Electrical engineering and computer science

School of Electrical Engineering and Computer Science

The School of Electrical Engineering and Computer Science has responsibility for the three IT streams of the four-year Bachelor of Engineering degree: the electrical engineering stream, the computer engineering stream and the software engineering stream as detailed in *Bachelor of Engineering (electrical, computer and software engineering) BE(IT) or BE (p.1)*.

Each of these streams of the BE and BE(IT) can be combined with degrees in arts, commerce, law and science as detailed in *Bachelor of Engineering (electrical, computer, software) BE(IT) or BE combined courses (p.5)*.

The school also offers a three-year Bachelor of Computer Science degree which includes an optional fourth year leading to the degree BCS (Honours) as detailed in *Bachelor of Computer Science (BCS) (p.2)*.

The Bachelor of Computer Science degree is also available as a combined degree with mechanical engineering, BE/BCS (Mechatronics), see *Bachelor of Engineering (Mechatronics)/Bachelor of Computer Science (BE/BCS) (p.5)* and in the BCS/LLB see *Bachelor of Computer Science and Bachelor of Laws (BCS/LLB) (p.3)*

Bachelor of Engineering (electrical, computer and software engineering) BE(IT) or BE

Introduction

The BE and BE(IT) courses in the School of Electrical Engineering and Computer Science offer three distinct streams of the BE degree: electrical engineering, computer engineering and software engineering. The three streams have most first-year subjects in common, and with the appropriate selection of subjects it is possible to defer the choice of stream until the commencement of second year, and in some cases, until the middle of second year. Each of the three streams may be taken in the combined degrees BE/BA, BE(IT)/BA (with an arts major in any department in the Faculty of Arts); BE/BCom, BE(IT)/BCom (with a commerce major in any department in the Faculty of Economics and Commerce); BE/LLB, BE(IT)/LLB; and BSc/BE, BE(IT)/BSc (with a major in any department in the Faculty of Science, with the majority of students undertaking a major in computer science, physics or mathematics, however students in the software engineering stream of the BE or BE(IT) are not permitted to take a computer science major in the BSc). Computer science as a Science Faculty major may be combined with a BE in chemical, civil, environmental, mechanical or manufacturing through the BE/BSc degree program.

BE(IT) or BE (electrical, computer or software engineering)

The recommended or standard course structures are listed below. When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

First year (computer, electrical, software engineering)		Points
Semester 1		
431-102	Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151	Introduction to Programming (Advanced) *(p.15)*	12.5
or		
433-171	Introduction to Programming *(p.15)*	12.5
620-121	Mathematics A (Advanced) *(p.4)*	12.5
or		
620-141	Mathematics A *(p.5)*	12.5
640-121	Physics A (Adv) *(p.2)*	12.5
or		
640-141	Physics A *(p.2)*	12.5
Semester 2		
431-103	Electrical Circuits *(p.9)*	12.5
433-152	Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
First year (computer, electrical, software engineering)		Points
or		
433-172	Algorithmic Problem Solving *(p.15)*	12.5
620-123	Applied Mathematics (Advanced) *(p.4)*	12.5
or		
620-143	Applied Mathematics *(p.5)*	12.5
640-122	Physics B (Adv) *(p.2)*	12.5
or		
640-142	Physics B *(p.3)*	12.5

The subject 640-121 Physics A (Advanced) or 640-141 Physics A is optional in the software engineering stream, and students not wishing to retain electrical engineering as a choice may replace it.

Second year (computer engineering)		Points
Semester 1		
431-201	Engineering Analysis A *(p.9)*	12.5
431-204	Digital Systems 2: System Design *(p.9)*	12.5
431-210	Circuit Analysis *(p.10)*	12.5
433-252	Software Engineering Principles & Tools *(p.15)*	12.5
Semester 2		
431-202	Engineering Analysis B *(p.9)*	12.5
431-222	Electronic Devices and Circuits *(p.10)*	12.5
431-221	Fundamentals of Signals and Systems *(p.10)*	12.5
433-253	Algorithms and Data Structures *(p.16)*	12.5

Third year (computer engineering)		Points
431-328	Digital Systems 3: Circuits and Systems *(p.11)*	12.5
431-330	Design Laboratory *(p.11)*	12.5
433-254	Software Design *(p.16)*	12.5
433-313	Computer Design *(p.16)*	12.5
431-325	Stochastic Signals and Systems *(p.11)*	12.5
or		
620-201	Probability *(p.6)*	12.5
Elective subjects		37.5

Computer engineering students are required to complete 431-325 Stochastic Signals and Systems (or alternatively 620-201 Probability) and 431-327 Communication Systems in their third year if they wish to take 400-level electrical engineering optional subjects in their fourth year of study. These subjects are prerequisites for many of the 400-level electrical engineering elective subjects.

Elective subjects may be used for additional electrical engineering or computer science subjects. However, at least 25 points of non-technical subjects must be completed during the degree.

Fourth year (computer engineering)		Points
431-400 Project Work (or 433-464 Project Work)		
431-467	Digital Systems 4: High Speed Systems *(p.13)*	12.5
433-332	Operating Systems *(p.17)*	12.5
433-353	Networks and Communications *(p.18)*	12.5
Elective subjects		37.5

Elective subjects may be taken from electrical engineering electives, 300-level and 400-level computer science subjects and subjects offered by other departments.

Computer Engineering students choosing the elective subjects are reminded they must include 25 points from management or non-technical subjects. The selection of elective subjects may be restricted by timetable and prerequisite requirements.

Second year (electrical engineering)		Points
Semester 1		
431-201	Engineering Analysis A *(p.9)*	12.5
431-204	Digital Systems 2: System Design *(p.9)*	12.5
431-210	Circuit Analysis *(p.10)*	12.5
Elective		12.5
Semester 2		
431-202	Engineering Analysis B *(p.9)*	12.5
431-221	Fundamentals of Signals and Systems *(p.10)*	12.5
431-222	Electronic Devices and Circuits *(p.10)*	12.5
Elective		12.5

Elective subjects may be used for additional electrical engineering or computer science subjects. However, at least 25 points of non-technical subjects must be completed during the degree.

Third year (electrical engineering)		Points
431-325	Stochastic Signals and Systems *(p.11)*	12.5
or		
620-201	Probability *(p.6)*	12.5
431-327	Communication Systems *(p.11)*	12.5
431-330	Design Laboratory *(p.11)*	12.5

Third year (electrical engineering)		Points
At least three subjects chosen from:		
431-324	System Modelling and Control *(p.10)*	12.5
431-326	Electronic System Design *(p.11)*	12.5
431-328	Digital Systems 3: Circuits and Systems *(p.11)*	12.5
431-329	Electromagnetics *(p.11)*	12.5
640-381	Principles and Applications of Sensors *(p.9)*	12.5
Elective subjects		25

Elective subjects may be used for additional electrical engineering or computer science subjects. However, at least 25 points of non-technical subjects must be completed during the degree.

Fourth year (electrical engineering)		Points
431-400	Project Work *(p.12)*	25
At least four units from fourth-year electrical engineering electives		50
Elective subjects		25

Elective subjects may be taken from fourth-year electrical engineering electives, 300-level and 400-level computer science subjects and subjects offered from other departments.

Electrical engineering students choosing the elective subjects are reminded that they must include 25 points from management or non-technical subjects. The selection of elective subjects may be restricted by timetable and prerequisite requirements.

Second year (software engineering)		Points
Semester 1		
431-201	Engineering Analysis A *(p.9)*	12.5
431-204	Digital Systems 2: System Design *(p.9)*	12.5
433-252	Software Engineering Principles & Tools *(p.15)*	12.5
433-253	Algorithms and Data Structures *(p.16)*	12.5
Semester 2		
431-202	Engineering Analysis B *(p.9)*	12.5
433-254	Software Design *(p.16)*	12.5
433-255	Logic and Computation *(p.16)*	12.5
Elective		12.5

Elective subjects may be used for additional electrical engineering or computer science subjects, or for subjects from other departments.

The subject 431-204 Digital Systems 2: System Design may be replaced by 433-313 Computer Design, taken in third year.

Third year (software engineering)		Points
433-340	Software Engineering Project *(p.17)*	25
433-341	Software Engineering Process & Practice *(p.17)*	12.5
433-343	Professional Issues in Computing *(p.17)*	12.5
Two elective computer science 300-level subjects		25
Elective subjects		25

Within the 62.5 points of computer science electives in third and fourth years, students must complete at least four of 433-332, 433-342, 433-351, 433-353, 433-371, 433-441. Subject 615-335 Distributed Systems may also be taken as a CSSE option. Other elective subjects may be used for additional computer science or electrical engineering subjects, or for subjects in other departments.

Fourth year (software engineering)		Points
433-440	Advanced Software Engineering Project *(p.19)*	25
433-443	Software Project Management *(p.19)*	12.5
Three electives chosen from 300-level or 400-level computer science subjects		37.5
Elective subjects		25

Within the 62.5 points of computer science electives in third and fourth years, students must complete at least four of 433-332, 433-342, 433-351, 433-353, 433-371and 433-441. Subject 615-335 Distributed Systems may also be taken as a CSSE option. The selection of elective subjects may be restricted by timetable and prerequisite requirements.

Electrical engineering electives		Sem.
(these electives will not all be offered every year)		
431-451	Project Mgt & Product Commercialisation *(p.12)*	1
431-460	Digital Communications *(p.12)*	1
431-461	Digital Signal Processing *(p.12)*	1
431-462	Communication Networks *(p.13)*	1
431-468	Biomedical Engineering *(p.14)*	1
431-463	Directed Study 4.1 *(p.13)*	1
431-464	Digital Control and Identification *(p.13)*	2
431-465	Wireless Communication *(p.13)*	2
431-466	Photonic Devices and Systems *(p.13)*	2
431-467	Digital Systems 4: High Speed Systems *(p.13)*	2
431-469	Multimedia Signal Processing *(p.14)*	2
431-470	Directed Study 4.2 *(p.14)*	2

Computer science electives		Sem.
300-level (these electives will not all be offered every year)		
433-303	Artificial Intelligence *(p.16)*	2
433-313	Computer Design *(p.16)*	2
433-330	Theory of Computation *(p.17)*	1
433-332	Operating Systems *(p.17)*	1
433-341	Software Engineering Process & Practice *(p.17)*	1
433-342	Software Engineering Methods *(p.17)*	2
433-343	Professional Issues in Computing *(p.17)*	1
433-351	Database Systems *(p.18)*	1
433-353	Networks and Communications *(p.18)*	1 rep 2
433-361	Programming Language Implementation *(p.18)*	2
433-371	Interactive System Design *(p.18)*	2
433-380	Graphics and Computation *(p.18)*	1
433-385	Modelling, Analysis and Visualisation *(p.18)*	2
433-398	Directed Study 3A *(p.19)*	1 rep 2, Summer
433-399	Directed Study 3B *(p.19)*	1 rep 2, Summer
400-level (these electives will not all be offered every year)		
433-441	System Modelling and Analysis *(p.19)*	N/A
433-443	Software Project Management *(p.19)*	1
433-448	Applied Cryptography and Coding *(p.19)*	1
433-460	Human Language Technology *(p.19)*	2
433-470	Functional Programming *(p.20)*	1
433-471	Logic Programming *(p.20)*	2
433-475	High Performance Database Systems *(p.20)*	1
433-476	Algorithms for Constrained Search *(p.21)*	N/A
433-480	Computer Vision and Image Processing *(p.21)*	N/A
433-481	Knowledge Representation and Reasoning *(p.21)*	1
433-496	Directed Study 4A *(p.21)*	1 rep 2
433-497	Directed Study 4B *(p.21)*	1 rep 2, Summer
433-498	Advanced Topic in Computer Science *(p.21)*	1 rep 2

Enrolment in directed study subjects must be approved by the department.

Bachelor of Computer Science (BCS)

The course aims to develop skilled computer scientists with the technical knowledge to develop well-designed and robust computer-based solutions to a range of problems in business and industry. Studies include computer science (including introduction to computer programming, algorithms and problem solving, software development) and mathematics. Electives may be chosen from a wide variety of other disciplines including digital electronics and information systems. Subjects in later years include artificial intelligence, software engineering, computer networks, operating systems, graphics and computer design.

Computer science graduates work in government, the manufacturing industry, the information industry, commerce and education. Some graduates spend their time on software development and systems support and remain in a mostly technical environment. Others move to a mixture of consulting and advice-giving roles which place more emphasis on talking to others about the use of the technology. In all types of work environments, whether with small companies or large, success in employment involves a mixture of technical expertise and strong communication skills. The knowledge and qualifications gained will enable you to work in any country.

The recommended or standard course structures are listed below. When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

Bachelor of Computer Science course structure

Students in the Bachelor of Computer Science are required to take the following subjects:

First year		Points
Semester 1		
431-102	Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151	Introduction to Programming (Advanced) *(p.15)*	12.5
or		
433-171	Introduction to Programming *(p.15)*	12.5

First year	Points
620-1xx mathematics subject	12.5
Elective	12.5
Semester 2	
433-152 Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or	
433-172 Algorithmic Problem Solving *(p.15)*	12.5
620-1xx mathematics subject	12.5
Electives	25

The subject 431-102 Digital Systems 1: Fundamentals may be taken in second year, swapping an additional elective into first year.

The subjects listed as 620-1xx represent 25 points of 100-level mathematics and statistics. The recommended combination of subjects for students who have completed both Mathematical Methods 3/4 and Specialist Mathematics 3/4 in Year 12 is 620-141 Mathematics A and 620-143 Applied Mathematics, or the corresponding pair of advanced subjects. The recommended combination of subjects for students who have completed Mathematical Methods 3/4 but not Specialist Mathematics 3/4 is 620-161 Introductory Mathematics and 620-140 Intermediate Mathematics.

Second year	Points
Semester 1	
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
433-253 Algorithms and Data Structures *(p.16)*	12.5
Electives	25
Semester 2	
433-254 Software Design *(p.16)*	12.5
433-255 Logic and Computation *(p.16)*	12.5
Electives	25

Students considering extending their study by enrolling in the BCS (Honours) degree should note that study of mathematics or statistics at the second year level is strongly recommended.

Third year	Points
Semester 1	
433-343 Professional Issues in Computing *(p.17)*	12.5
300-level computer science subjects	37.5
Semester 2	
300-level computer science subjects	37.5
Elective	12.5

The 75 points listed as computer science subjects may be any 300-level subjects taught by the department except for 433-340 Software Engineering Project and 433-344 Legal Issues in Computing. Subject 615-335 Distributed Systems may also be taken as an option within the 75 points of computer science subjects.

Students in the BCS are required to complete at least 12.5 points of non-technical studies from outside the Department of Computer Science. To satisfy non-technical study requirements, students may take suitable subjects from any department in the University prepared to accept their enrolment, subject to prerequisite and timetabling constraints. Subjects that meet the requirements include the management subjects offered in the Faculty of Engineering and in the Faculty of Economics and Commerce, and subjects from the Faculty of Arts. Students are especially encouraged to consider subjects where the study and assessment requirements include written and oral presentation components.

Within the BCS, students are entitled to complete 25 points from departments which are not budget departments of the Faculty of Science or the Faculty of Engineering. Students who wish to include additional subjects from departments which are not budget departments of the Faculty of Science or the Faculty of Engineering can do so within the BCS, with approval from the Department of Computer Science and Software Engineering, up to a total of 62.5 points. Normally, approval would not be given for students to undertake more than 25 of the 62.5 points at 100-level. Students in the BCS may not take more than 62.5 points of studies from outside the Faculties of Science and Engineering.

At most 125 points of the 300 points in a BCS degree may be at 100 level.

Bachelor of Computer Science (Bioinformatics stream)

First year	Points
Semester 1	
433-151 Introduction to Programming (Advanced) *(p.15)*	12.5
or	
433-171 Introduction to Programming *(p.15)*	12.5
620-1xx mathematics subject	12.5
610-141 Chemistry *(p.2)**	12.5
Elective (600-141 Biology of Cells and Organisms is recommended)	12.5
Semester 2	
433-152 Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or	
433-172 Algorithmic Problem Solving *(p.15)*	12.5
620-1xx mathematics subject	12.5
610-142 Chemistry *(p.2)**	12.5
Elective (non-technical if not taken in semester 1)	12.5

* The chemistry sequence of 610-141 and 610-142 is available to students who have completed VCE chemistry. Students who have not completed VCE chemistry will be required to take 610-171 followed by 610-141 and 610-142 over summer. Some students who are required to take 610-171 may be granted exemption from 610-141. Students intending to undertake chemistry 610-142 upon successful completion of 610-171 must achieve a high level in the examination component of chemistry 610-171 in order to meet prerequisites for later-year chemistry or biochemistry subjects.

Students enrolled on a HECS basis who are required to pursue the sequences 610-171 followed by 610-141 and 610-142 may enrol in 610-142 in the Summer Semester on a HECS basis.

Local and international students enrolled on a full-fee basis who are required to pursue the sequences 610-171 followed by 610-141 and 610-142 note that the normal pro rata fee will apply for each subject.

Second year	Points
Semester 1	
431-102 Digital Systems 1: Fundamentals *(p.9)*	12.5
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
433-253 Algorithms and Data Structures *(p.16)*	12.5
521-211 Biochemistry & Molecular Biology Part A *(p.2)*	12.5
Semester 2	
433-254 Software Design *(p.16)*	12.5
433-255 Logic and Computation *(p.16)*	12.5
521-212 Biochemistry & Molecular Biology Part B *(p.2)*	12.5
521-2xx Biochemistry and Molecular Biology Elective	12.5

Third year	Points
Semester 1	
433-343 Professional Issues in Computing *(p.17)*	12.5
433-3xx (300-level computer science subjects)	25
521-301 Protein Structure, Design & Engineering *(p.2)*	12.5
Semester 2	
433-303 Artificial Intelligence *(p.16)*	12.5
433-351 Database Systems *(p.18)*	12.5
433-3xx Computer Science elective	12.5
521-3xx Biochemistry subject to be approved	12.5

Recommended 300-level computer science electives include 433-371 Interactive System Design, 433-353 Networks and Communications, 433-380 Graphics and Computation and 433-385 Modelling Analysis and Visualisation.

Students who fulfil the faculty requirements for overloading may be interested in the subjects 521-303 Molecular and Cell Biology and 521-307 Biomolecular Structure and Bioinformatics.

Bachelor of Computer Science and Bachelor of Laws (BCS/LLB)

BCS requirements

To be awarded the BCS in the combined BCS/LLB degree program, students must have completed a total of 200 points not counted towards their LLB degree, including:

- 433-151 Introduction to Programming (Advanced) or 433-171 Introduction to Programming, and 433-152 Algorithmic Problem Solving (Advanced) or 433-172 Algorithmic Problem Solving (25 points);
- 25 points of first-year mathematics or statistics (suitable subjects include 620-161 Introductory Mathematics, 620-140 Intermediate Mathematics, 620-141 Mathematics A, 620-142 Mathematics B, 620-143 Applied Mathematics, and 620-160 Experimental Design and Data Analysis);
- 431-102 Digital Systems 1: Fundamentals (12.5 points);
- 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures, 433-254 Software Design, and 433-255 Logic and Computation (50 points);
- 433-344 Legal Issues in Computing (12.5 points); and
- a further 75 points of 300-level subjects in the Department of Computer Science and Software Engineering.

LLB requirements

To be awarded the LLB in the combined BCS/LLB degree program, students must have completed a total of 300 points not counted towards their BCS degree, including:

- 730-260 Criminal Law and Procedure, 730-104 Torts and the Process of Law, 730-105 History and Philosophy of Law I and 730-115 History and Philosophy of Law II (75 points);
- 730-202 Contracts, 730-304 Property and 730-301 Constitutional and Administrative Law (75 points);
- 730-462 Equity and Trusts (12.5 points); and
- A further 137.5 points selected from the optional subject program in the Faculty of Law including 12.5 points of legal theory.

Recommended course structure

The recommended or standard course structures are listed below. When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

First year	Points
Year long	
730-104 Torts and the Process Of Law *(p.1)*	25
Semester 1	
433-151 Introduction to Programming (Advanced) *(p.15)*	12.5
or	
433-171 Introduction to Programming *(p.15)*	12.5
620-1xx mathematics subject	12.5
730-105 History and Philosophy of Law I *(p.1)*	12.5
Semester 2	
433-152 Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or	
433-172 Algorithmic Problem Solving *(p.15)*	12.5
620-1xx mathematics subject	12.5
730-115 History and Philosophy of Law II *(p.1)*	12.5

Second year	Points
Year long	
730-260 Criminal Law and Procedure *(p.1)*	25
730-202 Contracts *(p.1)*	25
Semester 1	
431-102 Digital Systems 1: Fundamentals *(p.9)*	12.5
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
Semester 2	
433-253 Algorithms and Data Structures *(p.16)*	12.5
433-255 Logic and Computation *(p.16)*	12.5

Third year	Points
Year long	
730-301 Constitutional and Adminstrative Law *(p.2)*	25
730-304 Property *(p.2)*	25
Semester 1	
433-254 Software Design *(p.16)*	12.5
730-462 Equity and Trusts *(p.2)*	12.5
Semester 2	
Computer science electives	25

Fourth year	Points
Semester 1	
Computer science electives	25
433-344 Legal Issues in Computing *(p.17)*	12.5
730-441 Copyright and Patent Law *(p.5)*	12.5
Semester 2	
Computer science electives	25
730-335 Trade Marks and Unfair Competition *(p.13)*	12.5
Law elective	12.5

Fifth year	Points
Semester 1	
Law electives	50
Semester 2	
Law electives	50

Note: There is considerable flexibility within the fourth and fifth years of study, and students seeking combinations of electives offered only in particular semesters will be able to rearrange subjects as required. The skeleton presented here is intended to be indicative rather than prescriptive.

Bachelor of Computer Science (Honours) (BCS Hons)

Students who wish to consolidate their knowledge of computer science and who have achieved an honours grade average in their third-year studies should consider completing the BCS (Honours) year. This involves completing a substantial research project and advanced coursework. Completion of the honours year serves both as a preparation for postgraduate study and as an opportunity to strengthen practical skills before seeking employment.

Overview

The BCS (Honours) program is designed to:

- provide an introduction to the process and practice of research in computer science;
- enable the acquisition of current research skills in specific areas;
- encourage the development of the ability to think critically and independently;
- consolidate and extend the student's understanding of a range of aspects of the disciplines of computer science and software engineering;
- improve oral and written communication skills.

Admission requirements

To enter the BCS (Honours), students must have:

- completed a BCS;
- passed at least 25 points of 100-level mathematics or statistics;
- a final-year average mark of at least 65.

Students should also note that study of mathematics or statistics at the second-year level is strongly recommended.

Students from other institutions and other backgrounds should contact the honours coordinator to determine their eligibility for entry to the BCS (Honours) degree.

Honours coordinator

The honours coordinator is Dr Linda Stern

Duration and commencement of course

The BCS (Honours) program can be undertaken on a full-time or part-time basis, commencing in either late February or mid July each year. The program requires one year of full-time study, or two years of part-time study.

Assessment

Hurdle assessment requirements

Students enrolled in the BCS (Honours) must pass at least 100 points of approved subjects, including 433-401 Computer Science Research Project, and must have a weighted average mark (calculated over the best 100 points of such approved subjects, but always including 433-401 Computer Science Research Project) of at least 65 per cent.

Students enrolled the BCS (Honours) are also expected to have a satisfactory level of attendance at departmental seminars.

Students will be advised of hurdle requirements for the individual coursework subjects at the commencement of each subject.

Components of assessment

The BCS (Honours) program comprises a research project subject and five advanced coursework subjects. These subjects with their relative weightings are as follows:

- 433-401 Computer Science Research Project = 37.5%
- Advanced Coursework subjects, five at 12.5 points each = 62.5%

The final honours grade is the weighted average mark over the 100 points included in these two components. Students who complete more than 62.5 points of advanced coursework will have their final honours grade calculated as their weighted average mark over the 100 points of study obtained by including their best 62.5 points of advanced coursework.

Advanced coursework subjects

The following 400-level subjects are offered to students enrolled in the BCS (Honours) degree:

400-level computer science subjects	Sem.
433-441 System Modelling and Analysis *(p.19)*	N/A
433-443 Software Project Management *(p.19)*	1
433-448 Applied Cryptography and Coding *(p.19)*	1
433-460 Human Language Technology *(p.19)*	2
433-470 Functional Programming *(p.20)*	1
433-471 Logic Programming *(p.20)*	2
433-475 High Performance Database Systems *(p.20)*	1
433-476 Algorithms for Constrained Search *(p.21)*	N/A

400-level computer science subjects		Sem.
433-480	Computer Vision and Image Processing *(p.21)*	N/A
433-481	Knowledge Representation and Reasoning *(p.21)*	1
433-498	Advanced Topic in Computer Science *(p.21)*	1 rep 2

Students may enrol in one 300-level subject in computer science as part of their coursework component, and as many as two of the following 600-level postgraduate subjects taught by the department:

- 433-641 Systems Requirements Engineering
- 433-642 Software Engineering Case Studies
- 433-645 Software System Security
- 433-670 Principles of Programming Languages
- 433-671 Constraint Programming
- 433-675 Database Principles and Technology
- 433-676 Text and Document Management
- 433-678 Cluster and Grid Computing
- 433-679 Evolutionary and Neural Computation
- 433-680 Machine Learning
- 433-681 Autonomous Robots (Not offered in 2003)
- 433-682 Software Agents (Not offered in 2003)

For details of these subjects, see the Faculty of Engineering Postgraduate Handbook, contact the Department of Computer Science and Software Engineering, or visit the departmental web site at <http://www.cs.mu.oz.au/>.

Students should note that in any given year the department may choose not to offer one or more of the pool of 400- and 600-level subjects. Students are advised to make contact with the department late in the previous year to determine if particular subjects will be available.

Students are reminded that to be awarded a BCS (Honours) degree they must complete at least 100 points of approved subjects including an honours project, and must obtain a weighted average over those subjects of at least 65 per cent.

Research project

In addition to the advanced coursework, students must complete a total of 37.5 points of enrolment in the subject 433-401 Computer Science Research Project. In any given semester this subject may be weighted as 12.5, 25.0, or 37.5 points, depending upon the other subjects being undertaken in that semester and whether the student is full or part time. A CNT mark (continuing) will be assigned to this subject until an aggregate of 37.5 points of enrolment in it has been reached.

The honours Computer Science Research Project subject assessment comprises a research report (thesis) of up to 40 pages (20 000 words) and an oral presentation not exceeding 30 minutes.

Further information

If you require further information about the BCS (Honours) program contact:

Dr Linda Stern tel: +61 3 8344 9169

Bachelor of Engineering (Mechatronics)/Bachelor of Computer Science (BE/BCS)

For details of this five-year degree see *Bachelor of Engineering (Mechatronics)/Bachelor of Computer Science (BE/BCS) (p.5)*.

Bachelor of Engineering (electrical, computer, software) BE(IT) or BE combined courses

The BE(IT) and BE in computer, electrical and software engineering can be combined with a number of degrees from other faculties. Students in these combined programs typically take a mixture of subjects from both faculties during each year of the combined program. Standard templates, to be completed by the addition of the subject choices from the other faculty, appear below, see page 6.

Bachelor of Arts/Bachelor of Engineering (computer, electrical, software) BA/BE(IT) or BA/BE

The combined BA/BE(IT) and BA/BE course in engineering (computer, electrical or software engineering) and arts, must satisfy the following requirements:

- All requirements of the chosen stream of the BE(IT) or BE course must be satisfied, except that the requirement for physics is waived. For the software engineering stream the requirement for 431-202 Engineering Analysis B is also waived. However, students in the computer and electrical streams are strongly encouraged to complete 640-142 Physics B as an additional elective, as a number of the 300-level and 400-level elective subjects in electrical engineering require physics as a prerequisite. Students must complete a total of 300 engineering points.

  The remaining elective subjects to make up 400 points for the award of the engineering degree, including the non-technical requirements of the computer and electrical engineering streams, are credited from the arts subjects undertaken.
- A total of 200 arts points must be completed, comprised of 50 points of 100-level arts subjects, 75 points of 200-level arts subjects, and 75 points of 300-level arts subjects.

Typical course plans for the three engineering streams of this combined degree appear below, see page 6.

Bachelor of Engineering/ Bachelor of Commerce (computer, electrical, software) BE(IT)/BCom or BE/BCom

The combined BE(IT)/BCom and BE/BCom course in engineering (computer, electrical or software engineering) and commerce, must satisfy the following requirements:

- All requirements of the chosen stream of the BE(IT) or BE course must be satisfied, except that the requirement for physics is waived. For the software engineering stream the requirement for 431-202 Engineering Analysis B is also waived. However, students in the computer and electrical streams are strongly encouraged to complete 640-142 Physics B as an additional elective, as a number of the 300-level and 400-level elective subjects in electrical engineering require physics as a prerequisite. Students must complete a total of 300 engineering points.

  The remaining elective subjects to make up 400 points for the award of the engineering degree, including the non-technical requirements of the computer and electrical engineering streams, are credited from the commerce subjects undertaken.
- A total of 200 commerce points must be completed. These include the four compulsory subjects 316-101 Introductory Macroeconomics, 316-102 Introductory Microeconomics, 316-130 Quantitative Methods 1, and 316-205 Introductory Econometrics; at least 50 points at 100-level; and at least 50 points at 300 level.

Typical course plans for the three engineering streams of this combined degree appear below, see page 6.

Bachelor of Laws/Bachelor of Engineering (computer, electrical, software) LLB/BE(IT) or LLB/BE

The combined LLB/BE(IT) and LLB/BE course in computer, electrical or software engineering and law, must satisfy the following requirements:

- All requirements of the chosen stream of the BE(IT) or BE course must be satisfied, except that the requirement for physics is waived. For the software engineering stream the requirement for 431-202 Engineering Analysis B is also waived. However, students in the computer and electrical streams are strongly encouraged to complete 640-142 Physics B as an additional elective, as a number of the 300-level and 400-level elective subjects in electrical engineering require physics as a prerequisite. Students must complete a total of 300 engineering points.

  The remaining elective subjects to make up 400 points for the award of the engineering degree, including the non-technical requirements of the computer and electrical engineering streams, are credited from the law subjects undertaken.
- A total of 300 law points must be completed, including a number of compulsory subjects: 730-104 Torts and the Process of Law, 730-105 History and Philosophy of Law I, 730-102 Criminal Law and Procedure, 730-115 History and Philosophy of Law II, 730-202 Contracts, 730-304 Property, 730-301 Constitutional and Administrative Law, 730-462 Equity and Trusts and 12.5 points of legal theory.

Typical course plans for the three engineering streams of this combined degree appear below see page 6.

Timetabling of combined degrees

The recommended or standard course structures are listed below. When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

Combined degree course structures with electrical, computer and software engineering

First year (combined degrees in arts, commerce, law, with computer, electrical, software engineering)	Points
Semester 1	
433-151 Introduction to Programming (Advanced) *(p.15)*	12.5
or	
433-171 Introduction to Programming *(p.15)*	12.5
620-121 Mathematics A (Advanced) *(p.4)*	12.5
or	
620-141 Mathematics A *(p.5)*	12.5
Subjects from other degree as required	25
Semester 2	
620-123 Applied Mathematics (Advanced) *(p.4)*	12.5
or	
620-143 Applied Mathematics *(p.5)*	12.5
431-103 Electrical Circuits *(p.9)*	12.5
Subjects from other degree as required	25

Second year (computer, electrical, software engineering)	Points
Semester 1	
431-102 Digital Systems 1: Fundamentals *(p.9)*	12.5
Subjects from other degree as required	37.5
Semester 2	
433-152 Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or	
433-172 Algorithmic Problem Solving *(p.15)*	12.5
Subjects from other degree as required	37.5

Third year (computer and electrical engineering)	Points
Semester 1	
431-201 Engineering Analysis A *(p.9)*	12.5
431-204 Digital Systems 2: System Design *(p.9)*	12.5
431-210 Circuit Analysis *(p.10)*	12.5
Subject from other degree as required	12.5
Semester 2	
431-202 Engineering Analysis B *(p.9)*	12.5
431-221 Fundamentals of Signals and Systems *(p.10)*	12.5
431-222 Electronic Devices and Circuits *(p.10)*	12.5
Subject from other degree as required	12.5

Fourth year (computer engineering)	Points
Semester 1	
431-330 Design Laboratory *(p.11)*	12.5
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
433-253 Algorithms and Data Structures *(p.16)*	12.5
Subject from other degree as required	12.5
Semester 2	
431-328 Digital Systems 3: Circuits and Systems *(p.11)*	12.5
433-254 Software Design *(p.16)*	12.5
433-313 Computer Design *(p.16)*	12.5
Subject from other degree as required	12.5

Fifth year (computer engineering)	Points
Year long	
431-400 Project Work [1]or 433-464 Project Work	25
Semester 1	
431-325 Stochastic Signals and Systems *(p.11)*	12.5
or	
620-201 Probability *(p.6)*	12.5
433-332 Operating Systems *(p.17)*	12.5
Subject from other degree as required	12.5
Semester 2	
431-467 Digital Systems 4: High Speed Systems *(p.13)*	12.5
433-353 Networks and Communications *(p.18)*	12.5
Subject from other degree as required	12.5

1. The project subject may be taken over two semesters, or as a 25-point load in a single semester. Students with an H2A or better average may replace the 25-point project and two of the elective subjects by a 50-point project subject

Fourth year (electrical engineering)	Points
Semester 1	
431-325 Stochastic Signals and Systems *(p.11)*	12.5
or	
620-201 Probability *(p.6)*	12.5
Electrical engineering 300-level electives	25

Fourth year (electrical engineering)	Points
Subject from other degree as required	12.5
Semester 2	
431-327 Communication Systems *(p.11)*	12.5
431-330 Design Laboratory *(p.11)*	12.5
Electrical engineering 300-level elective	12.5
Subject from other degree as required	12.5

Fifth year (electrical engineering)	Points
Year long	
431-400 Project Work *(p.12)*[1]	25
Semester 1	
Electrical engineering 400-level electives	25
Subjects from other degree as required	12.5
Semester 2	
Electrical engineering 400-level electives	25
Subjects from other degree as required	12.5

1. The project subject may be taken over two semesters, or as a 25-point load in a single semester. Students with an H2A or better average may replace the 25-point project and two of the elective subjects by a 50-point project subject.

Third year (software engineering)	Points
Semester 1	
431-204 Digital Systems 2: System Design *(p.9)*	12.5
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
433-253 Algorithms and Data Structures *(p.16)*	12.5
Subject from other degree as required	12.5
Semester 2	
431-201 Engineering Analysis A *(p.9)*	12.5
433-254 Software Design *(p.16)*	12.5
433-255 Logic and Computation *(p.16)*	12.5
Subject from other degree as required	12.5

Fourth year (software engineering)	Points
Year long	
433-340 Software Engineering Project *(p.17)*	25
Semester 1	
433-341 Software Engineering Process & Practice *(p.17)*	12.5
433-343 Professional Issues in Computing *(p.17)*	12.5
Subject from other degree as required	12.5
Semester 2	
CSSE 300-level electives	25
Subject from other degree as required	12.5

Fifth year (software engineering)	Points
Year long	
433-440 Advanced Software Engineering Project *(p.19)*	25
Semester 1	
433-443 Software Project Management *(p.19)*	12.5
CSSE 300-level and 400-level electives	12.5
Subject from other degree as required	12.5
Semester 2	
CSSE 300-level and 400-level electives	25
Subject from other degree as required	12.5

The 62.5 points labelled CSSE electives must be selected, subject to prerequisites being satisfied, from the 300-level, 400-level and (with the approval of the department) masters-level subjects offered by the Department of Computer Science and Software Engineering and must include at least 50 points selected from: 433-332 Operating Systems, 433-342 Software Engineering Methods, 433-351 Database Systems, 433-353 Networks and Communications, 433-371 Interactive System Design, 433-441 System Modelling and Analysis. Subject 615-335 Distributed Systems may also be taken as a CSSE option.

Sixth year (LLB/BE(IT) or LLB/BE with computer, electrical and software engineering)	Points
Law subjects to complete the requirements of the LLB degree.	100

Accelerated program for a major in computer science in the BSc component of the Bachelor of Engineering (computer or electrical)/ Bachelor of Science (BE(IT)/BSc) or (BSc/BE).

Students commencing in the BE(IT)/BSc program in 2003 and those enrolled in the BSc/BE prior to 2003, planning to undertake a science major in computer science, should take this accelerated sequence of subjects in order to maximise their choice of computer or electrical engineering electives in their final two years of study.

First year (computer, electrical engineering)		Points
Semester 1		
431-102	Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151	Introduction to Programming (Advanced) *(p.15)*	12.5
or		
433-171	Introduction to Programming *(p.15)*	12.5
620-121	Mathematics A (Advanced) *(p.4)*	12.5
or		
620-141	Mathematics A *(p.5)*	12.5
640-121	Physics A (Adv) *(p.2)*	12.5
or		
640-141	Physics A *(p.2)*	12.5
Semester 2		
431-103	Electrical Circuits *(p.9)*	12.5
433-152	Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or		
433-172	Algorithmic Problem Solving *(p.15)*	12.5
620-123	Applied Mathematics (Advanced) *(p.4)*	12.5
or		
620-143	Applied Mathematics *(p.5)*	12.5
640-122	Physics B (Adv) *(p.2)*	12.5
or		
640-142	Physics B *(p.3)*	12.5

Second year (computer, electrical engineering)		Points
Semester 1		
431-204	Digital Systems 2: System Design *(p.9)*	12.5
431-210	Circuit Analysis *(p.10)*	12.5
433-252	Software Engineering Principles & Tools *(p.15)*	12.5
620-122	Mathematics B (Advanced) *(p.4)*	12.5
or		
620-142	Mathematics B *(p.5)*	12.5
Semester 2		
431-221	Fundamentals of Signals and Systems *(p.10)*	12.5
431-222	Electronic Devices and Circuits *(p.10)*	12.5
433-253	Algorithms and Data Structures *(p.16)*	12.5
620-232	Mathematical Methods *(p.7)*	12.5

Third year (computer engineering)		Points
Semester 1		
431-325	Stochastic Signals and Systems *(p.11)*	12.5
or		
620-201	Probability *(p.6)*	12.5
431-326	Electronic System Design *(p.11)*	12.5
433-254	Software Design *(p.16)*	12.5
620-231	Vector Analysis *(p.7)*	12.5
Semester 2		
431-327	Communication Systems *(p.11)*	12.5
431-328	Digital Systems 3: Circuits and Systems *(p.11)*	12.5
431-330	Design Laboratory *(p.11)*	12.5
433-255	Logic and Computation *(p.16)*	12.5

Fourth year (computer engineering)	Points
CSSE 300-level subjects, including 433-313, 433-332 and 433-353.	100

Note: To ensure breadth, students in the computer engineering stream taking a computer science major for the BSc are required to complete 431-326 Electronic System Design and 431-327 Communication Systems. Students are also expected to complete 25 points of non-technical electives as part of their final year

Third year (electrical engineering)		Points
Semester 1		
431-325	Stochastic Signals and Systems *(p.11)*	12.5
or		
620-201	Probability *(p.6)*	12.5
Electrical engineering elective		12.5
433-254	Software Design *(p.16)*	12.5
620-231	Vector Analysis *(p.7)*	12.5
Semester 2		
431-327	Communication Systems *(p.11)*	12.5
431-330	Design Laboratory *(p.11)*	12.5
Electrical engineering elective		12.5
433-255	Logic and Computation *(p.16)*	12.5

Fourth year (electrical engineering)	Points
CSSE 300-level subjects	87.5
Electrical engineering elective	12.5

Fifth year (computer, electrical engineering)	Points
Subjects as for the final year of the single computer or electrical BE(IT) program, including 25 points of non-technical electives.	100

Students taking the combined course in computer science with computer engineering should note that they are required to enrol in 431-400 Project Work, to ensure breadth in the combined degree.

Accelerated program for a major in mathematics in the BSc component of the Bachelor of Engineering (computer, electrical, software)/Bachelor of Science (BE(IT)/BSc) or (BSc/BE)

Students commencing in the BE(IT)/BSc program in 2003 and those students enrolled in the BSc/BE prior to 2003 who are planning to take a science major in mathematics, should take this accelerated sequence of subjects in order to maximise their choice of computer, electrical or software engineering electives in their final two years of study.

First year (computer, electrical, software engineering)		Points
Semester 1		
431-102	Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151	Introduction to Programming (Advanced) *(p.15)*	12.5
or		
433-171	Introduction to Programming *(p.15)*	12.5
620-121	Mathematics A (Advanced) *(p.4)*	12.5
or		
620-141	Mathematics A *(p.5)*	12.5
640-121	Physics A (Adv) *(p.2)*	12.5
or		
640-141	Physics A *(p.2)*	12.5
Semester 2		
431-103	Electrical Circuits *(p.9)*	12.5
433-152	Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or		
433-172	Algorithmic Problem Solving *(p.15)*	12.5
620-123	Applied Mathematics (Advanced) *(p.4)*	12.5
or		
620-143	Applied Mathematics *(p.5)*	12.5
640-122	Physics B (Adv) *(p.2)*	12.5
or		
640-142	Physics B *(p.3)*	12.5

Second year (computer engineering)		Points
Semester 1		
431-204	Digital Systems 2: System Design *(p.9)*	12.5
431-210	Circuit Analysis *(p.10)*	12.5
620-122	Mathematics B (Advanced) *(p.4)*	12.5
or		
620-142	Mathematics B *(p.5)*	12.5
620-231	Vector Analysis *(p.7)*	12.5
Semester 2		
431-221	Fundamentals of Signals and Systems *(p.10)*	12.5
431-222	Electronic Devices and Circuits *(p.10)*	12.5
433-252	Software Engineering Principles & Tools *(p.15)*	12.5
620-232	Mathematical Methods *(p.7)*	12.5

Third year (computer engineering)		Points
Semester 1		
431-325	Stochastic Signals and Systems *(p.11)*	12.5
or		
620-201	Probability *(p.6)*	12.5
433-253	Algorithms and Data Structures *(p.16)*	12.5
433-254	Software Design *(p.16)*	12.5
620-2xx mathematics subject		12.5
Semester 2		
431-328	Digital Systems 3: Circuits and Systems *(p.11)*	12.5
431-330	Design Laboratory *(p.11)*	12.5
433-313	Computer Design *(p.16)*	12.5
620-2xx mathematics subject		12.5

Fourth year (computer engineering)	Points
Science subjects	100

Fifth year (computer engineering)		Points
Year long		
431-400	Project Work *(p.12)*	25
or		
433-464	Project Work *(p.20)*	25
Semester 1		

Fifth year (computer engineering)	Points
433-332 Operating Systems *(p.17)*	12.5
433-353 Networks and Communications *(p.18)*	12.5
Non-technical elective	12.5
Semester 2	
431-467 Digital Systems 4: High Speed Systems *(p.13)*	12.5
Non-technical elective	12.5
Elective	12.5

Second year (electrical engineering)	Points
Semester 1	
431-204 Digital Systems 2: System Design *(p.9)*	12.5
431-210 Circuit Analysis *(p.10)*	12.5
620-122 Mathematics B (Advanced) *(p.4)*	12.5
or	
620-142 Mathematics B *(p.5)*	12.5
620-231 Vector Analysis *(p.7)*	12.5
Semester 2	
431-221 Fundamentals of Signals and Systems *(p.10)*	12.5
431-222 Electronic Devices and Circuits *(p.10)*	12.5
620-232 Mathematical Methods *(p.7)*	12.5
Non-technical subject	12.5

Third year (electrical engineering)	Points
Semester 1	
431-3xx third year electrical engineering electives	25
431-325 Stochastic Signals and Systems *(p.11)*	12.5
or	
620-201 Probability *(p.6)*	12.5
620-2xx mathematics subject	12.5
Semester 2	
431-327 Communication Systems *(p.11)*	12.5
431-330 Design Laboratory *(p.11)*	12.5
431-3xx third year electrical engineering elective	12.5
620-2xx mathematics subject	12.5

Fourth year (electrical engineering)	Points
Science subjects	100

Fifth year (electrical engineering)	Points
Year long	
431-400 Project Work *(p.12)*	25
Semester 1	
431-4xx fourth year electrical engineering electives	25
Non-technical elective	12.5
Semester 2	
431-4xx fourth year electrical engineering electives	37.5

Second year (software engineering)	Points
Semester 1	
620-122 Mathematics B (Advanced) *(p.4)*	12.5
or	
620-142 Mathematics B *(p.5)*	12.5
431-204 Digital Systems 2: System Design *(p.9)*	12.5
433-252 Software Engineering Principles & Tools *(p.15)*	12.5
433-253 Algorithms and Data Structures *(p.16)*	12.5
Semester 2	
620-231 Vector Analysis *(p.7)*	12.5
620-232 Mathematical Methods *(p.7)*	12.5
433-254 Software Design *(p.16)*	12.5
433-255 Logic and Computation *(p.16)*	12.5

Third year (software engineering)	Points
Year long	
433-340 Software Engineering Project *(p.17)*	25
Semester 1	
433-341 Software Engineering Process & Practice *(p.17)*	12.5
433-343 Professional Issues in Computing *(p.17)*	12.5
620-2xx mathematics subject	12.5
Semester 2	
433-3xx third year software engineering subjects	25
620-2xx mathematics subject	12.5

Fourth year (software engineering)	Points
Science subjects	100

Fifth year (software engineering)	Points
Year long	
433-440 Advanced Software Engineering Project *(p.19)*	25
Semester 1	
433-443 Software Project Management *(p.19)*	12.5
CSSE 300-level or 400-level elective	12.5
Elective	12.5
Semester 2	
CSSE 300-level and 400-level electives	25
Elective	12.5

The 62.5 points labelled CSSE electives must be selected, subject to prerequisites being satisfied, from the 300-level, 400-level and (with the approval of the Department) masters-level subjects offered by the Department of Computer Science and Software Engineering and must include at least 50 points selected from: 433-332 Operating Systems, 433-342 Software Engineering Methods, 433-351 Database Systems, 433-353 Networks and Communications, 433-371 Interactive System Design, 433-441 System Modelling and Analysis. Subject 615-335 Distributed Systems may also be taken as a CSSE option.

Accelerated program for students majoring in physics in the BSc component of the Bachelor of Engineering(IT)/Bachelor of Science (BE(IT)/BSc) or (BSc/BE)

Students commencing in the BE(IT)/BSc program in 2003 and those enrolled in the BSc/BE prior to 2003 who are planning to take a science major in physics, should seek course advice from the Faculty of Science, Department of Computer Science and Software Engineering and the Department of Electrical and Electronic Engineering at these web sites:

<http://www.cs.mu.oz.au/courseadvice>

<http://www.ee.mu.oz.au/courses/advice/advice 2003>

First year (computer, electrical engineering)	Points
Semester 1	
431-102 Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151 Introduction to Programming (Advanced) *(p.15)*	12.5
or	
433-171 Introduction to Programming *(p.15)*	12.5
620-121 Mathematics A (Advanced) *(p.4)*	12.5
or	
620-141 Mathematics A *(p.5)*	12.5
640-121 Physics A (Adv) *(p.2)*	12.5
or	
640-141 Physics A *(p.2)*	12.5
Semester 2	
431-103 Electrical Circuits *(p.9)*	12.5
620-122 Mathematics B (Advanced) *(p.4)*	12.5
or	
620-142 Mathematics B *(p.5)*	12.5
620-123 Applied Mathematics (Advanced) *(p.4)*	12.5
or	
620-143 Applied Mathematics *(p.5)*	12.5
640-122 Physics B (Adv) *(p.2)*	12.5
or	
640-142 Physics B *(p.3)*	12.5

First year (software engineering)	Points
Semester 1	
431-102 Digital Systems 1: Fundamentals *(p.9)*	12.5
433-151 Introduction to Programming (Advanced) *(p.15)*	12.5
or	
433-171 Introduction to Programming *(p.15)*	12.5
620-121 Mathematics A (Advanced) *(p.4)*	12.5
or	
620-141 Mathematics A *(p.5)*	12.5
640-121 Physics A (Adv) *(p.2)*	12.5
or	
640-141 Physics A *(p.2)*	12.5
Semester 2	
431-103 Electrical Circuits *(p.9)*	12.5
433-152 Algorithmic Problem Solving (Advanced) *(p.15)*	12.5
or	
433-172 Algorithmic Problem Solving *(p.15)*	12.5
620-123 Applied Mathematics (Advanced) *(p.4)*	12.5
or	
620-143 Applied Mathematics *(p.5)*	12.5
640-122 Physics B (Adv) *(p.2)*	12.5
or	
640-142 Physics B *(p.3)*	12.5

Details of later years of the BE(IT)/BSc or BSc(Physics)/BE (computer, electrical, software) combined degree program are available from the Department of Electrical and Electronic Engineering or the Department of Computer Science and Software Engineering.

Students wishing to take science majors other than the ones listed above should contact the Faculty of Science, Department of Computer Science and Software Engineering and the Department of Electrical and Electronic Engineering for course planning advice.

Students must plan their course so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

Subjects in courses of the School of Electrical Engineering and Computer Science

145-126 Effective Communication for Engineering

See full subject details on page 1.

316-101 Introductory Macroeconomics

See full subject details on page 1.

316-102 Introductory Microeconomics

See full subject details on page 1.

316-130 Quantitative Methods 1

See full subject details on page 1.

431-101 Fundamentals of Electrical Engineering

Credit points: 12.5 **HECS-band:** 2

Contact: Eighteen hours of lectures, 18 hours of tutorials, 12 hours of laboratory work *(Semester 2).*

Description: The aim of this subject is to give an introduction to state-of-the-art electrical and electronic engineering for non-electrical engineers.

Topics include analog circuit theory: Thevenin and Norton equivalents, power supplies/rectification, motors, transformers and cabling, DC, AC; sensors; analog to digital converters and digital to analog converters; coding; basic electronics such as filters, signal 'conditioning', ideal diodes, opamps; safety issues; digital electronics and microprocessors including sequential/basic logic, microcontrollers, interfacing; electronic instrumentation, electromagnetic compatibility, signal transmission; and networks/telecommunications/LANs/protocols.

Assessment: One written examination not exceeding three hours; practice classes, tests, laboratory reports and notebooks, assignments and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-102 Digital Systems 1: Fundamentals

Credit points: 12.5 **HECS-band:** 2

Contact: 24 hours of lectures, 24 hours of tutorials and 12 hours of laboratory work *(Semester 1, repeat Summer).*

Description: This course serves as an introduction to the fundamentals of digital system design and to the technical language used in this field. This includes Boolean algebra; number systems and digital arithmetic; the analysis and design of combinational logic systems with examples ranging from designs based on logic gates to designs involving decoders and multiplexers to achieve target functionality; the use of Karnaugh maps for combinational logic simplification; an introduction to bit storage units (latches and flip-flops); the analysis and design of synchronous (ie: clocked) sequential logic systems with examples ranging from registers and counters to generic finite state machine design; and a brief introduction to memory units, microprocessor systems and configurable logic devices (PLDs).

Assessment: One written examination not exceeding 3 hours, practice classes, tests, laboratory reports and notebooks, assignments, tutorial attendance and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-103 Electrical Circuits

Credit points: 12.5 **HECS-band:** 2

Contact: Twenty-four hours of lectures, 24 hours of tutorials, 12 hours of laboratory work, web-based study *(Semester 2, repeat Summer).*

Description: Students completing this subject should develop skills in performing circuit analysis on simple linear electrical networks, understand elementary physical electronics and gain an appreciation of the importance of a systems approach to electrical engineering.

Topics include electrical networks; linear DC networks, Kirchoff's laws, Thevenin and Norton equivalents, superposition, simple non-linear elements, 1st order transient, AC sinusoidal steady state networks, phasor diagrams; and electronics: elementary physical electronics, diode circuit-analysis, switches and amplifiers, operational amplifiers, feedback.

Assessment: One written examination not exceeding three hours, practice classes, tests, laboratory reports and notebooks, assignments, tutorial attendance and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-201 Engineering Analysis A

Note: Credit cannot be obtained for 431-201 Engineering Analysis A and 620-142 Mathematics B or 620-122 Mathematics B (Advanced) or 620-211 Mathematics 2 (Advanced). Students may only gain credit for 1 of the following groups of subjects (620-231 Vector Analysis and 620-232 Mathematical Methods) or (431-201 Engineering Analysis A and 431202 Engineering Analysis B)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Doreen Thomas

Prerequisites: 620-141 Mathematics A and 620-143 Applied Mathematics or equivalent

Contact: Thirty-six hours of lectures and 12 hours of tutorials *(Semester 1, repeat 2).*

Description: This subject introduces important mathematical concepts required in engineering. Students should develop an ability to apply vector space methods to the study of linear algebraic equations and linear transformations. Students will also learn to formulate and solve a range of decision-making problems by well-known algorithms. Students will develop an ability to represent elementary functions by a power series. Students will develop an ability to use statistical methods to analyse empirical data. Students will gain experience in using a mathematical software system.

Topics include vector spaces, linear systems of equations, matrix methods; networks, linear programming, sequences and series; and probability distributions, random variables, hypothesis testing, linear regression.

Assessment: Up to 24 pages of written assignments (20%) and a 3-hour end-of-semester written examination (80%).

431-202 Engineering Analysis B

Note: Students may only gain credit for one of the following groups of subjects (620-231 Vector Analysis and 620-232 Mathematical Methods) or (431-201 Engineering Analysis A and 431202 Engineering Analysis B).

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Doreen Thomas

Prerequisites: 431-201 Engineering Analysis A (prior to 2001, 421-204 Engineering Analysis A) or equivalent

Contact: Thirty-six hours of lectures and 12 hours of tutorials *(Semester 2).*

Description: This subject introduces important mathematical methods required in engineering. Students should develop an ability to set up and compute double and triple integrals, manipulate vector differential operators. Students should develop an ability to solve a range of ordinary differential equations by a variety of methods including Laplace transformations, and to gain an understanding of the behaviour of their solutions. They will learn to represent suitable functions in terms of a Fourier series or integral, and to use these representations and other methods to solve partial differential equations. Students will gain experience in using a mathematical software system.

Topics include multiple integrals, vector calculus, higher order ordinary differential equations, solutions and phase portraits of systems of ordinary differential equations, Laplace transforms. Fourier series, Fourier integrals, method of characterisitcs for first order partial differential equations, second order hyperbolic, parabolic and elliptic partial differential equations.

Assessment: Up to 24 pages of written assignments (20%) and a 3-hour end-of-semester written examination (80%).

431-204 Digital Systems 2: System Design

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-102 Digital Systems 1: Fundamentals

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 1).*

Description: The objective of this course is to introduce the student to various tools and paradigms for digital system design and to further their knowledge of the technical language used in this field. The focus of the course is at a level of abstraction that sits between high-level system specification issues and low-level system realisation issues. Topics covered include hardwired and stored logic paradigms for digital system implementation; the hardware description language VHDL, as a tool for modelling digital systems; a lab based introduction to configurable logic devices such as PLDs and FPGAs; system interconnection structures, including an introduction to bus arbitration

schemes and data-link level bus communication protocols; architectural and operational aspects of general purpose central processing units (CPUs); an introduction to the use of programming languages (assembly and high-level) in the design of stored logic systems and related low-level issues such as the binding of programme and data to memory; and memory and input/output organisations and interrupt mechanisms.

Assessment: One written examination not exceeding three hours, practice classes, tests, laboratory reports and notebooks, assignments and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-210 Circuit Analysis

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-103 Electrical Circuits, 620-141 Mathematics A and 620-143 Applied Mathematics or equivalent

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 1).*

Description: In this subject students should gain an understanding of the techniques and theorems for analysing common electrical circuits comprising both passive and active devices and have a working knowledge of computer-aided analysis for the design of electrical circuits to specifications.

Topics include review of DC and AC networks, circuit theorems, independent and controlled sources and sinusoidal steady state analysis; power in AC circuits; three phase AC circuit analysis; magnetic circuits; mutual inductance, transformers; transient response of RL, RC and RLC circuits; introduction to computer-aided circuit analysis - SPICE; introduction to electronic systems, amplifiers: specifications and interfaces, analysis of circuits with op-amps; and power diode circuits: distortion and displacement factors, modelling.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments and project reports not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-221 Fundamentals of Signals and Systems

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-201 Engineering Analysis A (prior to 2001, 421-204 Engineering Analysis A) or 2003 summer subject 431-225 Engineering Analysis A (old) or equivalent and 431-210 Circuit Analysis.

Contact: Thirty-six hours of lectures and tutorials, 12 hours of laboratory work *(Semester 2).*

Description: This subject introduces students to the fundamental principles of signals and systems. Signals and systems theory will be treated in a generic engineering context, but with an emphasis to prepare students for the application of basic knowledge to the areas of communication and control engineering. The subject will approach the signals and systems theory, treating equally mathematical analysis as well as engineering synthesis. Students will learn how to model particular systems and signals environments, using time and frequency domain ideas. Students will learn how to represent and analyse signals and systems with specific properties using the MATLAB software environment.

Topics include:

Signals: definition of a signal with examples; periodic and aperiodic signals; continuous and discrete-time signals (sinusoidal, exponential, step, impulse). 1-dimensional and 2-dimensional signals; and representations of signals in time and frequency domains.

Transforms: Laplace, Fourier, z and discrete-time Fourier; sampling theorem; aliasing; and norms of signals.

Systems: definitions of inputs, outputs and a system. Basic model properties: memory, invertibility, causality, stability, time-invariance, linearity; classification of system models; representations of Linear time invariant (LTI) systems (continuous-time and discrete-time): input-output models (including mulitple-input mulitple-output); state space models; impulse response; convolution representations; transfer function, poles and zeros; block diagrams (series, parallel and feedback connections); frequency response and Bode plots; relationships between the time and frequency response of a system; and norms of systems.

All concepts are illustrated by examples from control theory, signal processing and telecommunications.

Assessment: One written examination not exceeding three hours, assignments and/or project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-222 Electronic Devices and Circuits

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-210 Circuit Analysis and 431-201 Engineering Analysis A or 431-225 Engineering Analysis A (old) (prior to 2001, 421-204 Engineering Analysis A) or equivalent.

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 2).*

Description: In this subject students should gain an understanding of common semiconductor electronic devices and acquire a knowledge of the use of electronic devices in a variety of analog circuits.

Topics include review of diode circuits, transistors and small-signal models: BJTs, FETs, MOS, physics of semiconductor devices; amplifier configurations: CE, CC, CB, biasing; design of BJT/FET amplifiers; switched mode downconverter with SPICE simulation; semiconductor devices; feedback; practical op-amp circuits and examples of common chips; and differential amplifiers.

Assessment: One written examination not exceeding three hours, practice classes, tests, laboratory reports and notebooks, assignments and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-225 Engineering Analysis A (old)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Doreen Thomas

Prerequisites: 620-141 Mathematics A and 620-143 Applied Mathematics or equivalent

Contact: Thirty-six hours of lectures and 12 hours of tutorials *(Summer semester).*

Description: This subject introduces important mathematical methods required in engineering. Students should develop an ability to decompose matrices, represent elementary functions by a power series, set up and compute double and triple integrals, manipulate vector differential operators and to use Laplace transforms to solve ordinary differential equations. Students will gain experience in using a mathematical software system. Topics include matrix methods, sequences and series, multiple integrals, vector calculus, Laplace transforms and additional material from one of probability, linear algebra and operations research.

Assessment: Up to 24 pages of written assignments (20%) and a 3-hour end-of-semester written examination (80%)

431-226 Engineering Analysis B (old)

Note: This subject is only available to students who undertook 431-201 Engineering Analysis A in 2002, 431-225 Engineering Analysis A (old) or those who failed 431-202 Engineering Analysis B in 2002.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Doreen Thomas

Prerequisites: 431-201 Engineering Analysis A or 431-225 Engineering Analysis A (old)

Contact: Thirty-six hours of lectures and 12 hours of tutorials *(Semester 1, repeat Summer).*

Description: This subject deals with advanced mathematical methods required in engineering. Students should develop an ability to solve a range of ordinary differential equations by a variety of methods, and to gain an understanding of the behaviour of their solutions. Students will also learn to formulate and solve a range of decision-making problems by well-known algorithms. They will learn to represent suitable functions in terms of a Fourier series or integral, and to use these representations and other methods to solve partial differential equations. Students will gain further experience in using a mathematical software system. Topics include higher order ordinary differential equations, solutions and phase portraits of systems of ordinary differential equations, networks, linear programming, integer programming, Fourier series, Fourier integrals and transforms, partial differential equations and additional material from one of statistics, linear algebra and difference equations.

Assessment: Up to 24 pages of written assignments (20%) and a 3-hour end-of-semester written examination (80%)

431-324 System Modelling and Control

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-221 Fundamentals of Signals and Systems and 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B) or 431-226 Engineering Analysis B (old) or equivalent

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 1).*

Description: On completion of this subject students should understand the relevance of mathematics and physics to dynamical systems in engineering practice, understand the derivation of different system models and be able to use these models to represent, analyse, design and simulate dynamical systems such as electrical, mechanical and thermal systems, understand the properties of linear and nonlinear system models and be able to analyse these models in the time and frequency domains; and understand the concept of

sampling of signals and systems, be able to analyse discrete system models in the time and frequency domains.

Topics include mathematical modelling of dynamical systems by physical laws and measurements; state space equation and transfer function of systems; time domain and frequency domain performance of systems; stability of systems and stability criteria; sampling of signals and dynamical systems; state equation and transfer function of discrete time systems; the concept of feedback control and PID feedback control; and introduction to computer control and simulation of dynamical systems.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments, laboratory reports and project reports, not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-325 Stochastic Signals and Systems

Note: Credit may not be obtained for both 431-325 Stochastic Signals and Systems and 620-201 Probability

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-221 Fundamentals of Signals and Systems and 431-201 Engineering Analysis A (prior to 2001, 421-204 Engineering Analysis A) and 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B) or equivalent.

Contact: Thirty-six lectures and 12 tutorial/practice class hours *(Semester 1).*

Description: This subject builds on the concepts developed in 431-221 Fundamentals of Signals and Systems. It aims to give students basic skills in the modelling and analysis of stochastic signals and systems for the analysis and design of modern telecommunication systems and control systems.

Topics include basic concepts: introduction to probability concepts; discrete and continuous random variables, and their distributional properties and moments; transformation of random variables; random signals in communications: random processes; stationarity; models of stochastic signals used in communications system analysis, including Gaussian processes, signal spectra and power spectral density; linear communication and control systems with stochastic inputs; communication network models; basic queueing models of circuit-switched and packet-switched networks using Markov chains; and simulation of communication systems, simulation of random variables used in communication systems.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments and project reports, not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-326 Electronic System Design

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-221 Fundamentals of Signals and Systems, 431-222 Electronic Devices and Circuits and 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B) or equivalent.

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 1).*

Description: In this subject students should gain an understanding of the methodologies for designing a variety of electronic circuits and acquire a knowledge of design and synthesis techniques for common analog and digital filters.

Topics include comparators and timers; wideband amplifiers: frequency response, loading effects, multistage amplifiers; tuned circuits; output stages: distortion; nonlinear analog circuits: multipliers, rectifiers; analog filter design and synthesis; and digital filter design.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments, laboratory reports and project reports, not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-327 Communication Systems

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-221 Fundamentals of Signals and Systems, and 431-325 Stochastic Signals and Systems or 620-201 Probability

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 2).*

Description: On completion of this subject students should understand techniques for the digital coding of analog waveforms; understand the causes of, and cures for, interference in digital transmission; understand the effects of noise in analog and digital communication systems; and possess a basic skill in carrying out noise and signal analysis for communication system design

Topics include review of signals and systems: amplitude and frequency response, bandwidth, distortion, bandpass signals, lowpass equivalent etc.; amplitude modulation: DSBLC, DSBSC, SSBSC, VSB, AM circuits, AM radio and television broadcasting; phase-locked loop; frequency modulation: theory, Carson's rule, direct and indirect FM, demodulation by frequency discrimination, PLL; review of bandpass random processes and white, Gaussian noise; noise in AM and FM: SNR calculations, plus threshold effects, and pre-emphasis and de-emphasis filtering; and digital communication: sampling and quantisation, regeneration, pulse coded modulation (including differential PCM, and delta modulation), intersymbol interference, matched filter.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments, laboratory reports and project reports not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-328 Digital Systems 3: Circuits and Systems

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-204 Digital Systems 2: Systems Design and 431-222 Electronic Devices and Circuits

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 2).*

Description: On completion of this course the student will have an understanding of various realisation issues in digital system design. Topics covered are taken from the following:

Switching circuits - Switching of bipolar and MOS transistors; characteristics of bipolar, CMOS amd mixed bipolar and CMOS logic families; AC/DC noise margins; tools for circuit modelling and simulation; and an introduction to timing issues.

Signal integrity analysis and design - Introduction to transmission lines and distributed circuits; the eye diagram; printed circuit board (PCB) interconnects and associated electrical characteristics; and analysis and design of point-to-point, point-to-multipoint and multipoint-to-multipoint PCB interconnects.

Assessment: One written examination not exceeding three hours, practice classes, tests, laboratory reports and notebooks, assignments, tutorial attendance and project reports. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-329 Electromagnetics

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-201 Engineering Analysis A (prior to 2001, 421-204 Engineering Analysis A) or equivalent, 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B) or equivalent and 640-142 Physics 1B or equivalent.

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work *(Semester 2).*

Description: On completion of this subject, students should appreciate the role of Maxwell's equations as a fundamental description of electromagnetic phenomena; understand the use of Maxwell's equations; be able to analyse and compute electromagnetic fields for static and time-varying situations; understand the behaviour of transmission lines and free space propagation of electromagnetic fields when transmitting and processing high speed signals; and be able to measure, analyse, and design a variety of electrical transmission networks in the frequency and time domains using combinations of transmission lines, lumped and active networks.

Topics include Maxwell's equations, electric and magnetic fields in free and material space, electric scalar and magnetic potentials, numerical computation of fields, time-varying electromagnetic (EM) fields in material media, plane wave propagation of EM fields, interface phenomena, general lossy transmission lines in both time and frequency domains, application distributed circuits, matching techniques, Smith Chart, scattering parameters, coupled-lines and directional coupler, and introduction to microstrip and stripline.

Assessment: One written examination not exceeding three hours, practice classes, tests, assignments, laboratory reports and project reports, not exceeding 20 pages. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-330 Design Laboratory

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-222 Electronic Devices and Circuits and 431-204 Digital Systems 2: System Design

Contact: Ten hours of lectures, 36 hours of laboratory, two hours of presentation *(Semester 1, repeat 2).*

Description: On completion of this subject students should be able to plan, manage and complete a small engineering project as a team; design and construct to professional standards using commercial components to a specification; keep laboratory notebooks to professional standards; and write clear and concise reports and present a project to a group of peers.

Topics include two design tasks relevant to electrical and computer engineering to be completed by small teams. Support lectures on project management, design and construction skills, oral and written presentations will be given.

Assessment: Laboratory notebooks to be kept during laboratory sessions and submitted at the end of the semester, a formal written report (less than 3000 words) to be submitted by each team for each design task, an oral presentation on one of the design tasks. Marks will also be awarded for practical and construction skills for both projects. Students will be notified of the weighting of assessment components at the beginning of the semester.

431-400 Project Work

Credit points: 25 **HECS-band:** 2

Prerequisites: Completion of third year of standard electrical engineering or computer engineering course, including 431-330 Design Laboratory

Corequisites: Enrolment in at least 50% of standard final year electrical engineering or computer engineering course

Contact: One day per week for 24 weeks *(Year long).*

Description: On completion of this subject students should have acquired practical design and research skills related to professional practice in electrical and electronic engineering and computing, and have demonstrated the ability to work in a small team under broad project guidelines and to successfully achieve the agreed project goals.

Projects will be undertaken under the supervision of a member of academic staff of the department. Projects will require activities related to design, implementation and testing of electrical, electronic or computing systems with associated literature reviews, computing and workbench activities. A project list will be provided by the department. Students are encouraged to submit their own project proposals for consideration by the department. A number of project proposals are also solicited from local industry. Project management and reporting will comprise a significant part of all projects. Students will be expected to keep a laboratory notebook recording their contributions to the project. At the end of the year, students will present their projects on Project Day that will be open to staff, students and their invitees.

Assessment: Submission for examination of laboratory notebooks, and of group project reports not exceeding 100 pages including appendices, diagrams, tables, graphs and computer output (80%). Oral presentation and demonstration of project results (20%).

431-401 Project Work Extended

Credit points: 50 **HECS-band:** 2

Prerequisites: Completion of third year of standard electrical engineering or computer engineering course, with an average mark of H2A or better.

Corequisites: Enrolment in full standard final-year electrical engineering or computer engineering course.

Contact: Two days per week for 24 weeks *(Year long).*

Description: On completion of this subject students should have acquired practical design and research skills related to professional practice in electrical and electronic engineering and computing, and have demonstrated the ability to work in a small team under broad project guidelines and to successfully achieve the agreed project goals.

Projects will be undertaken under the supervision of a member of academic staff of the department. Projects will require activities related to design, implementation and testing of electrical, electronic or computing systems with associated literature reviews, computing and workbench activities. A project list will be provided by the department. Students are encouraged to submit their own project proposals for consideration by the department. A number of project proposals are also solicited from local industry. Projects will be of greater scope and level of difficulty than those offered in 431-400 Project Work. Project management and reporting will comprise a significant part of all projects. Students will be expected to keep a laboratory notebook recording their contributions to the project. At the end of the year, students will present their projects on Project Day that will be open to staff, students and their invitees.

Assessment: Submission for examination of laboratory notebooks, and of group project reports not exceeding 150 pages including appendices, diagrams, tables, graphs and computer output (80%). Oral presentation and demonstration of project results (20%).

431-451 Project Mgt & Product Commercialisation

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering

Credit points: 12.5 **HECS-band:** 2

Contact: Twenty-four hours of lectures and 24 hours of tutorials and project work *(Semester 1).*

Description: Upon completion of this subject, the student should understand the role of an engineer in coordinating a multidisciplinary project; understand what is necessary to ensure delivery of projects on time, to the specified quality and within budget; demonstrate skills in forecasting, planning and communicating with management; demonstrate a knowledge of commercialisation requirements for new products with an emphasis on innovation.

The content covers the study of project management and commercialisation of new products within the context of the modern high technology enterprise, structure and integrated strategy; coordinating marketing and engineering; coordinating marketing and production; coordinating production and engineering; assuring quality; financial return and its effect on growth; general management and personnel policies; formulation of an integrated strategy; reporting and control processes; development of rigorous project management and communication, system engineering approach to project management; planning, estimating, financing and controlling projects using PERT/CPM; cash flow and cost control; cost and schedule control systems (CSCS); design for manufacuture; quality assurance management; total quality management; international safety and regulatory requirements, and development of an understanding of processes essential to effective commercialisation of new products, difference between an idea and a business opportunity; innovation and product improvement; protection of intellectual property; product life cycles; venture capital; case studies; industry, and Federal and State government support for product commercialisation.

Assessment: One 3-hour end-of-semester written examination (70%); assignment, mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of the assignment, mid-semester test and/or project report will be specified in the first lecture and on the subject web page at the start of semester.

431-460 Digital Communications

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-327 Communication Systems

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 1).*

Description: This subject focuses on the fundamentals of modulation/demodulation, also introducing basic and fundamental concepts of information theory and error control. This area of communications is often called the 'physical layer', and deals with issues of point-to-point communications. This subject is fundamental to all forms of digital communications (eg. mobile, wired, wireless, satellite etc).

Content includes information theory and channel capacity, digital modulation and optimal demodulation for AWGN channels, error probability calculations, block and recursive error control coding, signalling through band-limited channels, optimum transmitting and receiving filters, equalisation techniques; and receivers for Rayleigh fading channels. A selection of advanced topics includes synchronisation, narrowband mobile communications (eg. GSM), diversity reception, spread spectrum mobile communications (eg. CDMA), computer modems, and high speed digital subscriber line modems (eg. ISDN, xDSL).

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-461 Digital Signal Processing

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-325 Stochastic Signals and Systems

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory experiment or project work *(Semester 1).*

Description: On completion of this subject students should understand the fundamental principles of digital filter design, spectral estimation and statistical signal processing, be able to derive and analyse signal processing algorithms; and appreciate the interdisciplinary nature of this field, and an awareness of its wide applications.

Content includes sampling and quantisation, discrete Fourier transform (DFT), fast Fourier transform (FFT), discrete convolution, discrete filter design; power spectral estimation; discrete-time stochastic systems, least squares and recursive least squares for parameter estimation, optimal state estimation via Kalman filters and hidden Markov model filters; maximum likelihood parameter estimation; and Cramer Rao bounds.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-462 Communication Networks

Note: Students may not obtain credit for both this subject and 431-223 Telecommunication Networks

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-325 Stochastic Signals and Systems

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 1)*.

Description: On completion of this subject students should understand both the functionality of modern computer and telecommunication networks, and state-of-the-art models and techniques for the analysis and design of such networks.

Topics include network topologies for core and access networks; network components and mechanisms: multiplexing, circuit and packet switching, switch architectures, layered network architectures, medium access control (MAC) protocols, error detection, ARQ, flow control, routing, admission control, end-to-end protocols; network analysis, design and control: queueing and other probabilistic models, network optimisation, reliability. Plus a selection of the following topics: LAN protocols, wireless networks, ATM, signalling, intelligent networks, internet, mobile IP, and other topical areas.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-463 Directed Study 4.1

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: Selected 300-level subjects to be announced annually

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 1)*.

Description: Upon completion of this subject, the student should be familiar with the basic precepts of a particular research topic in electrical engineering.

The content of this subject will change from year to year. The subject will be used to present in formal lectures new research-oriented topics in electrical engineering, and will generally be presented by researchers who are visiting the department.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-464 Digital Control and Identification

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-324 System Modelling and Control, 431-461 Digital Signal Processing

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 2)*.

Description: On completion of this subject students should understand the basic concept and methods of system control and optimisation; understand mathematical formulations and solutions of practical control and identification problems; and be able to formulate and solve basic optimal control and identification problems.

Content includes introduction to digital control; controllability, observability and stability of systems, state feedback control and pole placement, state observers, disturbance models, linear quadratic optimal control, mathematical model building and system identification

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-465 Wireless Communication

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-460 Digital Communications, 431-462 Communication Networks

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 2)*.

Description: On completion of this subject students should understand the fundamental characteristics of antennas and be able to design simple antennas for free space propagation, understand wireless propagation, and be able to use standard propagation models, understand the principles and applications of modern radio and satellite communication systems, at both the physical layer and network layer.

Topics include antennas: radiation and simple antennas; propagation between antennas; antenna arrays and smart antennas; wireless channels: propagation and signal strength prediction; multipath characteristics of GSM and CDMA channels; space-time diversity reception; RAKE receiver; satellite communications: modulation format; multiple access techniques; figure of merit, station margin, link margin, power budgets, outage; single and multiple interfering satellites; satellite communication standards; low-earth orbit satellites; cellular mobile communications: principles of cellular mobile communications: frequency reuse, spectral efficiency, microcells and macrocells, handover, mobility management; comparison of FDMA, TDMA and spread spectrum systems: basic outage, capacity and traffic calculations; switching and signalling for mobile networks; and standards for mobile communications: AMPS, GSM, CDMA, third generation mobile systems, cordless systems.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-466 Photonic Devices and Systems

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-329 Electromagnetics, 431-222 Electronic Devices and Circuits

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 2)*.

Description: On completion of this subject students should have obtained an appreciation of the role of semiconductor materials in state-of-the-art photonic devices and novel device fabrication technologies, have a working knowledge of the operation of a wide range of optoelectronic devices, understand the underlying principles of fibre-optic communications, be able to analyse the operation of optical fibre transmission systems and understand the application of optical fibre in telecommunications systems and networks.

Topics include review of beam propagation in optical fibre, single and multimode fibre, dispersion, frequency response, attenuation, absorption and scattering, review of optical fibre components, review of interaction of radiation and atomic systems, absorption and amplification, theory of laser oscillation, Fabry-Perot lasers, distributed feedback lasers, distributed Bragg reflector lasers, quantum well lasers, strained layer lasers, rate equation description of laser dynamics, short pulse generation techniques, Erbium doped fibre and semiconductor laser amplifiers, electro-optic materials, electro-optic amplitude modulators, phase modulation of light, optical switches, semiconductor photodiodes, avalanche photodiodes, integrated photonics, noise in optical communication systems, thermal and quantum noise, error detection probability for optical receivers, system design relations, link budget calculations, applications of advanced optical devices such as optical amplifiers, filters and switches in subcarrier multiplexing, wavelength division multiplexing, coherent transmission, trunk networks, video distribution systems, and customer access networks.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-467 Digital Systems 4: High Speed Systems

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-328 Digital Systems 3: Circuits and Systems

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory and project work *(Semester 2)*.

Description: On completion of this subject students should have an appreciation of the critical design considerations needed for the construction of reliable high speed digital machines and understand the application of these ideas in certain application domains such as radar signal processing.

A selection of topics will cover the critical elements of high speed digital systems including power distribution, timing and clock distribution; synchronisation, asynchronous design techniques and properties, signalling conventions interconnects and buses, printed circuit board considerations, noise including cross-talk, intersymbol interference, flicker noise effects, EMI and EMC; and design issues for high speed multiprocessor and fast digital signal processing architectures for applications such as radar and communications.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendi-

ces, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-468 Biomedical Engineering

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering. It is expected that the subject will be offered in alternate years only.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-221 Fundamentals of Signals and Systems, 431-326 Electronic System Design

Contact: Twelve hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 1).*

Description: On completion of this subject students should have an understanding of the specialist field of biomedical engineering, understand the interdisciplinary nature of the biomedical engineering field and have a knowledge of basic physiology and instrumentation associated with clinical measurements of physiological parameters (haemodynamics and pneumatics), appreciate the importance of electrical safety in a clinical environment and know the precautions necessary to ensure patient safety at all times.

This introduction to electro-physiology and associated bioelectricactivity covers clinical signal and systems such as electrocardiographs the bioelectric activity of the heart; electroencephalographs in neural networks, acoustics in the auditory process and myoelectrographs with biomechanics. Medical devices associated with these systems include bedside monitors, defibrillation, pacemakers and stimulators. Computer applications in medicine include computing in monitoring, medical imaging and closed loop control. Medical imaging examines endoscopy, ultrasound, X-Rays, computer-aided topography and magnetic resonance imaging.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-469 Multimedia Signal Processing

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering. It is expected that the subject will be offered in alternate years only.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 431-325 Stochastic Signals and Systems

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 2).*

Description: On completion of this subject students should have obtained an appreciation of the rapidly emerging field of pattern recognition and artificial neural networks, understand the application of pattern recognition techniques to problems in signal processing, be able to design intelligent systems for the solution of real-world prediction and classification problems and be able to understand the signal processing techniques needed for the design of multimedia systems and its applications.

Topics include introduction to statistical and neural network based pattern recognition methods; multilayered feedforward neural networks; self organising neural networks; feedback neural networks; applications to signal and image processing; speech, image and video processing; image segmentation and feature extraction; image tracking and recognition systems; and speech and image compression techniques, video on demand, applications of multimedia signal processing.

Assessment: One 3-hour end-of-semester written examination (70%); mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-470 Directed Study 4.2

Availability: This subject may not be offered every year, please refer to the Department of Electrical and Electronic Engineering.

Credit points: 12.5 **HECS-band:** 2

Prerequisites: Selected 300-level and 400-level subjects to be announced annually.

Contact: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory or project work *(Semester 2).*

Description: Upon completion of this subject, the student should be familiar with the basic precepts of a particular research topic in electrical engineering.

The content of this subject will change from year to year. The subject will be used to present in formal lectures new research-oriented topics in electrical engineering, and will generally be presented by researchers who are visiting the department.

Assessment: One 3-hour end-of-semester written examination (70%), mid-semester test and/or project report not exceeding 20 pages including appendices, diagrams, tables, graphs and computer output (30%). The relative weighting of test and/or project report will be specified both in the first lecture and on the subject web page at the start of semester.

431-480 Project Work

Credit points: 25 **HECS-band:** 2

Prerequisites: Completion of third year of standard electrical engineering or computer engineering course, including 431-330 Design Laboratory

Corequisites: Enrolment in at least 50% of standard final-year electrical engineering or computer engineering course

Contact: Two days per week for 12 weeks *(Semester 1, repeat 2).*

Description: On completion of this subject students should have acquired practical design and research skills related to professional practice in electrical and electronic engineering and computing, and have demonstrated the ability to work in a small team under broad project guidelines and to successfully achieve the agreed project goals.

Projects will be undertaken under the supervision of a member of academic staff of the department or while on an exchange program. Projects will require activities related to design, implementation and testing of electrical, electronic or computing systems with associated literature reviews, computing and workbench activities. A project list will be provided by the department. Students are encouraged to submit their own project proposals for consideration by the department. A number of project proposals are also solicited from local industry.

Project management and reporting will comprise a significant part of all projects. Students will be expected to keep a laboratory notebook recording their contributions to the project.

Assessment: Submission for examination of laboratory notebooks, and of group project reports not exceeding 100 pages including appendices, diagrams, tables, graphs and computer output (80%). Oral presentation and demonstration of project results (20%).

431-490 Project Work (Extended)

Credit points: 50 **HECS-band:** 2

Prerequisites: Completion of third year of standard electrical engineering or computer engineering course, with an average mark of H2A or better.

Corequisites: Enrolment in full standard final-year electrical engineering or computer engineering course.

Contact: Four days per week for 12 weeks *(Semester 1, repeat 2).*

Description: On completion of this subject students should have acquired practical design and research skills related to professional practice in electrical and electronic engineering and computing, and have demonstrated the ability to work in a small team under broad project guidelines and to successfully achieve the agreed project goals.

Projects will be undertaken under the supervision of a member of academic staff of the department or while on an exchange program. Projects will require activities related to design, implementation and testing of electrical, electronic or computing systems with associated literature reviews, computing and workbench activities. A project list will be provided by the department. Students are encouraged to submit their own project proposals for consideration by the department. A number of project proposals are also solicited from local industry. Projects will be of greater scope and level of difficulty than those offered in 431-480 Project Work. Project management and reporting will comprise a significant part of all projects. Students will be expected to keep a laboratory notebook recording their contributions to the project.

Assessment: Submission for examination of laboratory notebooks, and of group project reports not exceeding 150 pages including appendices, diagrams, tables, graphs and computer output (80%). Oral presentation and demonstration of project results (20%).

433-142 Computing Fundamentals B

Note: Credit may not be gained for both 433-142 Computing Fundamentals B or any of: 615-145 Concepts in Software Development 1, 433-171 Introduction to Programming or 433-151 Introduction to Programming (Advanced).

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M Viswanathan

Prerequisites: 433-141 Computing Fundamentals A

Contact: Thirty-six hours of lectures, 12 hours of tutorials and 24 hours of laboratory classes *(Semester 2, repeat Summer).*

Description: The objective of this subject is for students to develop proficiency in programming in a high level imperative language; to be familiar with abstract data types and be aware of their relevance to problem solving; to develop an understanding of design issues relevant to programming in a functional language and in an imperative language (C); to develop knowledge of

the structure of computer systems and the role of systems software; and to develop a background of relevant knowledge and skills on which to base further study of computer science.

Topics covered include advanced programming techniques: dynamic data structures; abstract data types; computer organisation: components; data storage; data manipulation; execution of algorithms: program translation; operating systems; programming paradigms: functional; imperative; logic; software engineering: software life cycle; program testing and debugging; and theory of computation: computability; complexity; and correctness.

Assessment: Project work (expected to take about 30 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-151 Introduction to Programming (Advanced)

Note: This subject is intended for students who have attained a mark of 35 or more for Mathematical Methods 3/4 (or equivalent), and an ENTER of 90 or more (or equivalent). Students who fall outside these guidelines and who do not have prior programming experience should enrol in 433-171 Introduction to Programming instead.

Students may not gain credit for both 433-151 Introduction to Programming (Advanced) or any of 433-142 Computing Fundamentals B, 433-171 Introduction to Programming, or 615-145 Concepts in Software Development 1.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr N Barnes

Prerequisites: Knowledge of Mathematical Methods 3/4 or Specialist Mathematics is assumed

Contact: Thirty-six hours of lectures, 11 hours of tutorials, 22 hours of laboratory classes *(Semester 1).*

Description: The objective for this subject is for students to develop an understanding of approaches to solving problems with computers and to be able to demonstrate proficiency in designing and writing programs using a high-level procedural programming language.

Topics covered include algorithmic problem-solving; fundamental data types: numbers, truth values, characters, pointers; fundamental program structures: sequencing, selection, repetition, functions and functional decomposition; number representation, accuracy in numerical computations; simple data storage structures: variables, arrays and structures (records); dynamic data types, including list-, tree-, and hash-based implementations of dictionary and priority queue data structures; and searching and sorting algorithms.

Programming work will be undertaken in the language C.

Assessment: Laboratory work (expected to take about 30 hours) during semester, worth 10% of the final grade; a mid-semester test worth 15% of the final grade; and a written examination (not exceeding three hours) at the end of the semester, worth 75% of the final grade. Details of assessment components will be advised at the commencement of the subject; all components must be completed satisfactorily to pass the subject.

433-152 Algorithmic Problem Solving (Advanced)

Note: Students who have obtained a high level of achievement in 433-171 Introduction to Programming and who have reached a minimum required standard in an exemption test will be permitted to enrol in this subject.

Students may not gain credit for both 433-152 Algorithmic Problem Solving (Advanced) and either 433-141 Computing Fundamentals A or 433-172 Algorithmic Problem Solving.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof H Sondergaard

Prerequisites: 433-151 Introduction to Programming (Advanced) or 433-142 Computing Fundamentals B

Contact: Thirty-six hours of lectures, 11 hours of tutorials, 22 hours of laboratory classes *(Semester 2).*

Description: The objective for this subject is for students to build upon their understanding of approaches to solving problems with computers, and to be able to demonstrate proficiency in designing and writing programs for symbolic computation using a functional programming language.

Topics covered include algorithmic problem solving; elements of functional programming, including lists and tuples, polymorphism, algebraic data types, higher order functions, monadic programming and symbolic computation; searching and sorting mechanisms for secondary memory devices; systems software including compilers, interpreters, debuggers and profilers. Programming work wil be undertaken in the languages C and Haskell (or an equivalent substitute).

Assessment: Laboratory work (expected to take about 30 hours) during semester, worth 10% of the final grade; a mid-semester test worth 15% of the final grade; and a written examination (not exceeding three hours) at the end of the semester, worth 75% of the final grade. Details of assessment components will be advised at the commencement of the subject; all components must be completed satisfactorily to pass the subject.

433-171 Introduction to Programming

Note: Credit may not be gained for both 433-171 Introduction to Programming or any of: 433-142 Computing Fundamentals B, 433-151 Introduction to programming (Advanced) or 615-145 Concepts in Software Development 1

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof A Moffat

Prerequisites: Knowledge of VCE Mathematical Methods 3/4 or Specialist Mathematics is assumed.

Contact: Thirty-six hours of lectures, 11 hours of tutorials, 22 hours of laboratory classes *(Semester 1).*

Description: The objective for this subject is for students to develop an understanding of approaches to solving moderately complex problems with computers, and to be able to demonstrate proficiency in designing and writing programs using a high-level procedural programming language (C).

Topics covered include algorithmic problem solving; fundamental data types: numbers, truth values, characters, pointers; fundamental program structures: sequencing, selection, repetition, functions and functional decomposition; number representation, and accuracy in numerical computations; and simple data storage structures: variables, arrays, structures (records), files.

Assessment: Project work (expected to take about 30 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-172 Algorithmic Problem Solving

Note: Students may not gain credit for both 433-172 Algorithmic Problem Solving and either 433-141 Computing Fundamentals A, or 433-152 Algorithmic Problem Solving (Advanced)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof P Stuckey

Prerequisites: 433-171 Introduction to Programming or 433-151 Introduction to Programming (Advanced) or 433-142 Computing Fundamentals B

Contact: Thirty-six hours of lectures, 11 hours of tutorials, 22 hours of laboratory classes *(Semester 2).*

Description: The objective for this subject is for students to build upon their understanding of approaches to solving moderately complex problems with computers, and to be able to demonstrate proficiency in designing and writing programs using both a high-level procedural programming language and a functional language.

Topics covered include algorithmic problem solving; dynamic data types, including list-, tree-, and hash-based implementations of dictionary and priority queue data structures; searching and sorting algorithms; elements of functional programming, including lists and tuples, polymorphism, higher-order functions, dynamic tree-based structures, and symbolic computation; and an introduction to systems software including compilers, interpreters, debuggers and profilers. Programming work will be undertaken in the languages C and Haskell (or an equivalent substitute)

Assessment: Laboratory work (expected to take about 30 hours) during semester, worth 10% of the final grade; a mid-semester test worth 15% of the final grade; and a written examination (not exceeding three hours) at the end of the semester, worth 75% of the final grade. Details of assessment components will be advised at the commencement of the subject; all components must be completed satisfactorily to pass the subject.

433-252 Software Engineering Principles & Tools

Note: The requirement for 433-142 Computing Fundamentals B as a prerequisite may, subject to approval by the department, be replaced by 433-171 Introduction to Programming, supplemented by appropriate extension work and assessment completed to the satisfaction of the department prior to the commencement of the semester.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr L Kitchen

Prerequisites: 433-171 Introduction to Programming or 433-151 Introduction to Programming (Advanced) (prior to 2003, 433-142 Computing Fundamentals B)

Contact: Twenty-four hours of lectures, 24 hours of laboratory classes *(Semester 1, repeat 2).*

Description: The objective of this subject is for students to be prepared for participation in teams for creating medium-sized programs; to be familiar with the principles applying to team programming and programming-in-the-large; to be able to use some of the tools that support implementation of these principles; and to be familiar with the concept of assembly language.

Topics covered include overview of the software development life cycle; command languages; modularity, compilation environments, code libraries; version control and configuration management; programming for reliability; standard testing and debugging techniques; assembly language; and profiling and simple code improvement techniques.

Assessment: One practical examination (not exceeding three hours) at the end of semester and one written examination (not exceeding two hours) at the end of the semester. Each exam must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-253 Algorithms and Data Structures

Note: The requirement for 433-142 Computing Fundamentals B as a prerequisite may, subject to approval by the department, be replaced by 433-171 Introduction to Programming, supplemented by appropriate extension work and assessment completed to the satisfaction of the department prior to the commencement of the semester.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr U Parampalli

Prerequisites: 433-171 Introduction to Programming and 433-172 Algorithmic Problem Solving or equivalents (prior to 2003, 433-141 Computing Fundamentals A and 433-142 Computing Fundamentals B) and two subjects (25 points) of first-year mathematics

Pre or Corequisites: Prior or concurrent enrolment in 433-252 Software Engineering Principles and Tools is strongly recommended

Contact: Twenty-four hours of lectures, 12 hours of tutorials, 12 hours of practice classes *(Semester 1, repeat 2).*

Description: The objective of this subject is for students to be familiar with a range of programming languages and their application to the efficient solution of problems by computer; to know a variety of techniques for solving, sorting and searching problems and develop a basic understanding of graph algorithms; to develop experience with using complex algorithms and data structures in a variety of programming languages; to be able to perform basic complexity analyses of algorithms; and to acquire some knowledge of the concepts of computability, tractability and problem complexity.

Topics covered include complexity of algorithms and complexity classes; abstract data types; algorithms for sorting arrays, lists and files; algorithms and data structures for searching: tree structures and hashing; and graph representations and algorithms.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-254 Software Design

Note: Students may not gain credit for both 433-254 Software Design and 615-240 Concepts in Software Development II.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr J Bailey

Prerequisites: One of 433-151 Introduction to Programming (Advanced) or 433-171 Introduction to Programming, or 433-142 Computing Fundamentals B; plus one of 433-152 Algorithmic Problem Solving (Advanced) or 433-172 Algorithmic Problem Solving or 433-141 Computing Fundamentals A

Pre or Corequisites: 433-252 Software Engineering Principles and Tools and 433-253 Algorithms and Data Structures

Contact: Thirty hours of lectures, 12 hours of tutorials, six hours of practice classes *(Semester 1, repeat 2).*

Description: The objective of this subject is for students to be familiar with a range of design techniques and to be able to select a design technique appropriate for a given problem; to be able to program in an object-oriented programming language and to be able to produce programs from designs.

Topics covered include principles of design; design methods based on the structures of input and output; structure clash resolution; abstract data types; UML and object-oriented design and programming; event-based programming and exception handling.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester; both must be completed satisfactorily to pass the subject. Details and weighting of assessment components will be advised at the commencement of the subject.

433-255 Logic and Computation

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr P Schachte

Prerequisites: 433-172 Algorithmic Problem Solving or equivalent (prior to 2003, 433-141 Computing Fundamentals A)

Contact: Thirty hours of lectures, 12 hours of tutorials and six hours of laboratory classes *(Semester 1, repeat 2).*

Description: The objective of this subject is for students to be able to reason formally about the properties of simple specifications and programs; to be able to reason formally about simple models of computation; to appreciate the variety of applications of discrete mathematical techniques in computer science; and to gain working experience with a logic programming language.

Topics include logic: propositional and predicate calculus, proof structures; logic programming languages (Prolog); formal specification, refinement and program proof; and selected topics from: the Chomsky hierarchy of languages, computability, and computational complexity.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-258 Database Systems for Engineers

Note: Students may not gain credit for 433-258 Database Systems for Engineers and 433-351 Database Systems and/or 615-230 Database Concepts. This subject is not offered in 2003

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 433-171 Introduction to Programming, or equivalent

Semester: Not Offered

Description: The objective of this subject is for students to understand the principles and practice of database systems. Topics may include, but are not restricted to, data modelling for relational databases; query languages for databases such as SQL; database architectures and implementations; non-relational databases such as hierarchical, network and object-oriented databases; data integrity; data warehousing; data administration; and alternative organisational memory technologies such as groupware.

On completion of this subject, students should be familiar with the use of databases within organisations; database design; database manipulation; and data administration.

433-303 Artificial Intelligence

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof Z-Q Liu

Prerequisites: 433-253 Algorithms and Data Structures and 433-255 Logic and Computation

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 2).*

Description: The objective of this subject is for students to understand the foundations of artificial intelligence and the associated technologies that evolved in both declarative and procedural approaches.

Topics covered include searching, problem solving, logic and deduction, knowledge representation, machine learning, programming languages for artificial intelligence; and a selection from the following: game playing, expert systems, pattern recognition, machine vision, natural language, robotics and planning, neural networks.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-313 Computer Design

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Z Somogyi

Prerequisites: 433-252 Software Engineering Principles and Tools and 431-102 Digital Electronics and Microprocessors

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 2).*

Description: The objective of this subject is for students to be able to describe the components of current computer systems as well as their interactions; to be able to evaluate the suitability of a given computer for a given task; to be able to analyse the effects of architectural features on the efficiency of a given program and of programs in general; and to understand the process of computer design.

Topics covered include memory hierarchy, processor implementation, pipelining, instruction sets, multiprocessors, input/output, performance measurement, and the design process.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-330 Theory of Computation

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof H Sondergaard

Prerequisites: 433-253 Algorithms and Data Structures and 433-255 Logic and Computation

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 1)*.

Description: The objective of this subject is for students to understand the essence of computing through simple models of computational devices; to understand the limitations of computing, the relative power of formal languages and the inherent complexity of many computational problems of practical importance; to be able to apply these models in practice to solving problems in diverse areas such as string searching, pattern matching, cryptography, and language design; to be familiar with standard tools and notation for formal reasoning about machines and programs; and to improve reasoning and problem-solving skills.

Topics covered include formal languages, grammars and recognisers; models of computation: finite state machines, pushdown automata, Turing machines; computability: the Church-Turing thesis, decidability, reducibility; complexity: the classes P and NP, NP-complete problems, space complexity; and other topics selected from information and coding theory, lambda calculus, recursion theory, approximation algorithms, probabilistic algorithms, cryptography, quantum computing.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-332 Operating Systems

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr J Bailey

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures and 433-254 Software Design

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 1)*.

Description: The objective of this subject is for students to understand the function of operating system components and their interactions; to be able to exploit operating system facilities to improve the functionality and efficiency of programs; and to be able to evaluate the suitability of a given operating system for a given task.

Topics covered include operating system structure: interrupts, system calls; memory management: paging, segmentation; concurrent processes: mutual exclusion, synchronisation, deadlocks, scheduling; input/output, DMA; file systems, security; and introduction to distributed systems.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-340 Software Engineering Project

Note: This subject may only be taken by students enrolled in the Software Engineering stream of the BE degree.

Credit points: 25 **HECS-band:** 2

Coordinator: Dr E Kazmierczak

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures and 433-254 Software Design

Corequisites: 433-341 Software Engineering Process and Practice

Contact: Twenty-four hours of lectures and 24, 2-hour workshops *(Year long)*.

Description: The objective of this subject is for students to experience team-oriented software engineering; to appreciate the importance of planning and managing the software process; to be involved in requirements elicitation and the subsequent phases of software development including documentation, requirements analysis, specification, design, implementation and testing; and to be familiar with some of the problems that can arise during execution of the software development process. Students will work on a substantial practical team project drawn from areas such as system software, applications software, graphics or networks. They will be involved in all phases of the project, including requirements analysis, functional specification, system design, implementation, documentation and testing. Lectures will cover applied software engineering issues in areas such as configuration management, release engineering, technical reviews, and software testing.

Assessment: Satisfactory contribution to the group project (about 120 hours project work), including system and user documentation, and progress and final reports, as advised at the commencement of the subject

433-341 Software Engineering Process & Practice

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof L Sterling

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures, and 433-254 Software Design

Contact: 24 hours of lectures and approximately 12 hours of practice classes *(Semester 1)*.

Description: The objective of this subject is for students to appreciate the issues involved in engineering large-scale software systems; to understand the phases and activities involved in the conventional software life cycle models; to be aware of the potential benefits of good software project management; to be able to analyse requirements; to be able to select and apply appropriate design techniques; and to understand the importance of the software development process in achieving software quality and be aware of some relevant techniques and tools.

The subject will deal with topics such as project management, the software development process, requirements analysis and specification, design techniques and human computer interaction. Topics such as testing, tools, measurement, standards and quality assurance will also be introduced.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-342 Software Engineering Methods

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr E Kazmierczak

Prerequisites: 433-341 Software Engineering Process and Practice

Contact: Twenty-four hours of lectures, 12 hours of tutorials *(Semester 2)*.

Description: Software Engineering Methods aims to examine some of the more specific processes required for the production of high quality software, for example, methods for testing software, ensuring reliability or performance in software. At the conclusion of this subject students are expected to understand the principles of software testing, to know how to apply software testing techniques to the development of quality software, to understand the principles of software reliability and methods for assessing software reliability; to understand and apply a range of engineering methods.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination not exceeding three hours, at the end of semester; both must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-343 Professional Issues in Computing

Note: Students may not gain credit for both 433-343 Professional Issues In Computing and 615-355 Legal and Ethical Frameworks

This subject is regarded by the Faculty of Science as a non-science subject for students enrolled in the BSc.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr P Gruba

Prerequisites: Successful completion of at least 37.5 points of study from 200-level subjects in either computer science or information systems.

Contact: Thirty-six hours of lectures and 12 hours of tutorials *(Semester 1)*.

Description: The aim of this subject is to develop an appreciation of what it means to be considered a professional in computer science and software engineering. To achieve this objective, we will critically examine such issues as intellectual property and related legal aspects of software development, codes of practice and ethical principles in professional computer associations and the social implications of information technology in modern society. The development of oral and written communication skills, itself a professional issue, will also be a focal part of the subject.

Assessment: Written assignments (not exceeding 6000 words in total), oral presentation and participation in tutorials and group activities. Weighting of assessment components will be advised at the commencement of the subject.

433-344 Legal Issues in Computing

Note: This subject is regarded by the Faculty of Science as a non-science subject for students enrolled in the BSc.

Credit points: 12.5 **HECS-band:** 3

Coordinator: Prof L Sterling

Prerequisites: Successful completion of at least 37.5 points of study from 200-level subjects in computer science and software engineering and successful completion of at least 125 points of law subjects in the Faculty of Law.

Contact: Twelve 2-hour tutorials *(Semester 1)*.

Description: The objective of this subject is for students to develop an understanding of either one aspect of the role computers play in the legal profession, or one aspect of the role that legal issues play in guiding the use of computer technology. Students work on individual research projects under the supervision of a member of the academic staff in either the Department of Computer Science and Software Engineering or the Faculty of Law, and will exchange information with that staff member, with the subject convener, and with other students, through a weekly tutorial.

Assessment: One or more written essays (not exceeding 8000 words in total), and oral presentations (not exceeding 30 minutes in total). Weighting of assessment components will be advised at the commencement of the subject.

433-351 Database Systems

Note: Credit may not be gained for 433-351 Database Systems and 433-258 Database Systems for Engineers and/or 615-230 Database Concepts and/or 615-330 Advanced Concepts in Database

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr L Stern

Prerequisites: 433-253 Algorithms and Data Structures and 433-255 Logic and Computation

Contact: Twenty-four hours of lectures, 12 hours of tutorials *(Semester 1)*.

Description: The objective of this subject is for students to understand the fundamentals of database systems, including data modelling and database design; to understand the languages and facilities provided by database systems; and to understand the implementation of database systems.

Topics covered include data models: relational, deductive, object-oriented, network, hierarchical, semantic; database design; relation normalisation; query languages including SQL; integrity; security; concurrency; query processing and optimisation; and implementation of data models and database languages.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-353 Networks and Communications

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr A Harwood

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures and 433-254 Software Design

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 1, repeat 2)*.

Description: The objective of this subject is for students to develop a solid foundation in the fundamentals of data communication and in particular, the techniques that are used to achieve the reliable transfer of data between two devices connected by means of a direct data path; to be familiar with the mode of operation and the various interface standards and protocols associated with the different types of data network that are used for computer to computer communication; and to be familiar with the range of international standard protocols to achieve open systems interconnection in various application environments.

Topics covered include communication hardware; network topology; local area and long-haul networks; OSI model and alternatives; and error control, integrity, security.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-361 Programming Language Implementation

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof P Stuckey

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures and 433-254 Software Design

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 2)*.

Description: The objective of this subject is for students to be familiar with important concepts and techniques in programming language implementation; to develop a general appreciation of the constraints imposed on programming languages by implementation considerations; and to understand the basic ideas behind implementation of the programming language paradigms: imperative, object-oriented, functional and logic programming.

Topics covered include compilers and interpreters: compiler structures; intermediate representations of programs; and global tables, run-time structures, lexical analysis, parsing, semantic analysis, code generation, optimisation.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding 3 hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-371 Interactive System Design

Note: Credit may not be gained for both 433-371 Interactive System Design and 615-348 Human Computer Interaction (prior to 2001, 615-247)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr L Kitchen

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures and 433-254 Software Design

Contact: 24 hours of lectures, 12 hours of tutorials *(Semester 2)*.

Description: The objective of this subject is for students to become familiar with a range of technical and human issues associated with the design and implementation of usable interactive systems; and to develop an understanding of the importance of user and system models in system design.

Topics covered will include user modelling, user centred design, user interface prototyping, usability evaluation, data visualisation, human perception, multi-modal interfaces, and environments for building multimedia applications.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-380 Graphics and Computation

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr A Pearce

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures, 433-254 Software Design and two subjects (25 points) of first year mathematics

Contact: Twenty-four hours of lectures and approximately 12 hours of practice classes *(Semester 1)*.

Description: The objective of this subject is for students to have knowledge of computational approaches and methods for robotics, graphics and related areas.

Topics covered will include 2-D and 3-D analytic geometry for graphics, representation of 3-D objects, computational techniques for realistic graphic rendering, robot configuration and kinematics, and associated numerical methods.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-385 Modelling, Analysis and Visualisation

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr L Stern

Prerequisites: 433-252 Software Engineering Principles and Tools, 433-253 Algorithms and Data Structures, 433-254 Software Design and two subjects (25 points) of first year-mathematics. Students are advised that the study of mathematics or engineering analysis at the second-year level is strongly recommended.

Contact: Twenty-four lectures, 12 laboratory classes *(Semester 2)*.

Description: The objective of this subject is to introduce students to methods of modelling, numerical analysis and visualisation, and to a number of key developing areas in computational science. Students will learn to use the IDL programming environment, and within this context apply their knowledge to fractal analysis, chaos and dynamical systems, financial modelling, neuroinformatics and bioinformatics.

Assessment: Project work during semester (expected to take about 36 hours) leading to submission of program or written material, and one written examination (not exceeding three hours) at the end of the semester. Both components of assessment must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-398 Directed Study 3A

Note: This subject may be taken only with the permission of the head of the Department of Computer Science

This subject is regarded by the Faculty of Science as a non-science subject for students enrolled in the BSc.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Semester: Semester 1, repeat 2, Summer

Description: The objective of this subject is for students to broaden and deepen their knowledge of modern concepts and techniques in computer science.

The subject consists of directed study in computer science covering material which is not otherwise available to the student. The details of the topics covered will depend on the course of directed study selected and may involve substantial system development.

Assessment: Written reports not exceeding 10 000 words and one written examination (not exceeding three hours) at the end of the semester. Assigned project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-399 Directed Study 3B

Note: This subject may be taken only with the permission of the head of the Department of Computer Science

This subject is regarded by the Faculty of Science as a non-science subject for students enrolled in the BSc.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Semester: Semester 1, repeat 2, Summer

Description: The objective of this subject is for students to broaden and deepen their knowledge of modern concepts and techniques in computer science.

The subject consists of directed study in computer science covering material which is not otherwise available to the student. The details of the topics covered will depend on the course of directed study selected and may involve substantial system development.

Assessment: Written reports not exceeding 10 000 words and one written examination (not exceeding three hours) at the end of the semester. Assigned project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-401 Computer Science Research Project

Note: This subject is only available to students enrolled in the BSc(Honours) and BCS(Honours) degrees.

Students enrol in this subject over one, two, or three semesters, depending upon their individual course plan, and the subject will be weighted at 12.5, 25.0, or 37.5 points per semester of enrolment, depending upon the other subjects that comprise their course plan, and whether they are part-time or full-time students. A grade will only be awarded when 37.5 points of enrolment have been completed.

Credit points: 37.5 **HECS-band:** 2

Coordinator: Dr L Stern

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering, and theory of computation.

Contact: Students are required to attend regular meetings with their supervisor, and undertake approximately 400 hrs of investigative work *(Research)*.

Description: Students undertake a research investigation under the supervision of a member of the academic staff and in the context of one of the departmental research groups.

Assessment: Written project report not exceeding 40 pages (20 000 words) and an oral presentation not exceeding 30 minutes. Weighting of assessment components will be advised at the commencement of the semester.

433-440 Advanced Software Engineering Project

Note: This subject may only be taken by students enrolled in the software engineering stream of the BE degree.

Credit points: 25 **HECS-band:** 2

Coordinator: Mr A Senyard

Prerequisites: 433-340 Software Engineering Project

Corequisites: 433-443 Software Project Management

Contact: Twenty-four 1-hour tutorials and 24 2-hour workshops *(Year long)*.

Description: The objective of this subject is for students to gain further experience in team-oriented software engineering; to apply their prior experience of team-oriented software engineering to improving all phases of a software project; to participate in management activities for a team project; to be able to manage some of the problems that can arise during execution of the software development process; and to be able to apply a range of software engineering tools. Students will work in teams on a large software project.

Assessment: Satisfactory contribution to the group project, including system and user documentation, progress and final reports, as specified at the start of the subject.

433-441 System Modelling and Analysis

Note: Not offered in 2003

Credit points: 12.5 **HECS-band:** 2

Prerequisites: 433-255 Logic and Computation and 433-341 Software Engineering Process and Practice

Semester: Not Offered

Description: The objective of this subject is for students to understand the use of mathematical modelling in the analysis of discrete systems; to be familiar with the form, content and uses of mathematical models in the analysis of discrete systems; to be familiar with a range of standards, techniques and languages developed to support mathematical modelling and analysis of discrete systems; and to be able to contribute to the production of high quality software.

Topics covered will be selected from: model-oriented specifications, the Z specification language; modelling and analysis of concurrent systems, automata, process algebra, Petri nets, axiomatic specifications languages and modelling tools.

433-443 Software Project Management

Note: Credit may not be gained for both 433-443 Software Project Management and 433-643 IT Project Management.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof B Nath

Prerequisites: 433-340 Software Engineering Project

Contact: 24 hours of lectures and 12 hours of workshops *(Semester 1)*.

Description: The objective of this subject is for students to understand the issues involved in software project management and the factors that affect software quality; to be familiar with a range of standards, techniques and tools developed to support software project management and the production of high quality software; and to be able to develop software project plans and supporting software quality plans and risk management plans.

Topics covered include project management issues: client management; management of technical teams, project planning and scheduling, risk management, configuration management, quality assurance and accreditation, legal issues; software quality: factors affecting software quality; planning for quality; software quality assurance plans; software measurement; and standards: Australian and international.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-448 Applied Cryptography and Coding

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr U Parampalli

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages and software engineering

Contact: 24 hours of lectures and 12 hours of workshops *(Semester 1)*.

Description: The objective of this subject is for students to understand the fundamentals of cryptographic and coding principles, to be able to implement cryptographic algorithms and to be familiar with various coding schemes in communications and computers.

Topics covered include public key systems, stream ciphers, discrete logarithms based schemes, digital signatures, error correcting and detecting codes, and Hamming and BCH codes.

Assessment: Project work (expected to take about 36 hours) during semester (50%) and one written examination (not exceeding three hours) at the end of the semester (50%). The project work must be completed satisfactorily to pass the subject.

433-460 Human Language Technology

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof S Bird

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages and software engineering. Completion of 620-201 Probability (or equivalent) would be an advantage.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Semester 2).*

Description: The objective of this subject is for students to understand the foundations of symbolic and statistical natural language processing; to be familiar with key concepts in language description; to develop and evaluate language models based on large corpora; and to be familiar with a variety of human language technologies.

Topics covered include the linguistics of words and phrases, part-of-speech tagging, finite-state transducers, chart parsing and chunk parsing, hidden Markov models, n-gram language models, spelling and grammar checking, collocation analysis, word-sense disambiguation, text retrieval, information extraction, and machine translation. Programming work will be undertaken in the Python language, and will use NLTK, the Natural Language Toolkit (nltk.sf.net).

Assessment: Project work (expected to take about 36 hours) during semester (50%) and one written examination (not exceeding three hours) at the end of semester (50%). Both components must be completed satisfactorily to pass the subject.

433-464 Project Work

Note: Students enrol in this subject over one or two semesters, depending upon their individual course plan. The subject will be weighted at 12.5 or 25.0 points per semester of enrolment, depending upon the other subjects that comprise that course plan and whether students are part time or full time. A grade will only be awarded when 25 points of enrolment have been completed.

Credit points: 25 **HECS-band:** 2

Coordinator: Dr U Parampalli

Prerequisites: Successful completion of at least 37.5 points of 300-level computer science subjects. Prior or concurrent enrolment in 433-343 Professional Issues in Computing is recommended.

Contact: Students are required to attend regular meetings with their supervisor and to undertake approximately 240 hours of investigative work *(Research).*

Description: The objective of this subject is for students to acquire practical design and research skills related to professional practice in computing. Projects, selected from a list offered by the department each year, will be undertaken under the supervision of a member of the academic staff of the department with relevant expertise. Projects will require activities related to design, implementation and testing of computing systems with associated literature reviews. Project management and reporting will also be assessed. Students with specific interests are encouraged to submit their own project proposals for consideration by the department.

Assessment: Submission for examination of project reports not exceeding 12 000 words with no more than 30 pages of supporting material in the way of appendices, diagrams, tables, computations and computer output (100%). Students may be required to give an oral presentation of their work.

433-465 Mechatronics Project

Note: This subject may only be taken by students enrolled in the BE/BCS (Mechatronics) degree program.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr N Barnes

Prerequisites: Successful completion of at least 37.5 points of 300-level computer science subjects. Prior or concurrent enrolment in 433-343 Professional Issues in Computing is recommended.

Contact: Students are required to attend regular meetings with their supervisor, and to undertake approximately 120 hours of investigative work *(Research).*

Description: Upon completion students should have gained experience in applying their knowledge in the disciplines of mechatronics, to a real engineering investigative problem, working collaboratively, collating background data beyond the scope of coursework and making engineering decisions and reporting the results of their investigations. The subject involves the undertaking of a major project requiring an independent investigation and the preparation of a report on an approved advanced topic in mechatronics. Projects undertaken in this subject will be supervised by the Department of Computer Science and Software Engineering.

Assessment: Submission for examination of a technical report not exceeding 6000 works, with no more than 30 pages of supporting material in the way of appendices, diagrams, tables, computations and computer output (100%). Students may be required to give an oral presentation of their work.

433-470 Functional Programming

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof H Sondergaard

Prerequisites: Knowledge of functional programming, and study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering, and theory of computation.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Semester 1).*

Description: Functional programming is an appealing programming language paradigm that all programmers should be aware of. Functional programming languages are generally simple and powerful, owing to a high degree of orthogonality. To learn a functional language, there are few rules to remember, and even fewer exceptions. Possibly, the largest group of functional programmers are users of tools such as Maple and Mathematica. With the giant telecommunications company Ericsson's adoption of the language Erlang, there are also signs that functional programming may finally get the recognition it deserves from industry.

Topics covered include functional programming languages: pattern matching, list comprehension, higher-order functions, strict and lazy evaluation; functional programming techniques: accumulators, higher-order programming, continuations, monads; declarative input/output; types: polymorphism, type classes; and computational models: evaluation of functional programs, lambda calculus, combinators, graph reduction; implementation: translation to lambda expression and combinator form, abstract machines, strictness analysis, parallel evaluation.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-471 Logic Programming

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr Z Somogyi

Prerequisites: Knowledge of logic programming and study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering, and theory of computation.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Semester 2).*

Description: The use of logic as a computational formalism originally grew out of natural language processing. Since then it has also been widely adopted in databases, rule-based systems, knowledge representation and formal methods. Logic programming languages offer a very high level approach to problem-solving and several novel programming techniques. Improvements in implementation techniques will further broaden the application of these languages.

Topics covered include computational models: logical semantics, fixpoint semantics, SLD resolution; logic programming languages: modes and types, logic variables, relational programming; logic programming techniques: accumulators, difference lists, coroutining, higher order programming, meta programming, program transformation; implementation issues: indexing, tail recursion, choice points; and debugging.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-475 High Performance Database Systems

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Prerequisites: 433-332 Operating Systems, 433-351 Database Systems, and study at the third-year level in at least two of the following areas: artificial intelligence, computer design, graphics, interactive system design, networks and communications, programming languages, software engineering, and theory of computation.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Semester 1).*

Description: All successful companies and organisations rely on the effective and efficient manipulation of data. These include telecommunication companies, banking, retailing, airline reservations, manufacturing, process control and government instrumentalities. Many end-user applications require the support of a database system. For these applications to be effective, a database system must provide secure and reliable storage of data and be able to retrieve and process the data very efficiently. Knowledge of how the database system works at the architectural level is essential to achieve correct behaviour and

the best possible performance for these applications. This subject explores various mechanisms which are used by database systems to provide the features that applications require.

Topics covered include database architecture: centralised, distributed, client-server; transaction models: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management; recovery: write-ahead logging, shadow paging; indexing structures: B-trees, hash files, multi-attribute indexing; relational operations: join algorithms, query optimisation; and performance: benchmarking, TPC benchmarks, object-oriented benchmarks.

All topics are addressed in the context of both relational and object-oriented database systems, including various commercial database systems.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-476 Algorithms for Constrained Search

Credit points: 12.5 **HECS-band:** 2

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering, and theory of computation.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Not Offered).*

Description: Many optimisation problems of practical significance can be modelled as constrained search problems. Efficient methods for solving such problems are therefore of considerable interest. In many cases, graph algorithms can provide exact solutions in polynomial time. Where exact solutions are infeasible, stochastic algorithms provide a means for obtaining near-optimal solutions, and have been used with success in many different applications. Various approaches to classical computer science problems are explored, and their relevance to practical problems is discussed. Both numerical and combinatorial optimisation will be covered.

Topics covered include graph algorithms: shortest path problems, flow networks; stochastic algorithms: genetic algorithms, evolution strategies, simulated annealing, tabu search; and classical problems: travelling salesman, knapsack, set-covering.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-480 Computer Vision and Image Processing

Note: This subject is not offered in 2003

Credit points: 12.5 **HECS-band:** 2

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering, and theory of computation. Prior study in the area of artificial intelligence would be an advantage.

Semester: Not Offered

Description: There is an increasing interest in the interaction of computer processing with the physical world, through sense inputs such as vision, for example for the development of autonomous robots.

Topics covered include low-level, mid-level, and high-level vision; segmentation and feature extraction; perceptual organisation; visual motion analysis; stereo; shape from shading and other properties; color processing; shape analysis; texture; hough transform; object recognition; and image interpretation and scene understanding.

433-481 Knowledge Representation and Reasoning

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr A Pearce

Prerequisites: Study at the third-year level in at least four of the following areas: artificial intelligence, computer design, database systems, graphics, interactive system design, networks and communications, operating systems, programming languages, software engineering and theory of computation.

Contact: Twenty-four hours of lectures, 12 hours of workshops *(Semester 1).*

Description: The objective of this subject is for students to understand the logical principles that make intelligent reasoning systems possible, as used in computational linguistics, robotics and software agents. The subject focuses on the fast growing area of non-classical logic that has enabled cognitive reasoning skills, such as rational behaviour and the ability to learn from experience. The emphasis is on implementation of automated reasoning and several commercial agent programming languages are explored.

Topics covered include reasoning about knowledge and belief; modal logic; reasoning about time: temporal logic; reasoning about uncertainty: causal inference and probabilistic conditioning; reasoning in the presence of incomplete information: non-monotonic logic and reasoning about experience: case-based reasoning and inductive logic programming. All topics are addressed in the context of computational complexity and language implementation via dynamic programming.

Assessment: Project work (expected to take about 36 hours) during semester worth 50% of the final mark; and submission of a technical report (of no more than 20 pages including appendices, figures, tables and graphs) worth 50% of the final mark. Students may be required to give an oral presentation of their work. Both components must be completed satisfactorily to pass the subject.

433-496 Directed Study 4A

Note: This subject may only be taken with the permission of the Head of Department.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Semester: Semester 1, repeat 2

Description: The objective of this subject is for students to broaden and deepen their knowledge of modern concepts and techniques in computer science.

The subject consists of directed study in computer science covering material which is not otherwise available to the student. The details of the topics covered will depend on the course of directed study selected and may involve substantial system development.

Assessment: Written reports not exceeding 10 000 words and one written examination (not exceeding three hours) at the end of the semester. Assigned project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-497 Directed Study 4B

Note: This subject may only be taken with the permission of the Head of Department.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Semester: Semester 1, repeat 2, Summer

Description: The objective of this subject is for students to broaden and deepen their knowledge of modern concepts and techniques in computer science.

The subject consists of directed study in computer science covering material which is not otherwise available to the student. The details of the topics covered will depend on the course of directed study selected and may involve substantial system development.

Assessment: Written reports not exceeding 10 000 words and one written examination (not exceeding three hours) at the end of the semester. Assigned project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

433-498 Advanced Topic in Computer Science

Note: Students may only enrol in this subject with the approval of the honours coordinator, and should note that it will only be offered when suitable teaching staff are available.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof R Kotagiri

Semester: Semester 1, repeat 2

Description: The objective of this subject is for students to study a particular area of computer science at an advanced level. This subject will be offered from time to time depending upon the availability of visiting researchers and academic staff and their particular areas of expertise.

Assessment: Project work (expected to take about 36 hours) during semester and one written examination (not exceeding three hours) at the end of the semester. The project work must be completed satisfactorily to pass the subject. Weighting of assessment components will be advised at the commencement of the subject.

620-121 Mathematics A (Advanced)

See full subject details on page 4.

620-122 Mathematics B (Advanced)

See full subject details on page 4.

620-123 Applied Mathematics (Advanced)
See full subject details on page 4.

620-141 Mathematics A
See full subject details on page 5.

620-142 Mathematics B
See full subject details on page 5.

620-143 Applied Mathematics
See full subject details on page 5.

620-201 Probability
See full subject details on page 6.

620-231 Vector Analysis
See full subject details on page 7.

620-232 Mathematical Methods
See full subject details on page 7.

620-252 Analysis
See full subject details on page 8.

620-331 Applied Partial Differential Equations
See full subject details on page 10.

620-332 Integral Transforms & Asymptotics
See full subject details on page 10.

640-121 Physics A (Adv)
See full subject details on page 2.

640-122 Physics B (Adv)
See full subject details on page 2.

640-141 Physics A
See full subject details on page 2.

640-142 Physics B
See full subject details on page 3.

640-223 Quantum Mechanics & Thermal Physics(Adv)
See full subject details on page 4.

640-243 Quantum Mechanics & Thermal Physics
See full subject details on page 5.

640-381 Principles and Applications of Sensors
See full subject details on page 9.

730-104 Torts and the Process Of Law
See full subject details on page 1.

730-105 History and Philosophy of Law I
See full subject details on page 1.

730-115 History and Philosophy of Law II
See full subject details on page 1.

730-202 Contracts
See full subject details on page 1.

730-335 Trade Marks and Unfair Competition
See full subject details on page 13.