1710 (6 units)

First Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and nine two-hour laboratory sessions

Course Description: This course focuses on multimedia and its delivery on the world wide web. It introduces multimedia as a combination of text, graphics, video, animation and sound for the purposes of information access, storage and dissemination, online art and promotion of art. Topics such as the nature of multimedia and types of multimedia objects, components of a multimedia system, Web authoring, multimedia delivery tools, multimedia applications and societal implications of multimedia, will be covered. Students will have the opportunity to create multimedia applications using XHTML, CSS, JavaScript, animation, sound, video and 3D.

Multimedia can be considered as one of the modern art and communication professions. Within this context we study professional issues such as the construction of multimedia software systems, client focus, and professional ethics. We also consider educational issues: curriculum issues, ANU experience.

Indicative Assessment: Laboratories (25 per cent); Assignment (35 per cent); Final Exam (40 per cent)

Programming for Scientists COMP1730 (6 units)

First Year Course

Second Semester, 2010

Prerequisites: MATH1003 or MATH1013 or MATH1115

Incompatibility: COMP1100

Course Description: This course teaches introductory programming within a problem solving framework applicable to the sciences. The course emphasises technical programming, the simulation of scientific systems and the processing of scientific data. There is an emphasis on designing and writing correct code. Testing and debugging are seen as integral to the programming enterprise. Both top-down and object oriented design are taught. There will be an introduction to widely-used computer science algorithms and to machine architecture. The course will be taught using one or more programming languages which are widely applicable to scientific work.

Indicative Assessment: Assignments (40 per cent), Exam (60 per cent)

Software Construction COMP2100 (6 units) B

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and five two-hour tutorial/laboratory sessions

Prerequisites: COMP1110 or COMP1510 and MATH1005 or MATH1014 or MATH1116

Incompatibility: COMP2500

Course Description: This course is about the implementation and test phases of the software construction process. It is based around creating individual practical assignments on the small scale, and modifying a medium scale project in two major assignments over the whole semester. In this project, students work on a substantial application, relevant to their experience as computer users. The project is closely specified and designed around a strong architectural structure as an exemplar, and may involve a graphical user interface. During the semester students learn to improve their own software development practices by following the Personal Software Process, learning time-management, planning, and quality control.

The following topics are covered: working with larger software systems; code review and inspections; test planning and unit testing (derived from specification and design documents); object-oriented (Java), and scripting (Bash) languages; recursive data structures; graphical user interfaces; the Personal Software Process; build tools (Make and Ant) and version control (Subversion); use of external code libraries.

Indicative Assessment: Assignments (30 per cent); Mid Semester Exam (20 per cent); Final Exam (50 per cent practical 25 per cent, theory 25 per cent)

Software Design COMP2110 (6 units) B

Later Year Course

Second Semester, 2010

Workload: Twenty six one-hour lectures, four one-hour tutorials and five two-hour tutorial/laboratory sessions

Prerequisites: COMP1110 or COMP1510 and MATH1005 or MATH1014 or MATH1116

Incompatibility: COMP2510

Course Description: This course is one of three courses (COMP2100, COMP2110, COMP3110) which address constructive aspects of the software development process. It has a primary focus on the design phase.
The following topics are covered. Introduction to requirements specifications. Designing to specifications. The design milieu (notations, documentation standards). Design techniques (object-oriented, software architectures, design patterns). Design review. Design in the context of requirements change. Principles of quality in design.

Indicative Assessment: Assignments (50 per cent); Presentation (10 per cent); Final Exam (40 per cent)

Introduction to Computer Systems COMP2300 (6 units) B

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and nine two-hour laboratory/tutorial sessions

Prerequisites: COMP1100 and 6 units of 1000-level MATH courses.

Course Description: An introduction to the hardware and software components of a modern computer system. Introduction to procedural and assembly languages typically used for low-level programming of computer systems. Representation of data on computers. Comparisons of different

types of instruction sets and corresponding addressing modes. Emphasis on the relationships among instruction sets, fetch and execute operations, and the underlying architecture. Consideration of the physical implementation of large memory systems, together with the techniques of data storage and checking. Overall concepts of virtual memory, operating system functions, file systems and networks. Virtual machines and the levels of machine organization, the assembly and linking process and software libraries.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Concurrent & Distributed Systems COMP2310 (6 units) B

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures, nine two-hour tutorials/ laboratory sessions.

Prerequisites: COMP1110 or COMP1510 and COMP2100 or COMP2500 or COMP2300 or enrolment in 4710

Course Description: This course is concerned with the issues that arise when computational processes are supported in a computer system. The scope is broad enough to include discussion of all the layers of a computer system - from the hardware to large information systems applications, and all sizes of computer system - from systems as small as a single processor, to systems as large as the entire Internet. The principal areas of study are processes and process coordination, concurrency support in operating systems and high level languages, and distributed systems.
The following topics are addressed: operating system structure, process management, interaction between system components (processes, devices and processors), mutual exclusion, concurrent programming, semaphores and monitors, inter-process communication, distributed systems, crash resilience and persistent data, deadlock, transaction processing.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Relational Databases COMP2400 (6 units) B

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and six two-hour tutorial/ laboratory sessions

Assumed Knowledge and Required Skills: COMP1100 or COMP1710 or INFS1001

Course Description: Introduction to the basic goals, functions, models, components, applications, and social impact of database system applications. The course introduces the relational data model and the database query language SQL. Entity-Relationship Diagrams are introduced as a tool for conceptual modeling. Effective mapping of a conceptual model to a relational database schema requires some appreciation of the role of integrity constraints, and the impact of DBMS characteristics.

Indicative Assessment: Continuous Assessment (30 per cent); Mid Semester Exam (20 per cent); Final Exam (50 per cent)

Networked Information Systems COMP2410 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and six two-hour tutorial/ laboratory sessions

Prerequisites: COMP1100 or COMP1710; and 6 units of 1000-level MATH/STAT courses

Incompatibility: COMP3400

Course Description: This course studies networking fundamentals including LANS, MANS, WANS, the Internet, intranets, extranets and the WWW, with the focus being the Internet. The topics covered include: hardware, software, network topologies, architecture and protocols; network and web applications; website design and construction; information architecture; standards; privacy, security, firewalls and reliability; systems integration; network monitoring and management; and professional ethics and social issues.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Software Construction for Software Engineers COMP2500 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures, five two-hour tutorial/ laboratory sessions and three one to two-hour seminars

Prerequisites: Enrolment in BSEng 4708 or 4711 or 4712 and COMP1510 or COMP1110 and MATH1005 or MATH1014 or MATH1116

Assumed Knowledge and Required Skills: Introductory programming, preferably in an object-oriented language

Incompatibility: COMP2100

Course Description: This course is about the implementation and test phases of the software construction process. It is based around creating individual practical assignments on the small scale, and modifying a medium scale project in two major assignments over the whole semester. In this project, students work on a substantial application, relevant to their experience as computer users. The project is closely specified and designed around a strong architectural structure as an exemplar, and may involve a graphical user interface. During the semester students learn to improve their own software development practices by following the Personal Software Process, learning time-management, planning, and quality control. The course also studies aspects of the principles and practices of software engineering.

The following topics are covered: working with software larger systems; code review and inspections; test planning and unit testing (derived from specification and design documents); object-oriented (Java), and scripting (Bash) languages; recursive data structures; graphical user interfaces; the Personal Software Process; build tools (Make and Ant) and version control (Subversion); use of external code libraries.

Indicative Assessment: Assignments (20 per cent); Mid Semester Exam (20 per cent); Presentation (5 per cent); Report (5 per cent); Final Exam (50 per cent: practical 25 per cent, theory 25 per cent)

Software Design for Software Engineers COMP2510 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures, six one-hour tutorial and one two-hour laboratory sessions, and three two-hour seminars

Prerequisites: Enrolment in BSEng 4708 or 4711 or 4712 and COMP1510 or COMP1110 and MATH1005 or MATH1014 or MATH1116

Incompatibility: COMP2110

Course Description: This course is one of three courses (COMP2500, COMP2510, COMP3110) that address constructive aspects of the software development process for software engineering students. It has a primary focus on the design phase. The course also studies aspects of the principles and practices of software engineering.
The following topics are covered; Introduction to requirements specifications; Designing to specifications; The design milieu (notations, documentation standards); Design techniques (object-oriented, software architectures, design patterns, structured); Design review; Design in the context of requirements change; Principles of quality in design.

Indicative Assessment: Assignments (50 per cent); Presentation (10 per cent); Final Exam (40 per cent)

Formal Methods in Software Engineering COMP2600 (6 units) B

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures, eight one-hour tutorials and four two-hour laboratory sessions.

Prerequisites: COMP1110 or COMP1510 or COMP2750 and MATH1005 or MATH1014 or MATH1116 or enrolment in Bachelor of Computer Science Honours

Course Description: This course presents some formal notations that are commonly used for the description of computation and of computing systems, for the specification of software and for mathematically rigorous arguments about program properties. The following areas of study constitute the backbone of the course. Predicate calculus and natural deduction, inductive definitions of data types as a basis for recursive functions and structural induction, formal language theory (particularly regular expressions, finite state machines and context free grammars), specification languages, propositional programming language semantics, partial correctness and proofs of termination.

Indicative Assessment: Assignments (40 per cent); Tutorials and Laboratories (5 per cent); Quiz (10 per cent); Final Exam (45 per cent)

Automating Tools for New Media COMP2720 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and ten two-hour laboratory sessions

Prerequisites: COMP1710 or COMP1100

Course Description: This course will introduce coding in the context of New Media. Topics covered will include the nature of New Media applications, New Media data formats and data manipulation, program organisation, control structures, writing and debugging New Media programs.

In terms of the modern art world, the computer is not just another medium, it is a whole other range of media. Students will experience and experiment with a large suite of programming components which have been used to construct interactive works of New Media art. They will learn how to conceptualise, brainstorm, plan and realise an original and creative New Media work of their own.

In modern times, the boundary between data visualisation and artistic practice is porus. That is, the techniques used by computer professionals to visualise and present data are heavily influenced by techniques invented by artists and vice versa. Students will gain an appreciation of the techniques and impact of good visual design.

Indicative Assessment: Assignments (80 per cent); Final Exam (20 per cent)

Java Programming for New Media COMP2750 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures, six two-hour laboratory sessions.

Prerequisites: COMP1100 or COMP2720

Incompatibility: COMP1110 and COMP1510

Course Description: A Java-based introductory programming course which includes aspects of graphical user-interfaces and Java2D graphics as well as good programming practice and software engineering.

Indicative Assessment: Homework and Labs (10 per cent); Two Programming Assignments (30 per cent); Final Theory Exam (60 per cent)

Computer Science Research Project COMP3006 (6 units)

Later Year Course

Second Semester, 2010

Workload: As many hours as necessary for meetings with supervisors and a nominal 10 hours per week

Prerequisites: Enrolment in BCS(H) of PhB or BE(R&D); 12 units of 3000-series COMP courses

Course Description: Students will conduct a small research project, under supervision. This will give them experience in research in an area of interest in computer science. The activities in the course will normally include some combination of reading, writing, project work and presentation as appropriate to the topic. The learning objectives, project overview and assessment arrangements will be specified at the outset using the Department of Computer Science form 'Independent Study Contract'.

Indicative Assessment: The assessment arrangements will be specified at the outset using the Department of Computer Science form 'Independent Study Contract'.

Software Engineering Group Project COMP3100 (6 units) C

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Annual course. Students must enrol in Semester 1 and Semester 2

Forty one-hour lectures and 300 hours of group project work

Prerequisites: COMP2100 and COMP2110; or COMP2500 and COMP2510; and 12 units of courses from COMP2300, COMP2310, COMP2400 and COMP2600

Corequisites: COMP3110

Incompatibility: COMP3500

Course Description: This course provides the student with project experience to complement the studies of the software development process in courses COMP2100, COMP2110, COMP3110 and COMP3120.

Students work in small groups and participate in all the development phases (requirements analysis, design, construction, testing and documentation) of a nontrivial software system. As well, each group has to address the control of the development process by constructing and following a detailed software development management plan.

Indicative Assessment: Project (90 per cent); Presentation (10 per cent)

Software Analysis & Design COMP3110 (6 units) C

Later Year Course

First Semester, 2010

Workload: Thirteen two-hour lectures and seven two-hour workshop sessions

Prerequisites: 12 units of 2000-level COMP or INFS courses including COMP2110 or COMP2510 or INFS2024; and 6 units of 1000-level MATH courses

Course Description: This course is one of three courses (COMP2100, COMP2110, COMP3110) which address constructive aspects of the software development process. It has a primary focus on modeling and its central role in eliciting, analysing, understanding and communicating software requirements and design. In the first part of the course, students will learn to use several different modeling approaches to describe complex subject matters. While most of the approaches will seem straight forward and even conceptually simple, students will discover that a good deal of effort and diligence is required to produce useful, accurate, meaningful, understandable and easily maintainable models. Through a series of practical workshops, students will develop an appreciation for the characteristics and capabilities of each approach, and will learn to make decisions as to the best approach to use in a given situation. Students will then learn how to integrate several modeling approaches to form software requirements specifications that are unambiguous, consistent and understandable.

During the second part of the course, students will be introduced to various approaches for translating specifications (models) into operational software systems. This will include consideration of architectural and design issues, model translation, code generation, and an overview of active research in the area of model-driven engineering.

Indicative Assessment: Workshops (30 per cent), Mid-Semester Exam (30 per cent); Final Exam (40 per cent)

Managing Software Development COMP3120 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and five two-hour laboratory sessions.

Prerequisites: 12 units of 3000-series IT

Course Description: This course introduces students to a range of technically-orientated issues in business, engineering and software management. Students are provided with concrete strategies for addressing important issues within practical, relevant and contemporary contexts.

The course comprises selections from one or more of the following topic areas:

- Project Management. This is a major topic for the course. Tools and techniques appropriate to management of both generic and software-specific projects are introduced.
- Business Environments - a systems-thinking approach to understanding the internal and external environments for an organisation will be used to set the stage for work in business planning and management.
- Business Planning - students will gain practical experience of new venture planning
- Ethics and Corporate Responsibility - individual ethics and ethical culture - structured approach to arrive a a normative conclusion
- Planning and Strategic management - management decision-making; risk management
- Organisational Design - alignment with corporate goals; staffing and people management
- Leadership - motivating, influencing, communicating, managing groups and teams
- Control in Organisations and change management
- Quality - definition, value and scope. Quality management techniques
- Understanding Variation - the truth behind the management report, statistical process control (SPC) for managers
- Software specific issues - Choosing or tailoring a software development life cycle. Constructing a software development plan. Applying techniques and tools for determining size, effort and cost of a software development. Constructing a schedule and determining resource requirements and allocations. Identifying, assessing and managing risks (including technical, schedule and resource risks). Choosing and using metrics for different purposes such as monitoring progress, controlling resources and estimating rework.

Indicative Assessment: Individual Project Plan (25 per cent); Group Business Plan (25 per cent weighted as 15 per cent for the document; 10 per cent for a concept presentation & minutes of the first meeting); Final Exam (50 per cent)

Computer Science Group Project COMP3130 (6 units)

Later Year Course

First Semester, 2010

Workload: As many hours as necessary for meetings with supervisors and a nominal 10 hours per week

Prerequisites: Enrolment in BCS(Hons) or PhB or BE (R&D); 12 units of 3000-series COMP courses.

Course Description: This course provides the students with research experience. It exposes the students to team work, problem solving skills, research skills and project management. Students will work in small groups on a synergistic project that covers at least two of the areas in computer science, such as the following: Applications, Programming Languages and Systems and Theory. This will promote depth of study in at least two different areas of computer science for the students.

Indicative Assessment: Project (90 per cent); Presentation (10 per cent)

Operating Systems Implementation COMP3300 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and twelve two-hour tutorials/laboratory sessions.

Prerequisites: COMP2300 and COMP2310; and 6 units of 2000-level MATH courses or COMP2600

Course Description: This course takes a detailed look at the services provided by, and the internals of, an existing operating system to see how each part is constructed and integrated into the whole. The lectures will also address recent literature describing advances in operating systems. The following topics are addressed: system programming and its facilities (including I/O, signals, job control, interprocess communication, sockets, transport layers, remote operations), system calls and their relation to the system libraries, process management and coordination, implementation of message passing, memory management, interrupt handling, real-time clocks, device-independent input/output, serial-line drivers, network communication, disk drivers, deadlock avoidance, scheduling paradigms, file systems, security.

Indicative Assessment: Assignments (20 per cent); Tutorials and Laboratories (10 per cent); Final Exam (70 per cent)

Course offered Semester 2 in alternate, even-numbered years.

Computer Networks COMP3310 (6 units) C

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and six two-hour laboratory/tutorial sessions.

Prerequisites: 12 units of 2000-level COMP or INFS courses including COMP2300; and 6 units of 2000-level MATH courses or COMP2600

Incompatibility: ENGN 4535

Course Description: This course studies the standard models for the layered approach to communication between autonomous machines in a network and the main characteristics of data communication (transmission protocols) for the lower layers. It introduces several application layer protocols from a distributed systems viewpoint, and considers alternative lower layer methods such as ATM, and problem areas in the Internet protocol suite.
The following topics are included: introduction to communication network architectures (protocol hierarchies, layered services, the OSI model); the physical layer (transmission media, signal representation, limits to data capacity); the data link layer (error detection and recovery, point-to-point protocols); the medium access layer (protocols for Local Area Networks and satellite communication); the network layer (routing algorithms, congestion control); internetworking (addressing, internetwork routing and protocols, quality of service); the transport layer (connection-oriented transport layer services and protocols); application protocols for distributed systems.

Indicative Assessment: Assignments (30 per cent); Quizzes (5 per cent); Final Exam (65 per cent)

Course offered Semester 1 in alternate, even-numbered years.

High Performance Scientific Computation COMP3320 (6 units) C

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and six two-hour tutorial/laboratory sessions

Prerequisites: 12 units of 2000-level COMP courses including COMP2100 or COMP2500 or COMP2300; and 6 units of 2000-level MATH courses or COMP2600

Course Description: This course provides an introduction to High Performance Computing with an orientation towards applications in science and engineering. Aspects of numerical computing and the design and construction of sophisticated scientific software will be considered. The focus will be on the C and C++ programming languages, although reflecting the reality of modern scientific computation this course will also touch on other languages such as Python, Java and FORTRAN95. The course will study high performance computer architectures, including modern parallel processors, and will describe how an algorithm interacts with these architectures. It will also look at practical methods of estimating and measuring algorithm/architecture performance.

The following topics will be addressed: the C++ programming language; basic numerical computing from aspects of floating point error analysis to algorithms for solving differential equations; the engineering of scientific software; general high performance computing concepts and architectural principles; modern scalar architectures and their memory structure; performance and programmability issues, and program analysis techniques for high performance computing; parallel computing paradigms and programming using the OpenMP standard; trends in HPC systems.

Indicative Assessment: Assignment (40 per cent); Mid semester exam (10 per cent); Final Exam (50 per cent)

Course offered Semester 1 in alternate, even-numbered years.

Information Technology in Electronic Commerce COMP3410 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and seven two-hour tutorial/laboratory sessions

Prerequisites: COMP1100 or COMP2720; 12 units of 2000-series IT courses; and 6 units of MATH/STAT courses

Course Description: This course is about some of the current and potential applications of information technology in electronic commerce.
Topics will be chosen from areas such as document representation (XML, DTDs, XML Schema, XSLT, CSS), data management (metadata, digital libraries, electronic document management and processing), electronic trading (spontaneous, deliberative, auctions) and security (encryption, public key, symmetric key, PKI, authentication). Case studies will be used where appropriate. Other topics will be included to match recent developments and maturation of the area, such as web application frameworks, web services and the semantic web.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Advanced Databases & Data Mining COMP3420 (6 units) C

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures and six two-hour tutorials

Prerequisites: COMP1100 or COMP2720; COMP2400; 6 units of 2000-level IT courses; and 6 units of 1000-level MATH/STAT courses.

Course Description: This course examines the design of databases and data warehouses and their use for data mining; and investigates associated issues. Topics may include: relational theory and conceptual modelling; privacy and security; statistical databases; distributed databases; data warehousing; data cleaning and integration; and data mining concepts and techniques.

Indicative Assessment: Two assignments (40 marks); Final Exam (60 marks)

Software Engineering Project COMP3500 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Annual course. Students enrol in Semester 1 and Semester 2

Forty one-hour lectures and 300 hours of project work

Prerequisites: Enrolment in BSEng; COMP2500 and COMP2510; or COMP2100 and COMP2110; and 12 units of courses from COMP2300, COMP2310, COMP2400 and COMP2600

Corequisites: COMP3110

Incompatibility: COMP3100

Course Description: This course provides the student with project experience to complement the studies of the software development process in courses COMP2500, COMP2510, COMP3110 and COMP3120.
Students work in small groups and participate in all the development phases (requirements analysis, design, construction, testing and documentation) of a nontrivial software system. As well, each group has to address the control of the development process by constructing and following a detailed software development management plan. Students will also study relevant aspects of the software engineering milieux.

Indicative Assessment: Project (90 per cent); Presentation (10 per cent)

Algorithms COMP3600 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and four two-hour tutorial/laboratory sessions.

Prerequisites: COMP2100 or COMP2500; 6 units of 2000-level COMP courses or enrolment in BComptlSci; and 6 units of 2000-level MATH courses or COMP2600

Course Description: This course deals with the study of algorithms for solving practical problems, and of the data structures used in their implementation. Detailed analysis of the resource requirements of algorithms will be an important issue.

A large variety of algorithms are candidates for study. These include, but are not limited to, the following: greedy algorithms, dynamic programming, divide-and-conquer, exhaustive search, graph algorithms, advanced data structures such as binomial heaps and Fibonacci heaps, network flow algorithms, algorithms for string matching, parallel algorithms, heuristics and approximation algorithms, and an introduction to intractability. As well as studying the implementation, the mathematical tools used to study the resource usage of algorithms will be considered.

Indicative Assessment: Assignments (40 per cent); Final Exam (60 per cent)

Artificial Intelligence COMP3620 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures, six tutorials and six laboratory sessions

Prerequisites: COMP2100 or COMP2500; and COMP2600

Course Description: Artificial intelligence is the science that studies and develops methods of making computers more /intelligent/. The focus of this course is on core AI techniques for knowledge representation, search, reasoning, learning and designing intelligent agents. The course also aims to give an overview of other topics within AI, such as for example robotics, and of the historical, philosophical, and logical foundations of AI.

Indicative Assessment: Assignments (50 per cent); Final Exam (50 per cent)

Theory of Computation COMP3630 (6 units)

Later Year Course

First Semester, 2010

Prerequisites: COMP1140 and COMP2600

Course Description: This course covers the theoretical computer science areas of formallanguages and automata, computability and complexity. Topics covered include: regular and context-free languages; finite automata and pushdown automata; Turing machines; Church's thesis; computability - halting problem, solvable and unsolvable problems; space and time complexity; classes P, NP and PSPACE; NP-Completeness. Indicative Assessment: Assignments (40 per cent); Final Exam (60 per cent)

Topics in Software Engineering I COMP3700 (6 units) C

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Contact hours as appropriate

Prerequisites: Written approval of Head of Department of Computer Science.
Minimal background is 18 units of 2000 series COMP courses including COMP2500 and COMP2510; and 6 units of 2000-level MATH courses or COMP2600.

Course Description: This course is available so that senior students can pursue, under supervision, topics that are not covered in the regular curriculum or to execute a project that will significantly increase their knowledge of software engineering theory or practice.
The activities in the course will be some combination of lectures, reading, writing and project work, as appropriate to the topic.

Indicative Assessment: An appropriate combination of written report, exercises, examination and seminar presentation

Topics in Computer Science COMP3710 (6 units) C

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Contact hours as appropriate

Prerequisites: Written approval of Head of Department of Computer Science.
Minimal background is 18 units of 2000-level COMP courses including COMP2100 or COMP2500; and 6 units of 2000-level MATH courses or COMP2600.

Course Description: This course is available so that senior students can pursue, under supervision, topics that are not covered in the regular curriculum or to execute a project that will significantly increase their knowledge of some aspect of computer science.
The activities in the course will be some combination of lectures, reading, writing and project work, as appropriate to the topic.

Indicative Assessment: An appropriate combination of written report, exercises, examination and seminar presentation

Project Work in Computer Systems COMP3750 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of Head of Computer Science. Minimal background is 24 units of 2000-level IT courses.

Course Description: Students will conduct a small project, under supervision, that will act as a capstone to the Computer Systems major by applying and increasing the depth of the student's knowledge in this area.

The activities in the course will normally include some combination of reading, writing, project work and presentation as appropriate to the topic. The learning objectives, project overview and assessment arrangements will be specified at the outset using the Department of Computer Science form 'Independent Student Contract'.

Indicative Assessment: An appropriate combination of written report, project documentation and presentation, which may include a demonstration of the project.

Project Work in Information Systems COMP3760 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of Head of Computer Science. Minimal background is 24 units of 2000-level IT courses.

Course Description: Students will conduct a small project, under supervision, that will act as a capstone to the Information Systems major by applying and increasing the depth of the student's knowledge in this area.

The activities in the course will normally include some combination of reading, writing, project work and presentation as appropriate to the topic. The learning objectives, project overview and assessment arrangements will be specified at the outset using the Department of Computer Science form 'Independent Student Contract'.

Indicative Assessment: An appropriate combination of written report, project documentation and presentation, which may include a demonstration of the project.

Human Computer Interface Design & Evaluation COMP3900 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures

Prerequisites: COMP1110 or COMP2750; and a further 12 units of COMP 2000-series courses.

Course Description: This course will provide an introduction to the field of Human Computer Interaction and will introduce students to behavioural research methods and techniques used in usability testing. The course will give students the essential theoretical background to approaches, methods and techniques followed by practical experience in conducting usability studies for interactive systems. Students will gain experience in designing and evaluating user interfaces for new media.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Computer Science IV Honours COMP4005F (24 units to 48 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Full Year

Prerequisites: Enrolment in the BSc Honours Degree, with specialisation in Computer Science

Course Description: The honours program consists of a coursework component and a project component, of equal weight. The coursework component involves courses in advanced aspects of the computing discipline, which in recent years have been drawn from: architecture of parallel systems, artificial intelligence, computational logic, algorithms, object oriented databases, programs for parallel computer systems, formal aspects of software engineering, software engineering project, document technologies and automated reasoning. The project component involves a substantial individual project under detailed academic supervision. A formal thesis is submitted (nominally 10,000 words), and a seminar is presented.

Indicative Assessment: Courses (50 per cent); Project (50 per cent)

Computer Science IV Honours COMP4005P (12 units to 24 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Full Year
Part-Time Intensity

Prerequisites: Enrolment in the BSc Honours degree, with specialisation in computer science.

Course Description: The honours program consists of a coursework component and a project component, of equal weight. The coursework component involves courses in advanced aspects of the computing discipline, which in recent years have been drawn from: architecture of parallel systems, artificial intelligence, computational logic, algorithms, object oriented databases, programs for parallel computer systems, formal aspects of software engineering, software engineering project, document technologies and automated reasoning. The project component involves a substantial individual project under detailed academic supervision. A formal thesis is submitted (nominally 10,000 words), and a seminar is presented.

Indicative Assessment: Courses (50 per cent); Project (50 per cent)

Computer Science Honours COMP4006 (24 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: 24 units of honours level courses and 24 units of thesis

Prerequisites: Enrolment in the Bachelor of Computer Science (Honours) program 4710HBCSCI

Course Description: This course forms the honours year of the Bachelor of Computer Science (Honours) program. It consists of a coursework component and a project component, of equal weight. The coursework component involves courses in advanced aspects of the computing discipline, which in recent years have been drawn from: architecture of parallel systems, artificial intelligence, computational logic, algorithms, object oriented databases, programs for parallel computer systems, formal aspects of software engineering, software engineering project, document technologies and automated reasoning. The project component involves a substantial individual project under detailed academic supervision. A formal thesis is submitted (nominally 10,000 words), and a seminar is presented.

Indicative Assessment: The coursework and project components carry equal weight, because it is felt that are of equal importance. The individual courses studied have their own assessment rationale. The research project is assessed on the thesis and the seminar. The seminar tests objective 1; and the thesis objectives 2, 3 and 4; as listed above.

Managing Software Quality & Process COMP4130 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one hour lectures and five two hour laboratory sessions

Prerequisites: Enrolment in BSEng or permission from Head of Department of Computer Science; COMP2600;COMP3100 or COMP3500; and COMP3120

Incompatibility: Incompatible:COMP4100 and COMP4110

Course Description: This course introduces students to advanced topics on managing the quality of products to be delivered as part of the progression within a software development project, and managing the development process itself through software process improvement frameworks and standards.

Several causal aspects of (bad) software quality will be introduced and discussed so that students can understand the context for undertaking risk and bad quality avoidance.

There will be a focus on practical techniques for identifying and removing defects as well as for implementing procedures to track the success or failure of resk and kefect resolutions.

There are several Software Process Imporvement (SPI) frameworks and standards available, each one possessing its own merits and difficulties. Most are regarded as being more appropriate to large software development organisations where the assumed expenses of incorporated SPI initiatives typically provide significant return on investment. This course will introduce the various well known frameworks and standards in the context of importance to organisations but then also discuss tailored versions of some SPI frameworks that are more suitable to small organisations or teams of software developers.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Software Engineering Practice COMP4500 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Annual course. Student enrols in Semester 1 and Semester 2. As many hours as necessary for reviews and a nominal 12 hours per week.

Prerequisites: Enrolment in BSEng; COMP3110, COMP3120 and COMP3500

Incompatibility: COMP4540

Course Description: This course exposes students to profession software engineering practice through the development of a software system for an industry, government or university based customer. Students will work in small teams with their customer to plan (define, estimate, schedule) and manage an appropriate set of activities to ultimately deliver a software product according to the customer requirements. The implementation part of the project will include monitoring, measuring, tracking, managing change and ultimately close out of the project.

Indicative Assessment: Project (90 per cent); Presentation (10 per cent)

Software Engineering Research Project COMP4540 (12 units to 24 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: As many hours as necessary for meetings with supervisors and a nominal 20 hours per week

Prerequisites: Enrolment in BSEng and COMP3110, COMP3120 and COMP3500

Incompatibility: COMP4500

Course Description: Annual course. Students must enroll in Semester 1 and Semester 2.
Students will conduct an individual research project under the close supervision of one or more academic staff. Projects will, at least in part, require the application of theoretical or experimental research techniques. In particular, students will be expected to conduct and present a survey of the literature relevant to the research topic.

Students will prepare a thesis reporting on the research project and its outcomes. They will also be expected to present a poster and a short seminar describing their work.

Students will be expected to apply their software engineering knowledge and skills in the planning and execution of their research project.

Indicative Assessment: Project (90 per cent); Presentation (10 per cent)

Advanced Algorithms COMP4600 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Twenty-six one-hour lectures, together with occasional seminars

Prerequisites: 24 units of 3000-level COMP courses including COMP3600

Course Description: This course is concerned with the study of algorithms for solving practical problems efficiently, and the theoretical analysis of their behaviour. There will also be a brief introduction to complexity theory, the formal study of algorithm performance.
A large variety of algorithms are candidates for study. These include, but are not limited to, the following: greedy algorithms, dynamic programming, network flow algorithms, algorithms for string matching, parallel algorithms, graph algorithms and approximation algorithms.

Indicative Assessment: Assignments (50 per cent); Final Exam (50 per cent)

Advanced Topics in Artificial Intelligence COMP4620 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures

Prerequisites: COMP3620

Course Description: This is an advanced undergraduate course that covers advanced topics in Artificial Intelligence. Topics vary from one offering to the next and are likely to be drawn from the following list: planning & scheduling, games, constraint-based reasoning, knowledge compilation, model-based reasoning, decision-making under uncertainty, reinforcement learning.

Indicative Assessment: Assignments (45 per cent); Seminar (15 per cent); Final Exam (40 per cent)

Overview of Logic & Computation COMP4630 (6 units) C

Later Year Course

Second Semester, 2010

Workload: Twenty-six one-hour lectures, ten one-hour tutorials

Prerequisites: 24 units of 3000-level COMP courses including COMP3610

Course Description: This course covers: essentials of first order logic, up to and including completeness proofs; introductions to proof theory and model theory; elements of modal and temporal logic; introduction to automated reasoning. Students will have the opportunity to read and present material going beyond that in the lectures.

Indicative Assessment: Assignments (50 per cent); Final Exam (50 per cent)

Introduction to Statistical Machine Learning COMP4670 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures

Prerequisites: Departmental consent required to enrol in course

Course Description: This course provides a broad but thorough introduction to the methods and practice of statistical machine learning. Topics covered will include Bayesian inference and maximum likelihood modeling; regression, classification, density estimation, clustering, principal and independent component analysis; parametric, semi-parametric, and non-parametric models; basis functions, neural networks, kernel methods, and graphical models; deterministic and stochastic optimisation; overfitting, regularisation, and validation.

Indicative Assessment: Two Written Assignments (15 per cent each); Written Examination (70 per cent)

http://sml.nicta.com.au/Education/Teaching/IntroToSML

Topics in Software Engineering II COMP4700 (3 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Contact hours as appropriate

Prerequisites: Written approval of Head of Department of Computer Science. Minimal background is 24 units of 3000-level COMP courses.

Course Description: This course is available so that students can pursue, under supervision, topics that are not covered in the regular curriculum.
The activities in the course will be some combination of lectures, reading, writing and project work, as appropriate to the topic. These activities, and the assessment arrangements, will be specified, for each enrolled student, using a Computer Science Department 'Independent Study Contract'.

Indicative Assessment: An appropriate combination of written report, exercises, examination and seminar presentation

Topics in Software Engineering III COMP4710 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Contact hours as appropriate

Prerequisites: Written approval of Head of Department of Computer Science. Minimal background is 24 units of 3000-level COMP courses.

Course Description: This course is available so that students can pursue, under supervision, topics that are not covered in the regular curriculum.
The activities in the course will be some combination of lectures, reading, writing and project work, as appropriate to the topic. These activities, and the assessment arrangements, will be specified, for each enrolled student, using a Computer Science Department 'Independent Study Contract'.

Indicative Assessment: An appropriate combination of written report, exercises, examination and seminar presentation

Project Work in Software Engineering II COMP4730 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Contact hours as appropriate

Prerequisites: Written approval of Head of Department of Computer Science. Minimal background is 24 units of 3000-level COMP courses. Approval is also contingent on the availability of supervision.

Course Description: This course is available so that students can conduct, under superivision, a small project that will significantly increase their depth of knowledge in some aspect of software engineering theory or practice.
The activities in the course will normally include some combination of reading and writing as appropriate to the project. The learning objectives, project overview and assessment arrangements will be specified at the outset using the Department of Computer Science form 'Independent Study Contract'.

Indicative Assessment: An appropriate combination of written report and presentation (which may include a demonstration of the deliverable).

Industrial Experience COMP4800 (0 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Enrolment in BSEng and COMP3500.

Course Description: Industrial Experience gives the student exposure to current professional practice. It consists of 60 days of work, organised by the student. Of those 60 days, 20 must be in a software engineering context, 20 must be in a professional context, and the remaining 20 may be in any employment. Industrial Experience is usually undertaken outside study periods, and is graded satisfactory or unsatisfactory.
Students must fulfil the requirements during the course of their degree; they normally enrol in COMP4800 in their final year and need to have satisfied the requirements by October in order to graduate at the ceremony the following December.

http://cs.anu.edu.au/student/comp4800

Information Technology IV Honours(S) INFT4005F (24 units to 48 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Full Year

Prerequisites: Enrolment in the BInfTech Honours degree.

Course Description: The honours program consists of a coursework component and a project component, of equal weight. A student's individual course program is selected in consultation with the BInfTech honours coordinator. The coursework component involves courses in advanced aspects of the computing discipline and information systems. The coursework is drawn from the fourth year honours courses in Computer Science (see the COMP4005 course description), Information Systems (see the entry in Faculty of Economics and Commerce), and other Science departments.
The project component involves a substantial individual constructive project under detailed academic supervision. Several formal project reports are submitted for assessment.

Indicative Assessment: Courses (50 per cent); Project (50 per cent)

Information Technology IV Honours(S) INFT4005P (12 units to 24 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Workload: Full Year
Part-Time Intensity

Prerequisites: Enrolment in the BInfTech Honours degree.

Course Description: The honours program consists of a coursework component and a project component, of equal weight. A student's individual course program is selected in consultation with the BInfTech honours coordinator. The coursework component involves courses in advanced aspects of the computing discipline and information systems. The coursework is drawn from the fourth year honours courses

in Computer Science (see the COMP4001 course description), Information Systems (see the entry in Faculty of Economics and Commerce), and other Science departments.
The project component involves a substantial individual constructive project under detailed academic supervision. Several formal project reports are submitted for assessment.

Indicative Assessment: Courses (50 per cent); Project (50 per cent)

Discovering Engineering ENGN1211 (6 units)

First Year Course

First Semester, 2010

Workload: Thirty to thirty six one-hour lectures, ten one-hour tutorials, eighteen hours of labs, plus ~forty hours outside of class

Course Description: Discovering Engineering provides an introduction to three aspects of engineering: the disciplines; the practice; and the roles and responsibilities. These three themes are interwoven throughout the course to enhance student skills in communication, teamwork, problem formulation, systems design, an understanding of the responsibilities of engineering practice, and an awareness of reflective and ethical professional practice.

1. A range of engineering disciplines are discovered through team research projects and guest speaker presentations by practicing engineers in the fields of biomedicine, environment, military, telecommunications, production, materials, software development, robotics, virtual environments and more.
2. The practice of engineering is discovered in a group design and build project. From conceptualization to production and testing, students are responsible for the outcomes of an open-ended design problem. They gain an appreciation of the issues involved in taking a design from the concept phase to the manufacturing phase.
3. The roles and responsibilities of engineers, technologists and scientists in society are examined through analysis and debate of topical contentious issues. Students will appreciate the complexity of social issues and develop a framework for ethical, professional analysis of such issues. Contemporary issues examined include: decision-making in science and technology; environmental decision-making in support of sustainable development; the impact of technology on social health; privacy and security issues in the internet age; the future in artificial intelligence; professionalism and ethics in technological development.

Indicative Assessment: Team Project including documentation and presentation (60 per cent); Mid-semester quiz (10 per cent); Final exam (30 per cent)

Engineering Science ENGN1215 (6 units) A

First Year Course

Second Semester, 2010

Workload: Fifty eight contact hours maximum, thirty hours non-contact

Course Description: Introduction to materials science for structural, electrical, magnetic, and optical engineering applications. Atomic bonding, atomic basis of physical and chemical properties. The crystalline state; crystal structures and imperfections. The amorphous state; structure of metallic, inorganic and organic glasses. Multiphase materials, phase rule, binary phase diagrams of iron-carbon, aluminium-copper and ceramic examples. Kinetics of nucleation and crystal growth, atomic diffusion. Microstructures, TTT diagrams, heat treatment, hardening. Magnetism, hard and soft magnets, ceramic magnets. Electronic structure of solids; electronic conductivity, piezo- and pyro-electricity, solar cells. Materials in optical fibres, transparency, dispersion and IR absorption. Environmental degradation and corrosion of materials.

Indicative Assessment: Design eggcersise (20 per cent); Artifacts lab (15 per cent); Problem sets (5 per cent); Quizzes (30 per cent); Final Exam (30 per cent)

Introduction to Mechanics ENGN1217 (6 units)

First Year Course

Second Semester, 2010

Incompatibility: ENGN1221

Work Load: Three one-hour lectures, one one-hour tutorial per week
Course Description: This course introduces the fundamental principles in mechanics. Structural design applications are developed throughout the course using examples that elucidate the theory of mechanics. The primary aim of this course is to provide a solid foundation for students in the field of mechanical engineering. Specific topics include:

- Statics of particles; forces in a plane and in space
- Equivalent systems of forces; cartesian vector and vector operations
- Equilibrium of rigid bodies; including free body diagrams
- Simple trusses
- Distributed forces; centroids, centres of gravity and moments of inertia
- Static indeterminacy and friction
- Stress and strain concepts; including Hooke's law
- Mechanical properties of materials
- Axial and torsion loading
- Bending behaviour; including shear and moment diagrams

Indicative Assessment: Design exercise (20 per cent); Problem sets (30 per cent); Final Exam (50 per cent).

Introduction to Electronics ENGN1218 (6 units)

First Year Course

Second Semester, 2010

Work Load: Three one-hour lectures, one three-hour tutorial, one two-hour practical per week

Incompatibility: ENGN1221

Course Description: This course introduces the students to the fundamentals of electrical and electronic engineering. It provides the students with an understanding of basic electrical quantities, circuit elements and circuit analysis techniques. It also provides an understanding of the principles and operation of diodes and operational amplifiers. Specific topics include:

- Fundamental electrical quantities (charge, current, voltage) and circuit elements (resistor, capacitor, inductor, voltage and current sources)
- Circuit Analysis Techniques: Kirchhoff's voltage and current laws, Mesh current and Node voltage analysis, Thevenin and Norton Equivalent circuits, Superposition, Maximum power transfer, Wheatstone bridge
- First-order RC and RL Circuits with DC inputs: Time constant, Transient and steady state responses.
- Diodes: Basic diode concepts and diode circuit modes, applications (rectifier and wave shaping circuits), Zener diodes.
- Introduction to Operational Amplifiers: Ideal op-amp, Basic Op-amp configurations, Summing point constraint.

Indicative Assessment: Problem Sets (10 per cent); Hardware laboratories (30 per cent); Mid-semester Exam (20 per cent); Final Exam (50 per cent)

Mechanical Systems & Design ENGN2217 (6 units)

Later Year Course

First Semester, 2010

Work Load: Four one-hour lectures, one two-hour laboratory, one three-hour practical per week

Prerequisites: ENGN1217 or ENGN1221

Incompatible: ENGN2214

Course Description: This course builds on ENGN1217 Introduction to Mechanics. It will focus on the mechanical properties of materials and their importance for the design of structures and mechanical systems. The course will also include approaches to mechanical design, computer-aided design (CAD) and an introduction to stress analysis of mechanical structures. Small design exercises will integrate the main topics and concepts throughout. Specific topics include:

- Transverse shear and combined loadings
- Stress and strain transformations; plane stress, plane strain, material-property relationships
- Design of beams and shafts
- Buckling of columns
- Energy methods; including external work and strain energy

Computer-aided design (CAD) topics such as parts, assembles and drawings, multi-body parts, pattern features, surfaces, stress analysis.

Indicative Assessment: Design exercises (20 per cent); Problem sets (20 per cent); Computer-aided design (CAD) exercise (20 per cent); Final Exam (40 per cent)

Electronic Systems & Design ENGN2218 (6 units)

Later Year Course

First Semester, 2010

Work Load: Three one-hour lectures, one three-hour laboratory, one three-hour practical per week

Prerequisites: ENGN1218 or ENGN1221

Incompatible: ENGN2211

Course Description: This course builds on ENGN1218 Introduction to Electronics by developing the students' understanding of the principles and operation of advanced electronic circuits and devices (RLC circuits, operational amplifier, filters, bipolar junction transistor and digital logic gates). It also emphasizes the importance of modelling the behaviour of complex electronic circuits and devices using systematic mathematical techniques. Specific topics include:

- Steady State RLC circuit analysis: complex numbers, phasors, impedances, complex power.
- Introduction to Operational Filter Circuits: Transfer functions, Bode Plots, First order active filters (low-pass and high pass).
- Bipolar Junction Transistors: Basic BJT concepts and circuit models, BJT Amplifiers (bias circuits, small-signal and large-signal equivalent circuits), BJT Common Emitter and Common Collector amplifiers, Cascaded BJT amplifiers.
- Introduction to Digital Electronics: Number systems, Boolean algebra, Logic gates, Combinational logic circuits, Karnaugh maps, Combinational logic circuit design.

PSPICE is used extensively in the analysis and design.

Indicative Assessment: Computer laboratories (10 per cent); Hardware laboratories (20 per cent); Mid-Semester Exam (15 per cent); Final Exam (55 per cent)

Computing for Engineering Simulation ENGN2219 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty one-hour lectures and nine two-hour tutorial/laboratory sessions.

Prerequisites: COMP1100 or COMP1730

Course Description: This course introduces students familiar with programming concepts to tools and techniques for developing software systems in the computational engineering context. The course teaches the fundamental strategies of modelling, abstraction, decomposition and reuse as methods for constructing software systems used in Engineering simulation. Verification and validation techniques, with an emphasis on testing, are taught as a means to ensure that students are able to undertake meaningful simulations using computational tools, and deliver reliable software for this purpose. The course will be taught using one or more programming languages and environments which are widely applicable to engineering simulation.

In particular, the course will cover: interactive and stored program use of computers, modelling in the simulation context; program organisation; accuracy and performance issues in numerical algorithms; computational models relevant to engineering (serial, concurrent and real-time); structured numeric data types and abstract data types; procedural and object-oriented programming approaches; visual programming approaches for simulation; the software life-cycle; and verification and validation. Case studies will be taken from various Engineering simulation scenarios.

Indicative Assessment: Two Assignments (30 per cent); Lab Tests (20 per cent); Final Exam (50 per cent)

System Dynamics
ENGN2221 (6 units)

Later Year Course

Second Semester, 2010

Work Load: Three one-hour lectures, one one-hour tutorial per week
Prerequisites: MATH1014

Course Description: System dynamics is the study of the response of mechanical and electromechanical systems with changing time. The concepts learned in this unit can be used in a number of engineering disciplines including robotics, control system theory, dynamic response of mechanical, aerospace and marine structural components, manufacturing problems, biomedical engineering and interaction between electrical and mechanical systems. Several examples/design problems will be given to illustrate the principles of dynamics. The emphasis of this course will be on rigid body dynamics, electromechanical systems and computer aided design. The topics covered include kinematics of dynamics systems momentum formulation for system of particles, variational formulation for system of particles, dynamics of systems containing rigid bodies and dynamics of electrical and electromechanical systems.

Indicative Assessment: Problem Sets (20 per cent); Laboratory Work (5 per cent); Group Project (20 per cent); Final Exam (55 per cent)

Thermal Energy Systems
ENGN2222 (6 units) B

Later Year Course

Second Semester, 2010

Work Load: Three one-hour lectures, two one-hour tutorials per week
Prerequisites: PHYS1101 or PHYS1001

Course Description: Energy systems are of major importance in society and are a significant engineering research activity at ANU. This course emphasises a systems approach to engineering, integrating technical fundamentals with social and environmental issues through site visits and case studies of energy systems. Engineering science fundamentals include the first law of thermodynamics and heat transfer. The thermal performance of houses is used as a major systems theme for the course. The course also introduces the second law of thermodynamics, and fluid dynamics.

Indicative Assessment: House Thermal Analysis (20 per cent); Laboratory (15 per cent); Field Trip (5 per cent); Quiz (10 per cent); Final Exam (50 per cent)

Systems Engineering Design
ENGN2225 (6 units)

Later Year Course

First Semester, 2010

Work Load: Three one-hour lectures, one one-hour tutorial per week

Prerequisites: ENGN1211

Course Description: This course provides a framework for the interdisciplinary systems engineering program. It outlines the design process for an engineering product or service. The systems approach is used to give students an understanding of how to integrate the technical engineering disciplines required to solve complex problems. This approach is traditionally applied to highly technical engineering problems. However, students will also see how sustainable design principles can be introduced to the design process in order to accommodate environmental considerations.

Specific topics include:

- Systems engineering definitions and classifications; life-cycle engineering
- Conceptual system design: including problem definition, technical performance measures, quality function deployment (QFD), trade-off analyses, and system specification.
- Preliminary system design: subsystem design requirements, design review.
- Detailed design and development: Detailed design requirements and design engineering activities; review and feedback, and incorporation of design changes
- Design testing, evaluation and validation
- Design for sustainability: approaches that integrate sustainability principles into the design process

Indicative Assessment: Problem sets (25 per cent); Quiz (25 per cent); Individual design exercise (25 per cent); Group Design Project (25 per cent).

Systems Engineering Analysis
ENGN2226 (6 units)

Later Year Course

Second Semester, 2010

Work Load: Three one-hour lectures, one three-hour laboratory, one two-hour tutorial per week

Prerequisites: ENGN2225 and 12 units of MATH

Course Description: This course builds on ENGN2225 Systems Engineering Design. Systems analysis is an important part of the overall interdisciplinary systems engineering approach. This course will show students how to utilise systems analysis for effective design evaluation, and as a means for improving and optimising existing systems.

Specific topics include:

- Probabilistic and statistical approaches to engineering systems analysis
- Models in decision making and decision analysis; design-dependent and design-independent parameters
- Optimization in design and operations
- Queuing theory and analysis
- Control concepts and methods (critical path method, PERT)
- Design for reliability; measures and analysis methods
- Design for maintainability; measure of effectiveness and maintainability in the system life-cycle
- Design for affordability; life-cycle costing

Indicative Assessment: Problem-based tutorials (20 per cent); Systems Analysis laboratory (20 per cent); Final exam (60 per cent).

Signal Processing
ENGN2228 (6 units)

Later Year Course

Second Semester, 2010
Work Load: Three one-hour lectures, one three-hour laboratory, one three-hour practical

Prerequisites: ENGN2211 or ENGN2218

Incompatibility: ENGN2223

Course Description: Introduction to signals via RC circuits, step functions and impulse functions; impulse, frequency and step responses; Fourier analysis; linear time invariant systems; convolution; DTFT; line codes including power spectra; AM, FM, PM and phase locked loops; speech coding and delta modulation

Indicative Assessment: Proposed Assessment: Written Assignments (30 per cent), Labs (10 per cent), Exams (60 per cent)

Engineering Research & Development Project (Methods)
ENGN2706 (6 units)

Later Year Course

First Semester, 2010

Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree. Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: Academic program BEng(R&D) 4714 or BEng(R&D)/BSc 4715

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN2706 is a 6-unit research course designed to introduce the student to research methods and research skills through the completion of a basic research project in an area chosen by the student. The course forms part of the 42-unit R&D major that is a compulsory component of the aforementioned degree program. Each student will have their research supervised by one or more academic supervisors, with the approval of Head of Department or the Delegated Authority. Students are responsible for engaging and obtaining appropriate supervisory support.

Indicative Assessment: Continuous assessment of research

Practical Experience
ENGN3100 (0 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Work Load: Twelve weeks of full-time work experience
Prerequisites: Completion of 48 units of study

Course Description: Twelve weeks of suitable full-time employment, a requirement that applies to all BE degrees throughout Australia. The training has two purposes:

1. to expose the student to the workplace and workplace issues (such as human and industrial relations, job organisation, maintenance, safety and environmental issues).
2. to provide direct insight into professional engineering practice.

It is the student's responsibility to obtain the employment, although the Department of Engineering will assist in providing lists of people to contact.

As a general rule, the ideal would be four weeks in any sort of employment; four weeks in employment in a technical industry of some kind; and four weeks of work with engineering staff in an engineering environment (preferably working with professional engineers). Minor variations of this scheme may be acceptable, but at least a reasonable portion must be within an engineering environment.

Students are required to submit reports on their work experience and will satisfy the requirements when their portfolio is acceptable to the Head of Engineering.

Please refer to http://engnet.anu.edu.au/DEcourses/engn3100/

Engineering Internship
ENGN3200 (6 units to 24 units)

Later Year Course

Summer Session, 2010 and First Semester, 2010 and Second Semester, 2010

Course Description: The aim of this course is to use the internship experience to enable students to develop their engineering skills and practice. Students will be placed in industry, working full-time and assessed for academic credit. The internships will be aligned with the aims of the engineering program and its areas of specialisation. Students will experience a real-life engineering workplace and understand how their engineering and professional skills and knowledge can be utilised in industry. They will also be able to demonstrate functioning engineering knowledge, both new and existing, and identify areas of further development for their future careers.

Indicative Assessment: Internship e-Portfolio (20 per cent); Internship Report (50 per cent); Industry Supervisor Report (20 per cent); Internship interview and response to feedback (10 per cent)

Investment Decisions & Financial Systems
ENGN3211 (6 units)

Later Year Course

First Semester, 2010

Prerequisites: 12 units of 1000-series mathematics or statistics courses

Incompatible: BUSN1001, ASHI2021, ASHI2041, POLS1004, ECHI1105, ECHI1106, ASHI2023

Course Description: This course is taught in two parts: Part A – Financial Systems over the first seven weeks, and Part B – Economic Systems over the last six weeks of semester.

The Part A Financial systems segment focuses on accounting and financial management concepts and principles. This course equips students with methodologies to identify and analyse accounting information for making sound financial decisions in real business settings.

The Part B Economic systems segment of the course will provide an introduction to the economic principles which underlie

decisions on private and public investment. These principles will be used to analyse relevant issues such as choice of capacity, pollution, public goods, safety standards and patents. Mathematical models will be used to inform the analysis.

Indicative Assessment: Part A Tasks Class Quizzes 15 per cent; Mid-semester Exam 35 per cent

Part B Tasks Assignments 15 per cent; Final Exam 35 per cent

Manufacturing Technologies ENGN3212 (6 units)

Later Year Course

First Semester, 2010

Workload: Thirty five one-hour lectures, eleven three-hour workshops, one metrology lab, one turning lab and one sheet forming lab

Prerequisites: ENGN2214 or ENGN2217

Course Description: This subject introduces the elements of a number of basic manufacturing processes and associated materials behaviour required in the design of mechanical devices. The configuration of machine tools is discussed in the context of orthogonal cutting and the basics of materials deformation processes, including, casting, forging, sheet-metal forming and polymer processing, are developed. Graphical representation techniques include sectioning, conventional representations, dimensioning, tolerancing, and further develops computer-aided design skills (CAD). Also included are 24 hours of practical workshop experience with assorted hand and machine tools to produce a manufactured article.

Indicative Assessment: Reports (15 per cent); Group Design Exercise (50 per cent); Final Exam (35 per cent)

Digital Systems & Microprocessors ENGN3213 (6 units)

Later Year Course

First Semester, 2010

Workload: Twenty one lectures plus three hours of laboratories per week.

Prerequisites: ENGN2211 or ENGN2218

Course Description: This course provides an introduction to the analysis and design of digital systems and microprocessors. Review of combinational logic analysis and design. Systematic design methods. Analysis and design of synchronous sequential machines. Computer aided design and programming of digital electronic circuits using VHDL hardware description language and FPGA programmable logic devices. Microprocessor and microcomputer architecture. Microprocessor devices, their architecture and instruction sets. Hardware aspects of instruction execution. Assembler and C programming. Input/output, bus interfacing, interrupts. Co-design of digital hardware and microprocessor systems.

Indicative Assessment: Assessment (10 per cent) Midterm Exam (20 per cent) Labs (30 per cent) Exam and Project (40 per cent)

Engineering Management ENGN3221 (6 units)

Later Year Course

Second Semester, 2010

Workload: Three one-hour lectures, one two and a half-hour group meeting, one two-hour tutorial, one two-hour workshop per week
Prerequisites: ENGN1211 and ENGN3211 (or equivalent for combined programs)

Course Description: Engineering management introduces students to a range of people and technical orientated issues in management. Students are provided with concrete strategies for addressing these issues within practical, relevant and contemporary contexts.

The course comprises the following topics:

- Project Management - this topic engages almost half the course. Tools and techniques appropriate to management of both generic and software-specific projects are introduced.
- Business Environments - a systems thinking approach to understanding the internal and external environments for an organisation will be used to set the stage for work in business planning and management.
- Business Planning - students will gain practical experience of new venture planning
- Ethics and Corporate Responsibility - individual ethics and ethical culture - structured approach to arrive a a normative conclusion
- Planning and Strategic management - management decision-making; risk management
- Organisational Design - alignment with corporate goals; staffing and people management
- Leadership - motivating, influencing, communicating, managing groups and teams
- Control in Organisations and change management
- Quality - definition, value and scope. Quality management techniques
- Understanding Variation - the truth behind the management report, statistical process control (SPC) for managers.

Indicative Assessment: Individual Project Plan (25 per cent); Group Business Plan (25 per cent weighted as 15 per cent for the document; 10 per cent for a concept presentation & minutes of the first meeting); Final Exam (50 per cent)

Control Systems ENGN3223 (6 units)

Later Year Course

Second Semester, 2010

Workload: Three one-hour lectures, one three -hour laboratory, two one-hour tutorials per week

Prerequisites: MATH2305

Course Description: Introduction to control system analysis, identification, design and implementation. Laboratory work involves real-time identification and control of a range of electrical and electromechanical systems. Topics covered include:

- History of Control
- Representation of linear dynamics and properties of systems
- Time domain specifications of performance
- Discrete-time systems and the Z-transform
- Closed loop and open loop control
- Classical PID controllers
- Steady state errors and system type
- Stability and robustness
- Discrete-time systems and design by emulation
- Root locus analysis and design of continuous and discrete systems
- Frequency response of continuous and discrete time systems
- Nyquist plots and stability margins
- Lead-Lag control design
- Sensitivity and robustness in the frequency domain
- Practical design issues approaches.

Indicative Assessment: Problem Sheets (5 per cent); Quiz (10 per cent); Laboratories (30 per cent); Final Exam (55 per cent)

Energy Systems Engineering
ENGN3224 (6 units) C

Later Year Course

First Semester, 2010

Workload: Three one-hour lectures, one three-hour practical, three one-hour tutorials per week
Prerequisites: ENGN2222

Course Description: This course continues the study of energy systems and related environmental issues. The course begins with a revision of the first law of thermodynamics and heat transfer. It continues with a thorough examination of fluid dynamics and the second law of thermodynamics, emphasising energy analysis. Also included are quantitative economic and environmental analysis of design choices and thermo-economic optimisation (energy systems engineering). Generation of electric power is used as a systems theme for the course.

Indicative Assessment: Laboratories (30 per cent); Field Trip (5 per cent); Quizzes (15 per cent); Final Exam (50 per cent)

Digital Communications
ENGN3226 (6 units) C

Later Year Course

First Semester, 2010

Workload: Thirty one-hour lectures, four three-hour computer labs, two three-hour hardware labs and ten one-hour project tutorials

Prerequisites: ENGN2211 or ENGN2218

Course Description: This course presents the principles and techniques fundamental to the analysis and design of digital communication systems. It focuses on the basic building blocks of a digital communication system (channel encoder/decoder, digital modulator/demodulator and channel characteristics). The emphasis is on mathematical underpinnings of communications theory along with practical applications. Specific topics include:

- Probability and Random Processes: Probability distributions, Random variables, Random processes, Statistical averages, Correlation
- Digital Modulation Techniques: Signal space analysis, BPSK, QPSK, QAM, bit error rates
- Digital Demodulation & Detection Techniques: Correlator, Maximum a posteriori detection (MAP), Maximum likelihood detection (MLSD).
- Channel Encoder/Decoder: Linear block codes, Cyclic codes, Convolutional codes, Viterbi algorithm.
- Channel Characteristics: Wireline vs. wireless channels, Mathematical models for communication channels, Characterization of multipath channels.
- Digital Communication Systems: Multiple Access techniques, TDMA vs. CDMA communication systems.

Simulink/Matlab is used extensively in the analysis and design.

Indicative Assessment: Labs (18 per cent), Project (20 per cent), Mid-Semester Exam (12 per cent), Final Exam (50 per cent)

Semiconductors
ENGN3334 (6 units) B

Later Year Course

Second Semester, 2010

Workload: Two one-hour lectures, one three-hour practical, one one-hour tutorial per week
Prerequisites: ENGN2211 or ENGN2218

Course Description: This course introduces semiconductor physics, devices and technology. Physics topics comprise basic semiconductor physics, diodes, solar cells and transistors. Technology topics comprise oxidisation, diffusion, ion implantation, photolithography, film deposition, electrical interconnection, characterisation, packaging and process integration.

Indicative Assessment: Laboratories (10 per cent); Seminar (15 per cent); Quiz (15 per cent); Final Exam (60 per cent)

Engineering Materials
ENGN3601 (6 units) C

Later Year Course

First Semester, 2010

Workload: Three one-hour lectures per week

Prerequisites: ENGN2214 or ENGN2217

Course Description: This subject develops a knowledge of the variety of engineering materials, their properties and characteristics. Equilibrium phase diagrams and kinetic TTT diagrams for predicting microstructure in materials. Properties of alloys (steels, aluminium, magnesium, titanium, and other non-ferrous metals). Ceramic materials: ceramics and glasses; forming of ceramics; structure and defects in ceramics. Characterisation, structure and properties of polymers; polymer processing. Rubber elasticity. Strengthening and toughening mechanisms for materials. Fracture mechanics. Characterisation methods (mechanical and microstructural). Biomaterials and nano-materials.Stereoscopy, surfaces and spatial distributions, analytical and visualisation software. Focal plane, Fraunhofer diffraction, Fourier transform. Reflected optical microscopy, SEM, AFM. Phase identification. Transmission optical microscopy, TEM, EP

Indicative Assessment: Assignments (20 per cent); Course project (30 per cent); Final Exam (50 per cent)

Engineering Research & Development Project ENGN3706 (6 units)

Later Year Course

Summer Semester, 2010 and First Semester, 2010 and Second Semester, 2010

Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree.
Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: Prerequisite ENGN2706 and enrolment in the BE (R&D) 4714 or BE(R&D)/BSc 4715

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN3706 is a 6-unit research course designed to complement the students' basic research skills through non-trivial research work in an area chosen by the student. The course forms part of the 42-unit R&D major that is a compulsory component of the aforementioned degree program. Each student will have their research supervised by one or more academic supervisors, with the approval of Head of Department or the Delegated Authority. Students are responsible for engaging and obtaining appropriate supervisory support.

Indicative Assessment: Continuous assessment of research

Engineering Research & Development Project ENGN3712 (12 units)

Later Year Course

Summer Semester, 2010 and First Semester, 2010 and Second Semester, 2010

Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree.
Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: ENGN2706 and enrolment in the BE (R&D)

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) program. These courses are varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN3712 is a 12 unit research course designed to complement the student's basic research skills through non-trivial research work in an area chosen by the student.

Indicative Assessment: Continuous assessment of research through reports, posters and seminars.

Individual Project ENGN4200 (6 units to 12 units)

Later Year Course

Summer Session, 2010 and First Semester, 2010 and Second Semester, 2010

Students must enrol in both Semester 1 & 2.

Workload: One one-hour lecture per week plus research
Prerequisites: ENGN3221 The normal expectation is that students enrolling are completing their final year.

Course Description: Students undertake an individual engineering project, with supervision.
Students are encouraged to put forward their own ideas for the individual project, or they may select a project from a range of ideas offered by researchers across ANU. If the student initiates an idea, he or she must find a supervisor to accept the project. Students and their respective supervisors must jointly sign-off on acceptance of the project concept as part of the project registration process.
Project selection is normally completed as part of ENGN3221 - Engineering Management, by week 3 of the semester prior to commencement of ENGN4200. The planning phase of the project is integrated into the Engineering Management course, providing a deliberate foundation for the project execution phase that is ENGN4200.
Students are expected to manage all aspects of their individual project from conceptualization through the planning phase to the monitoring and control of the project performance and the ultimate achievement of the following deliverables:
- A thesis documenting the project
- A seminar describing the project
- A poster illustrating the project

Indicative Assessment: Individual Project Thesis (75 per cent); Seminar (15 per cent); Project Notebook (5 per cent); Extended abstract (5 per cent)

Systems Engineering Project ENGN4221 (6 units)

Later Year Course

First Semester, 2010

Workload: One two-hour weekly lecture; two-hour weekly formal group meetings; one-hour weekly meetings for team leaders, additional group/sub-group meetings as required (~one-2two hrs/week), individual research/reporting as required (~two-four hrs/week)

Prerequisites: ENGN2225 and ENGN2226 and ENGN3221
The normal expectation is that students enrolling are completing their final year.

Course Description: This course is designed to mimic an industrial design problem as closely as practical in a university setting. Students are assigned to teams and given an ill-defined problem statement. From the problem statement, the students are responsible for developing the full set of requirements and key performance indicators to guide the design. The students then proceed through a systems design process including conceptual design, sub-system requirements, and quantitative tradeoff analyses, using the full range of engineering science and professional skills developed during the degree course. The course emphasises teamwork (both team leadership and membership), communication skills (formal and informal, written and oral), and team and personal management and a professional approach to engineering design.

Indicative Assessment: Project Concept Document (10 per cent); Project plan and timeline (10 per cent); Requirements Report (20 per cent); Ideas review (15 per cent), Design Report (30 per cent); Design Presentation (15 per cent).

Composite Materials ENGN4511 (6 units) C

Later Year Course

First Semester, 2010

Prerequisites: ENGN2214 or ENGN2217

Workload: Three one-hour lectures and one two-hour tutorials per week

Course Description: This course provides a broad overview of engineering composites with a specialisation towards fibre reinforced matrix materials. Emphasis is placed on composite constituents, interfaces, all aspects of composites manufacturing, processing and composite mechanics (geometric aspects, laminate theory, strength and fracture theory). Practical composites design, environmental aspects and specialised composites are also introduced, geared towards recent developments. Laboratory practice gives hand-on experience in laminate fabrication and knowledge of composite microstructures.

Indicative Assessment: Laboratories (20 per cent); Quizzes (40 per cent); Research Report (40 per cent)

Fibre Optics Communications Systems ENGN4513 (6 units) C

Later Year Course

First Semester, 2010

Workload: Three one-hour lectures per week
Prerequisites: PHYS1201 (PHYS2016 and PHYS2017 are also recommended)

Incompatibility: PHYS3060, PHYS3050 and PHYS3051

Course Description: Optical fibres now constitute the backbone of the world's long-distance telecommunications systems and are also being used increasingly in other areas, such as sensing, biophotonics, automotive, etc. The course sets out to provide a basic understanding of optical transmission systems concentrating on light propagation along fibres and light processing using fibre- and planar waveguide-based devises. Light propagation includes: modal propagation and Maxwell?s equations; ray tracing, Snell's and Fesnel's Laws; single-mode, multi-mode and special fibres; pulse propagation and dispersions; nonlinear effects; fibre and planar waveguide fabrication; analytical and numerical techniques; birefringence and bend loss. Light processing devices include: couplers and splitters; gratings and arrayed waveguide gratings; Mach-Zehnder and multimode interferometers; optical amplifiers and attenuators; polarisers. Laboratory work covers both hands-on fibre-based experiments and numerical simulations.

Indicative Assessment: Assignments (20 per cent); Laboratories (30 per cent); Final Exam (50 per cent)

Energy Resources & Renewable Technologies ENGN4516 (6 units)

Later Year Course

Second Semester, 2010

Workload: Two one-hour lectures per week
Prerequisites: ENGN3211

Course Description: The introductory phase of this course is dedicated to the global aspects of energy production and demand in the world, with particular attention to the environmental and social aspects of energy usage, including climate change. Australia's energy resources and consumption patterns are specifically addressed. The rest of the course is dedicated to studying the main renewable energy technologies; biomass, geothermal, hydroelectric, solar thermal, photovoltaic, and wind, including technical and economical issues. Experts in different aspects of energy production and use give invited lectures on selected topics. Objectives of the unit include gaining reliable information on available energy resources and their associated environmental and climatological impacts, and to understand the potential and limitations of renewable energy technologies.

Indicative Assessment: Oral Presentation (40 per cent); Coursework (20 per cent); Final Exam (40 per cent)

Special Topics in Engineering I ENGN4520 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of the Head of Engineering

Course Description: Within this course, topics may be offered from time to time to take advantage of the expertise of visitors to the University and academic staff in the IAS. Admission to the course is at the discretion of the Head of Engineering.

Special Topics in Engineering 2 ENGN4521 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of the Head of Engineering
Course Description: Within this course, topics may be offered from time to time to take advantage of the expertise of visitors to the University and academic staff in the IAS. Admission to the course is at the discretion of the Head of Engineering.

Special Topics in Engineering 3 ENGN4522 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of the Head of Engineering
Course Description: Within this course, topics may be offered from time to time to take advantage of the expertise of visitors to the University and academic staff in the IAS. Admission to the course is at the discretion of the Head of Engineering.

Special Topics in Engineering 4 ENGN4523 (6 units)

Later Year Course

First Semester, 2010 and Second Semester, 2010

Prerequisites: Written approval of the Head of Engineering
Course Description: Within this course, topics may be offered from time to time to take advantage of the expertise of visitors to the University and academic staff in the IAS. Admission to the course is at the discretion of the Head of Engineering.

Solar Energy Technologies
ENGN4524 (6 units) C

Later Year Course

First Semester, 2010

Workload: Twenty six two-hour lectures, 12 one-hour labs

Prerequisites: ENGN2224 or ENGN3334

Course Description: Photovoltaic and solar thermal electric systems have become an important area of engineering and are a major research area in FEIT. They are an example of interdisciplinary systems engineering, where basic electronic materials science or thermodynamics and heat transfer are combined with power electronics, mechanical design, control systems and economic optimisation. The course will give an overview of the solar energy resource and examine two different approaches to conversion to electricity in detail. The physics and fabrication of silicon solar cells, including a discussion of the trade offs between cost, fabrication complexity and performance will be discussed. Computer modelling of solar cell operation using the program PC1D will be used to reinforce the physical understanding and as a tool for device design. The presentation of solar thermal systems will look at alternative approaches to concentration and conversion of energy, focal region flux prediction and measurement, plus modelling of steady state and dynamic thermal behaviour.

Indicative Assessment: Laboratories; Final Exam

Computer Vision
ENGN4528 (6 units)

Later Year Course

First Semester, 2010

Workload: Twenty six two-hour lectures, 12 one-hour labs

Prerequisites: ENGN2226

Course Description: This subject introduces the problems of computer vision and means for their solution. Topics include: image acquisition, sampling and quantisation; image segmentation, point, line and edge detection, and thresholding; geometric frameworks for vision, single view and two views; camera calibration; stereopsis, the correspondence problem and epipolar geometry; motion and optical flow; recognition, invariants, appearance and geometric-based identification; pose estimation in perspective images.

Indicative Assessment: Laboratories (10 per cent); Assignments (40 per cent); Final Exam (50 per cent)

Wireless Communications
ENGN4536 (6 units)

Later Year Course

Second Semester, 2010

Workload: Twenty six two-hour lectures, 12 one-hour labs

Prerequisites: ENGN3226

Course Description: Rayleigh fading; multipath models (eg Rician and Nakagami models); Huffman coding; Shannon capacity; diversity reception; maximum gain combining; satellite mobile systems; antenna arrays; broadband and UWB technologies.

Indicative Assessment: Assignments (20 per cent); Quiz (5 per cent); Laboratories (5 per cent); Final Exam (70 per cent)

Engineering Law
ENGN4611 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirteen weeks of lectures, with ten weeks of discussion exercises.

Prerequisites: ENGN1211

Incompatibility: ENGN4211, BUSN1101, ASHI2268, POLS1002, ECHI1105, ECHI1106

Course Description: Sources and classification of law; professional engineering legislation, code of ethics, registration and discipline; negligence; contract law; employment law; patent law and submission; environmental law. Introduction to intellectual property. What is intellectual property? Enforcement of rights. Copyright, trademarks, designs and patents. Intellectual property management. Commercialising intellectual property. University policy and practice and students' rights. Legal aspects of the Internet and electronic commerce.

Indicative Assessment: 20 per cent WebCT (or Wattle) discussion exercises; 80 per cent Final exam

Microphotonics, Biophotonics & Nanophotonics
ENGN4613 (6 units)

Later Year Course

Second Semester, 2010

Workload: Twenty four hours of lectures, six tutorials and twenty four hours laboratory sessions

Prerequisites: PHYS1201

Course Description: The micro-photonics part of the course will cover the application of optical fibres outside of the telecommunications applications (covered in ENGN4513) and includes architecture, astronomy a wide range of fibre sensors and applications in architecture, astronomy, automotive, aerospace and structural health (bridges, ships). Bio-Photonics will cover the increasing use of fibre optics in medical procedures and diagnostics including endoscopy, laser therapy and dosimetry. The nano-photonics part of the course will include carbon wires, lithography, photonic crystals, and nanofibres and devices. Laboratory work covers both hands-on, fibre-based experiments and software simulations.
Indicative Assessment: Assignments (20 per cent); Laboratories (30 per cent); Final Exam (50 per cent)

Finite Element Analysis
ENGN4615 (6 units)

Later Year Course

Second Semester, 2010

Workload: Three one-hour lectures per week and six three-hour labs

Prerequisites: ENGN2214 or ENGN2217

Course Description: The subject introduces finite element analysis. Topics covered include principles of virtual work and energy methods for stress analysis; derivation of stiffness matrices for one-dimensional problems, plane stress and plane strain problems, axisymmetric problems and general three-dimensional continuum elements; solution methods, effect of mesh densities and convergence criteria; variational approach

for finite element formulation; use of commercial finite element software; application of finite element analysis to problems in solid mechanics and steady-state field problems.

Indicative Assessment: Laboratories (20 per cent); Quizzes (40 per cent); Final Exam (40 per cent)

Power Electronics
ENGN4625 (6 units)

Later Year Course

Second Semester, 2010

Workload: Thirty six hours lectures, fifteen hours labs, ten hours tutorials

Prerequisites: ENGN2211 or ENGN2218

Course Description: This course covers the important aspects of power electronic circuits, components and design. Topics include device characteristics, heat dissipation, failure modes and discrete transistor circuits. Power magnetic devices are examined, together with their associated drive circuitry and snubbers. Techniques for designing DC-power supplies, static power inverters and universal power supplies, DC-DC converters, and switch-mode power supplies are discussed.

Further information available from http://wwwrsphysse.anu.edu.au/~bdb112/ENGN4625_6625

Indicative Assessment: Assignments and Presentation (15 per cent); Laboratories (35 per cent); Quiz (10 per cent); Final Exam (40 per cent)

Robotics
ENGN4627 (6 units)

Later Year Course

Second Semester, 2010

Workload: Three one-hour lectures and one-one hour tutorial per week

Prerequisites: ENGN2221

Course Description: This course provides an introduction to the mechanics of robots and spatial mechanics. The theoretical focus is on kinematics and dynamics of robotic manipulators and control design for non-linear mechanical systems. Topics covered include: homogeneous coordinate transformations, representation of spatial orientation, Denavit-Hartenberg link descriptions, forward and inverse kinematics, Jacobian rate and static force relations, singularities, recursive Newton-Euler iteration and Euler-Lagrange derivations of manipulator dynamics, trajectory planning, linear control, computed torque control, passivity based control. The applied component of the course includes experimental work with robotic manipulators and a mechatronic design and build project.

Indicative Assessment: Laboratories (50 per cent); Final Exam (50 per cent)

Engineering Research & Development Project
ENGN4706 (6 units)

Later Year Course

Summer Session, 2010 and First Semester, 2010 and Second Semester, 2010

Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree.
Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: ENGN2706 and enrolment in the BE (R&D)

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN4706 is a 6-unit research course designed to complement the students' basic research skills through non-trivial research work in an area chosen by the student. The course forms part of the 42-unit R&D major that is a compulsory component of the aforementioned degree program. Each student will have their research supervised by one or more academic supervisors, with the approval of Head of Department or the Delegated Authority. Students are responsible for engaging and obtaining appropriate supervisory support.

Indicative Assessment: Continuous assessment of research by reports, posters and seminars.

Engineering Research & Development Project
ENGN4712 (12 units)

Later Year Course

Summer Session, 2010 and First Semester, 2010 and Second Semester, 2010

Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree.
Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: ENGN2706 and enrolment in the BE (R&D)

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN4712 is a 12-unit research course designed to complement the students' basic research skills through non-trivial research work in an area chosen by the student. The course forms part of the 42-unit R&D major that is a compulsory component of the aforementioned degree program. Each student will have their research supervised by one or more academic supervisors, with the approval of Head of Department or the Delegated Authority. Students are responsible for engaging and obtaining appropriate supervisory support.

Indicative Assessment: Continuous assessment of research through reports, posters and seminars.

Engineering Research & Development Project
ENGN4718 (18 units)

Later Year Course

Summer Semester, 2010 and First Semester, 2010 and Second Semester, 2010
Workload: A research project of variable duration (approximately 130 hrs total time commitment hours per 6 units). The projects take into account the students' background and the stage of their degree.
Students are encouraged to meet with their supervisor on a regular basis (at least once a week).

Prerequisites: ENGN2706 and BE (R&D)

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN4718 is an 18-unit research course designed to complement the students' basic research skills through non-trivial research work in an area chosen by the student. Indicative Assessment: Continuous assessment of research through reports, posters and seminars.

Engineering Research & Development Project ENGN4724 (24 units)

Later Year Course

Summer Semester, 2010 and First Semester, 2010 and Second Semester, 2010

Prerequisites: ENGN2706 and and enrolment in BE (R&D)

Course Description: This course is one of a suite of research and development courses designed for the BE (R&D) Program. These courses are of varying length and are offered at different stages of the degree program and are essentially stand-alone research projects. ENGN4724 is a 24-unit research course designed to complement the students' basic research skills through non-trivial research work in an area chosen by the student. Indicative Assessment: Continuous assessment of research through reports, posters and seminars.

Computer Science Courses Not Offered in 2010

Courses not offered in 2010

Principles of Programming Languages COMP3610 (6 units) C

Later Year Course

Not offered in 2010

Workload: Thirty one-hour lectures, three one-hour tutorials and seven two-hour laboratory sessions.

Prerequisites: COMP2300 and COMP2600

Course Description: The course is built around an investigation of what programming languages are, and the notion of programs as artefacts. Two key aspects of the study of programming languages are their semantics, and their syntax.

We will survey some of the fundamental principles of the semantics and computational behaviour of programs, including the lambda calculus, types and fixed-points. Rigorous proofs of properties of programs, such as are needed for safety-critical software, or for program transformations such as are carried out by optimising compilers, require a formal description of the 'meaning' and behaviour of programs. We will study two of the dominant approaches: denotational semantics and operational semantics. In each case, standard proof techniques will be developed and applied.

The syntax of programming languages is routinely defined by well-understood means, in terms of formal grammars and their relation to certain classes of automata. We will investigate the algorithms underlying standard automata-based compiler generators and make practical use of them to construct simle translators.

Indicative Assessment: Assignments (30 per cent); Final Exam (70 per cent)

Course offered in Semester 2 in alternate odd-numbered years.

System Architectural Understanding & the Human Brain COMP3650 (6 units)

Later Year Course

Not offered in 2010

Prerequisites: 12 units of 2000-series COMP or 12 units of 2000-series PSYC

Course Description: This course will teach how to understand the behaviours of complex functional systems in terms of their components, using as an example the problem of relating psychology to physiology for the human brain. Students will learn how to approach understanding of complex functional systems by means of descriptions on many different levels of detail which can be mapped into each other. This is one of the basic skills needed to understand, design and modify complex functional systems. The course will be relevant to students interested in designing or maintaining complex functional systems. Using the human brain as the example will make the course relevant to students interested in research on the mammal brain, and students interested in medical studies of the human brain.

Indicative Assessment: Assignments (30 per cent); Exam (70 per cent)
Course offered in Setmester 1 in alternate odd-numbered years.

Parallel Systems COMP4300 (6 units) C

Later Year Course

Not offered in 2010

Workload: Thirty one-hour lectures, six two-hour tutorial/ laboratory sessions

Prerequisites: COMP2310; 6 units of 2000-series COMP courses; and 6 units of 2000-series MATH courses or COMP2600

Course Description: A practically oriented introduction to programming paradigms for parallel computers. Considers definitions of program efficiency on parallel computers, addresses the modelling, analysis and measurement of program performance. Description, implementation and use of parallel programming languages, parallel features of operating systems, library routines and applications.

Indicative Assessment: Assignments (30 per cent); Laboratories (20 per cent); Final Exam (50 per cent)

Course offered in Semester 1 in alternate odd-numbered years.

Real-Time & Embedded Systems COMP4330 (6 units)

Later Year Course

Not offered in 2010

Workload: Three hours per week lectures and two hours per week laboratory sessions

Prerequisites: COMP2300 and COMP2310; or ENGN2211 and ENGN2228

Course Description: Real-time and embedded systems are all around us. Controlling cars, trains, or aeroplanes, as well as mobile phones, cameras, or A/V equipment, embedded systems are a challenging and demanding part of computer science and engineering. This course delivers foundations of real-time analysis and implementation of systems which are interconnected with the physical world (embedded systems). It

also delivers the principles of fault tolerant systems and highly reliable systems. Techniques which are introduced include real-time calculus, real-time scheduling, elementary sensor data filtering and fusion methods, error recovery strategies, and graceful degradation methods.

Indicative Assessment: Laboratories (30 per cent); Final Exam (70 per cent)

Course offered in Semester 2 in alternate odd-numbered years.

Computer Graphics
COMP4610 (6 units) C

Later Year Course

Not offered in 2010

Workload: Thirty hours of lectures, some seminars, and ten laboratory sessions

Prerequisites: COMP2600 or COMP2750; and 6 units of 3000-series COMP courses

Course Description: Computer graphics are an intrinsic component of many modern software applications and are often essential to the success of these applications. The objective of this course is to familiarize the student with fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers. The principles and practise of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualisation, virtual reality, computer games and film animation. The course will include some practical experience of graphical software environments such as OpenGL, JOGL, VRML and Java3D.

Indicative Assessment: Assignments (40 per cent); Final Exam (60 per cent)

Course is offered in Semester 2 in alternate odd-numbered years.