Mathematical and Computing Sciences Faculty Handbook 1994
Mathematical and Computing Sciences Faculty Handbook 1994

This handbook should be read in conjunction with the UTS Calendar and Student Information Guide. The University attempts to ensure that the information contained in the handbook is correct as at 22 September 1993. The University reserves the right to vary any matter described in the handbook at any time without notice.
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• Blackfriars
  Blackfriars Street, Chippendale

• Smail Street
  3 Smail Street, Ultimo

• Wembley House
  839-847 George Street, Sydney

Balmain Campus
(Being replaced by a new building in Harris Street, Ultimo, end 1994)
Corner Mansfield and Batty Streets
Balmain

Kuring-gai Campus
Eton Road
Lindfield
(PO Box 222, Lindfield, NSW, 2070)

St Leonards Campus
• Dunbar Building
  Corner Pacific Highway and Westbourne Street, Gore Hill

• Clinical Studies, Centenary Lecture Theatre and West Wing Reserve Road, Royal North Shore Hospital

• Gore Hill Research Laboratories
  Royal North Shore Hospital

• School of Legal Practice (College of Law)
  Corner Chandos and Christie Streets
  St Leonards
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Balmain Campus
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- Small Street
  3 Small Street, Ultimo

- Wembley House
  839-847 George Street
  Sydney
Kuring-gai Campus
Eton Road
Lindfield

St Leonards Campus
- School of Biological and Biomedical Sciences
  Dunbar Building
  Corner Pacific Highway and Westbourne Street
  Gore Hill

- Clinical Studies, Centenary Lecture Theatre and West Wing
  Reserve Road, Royal North Shore Hospital

- Gore Hill Research Laboratories
  Royal North Shore Hospital

- School of Legal Practice (College of Law)
  Corner Chandos and Christie Streets
  St Leonards
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PREFACE

This handbook is one of a suite of ten publications comprising the University Calendar and nine faculty handbooks: Business; Design, Architecture and Building; Education; Engineering; Law and Legal Practice; Mathematical and Computing Sciences; Nursing; Science; and Social Sciences. Each handbook provides general information about the faculty as well as detailed information on the courses and subjects offered.

The Calendar contains the University By-law, which all students should read. It also contains a list of the University's courses, giving the name, abbreviation and title as indicated on the testamur. Copies of the Calendar are held in the University Library and in faculty offices, and may be purchased at the Co-op Bookshop.

The University also publishes a Student Information Guide, copies of which are provided free to students at enrolment. You should make sure that you read the student rules published in the guide. Information on the rights and responsibilities of students and on the services and facilities available is also given. The guide will assist you in your dealings with the University's administration and tell you whom to contact if you have a problem or need advice. Other publications providing information of a general nature are the UAC Guide, and the UTS Undergraduate and Postgraduate Studies Guides, all of which are available from the UTS Information Service.

For further information not provided in any of the publications mentioned, you should contact the UTS Information Service or your Faculty office. The latter will provide additional information on courses, methods of assessment, book lists and other faculty-specific information. If in doubt, don't hesitate to ask.

It is University policy to provide equal opportunity for all, regardless of race, sex, marital status, physical ability, sexual preference, age, political conviction or religious belief. The University also has an ethnic affairs policy to ensure that the University community is sensitive to the multicultural nature of Australian society and the cultural diversity within the University.

We hope you will enjoy your time as a student at UTS and wish you well in your studies.

FACULTY MISSION STATEMENT

The mission of the Faculty of Mathematical and Computing Sciences is to provide high quality, innovative programs of teaching, research and consulting, and continuing professional education to clients of wide backgrounds, both nationally and internationally. It is committed to technology transfer for the benefit of society by interacting closely with industry, business and government in research and development.

To support its mission, the Faculty aims to:

- excel in both the quality and professional relevance of its teaching programs, as well as the quality and intrinsic value of its research activities;
- preserve strong, effective links with industry, government, business, professional and community organisations;
- maintain a comprehensive range of educational programs to satisfy the spectrum of needs in the community;
- maintain a balanced portfolio of skills within its staff, which reflects perceived trends within the industries and disciplines addressed by the Faculty;
- expand research activities by promoting intra- and inter-faculty collaboration;
- encourage and facilitate the participation by staff in research activities;
- increase the participation rate of students in postgraduate programs – facilitated by the introduction of honours years;
- improve credit transfer arrangements to facilitate the movement of properly prepared students who wish to transfer between universities, or who move into the university sector with prior education and knowledge;
- ensure the principles of equity are observed in all aspects of the Faculty's work, with particular emphasis on the areas of importance identified in the University's Equity Plan;
- seek supplementary sources of external funding through research, joint ventures and entrepreneurial activities; and
- develop links with prestigious overseas universities and research institutions.
PRINCIPAL DATES FOR 1994

AUTUMN SEMESTER

January
5  School of Legal Practice enrolment day at St Leonards campus
10  Release of HSC results
14  Formal supplementary examinations for 1993 Spring semester students
17  Closing date for changes of preference to the Universities Admissions Centre (UAC) from 1993 NSW HSC applicants (by 4.30 pm)
20-31  Enrolment of students at City campus
26  Australia Day
28  Public school holidays end

February
1-17  Enrolment of students at City campus
2-7  Enrolment of new undergraduate students at City campus - includes UAC and direct applicants
7  Enrolment of all Teacher Education students at Kuring-gai campus
21  Enrolment of School of Biological and Biomedical Sciences students at St Leonards campus
28  Classes begin

March
11  Last day to enrol in a course or add subjects
11  Last day to change to upfront HECS payment
25  Last day to apply for leave of absence without incurring student fees/charges
31  HECS Census Date
31  Last day to withdraw from a subject without financial penalty

April
1  Public school holidays begin
1  Good Friday
4  Easter Monday
5-8  Vice-Chancellors’ Week (non-teaching)
6  Graduation period begins
8  Public school holidays end
8  Last day to withdraw from a subject without academic penalty
8  Last day to withdraw from a course without academic penalty
22  Graduation period ends
25  Anzac Day
30  Last day to apply to graduate in Spring semester 1994

May
31  Closing date for undergraduate/postgraduate applications for Spring semester

June
13  Formal examination period begins
27  Public school holidays begin

SPRING SEMESTER

July
1  Formal examination period ends
4  School of Legal Practice enrolment day at St Leonards campus
4-8  Vice-Chancellors’ Week (non-teaching)
8  Public school holidays end
22  Release of Autumn semester examination results
22  Formal supplementary examinations for Autumn semester students
25-29  Confirmation of Spring semester programs
26-27  Enrolment of new and readmitted students and students returning from leave/concurrent study

August
1  Applications available for undergraduate and postgraduate courses
1  Classes begin
4  Last day to withdraw from full-year subjects without academic penalty
12  Last day to enrol in a course or add subjects
12  Last day to change to upfront HECS payment
26  Last day to apply for leave of absence without incurring student fees/charges (Spring enrolments only)
31  HECS Census Date
31  Last day to withdraw from a subject without financial penalty
31  Last day to apply to graduate in Autumn semester 1995
## September

9  Last day to withdraw from a subject without academic penalty
9  Last day to withdraw from a course without academic penalty
26 Public school holidays begin
26-30 Vice-Chancellors’ Week (nonteaching)
30 Closing date for undergraduate applications via UAC (without late fee)
30 Closing date for inpUTS Special Admission Scheme applications
30 Closing date for postgraduate applications (to be confirmed)
30 Graduation period begins

## October

7 Public school holidays end
31 Closing date for postgraduate research and course award applications
31 Closing date for undergraduate applications via UAC (with late fee)
31 Closing date for undergraduate applications direct to UTS (without late fee)

## November

14 Formal examinations begin

## December

2 Formal examinations end
19 Public school holidays begin
23 Release of Spring semester examination results

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1 Information is correct as at 5 November 1993. The University reserves the right to vary any information described in Principal Dates for 1994 without notice.

2 HECS/postgraduate course fees will apply after the HECS Census Date.

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### THE FACULTY OF MATHEMATICAL AND COMPUTING SCIENCES

From 1995, only new students and those enrolled in courses that have undergone major changes will receive a free handbook.

The Faculty of Mathematical and Computing Sciences consists of two Schools – Mathematical Sciences and Computing Sciences. Together, these disciplines form the basis of 'enabling technologies' for applications in most other disciplines.

Each school teaches towards its own professional degrees from undergraduate through to doctoral studies. Thus, all the course and student administration, and much of the staff and research management are conducted at the school level. Each school has, as a consequence, developed its own management structure appropriate for the support of its teaching and research programs. Teaching is carried out across all campuses of the University, with the exception of the Balmain campus.

The Faculty has a commitment to cooperative education, both of the work experience 'sandwich' form, and of the newer style cooperative scholarship format. The Faculty is active in research and has close liaison with industry in all aspects of its work.

The structure of the School of Mathematical Sciences reflects the orientation and emphases of its academic program. There are three units:

- Mathematics
- Computational Mathematics
- Statistics and Operations Research

The School also provides a support service to all students of the University studying in various introductory mathematical or quantitative areas through its Mathematics Study Centre. Most of the teaching in the Centre occurs at an individual level and the Centre is open for at least 30 hours each week, with certain times devoted to particular areas of mathematics. Students can obtain help with individual problems, specific to a particular course. Alternatively, students with more systematic problems may study in the Centre on a regular basis, obtaining assistance from a tutor as necessary.
The structure of the School of Computing Sciences reflects the orientation and emphases of its academic work. There are two departments which are made up of two units:

Department of Computer Science
- Computer Methods Unit
- Computer Systems Unit

Department of Information Systems
- Information Systems Technology Unit
- Information Management Unit

The Key Centre for Advanced Computing Sciences is one of the seven original Key Centres established by the Commonwealth Government in 1985, and was the first federally-funded Centre for Advanced Computing Sciences in Australia. The Key Centre is based in the School of Computing Sciences and the School of Electrical Engineering; it is committed to research in computing, particularly through the development of links with industry.

The School of Computing Sciences presents a selection of Continuing Professional Education (CPE) courses each semester. These courses include Pascal Programming, Cobol Programming, Unix/C and Auditing Computer Systems. The School also offers a selection of professionally oriented courses from time to time; these courses include database design, expert systems design, distributed databases and capacity planning. Enquiries on CPE courses should be directed to the Key Centre on 330 1331.

**LIST OF COURSES AND CODES**

The Faculty offers the following courses:

**School of Mathematical Sciences**
- Bachelor of Science in Mathematics MM01
- Bachelor of Science (Honours) in Mathematics MM02
- Bachelor of Mathematics and Finance MM03
- Bachelor of Mathematics and Finance (Honours) MM04
- Graduate Diploma in Operations Research MM52
- Graduate Diploma in Statistics MM65
- Master of Science in Operations Research (by coursework) MM53
- Master of Science (by thesis) MM51
- Doctor of Philosophy MM54
- Graduate Certificate in Mathematical Sciences MM56

**School of Computing Sciences**
- Bachelor of Science in Computing Science MC02
- Bachelor of Information Technology MC03
- Graduate Diploma in Data Processing MC52
- Graduate Diploma in Information Technology Management MC75
- Master of Science in Computing (by coursework) MC53
- Master of Business in Information Technology Management MC85
- Master of Science (by thesis) MC51
- Doctor of Philosophy MC54
- Graduate Certificate in Applied Computing MC57
- Graduate Certificate in Advanced Information Technology MC62
- Graduate Certificate in Computer Science MC60
- Graduate Certificate in Human-Computer Interaction MC65
- Graduate Certificate in Information Systems MC61
- Graduate Certificate in Information Technology Management MC63
- Graduate Certificate in Programming Practice MC64
- Graduate Certificate in Software Quality Assurance MC56

All enquiries regarding courses should be directed to the School Offices. For contact numbers refer to school sections of this handbook.

**OFFICE LOCATION**

The office of the Dean of Mathematical and Computing Sciences and general Faculty Office are located in Room 335 on the third floor of Building 4, Broadway, City campus. Staff associated with these offices are:

Dean
Associate Professor
J M Hughes
Room Extn

342A 1801
STATEMENT OF GOOD PRACTICE AND ETHICS IN INFORMAL ASSESSMENT

AIMS OF ASSIGNMENTS

In many subjects offered by the Faculty, students undertake assessment tasks in the form of assignments. The setting of assignments is intended to promote a number of educational aims, including furthering each student’s learning of the subject, particularly the acquisition of practical skills; providing a means for staff to assess each student’s learning; providing feedback to the student on his or her progress in learning; and providing feedback to staff on the effectiveness of their teaching.

These aims can be subverted if students deceive staff about the authorship of their work.

ACCEPTABLE BEHAVIOUR

Using sources Whenever anything from someone else’s work is used, it is standard practice to indicate exactly where the information comes from. Acknowledgement is done by using a standard system of referencing, such as footnotes, end notes, the Harvard system, etc. The Guide to Writing Assignments (available from the Union Bookshop) explains how to use all these standard systems of reference.

Collaboration In some cases assignment guidelines may permit or require students to cooperate in developing a solution to part or all of an assignment. This may occur formally when a staff member assigns students to groups and indicates which components of the assignment they are to work on as a group and which components they are to work on individually.

It may also occur informally. For example, some assignments may involve an ‘ideas gathering’ phase followed by an ‘execution’ phase. Students may be permitted to collaborate informally on the preliminary phase(s), but be expected to work completely individually on the subsequent phase(s). In a programming assignment, for example, it is normally acceptable for one student to discuss with another student (or other person) the specifications of the task so as to determine the requirements (see below). Whether this collaboration could extend to subsequent phases (such as the design phase) would depend on the assignment guidelines; normally, collaboration in the design and subsequent phases is not permitted.

Depending on the type of assignment and degree of collaboration permitted it is possible to define several categories of collaboration:

- individual effort (the student is required to work on all phases entirely by himself or herself);
- group effort (the student is required to work on all phases as part of a formal group);
- mixed effort (the student is required or permitted to work on some or all phases as part of a formal or informal group).

Unless assignment guidelines specifically state otherwise, a student should assume that an assignment requires a completely individual effort. The forms of cooperative collaborative behaviour that are acceptable under most circumstances are:

- discussing assignment specifications with another student (or other person) with a view to clarifying what is required;
- getting help from another student (or other person) on technical matters that are not directly part of the assessment task (eg, on how to use some facility provided by the computer system, such as the editor);
- getting help from another student (or other person) in debugging a program. This is a common occurrence in computing; and
- obtaining help from a tutor.

Generally, what distinguishes the acceptable cases of collaborative behaviour from the unacceptable ones is the student’s intention to deceive. For example, in an
assignment requiring a completely individual effort, a student may encounter some snag, such as an unfamiliar compiler diagnostic. If the student were to seek help from another student (or person) to remove the snag, then this would normally be considered acceptable behaviour. If, however, several students designed and coded a solution together, then disguised this collaboration, that would be unacceptable behaviour.

UNACCEPTABLE BEHAVIOUR

Outright lying This is seen most often in programming assignments, where the program does not run, or runs incorrectly, yet the output handed in is correct. The output has been ‘tailored’ using a word processor in an attempt to fool the marker. Lying is never acceptable behaviour.

Plagiarism Plagiarism is the action of taking and using as one's own the thoughts, writings, or inventions of another with the intention to deceive.

For example, if one student in a computing subject were to obtain a copy of another student's (or other person's) program, were to modify parts of the program (eg, change variable names) so as to disguise its origin, and then submit the modified program as his or her solution, then this would be considered plagiarism.

As another example, a student may obtain all or a major part of the solution to an assignment problem from a text book and, without acknowledging this, submit the solution as his or her own work.

As a further example, a student may use a source of information in an essay, without acknowledging the source. Such plagiarism may range from a sentence or two, or a table or diagram, to occasional cases where the entire paper consists of material copied from a book with only a few sentences added by the student. The student thus submits another's ideas as his or her own work.

Plagiarism is a form of cheating and is never acceptable.

Collusion Collusion occurs when a student combines with one or more other students (or other persons) to produce a common essay or solution to part or all of an assignment, disguises the shared origin of the solution, and submits the solution as his or her individual work.

Collusion is regarded as a form of cheating and is never acceptable.

SCHOOL OF MATHEMATICAL SCIENCES

The School of Mathematical Sciences offers two courses leading to Bachelor's degrees, postgraduate courses leading to qualifications at the Graduate Certificate, Graduate Diploma and Master's level and two research degree programs leading to Master's and Doctoral level qualifications. They are:

the Bachelor of Science in Mathematics, which is offered as a three-year Pass degree and a fourth year Honours degree;

the Bachelor of Mathematics and Finance, offered in conjunction with the School of Finance and Economics, as a three-year Pass degree and a fourth year Honours degree;

the Graduate Certificate in Mathematical Sciences;

the Graduate Diploma in Statistics;

the Graduate Diploma in Operations Research;

the Master of Science in Operations Research (by coursework);

the Master of Science, which is awarded on the basis of supervised research and presentation of a thesis;

the Doctor of Philosophy, which is awarded on the basis of supervised research and presentation of a thesis.

STAFF CONTACT LIST

All staff of the School of Mathematical Sciences are located on Level 15 and 16 of the Tower Building (Building 1) on the City campus (Broadway).

When telephoning from outside the University all extension numbers should be prefixed by the digits 330.

<table>
<thead>
<tr>
<th>Name</th>
<th>Extn</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Professor</td>
<td>2247</td>
<td>1513</td>
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<tr>
<td>Lindsay Botten</td>
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<td></td>
</tr>
<tr>
<td>Head of School</td>
<td></td>
<td></td>
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<tr>
<td>Mr Martin Caden</td>
<td>2253</td>
<td>1618</td>
</tr>
<tr>
<td>Senior Systems Programmer</td>
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<td></td>
</tr>
<tr>
<td>Associate Professor</td>
<td>2262</td>
<td>1528</td>
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<tr>
<td>Graeme Cohen</td>
<td></td>
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<tr>
<td>Head, Mathematics Unit, and</td>
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<tr>
<td>Director of Postgraduate</td>
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COMPUTING FACILITIES

The School of Mathematical Sciences operates a number of powerful minicomputer systems, all running versions of the UNIX operating system. These include a Sun Sparcstation 2, two Sun ELCs, a Sun Sparcstation 1, a Silicon Graphics 4/25S, a Silicon Graphics 4/20G and a MIPS M/800. In total, these systems include over five gigabytes of storage space. The Sun systems run SunOS, derived from the Berkeley version of UNIX, while the other systems run AT&T System V UNIX. All of these systems are linked to the University's network via the School's TCP/IP subnet.

Access to the School's systems is available from three laboratories, owned and operated by the School for mathematics students, as well as from the various public access laboratories operated by the University's Information Technology Division. The School's laboratories provide terminals and Sun 3/50 workstations acting as X-terminals networked to a Sun server. They also provide IBM style PC 386 compatible computers linked via the School's Novell network. These PCs also act as terminals to any UNIX system in the University.

There are a number of limited access graphics instruments, including an HP 7580A A1 size drafting plotter, Silicon Graphics Iris 4D, PCs emulating graphics terminals, image processing hardware, and Postscript laser printers. An extensive library of in-house FORTRAN subroutines provide 2D and 3D graphics support.

The School has also acquired a significant quantity of software running on the Silicon Graphics, PCs, and Sun systems to support teaching and research in statistics, operations research, applied mathematics and computing. This is supplemented by software resources supplied centrally by the Information Technology Division.

Extensive use is made of the University’s central facilities, which consist of an Amdahl 470V/8 system and a number of large Sun server systems. These can all be accessed from any PC laboratory in the University, via ethernet.

The School is also actively involved in two major regional computing consortia. The Sydney Regional Centre for Parallel Computing operates a Thinking Machines Corporation CM5 parallel computer, located at the University of New South Wales and available to registered users via the AARNet. The Vislab Consortium operates a scientific visualisation project, with principal hardware components located at the University of Sydney, and available to users via AARNet.
UNDERGRADUATE PROGRAMS

Bachelor of Science in Mathematics (BSc)

Course code MM01

This degree aims to prepare students for employment in industry, commerce and government and to provide the foundation for higher studies in mathematics. It provides great flexibility by allowing students to follow a course of study which best suits their interests and aspirations. It aims to help students acquire sufficient experience and understanding in a broad range of mathematical disciplines to enable them to apply mathematical and computing techniques to industrial and commercial problems.

The course operates as a three-year Pass degree with a fourth year Honours degree. The basic structure of the Pass degree is as follows:

A core – providing a thorough grounding in the elements of mathematics, statistics, operations research, computing, and their applications. This component, occupying half of the Pass degree, is taught during the first two years of the full-time program.

A mathematics major – which occupies half of Year 3 of the full-time course (or Years 5 and 6 of the part-time course) and may be taken in one of the areas of applied mathematics, statistics or operations research. This framework provides for specialised study of a particular area of application. A major in operations research involves topics such as linear programming, simulation and optimisation. The statistics major aims to expose students to realistic statistical problems, preparing them to cope with data and its associated uncertainty and variability. Applied mathematics, particularly since the advent of computers, has developed a large collection of tools for the solution of practical problems. In many cases, these can be unified by a few basic geometric, analytic and algebraic ideas. The applied mathematics majors aim to develop these ideas and apply them in a variety of complex and practical situations.

Electives – which occupy one-third of the course and may be subjects from any school of the University chosen by students to strengthen their understanding in an area of their choice. Common choices are the major in computing offered by the School of Mathematical Sciences, an additional major in mathematics, a sub-major in financial management and various sub-majors in the sciences.

The computing major provides students with both practical and theoretical training in computer science (and its mathematical foundations), information systems and commercial computing, and a wide variety of applications. Because this major occupies the entire elective sequence, students who wish to pursue it are advised to commence it in their first year of study. However, because it is an elective major, students are not obliged to follow it to completion. The major is accredited at Level 1 by the Australian Computer Society and, accordingly, those who do complete it are eligible to apply for Associate Membership of that Society.

The course may be attempted on either a full-time or a part-time basis. Part-time students will be accommodated by the provision of some evening classes. It is expected that all part-time students will be able to attend classes for one afternoon and two evenings per week.

The standard full-time load for one semester is six subjects worth four credit points each and the standard part-time load for one semester is three subjects worth four credit points each. Most mathematics subjects involve two hours of lectures and a one-hour tutorial per week. Some subjects (especially those in computing) have additional laboratory hours.

Subject synopses and related details appear at the end of this section. As a general rule students should devote about twice the number of hours per week that are allocated to lectures and tutorials.

FULL-TIME PROGRAM

Credit points for each subject are shown in parentheses.

Year 1

<table>
<thead>
<tr>
<th>Autumn semester</th>
<th>Spring semester</th>
</tr>
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<tbody>
<tr>
<td>34706</td>
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<tr>
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<td>Analysis 1 (4cp)</td>
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<td>34701</td>
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<tr>
<td>Algebra 1 (4cp)</td>
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<td>34710</td>
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<td>Calculus (8cp)</td>
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<td>34770</td>
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<tr>
<td>Computing 1A (4cp)</td>
<td></td>
</tr>
<tr>
<td>Electives 1 (approx 4cp)</td>
<td></td>
</tr>
</tbody>
</table>
Year 2

**Autumn semester**
- 34740 Introduction to Operations Research Models (4cp)
- 34803 Algebra 3 (4cp)
- 34815 Ordinary Differential Equations (4cp)
- 34817 Vector Calculus (4cp)

**Spring semester**
- 34812 Analysis 2 (4cp)
- 34818 Complex Variables (4cp)
- 34821 Partial Differential Equations 1 (4cp)
- 34852 Statistics 2 (4cp)
- 34891 Numerical Methods A (4cp)

Year 3

**Autumn semester**
- 34790 Numerical Computing (4cp)
- 34802 Algebra 2 (4cp)
- Electives 1 (approx 8cp)

**Spring semester**
- 34803 Algebra 3 (4cp)
- 34815 Ordinary Differential Equations (4cp)
- Electives 1 (approx 4cp)

Year 4

**Autumn semester**
- 34812 Analysis 2 (4cp)
- 34821 Partial Differential Equations 1 (4cp)
- Electives 1 (approx 4cp)

**Spring semester**
- 34818 Complex Variables (4cp)
- 34852 Statistics 2 (4cp)
- 34891 Numerical Methods A (4cp)

Years 5 and 6

Years 5 and 6 of the part-time course comprise the Mathematics Major. This consists of a prescribed sequence of six subjects each worth four credit points taken from one of the four areas of statistics, operations research and physical and modern applied mathematics, together with 24 credit points of elective subjects.

**Note**
For each semester in Years 5 and 6 students should choose subjects with an approximate value of 12 credit points.

1 Students must attempt over the complete program elective subjects worth 48 credit points, distributed approximately as shown above in terms of credit point load. These electives may be chosen from subjects offered within the University and acceptable to the School of Mathematical Sciences. The most common choice of elective pattern is the computing major. Electives are discussed further below.

**MAJOR AREAS OF STUDY**
Students must complete at least one of the mathematics majors in the areas of statistics, operations research, modern applied mathematics or physical applied mathematics. Students may also choose to complete the major in computing.
• STATISTICS
FULL-TIME PROGRAM
Year 3

Autumn semester
34953 Statistical Inference (4cp)
34955 Regression Analysis (4cp)
34960 Probability (4cp)

Spring semester
34956 Design of Experiments (4cp)
34957 Quality Control (4cp)
34961 Stochastic Processes 1 (4cp)

PART-TIME PROGRAM
Years 5 and 6

Autumn semester
34953 Statistical Inference (4cp)
34955 Regression Analysis (4cp)
34961 Stochastic Processes 1 (4cp)

Spring semester
34956 Design of Experiments (4cp)
34957 Quality Control (4cp)
34960 Probability (4cp)

• OPERATIONS RESEARCH
FULL-TIME PROGRAM
Year 3

Autumn semester
34930 Simulation Techniques (4cp)
34931 Linear Programming (4cp)
34938 Financial Modelling Techniques (4cp)

Spring semester
34932 Optimisation Techniques (4cp)
34936 Decision Theory (4cp)
34961 Stochastic Processes 1 (4cp)

PART-TIME PROGRAM
Years 5 and 6

Autumn semester
34930 Simulation Techniques (4cp)
34931 Linear Programming (4cp)
34938 Financial Modelling Techniques (4cp)
34992 Numerical Methods B (4cp)

• PHYSICAL APPLIED MATHEMATICS

Full-time program Year 3 and part-time program Years 5 and 6

Autumn semester
34922 Partial Differential Equations 2 (4cp)
34924 Mechanics (4cp)
34927 Deterministic Optimal Control (4cp)

Spring semester
34916 Mathematical Methods (4cp)
34925 Wave Theory (4cp)
34992 Numerical Methods B (4cp)

• MODERN APPLIED MATHEMATICS

Full-time program Year 3 and part-time program Years 5 and 6

Autumn semester
34904 Algebra 4 (4cp)
34913 Modern Analysis (4cp)
34920 Integral Equations (4cp)

Spring semester
34914 Measure Theory (4cp)
34995 Advanced Numerical Analysis (4cp)
34996 Convexity and Optimisation (4cp)

1 In order to complete the requirements for either of the two applied mathematics majors, students must complete at least 16 credit points from the major of their choice and select the remainder from the alternative major. Subjects on offer in these majors may vary from year to year and will depend on demand. Students interested in these majors should discuss their enrolment with the Director of Undergraduate Studies late in the year immediately prior to their intended enrolment.

• COMPUTING
FULL-TIME PROGRAM
Year 1

Autumn semester
31611 Information Systems (4cp)

Spring semester
34771 Computing 1B (4cp)
34781 Mathematical Foundations of Computing 1 (4cp)

Year 2

Autumn semester
31622 Commercial Programming Development (4cp)
34872 Computing 2 (4cp)
Spring semester
34873  Computing 3 (4cp)
Year 3

Autumn semester
34982  Mathematical Foundations of Computing 2 (4cp)
Computing Electives (approx 8cp)

Spring semester
34984  Language Theory (4cp)
Computing Electives (approx 8cp)

PART-TIME PROGRAM
Year 1

Spring semester
34781  Mathematical Foundations of Computing 1 (4cp)

Year 2

Autumn semester
31611  Information Systems (4cp)

Spring semester
34771  Computing 1B (4cp)

Year 3

Autumn semester
34872  Computing 2 (4cp)

Spring semester
34873  Computing 3 (4cp)

Year 4

Autumn semester
31622  Commercial Programming Development (4cp)

Years 5 and 6

Autumn semester
34982  Mathematical Foundations of Computing 2 (4cp)
Computing Electives (approx 8cp)

Spring semester
34984  Language Theory (4cp)
Computing Electives (approx 8cp)

COMPUTING ELECTIVES
As a requirement of the computing major, elective subjects in computing to a value of 16 credit points must be completed in Year 3 of the full-time program or in Years 5 and 6 of the part-time program. These subjects may be selected from the following list.
34975  Computer Graphics (4cp)
34976  Neural Networks (4cp)
34977  Formal Specification (4cp)
34983  Mathematical Foundations of Computing 3 (4cp)
34985  Digital Image Processing (4cp)
34986  Cryptology (4cp)

Subjects in this list will be offered subject to demand and staff availability. Alternatively, students may undertake subjects offered by the School of Computing Sciences, subject to the approval of the Head of the Computational Mathematics Unit. Students wishing to take elective subjects in the area of commercial information systems are advised to enrol in subjects in the areas of systems analysis (for example, 31621 Systems Analysis) and database theory (for example, 31631 Database) offered by the School of Computing Sciences.

ELECTIVE SUBJECTS OFFERED WITHIN THE BSc IN MATHEMATICS DEGREE
There are 48 credit points in the Bachelor of Science in Mathematics program allocated to elective subjects. Students may choose to complete these subjects in a number of ways:

- By completing one additional mathematics major, leaving 24 unspecified elective credit points to be completed in the case of most double majors, and 28 unspecified elective credit points to be completed in the case of a double major in Statistics and Operations Research.

- By completing the Computing major, leaving no unspecified elective hours.

- By completing subjects worth a total of 48 credit points from subjects offered by this School or by other schools of the University. Common choices of subjects include those forming recognised sub-majors in other disciplines such as financial management, physics and electronics.

Whatever subjects are chosen, it is necessary that the student has satisfied all prerequisites of the chosen subjects; the student's enrolment in a subject is approved by the school which offers that subject; and the student's choice of subjects is approved by the School of Mathematical Sciences.
In addition to subjects listed within the descriptions of the majors, the following subjects offered by the School of Mathematical Sciences may be taken as electives.

34692-6 Project (2–6 cp)
34807 History of Mathematics (4cp)
34894 Mathematical and Business Modelling (4cp)
34906 Differential Geometry (4cp)
34909 Seminar: Mathematics (4cp)
34934 Network Optimisation (4cp)
34935 Inventory Control (4cp)
34939 Seminar: Operations Research (4cp)
34959 Seminar: Statistics (4cp)
34979 Seminar: Computing (4cp)

Sub-majors are available in various areas including finance and physics. Students may contact the office of the School of Mathematical Sciences for details.

Bachelor of Science (Honours) in Mathematics (BSc(Hons))

Course code MM02

The Honours degree provides the opportunity for students to develop their level of competence in the area of mathematics chosen as their major in the BSc in Mathematics degree. The Honours degree is offered over one year on a full-time basis or two years on a part-time basis and consists of advanced coursework (comprising 75 per cent of the program) and a project (comprising the remaining 25 per cent). This project provides the opportunity for students to utilise the expertise developed by their coursework in an area of application.

Students who complete the Honours degree will, accordingly, be well prepared to enter the workforce at a high level or to undertake graduate studies.

The precise selection of subjects to be offered in any strand in any given year will depend on the interests of students and the interests and availability of staff. Students should consult the Honours Coordinator, who will assist them in planning their program. This is of particular importance for part-time students since few subjects will be offered at night.

Admission to the Honours degree will be assessed individually according to the following criteria:

- Students who are eligible to graduate from the BSc in Mathematics degree with an average mark of 65 or more in Year 2 of the core and in their chosen major will be eligible for entry to the Honours degree.
- Students who have obtained qualifications equivalent to the BSc in Mathematics degree will, upon application, be considered for entry by the Head of the School of Mathematical Sciences, on the basis of assessed potential to complete the Honours degree.

The Honours program will require the completion of subjects worth 48 credit points in one year of full-time study or two years of part-time study. Honours will be offered in mathematics, statistics and operations research and will consist of nine coursework subjects each of four credit points and a project of 12 credit points.

Students contemplating taking Honours are advised to consult the Honours Coordinator or the Director of Undergraduate Studies on completing the core of the BSc in Mathematics degree. This will enable them to plan studies for the following years and make decisions at an early stage which will not close off options that otherwise would be available to them. Usually students decide to apply for Honours before the completion of the BSc but under the structure of the course, entry to Honours is possible even if the decision to do so is delayed until completion of the BSc.

Students who are deemed eligible for admission will be assigned a supervisor who will monitor their progress and supervise their project, which will be assessed by a report and seminar.

Students' final results will be based on the nine chosen Honours level subjects and the project. Satisfactory completion of the Honours program will result in the award of an Honours degree with the grades of First Class, Second Class (Division 1), or Second Class (Division 2).

The grade of Honours will be determined from an average mark of all Honours level subjects (subject numbers 340**) and the project weighted by the credit point values of the individual components. Grades of First Class, Second Class (Division 1) and Second Class (Division 2) Honours will be
awarded corresponding respectively to an average mark of 80 or greater, 65 to 79 and 50 to 64. An average mark of less than 50 will be regarded as a failure for the course and the student will be eligible to graduate with a pass BSc degree. A project that is of outstanding merit may justify an increase in the grade of Honours. A student with First Class Honours and outstanding results may be awarded a University Medal.

COURSE PROGRAM
The Honours degree consists of:

- 36 credit points of Honours level mathematics subjects (numbered as 340**) chosen in accordance with the rules below;
- a project whose weight is 12 credit points.

Honours will be offered in the mathematics, operations research and statistics strands, although some strands may not be offered in a given year. Each strand consists of:

- two compulsory subjects: 34013 Modern Analysis (Honours) and 34014 Measure Theory (Honours), each worth four credit points.

It should be noted that some Honours level subjects have as prerequisites Modern Analysis (Honours) and Measure Theory (Honours) which may be taken in Year 3 of the BSc course. If this is not done then some Honours degree options (such as Stochastic Processes 2) will be unavailable. If these subjects are taken in Year 3, students will need to defer two of their Year 3 BSc electives to the Honours year.

- a further 28 credit points of mathematics Honours (340**) subjects of which at least 20 credit points must be taken from one of the nominated major strands (mathematics, operations research or statistics);
- a 12 credit point project taken in the discipline of the major strand.

Undergraduate Studies to seek permission for such a substitution. There are no other exceptions to the general requirement of the 28/20 regulation rule referred to above.

Subjects offered in the various strands are:

Mathematics strand:
34019 Functional Analysis (4cp)
34023 Partial Differential Equations 3 (4cp)
34026 Fractal Geometry (4cp)
34028 Stochastic Optimal Control (4cp)
34029 Nonlinear Dynamical Systems (4cp)
34087 Analytic Number Theory (4cp)
34096 Convexity And Optimisation (Honours) (4cp)

Operations Research strand:
34031 Large-scale Mathematical Programming (4cp)
34033 Dynamic Optimisation (4cp)
34038 Corporate and Financial Decisions and Investment Analysis (4cp)
34040 Operations Research Models and Methodology (4cp)
34096 Convexity and Optimisation (Honours) (4cp)

Statistics strand:
34062 Stochastic Processes 2 (4cp)
34065 Time Series Analysis (4cp)
34066 Nonlinear Statistical Models (4cp)
34067 Multivariate Statistics (4cp)
34068 Statistical Modelling (4cp)
34069 Linear Models and Experimental Design (4cp)

Each strand is augmented by two seminar subjects, 34091 Honours Seminar 1 and 34092 Honours Seminar 2. These seminar subjects will be offered either by a visitor to the School or by members of the School's staff in some particular area of interest at the given time and play an important role in providing prospective graduate students with additional exposure to particular research areas of the School.

These strands may be amended as areas of significance and interest in the School change with time.

1 Under certain circumstances, students attempting the operations research strand may be permitted to substitute one Year 3 (349**) subject for an Honours level (340**) option in order to satisfy subject prerequisites. Typically, this would involve students wishing to include the subject 34062 Stochastic Processes 2 in their program and being permitted to substitute 34960 Probability for one of the Honours (340**) options. Students must consult the Honours Coordinator or the Director of
**Bachelor of Mathematics and Finance (BMathFin)**

Course code MM03

The years since deregulation of the Australian financial system have witnessed many sweeping changes and a considerable increase in the financial and economic activity of many Australian corporations. During this same period there has been an increasing use by major financial institutions of the sophisticated quantitative techniques that have been developed since the early 1970s. As a consequence, there is a demonstrated demand for a new type of graduate trained in both mathematics and finance.

To meet this need, the Bachelor of Mathematics and Finance degree has been jointly developed by the School of Mathematical Sciences and the School of Finance and Economics.

Students graduating from the BMathFin will have undertaken an integrated sequence of subjects in mathematics, statistics, finance, economics, accounting, business law and computing and so will have sound training in both the traditional theory of finance and the mathematical aspects of modern portfolio management techniques.

As a result, graduates should find interesting and rewarding employment in major financial institutions such as merchant banks, insurance companies and government instrumentalities.

The Bachelor of Mathematics and Finance is offered as a three-year Pass degree with a fourth year Honours degree (described below).

The Pass degree is offered on both a full-time and a part-time basis. The part-time course begins with a normal pattern of attendance of two nights and one afternoon per week. A standard program is given below. The final two years may require attendance at morning classes as some subjects, which form parts of other degrees, are not offered to part-time students at night. Programs will be arranged for students individually to incorporate the ten subjects of Year 3 of the full-time course over two years.

### FULL-TIME PROGRAM

#### Year 1

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<thead>
<tr>
<th>Autumn semester</th>
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<tbody>
<tr>
<td>22105</td>
<td>Accounting A (5cp)</td>
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<tr>
<td>25110</td>
<td>Microeconomics (5cp)</td>
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<td>34700</td>
<td>Discrete Mathematics (4cp)</td>
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<td>Algebra 1 (4cp)</td>
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<td>Calculus (8cp)</td>
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<tr>
<td>25209</td>
<td>Macroeconomics (5cp)</td>
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<tr>
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<td>Analysis 1 (4cp)</td>
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<tr>
<td>34751</td>
<td>Statistics 1 (4cp)</td>
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<tr>
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<td>Numerical Computing (4cp)</td>
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<td>Algebra 2 (4cp)</td>
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#### Year 2

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<tr>
<td>25210</td>
<td>Microeconomic Policy (5cp)</td>
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<tr>
<td>25308</td>
<td>Financial Institutions and Markets (5cp)</td>
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<tr>
<td>25314</td>
<td>Business Finance 1 (5cp)</td>
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<tr>
<td>34815</td>
<td>Ordinary Differential Equations (4cp)</td>
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<tr>
<td>34817</td>
<td>Vector Calculus (4cp)</td>
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<tr>
<td>34894</td>
<td>Mathematical and Business Modelling (4cp)</td>
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<tr>
<td>25905</td>
<td>Asset Pricing and Capital Markets Studies (Honours) (5cp)</td>
</tr>
<tr>
<td>34812</td>
<td>Analysis 2 (4cp)</td>
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<tr>
<td>34821</td>
<td>Partial Differential Equations 1 (4cp)</td>
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<tr>
<td>34852</td>
<td>Statistics 2 (4cp)</td>
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<td>34936</td>
<td>Decision Theory (4cp)</td>
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<td>79101</td>
<td>Law for Business (5cp)</td>
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#### Year 3

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<tbody>
<tr>
<td>25421</td>
<td>International Financial Management (5cp)</td>
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<tr>
<td>25906</td>
<td>Investment Analysis and Portfolio Management (Honours) (5cp)</td>
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<td>34913</td>
<td>Modern Analysis(^1) (4cp)</td>
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<td>34955</td>
<td>Regression Analysis (4cp)</td>
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<td>Probability (4cp)</td>
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<tr>
<td>25502</td>
<td>Current Issues in Finance (5cp)</td>
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<tr>
<td>25606</td>
<td>Financial Time Series Analysis (5cp)</td>
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<tr>
<td>34914</td>
<td>Measure Theory(^1) (4cp)</td>
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<td>34961</td>
<td>Stochastic Processes 1 (4cp)</td>
</tr>
<tr>
<td>34992</td>
<td>Numerical Methods B (4cp)</td>
</tr>
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</table>
PART-TIME PROGRAM

Year 1

*Autumn semester*
34700 Discrete Mathematics (4cp)
34710 Calculus (8cp)

*Spring semester*
22105 Accounting A (5cp)
25110 Microeconomics (5cp)
34701 Algebra 1 (4cp)

Year 2

*Autumn semester*
25209 Macroeconomics (5cp)
34711 Analysis 1 (4cp)
34751 Statistics 1 (4cp)

*Spring semester*
25210 Microeconomic Policy (5cp)
34817 Vector Calculus (4cp)

Year 3

*Autumn semester*
34790 Numerical Computing (4cp)
34802 Algebra 2 (4cp)
79101 Law for Business (5cp)

*Spring semester*
25308 Financial Institutions and Markets (5cp)
25314 Business Finance 1 (5cp)
34815 Ordinary Differential Equations (4cp)

Year 4

*Autumn semester*
34812 Analysis 2 (4cp)
34821 Partial Differential Equations 1 (4cp)
34894 Mathematical and Business Modelling (4cp)

*Spring semester*
25905 Asset Pricing and Capital Markets Studies (Honours) (5cp)
34852 Statistics 2 (4cp)
34936 Decision Theory (4cp)

Years 5 and 6

25502 Current Issues in Finance (5cp)
25421 International Financial Management (5cp)
25606 Financial Time Series Analysis (5cp)
25906 Investment Analysis and Portfolio Management (Honours) (5cp)
34913 Modern Analysis 1 (4cp)
34914 Measure Theory 1 (4cp)
34955 Regression Analysis (4cp)
34960 Probability (4cp)
34961 Stochastic Processes 1 (4cp)
34992 Numerical Methods B (4cp)

Note

Programs for Years 5 and 6 will be arranged for students individually. See the introduction to this section.

1 Students proceeding to the Honours year will be required to substitute 34013 Modern Analysis (Honours) and 34014 Measure Theory (Honours) for the two pass-level subjects.

Bachelor of Mathematics and Finance (Honours) (BMathFin(Hons))

Course code MM04

The Bachelor of Mathematics and Finance degree is also offered at an Honours level, requiring an additional year of advanced study. Honours degree graduates will be particularly sought after and their additional skills would enable them to compete for the top jobs in the banking sector. It is expected that most students will opt to undertake this additional year comprising nine coursework subjects in advanced mathematics, statistics and finance, each worth four credit points, and a research project worth 12 credit points.

Admission to the Honours degree will be assessed individually according to the following criteria:

- Students who are eligible to graduate from the BMathFin degree at UTS with a credit average, (ie, an average mark of 65 or more) over all subjects in Years 2 and 3 will be eligible for entry to the Honours degree, subject only to the approval of the Heads of the Schools of Mathematical Sciences and Finance and Economics.

- Students who have obtained qualifications equivalent to the BMathFin degree will be considered for entry, upon application, by the Heads of the two participating Schools on the basis of their assessed potential to complete the Honours degree.

The Honours degree will require completion of subjects worth 48 credit points over one year of full-time study. The year
consists of nine coursework subjects of an advanced nature in mathematics, statistics and finance together with a substantial project. The project will involve a major investigation in some area of finance, and will provide students with the opportunity to apply the skills developed in their coursework. The project will be assessed on the basis of a thesis and a seminar presented to the staff of both Schools.

The assessment of students' results will take into account the Honours level coursework subjects, the thesis and the seminar, and Honours at the grades of First Class, Second Class (Division 1), Second Class (Division 2) and Third Class will be awarded for the successful completion of the course.

The Honours degree will be offered for the first time in 1994.

Listed below is the course program for the BMathFin(Honours) degree. All subjects, except the thesis, carry four credit points, and require attendance of three hours each week. The thesis carries 12 credit points.

**COURSE PROGRAM**

**Year 4**

**Autumn semester**
- 25910 Thesis (6cp)
- 25907 Advanced Microeconomics (4cp)
- 34062 Stochastic Processes 2 (4cp)
- 34065 Time Series Analysis (4cp)
- 34927 Deterministic Optimal Control (4cp)

**Spring semester**
- 25910 Thesis (6cp)
- 25908 Futures and Options (4cp)
- 25909 Advanced Corporate Finance (4cp)
- 34028 Stochastic Optimal Control (4cp)
- 34029 Nonlinear Dynamical Systems (4cp)
- 34066 Nonlinear Statistical Models (4cp)

**POSTGRADUATE PROGRAMS**

**POSTGRADUATE RESEARCH DEGREES**

The Master of Science (by thesis) and Doctor of Philosophy degrees provide the opportunity for graduates to extend and deepen their knowledge in specialised areas of mathematics by undertaking research under the supervision of a member of the academic staff.

The main interests within the School of Mathematical Sciences are in applied and computational mathematics, operations research and statistics. Although a wide range of topics can be covered by the staff, particular interests and specialisations exist in the following areas:

**Clinical Trials and the Modelling of Medical Data**

Inversion of Raman spectra of living cells; stability and uniqueness in compartmental models for medical applications; diabetic control; insulin sensitivity; modelling of glucose and C-peptide response curves.

**Computational Mathematics and Computing**

Lattice rules for numerical multiple integration; development of AMPL (A Mathematical Programming Language); database management system for diabetes; computer performance modelling; mathematical foundations of computing; computer aided instruction in mathematics.

**Differential Geometry**

Topology and Ricci curvature; integral formulas of submanifolds of a Riemannian manifold.

**Geophysical Applications of Mathematics**

Seismic ray theory for slightly heterogeneous structures; properties of normal rays; seismic wave propagation; seismic velocity inversion; inverse problems; radio frequency propagation in coal seams.

**Mathematics Education**

PhD education of industrial mathematicians; mathematical education of engineers; tertiary education in applied mathematics.

**Number Theory**

Recurring sequences; odd perfect numbers and related numbers; arithmetical functions.

**Operations Research**

Manpower planning; delivery of health services; modelling of energy systems; simulation techniques.
Optics and Electromagnetic Diffraction Theory
Diffraction properties of 1D and 2D periodic structures; optics of thin films.

Statistics
Medical applications of statistics; measurement and test design; permissible statistics; stationary Markov sequences; simulation and density estimation.

The medically related research of the School is conducted through the Centre for Biomedical Technology which was formed in 1990. The Centre is an interfaculty network of research and education teams working in the field of biomedical technology. It integrates the University's diverse expertise and resources to enhance the scientific and technological base for biomedical technology research and training for industry, health care providers and government. Other schools involved with the Centre are the School of Biological and Biomedical Sciences, the School of Physical Sciences, the School of Electrical Engineering, the School of Mechanical Engineering, the School of Computing Sciences and the Faculty of Nursing.

In addition to these research interests, the staff of the School of Mathematical Sciences are involved in consulting activities and have well established and continuing industrial contacts. The staff are also active in their respective professional societies and publish numerous books and journal articles.

FEES
There are no tuition fees associated with either the MSc (by thesis) or the PhD program. HECS scholarships are awarded to all candidates for postgraduate research degrees, and these exempt them from the normal HECS payments.

RECENT THESIS
PhD theses
Hung W T, Modelling the Human Erythrocyte Sedimentation Rate, 1989
Ollerton R L, Adaptive Control and the Insulin Dependent Diabetic, 1990
Dobson R J, Modelling Host Regulation of Trichostrongylus Colubriformis, a Nematode Parasite of Sheep, 1992

MSc theses
Sayers M D, An Improved Lower Bound for the Total Number of Prime Factors of an Odd Perfect Number, 1987
Ollerton R L, Optimisation of Insulin Infusion Algorithms, 1988
Reuben A J, Mathematical Models of Erythrocyte Sedimentation, 1990
Haggar F, An Account of the Behaviour of Some Pairs of e(1) Variables, 1991
Lee J K, Strategies for Inversions for Some Geophysical and Medical Applications, 1991

Doctor of Philosophy (PhD)
Course code MM54
The PhD program provides an opportunity for graduates to acquire high level research skills and substantially deepen their knowledge in an area of the mathematical sciences by working under the guidance of a supervisor. The research program entails survey and mastery of a large body of literature in the chosen topic together with a substantial body of high level original work by the candidate. Students are also required to present seminars during the time of their enrolment and at the completion of their program.

The course is offered in full-time and part-time modes. For full-time enrolments the duration of the program is three years; for part-time enrolments it is six years. It is expected that part-time students will be able to devote 20 hours per week to the work towards the degree. All students are expected to maintain regular contact (at least weekly) with their supervisor.

Master of Science (by thesis) (MSc)
Course code MM51
The Master of Science program provides an opportunity for graduates to acquire research skills and deepen their knowledge in some areas of the mathematical sciences by working under the guidance of a supervisor who is a member of the full-time academic staff of the School. The research program entails survey and mastery of a substantial body of literature in the chosen topic together with original work from the
candidate. The degree is examined through the presentation of a thesis. Students are also required to present seminars during the time of their enrolment and at the completion of the program.

The course is offered in full-time and part-time modes. For full-time enrolments the normal duration of the program is two years; for part-time enrolments it is four years. It is expected that part-time students will be able to devote 20 hours each week to the work towards the degree. All students are expected to maintain regular contact (at least weekly) with their supervisor.

POSTGRADUATE COURSEWORK PROGRAMS

Master of Science in Operations Research (by coursework) (MSc)

Course code MM53

Operations research may be defined as the application of the methods of science to complex problems arising in the direction and management of large systems of people, machines, materials and money in industry, business, government and defence. This course aims to prepare graduates for high level professional work in the applications of operations research techniques to the problems of modern society.

The subjects in the program provide students with a suite of advanced techniques, together with the theoretical background for these methods. Studies in the fields of optimisation, mathematical programming, stochastic processes and the theory of finance, together with a broad survey of applications having industrial and social importance, will enable graduates to deal with high level professional work in operations research in business and industry.

FEES

The Master’s degree in Operations Research is offered within a fixed quota and the course fees have been set in accordance with University policy. In 1993, the tuition fees were $1,900 for each semester of equivalent full-time study. Fees for part-time students are levied on a pro rata basis. The total cost of the course is then $3,800 at current rates. Fees are revised from year to year in accordance with University and Government policy. Students paying tuition fees will not be liable for HECS (the Higher Education Contribution Scheme).

COURSE STRUCTURE

The course has a length of 48 credit points and consists of six core subjects (24 credit points), 12 credit points of elective subjects (incorporated to enable students to develop complementary skills) and a substantial project of 12 credit points (requiring students to undertake a survey and a modest level of research in some area of application of the discipline). The normal attendance pattern involves two years of part-time study. However, it is possible to complete the degree through one year of full-time study.

Applicants for this course must be graduates who have high level skills in the mathematical sciences. In particular, they must have:

- a knowledge of statistics equivalent to 34852 Statistics 2;
- completed studies in operations research corresponding to either the Graduate Diploma in Operations Research, the undergraduate major in operations research or its equivalent;
- completed prerequisites in mathematics which are presumed in the core subjects of the degree.

Applicants not satisfying these prerequisites are advised to consider enrolling in the graduate diploma or the graduate certificate programs offered by the School. Applicants should discuss their eligibility for entry with the Head of the Statistics and Operations Research Unit or the Director of Postgraduate Studies.

The course is composed of the following elements:

A sequence of subjects

The subjects are taught through lectures, tutorials and reading.

A seminar subject

Students are required to perform a survey of current literature and present a discussion of current and prospective research in operations research.

A major report

Students are required to investigate an approved topic in operations research. They are required to present an extensive written report and also to give an oral presentation in the form of a seminar.
Three electives
The electives have been included within the program to enable students to round out their education in an appropriate manner. It is intended that these subjects be of senior undergraduate standard or higher. Typical choices will include additional studies in operations research, statistics or possibly subjects from some area of business or management. The electives will be chosen by the student and an academic adviser who will be appointed by the Director of Postgraduate Studies.

Students will have their registration discontinued for failure to complete the course in three years from the time of registration in the case of a full-time student, or in four and a half years in the case of a part-time student (not inclusive of periods of leave of absence), or for recording any three failures in the course (unsatisfactory progress as defined by the Faculty Board resolution, FBMC/92/70).

PART-TIME PROGRAM
Semester 1
34033 Dynamic Optimisation (4cp)
34040 Operations Research Models and Methodology (4cp)
Electives (approx 4cp)

Semester 2
34031 Large-scale Mathematical Programming (4cp)
34038 Corporate Financial Decisions and Investment Analysis (4cp)
Electives (approx 4cp)

Semester 3
34036 Stochastic Models in Operations Research (4cp)
34039 Seminar: Applications in Operations Research (4cp)
34097 Report 1 (6cp)

Semester 4
34097 Report 1 (6cp)
Electives (approx 4cp)

This is a year-long subject. Students are expected to devote approximately three hours each week to the Report in Semester 3 and six hours each week in Semester 4.

Graduate Diploma in Operations Research (GradDipOR)
Course code MM52
This course is designed to train professional people in the application of operations research principles and methods. It may be regarded as a training or retraining course for graduates from a wide range of disciplines providing they have a sound foundation in mathematics, statistics and computing, to approximately second-year level. It is ideally suited for subsequent entry into the Master of Science in Operations Research.

The subjects in the Graduate Diploma provide a coverage of standard operations research techniques and their theoretical foundations. The range of topics covered and the level of presentation is commensurate with that found in senior undergraduate studies in these disciplines.

The length of the course is 48 credit points comprising 40 credit points of coursework (ten subjects) and a project of eight credit points.

Applicants for this course will be graduates from a variety of disciplines who satisfy the basic entry requirements consisting of a knowledge of pure and applied mathematics and statistics that is sufficient to satisfy the prerequisites of the program’s subjects and a knowledge of computer programming equivalent to the content of the subject 34790 Numerical Computing.

Applicants not satisfying these prerequisites are advised to consider enrolling in a graduate certificate course. Applicants for the Graduate Diploma program should discuss their eligibility with the Head of the Statistics and Operations Research Unit or the Director of Postgraduate Studies.

This course is offered with both full-time and part-time attendance patterns. The normal time to complete the course is one year for full-time students and two years for part-time students.

Students will have their registration discontinued for failure to complete the course in two years from the time of registration in the case of a full-time student, or in four years from the time of registration in the case of a part-time student (not inclusive of periods of leave of absence), or for failure in any subject three times (unsatisfactory progress as defined by the Faculty Board resolution, FBMC/92/71).

It is expected that the normal pattern of attendance will be part-time. Shown below is the course structure for part-time attendance over a period of two years. All subjects except the project carry four credit...
points and require attendance of three hours each week. The project carries eight credit points and requires six hours of attendance each week.

FEES

The Graduate Diploma in Operations Research is offered within a fixed quota and the course fees have been set in accordance with University policy. In 1993, the tuition fees were at $1,900 for each semester of equivalent full-time study. Fees for part-time students are levied on a pro rata basis. The total cost of the course is then $3,800 at current rates. Fees are revised from year to year in accordance with University and Government policy. Students paying tuition fees will not be liable for HECS (the Higher Education Contribution Scheme).

PART-TIME PROGRAM

| Semester 1 | 34740 Introduction to Operations Research Models (4cp) |
| 34852 Statistics 2 (4cp) |
| 34930 Simulation Techniques (4cp) |
| Semester 2 |
| 34931 Linear Programming (4cp) |
| 34935 Inventory Control (4cp) |
| 34936 Decision Theory (4cp) |
| Semester 3 |
| 34934 Network Optimisation (4cp) |
| 34938 Financial Modelling Techniques (4cp) |
| 34961 Stochastic Processes 1 (4cp) |
| Semester 4 |
| 34932 Optimisation Techniques (4cp) |
| 34997 Project (8cp) |

Graduate Diploma in Statistics (GradDipStats)

Course code MM65

The Graduate Diploma in Statistics aims to train graduates in the methods and principles of applied statistics. The course provides access to training or retraining in statistics to at least the level of skill attained by students completing the BSc degree with a major in statistics. Students will be expected to have had some exposure to statistics, usually the equivalent of two subjects to the second-year level. Some mathematical background is also necessary.

A knowledge of statistical methodology is becoming ever more important for graduates in many disciplines. Degree courses in the sciences, in engineering and in business often do not provide the exposure to statistics which graduates find they need in employment. Thus, this course is suitable for such graduates and also for those who have completed degrees in pure or applied mathematics without a major in statistics.

The subjects in the Graduate Diploma provide a coverage of standard statistical techniques and their theoretical foundations. The range of topics covered and the level of presentation is commensurate with that found in senior undergraduate studies in these disciplines.

The length of the course is 48 credit points, consisting of 40 credit points of coursework (ten subjects) and a project of eight credit points.

Applicants for this course will be graduates from a variety of disciplines who satisfy the basic entry requirements consisting of a knowledge of statistics and pure and applied mathematics that is sufficient to satisfy the prerequisites of the program’s subjects and a knowledge of computer programming equivalent to the content of the subject 34790 Numerical Computing.

Prospective applicants will be assessed by the Director of Postgraduate Studies and the Head of the Statistics and Operations Research Unit, and those who have not completed the necessary prerequisites will be required to enrol in appropriate subjects, either in a miscellaneous mode of study or as part of a graduate certificate program.

Students will have their registration discontinued for failure to complete the course in two years from the time of registration in the case of a full-time student, or in four years from the time of registration in the case of a part-time student (not inclusive of periods of leave of absence), or for failure in any subject three times (unsatisfactory progress as defined by the Faculty Board resolution, FBMC/92/71).

It is expected that the normal pattern of attendance will be part-time. Shown below is the course structure for part-time attendance over a period of two years.

FEES

At present no quota is available for this course and it is necessary to charge full fees. In 1993, the total cost of the course was $7,600.
PART-TIME PROGRAM

Semester 1
34930 Simulation Techniques (4cp)
34953 Statistical Inference (4cp)
34955 Regression Analysis (4cp)

Semester 2
34956 Design of Experiments (4cp)
34957 Quality Control (4cp)
34960 Probability (4cp)

Semester 3
34961 Stochastic Processes 1 (4cp)
Electives 1 (approx 8cp)

Semester 4
34936 Decision Theory (4cp)
34997 Project (8cp)

1 The electives are included to enable students to select topics which enhance their knowledge of the application of statistics in their chosen field. Students should discuss possible options with the Head of the Statistics and Operations Research Unit (or nominee).

Graduate Certificate in Mathematical Sciences

Course code MM56
The Graduate Certificate in Mathematical Sciences has been developed in response to a demand for short courses in statistics, operations research, and computational and applied mathematics. It provides those employed in industry with access to additional training or retraining in quantitative disciplines.

The course has a flexible structure and the wide range of subjects offered in the other postgraduate and undergraduate courses of the School of Mathematical Sciences would be available to intending students. Students may undertake any sequence of subjects offered by the School with a total value of 12 credit points, provided that individual subject prerequisites are satisfied. Approved elective subjects from other schools of the University may also be taken with the consent of the Head of School.

Applicants will normally be expected to hold a Bachelor's degree, or higher qualification, from a recognised tertiary institution. Applicants who do not possess such qualifications will be considered on an individual basis. Prior to their admission, all applicants will be required to discuss their preferred program of study with the Graduate Certificate Coordinator in order to ensure that they have the requisite background knowledge for their chosen subject sequences. A fee of $600 per subject is payable.

A number of coherent subject sequences in the areas of computational mathematics, applied mathematics, operations research and statistics are possible. Samples of these are listed below. Some computing subjects require extra attendance for laboratories. Details are given in the subject descriptions.

COMPUTATIONAL MATHEMATICS

Sequence A
Theme: Numerical Analysis

Presumed knowledge
Equivalent to tertiary-level courses in calculus, linear algebra and differential equations.

Program of study
34790 Numerical Computing (4cp)
34891 Numerical Methods A (4cp)
34992 Numerical Methods B (4cp)

Sequence B
Theme: Mathematical Computer Science (1)

Presumed knowledge
Equivalent to an introductory tertiary-level course in discrete mathematics.

Program of study
34770 Computing 1A (4cp)
34771 Computing 1B (4cp)
34781 Mathematical Foundations of Computing 1 (4cp)

Sequence C
Theme: Mathematical Computer Science (2)

Presumed knowledge
This sequence provides for an extension of the material prescribed in Sequence B. It is, therefore, presumed that students will have a working knowledge of Pascal or MODULA-2 and abstract data structures, as well as some experience with abstract algebraic structures (such as groups) and a functional programming language such as Miranda.

Program of study
34872 Computing 2 (4cp)
34873 Computing 3 (4cp)
34982 Mathematical Foundations of Computing 2 (4cp)
Sequence D
Theme: Mathematical Cryptology

Presumed knowledge
Equivalent to introductory-level courses in calculus and linear algebra.

Program of study
34790  Numerical Computing (4cp)
34803  Algebra 3 (4cp)
34986  Cryptology (4cp)

Sequence E
Theme: Neural Networks

Presumed knowledge
Equivalent to tertiary-level courses in statistics, multivariable calculus and matrix algebra.

Program of study
34790  Numerical Computing (4cp)
34802  Algebra 2 (4cp)
34976  Neural Networks (4cp)

MATHEMATICS

Sequence A
Theme: Differential Equations

Presumed knowledge
Equivalent to tertiary-level courses in multivariable calculus, real and complex analysis and linear algebra.

Program of study
34815  Ordinary Differential Equations (4cp)
34821  Partial Differential Equations 1 (4cp)
34922  Partial Differential Equations 2 (4cp)

Sequence B
Theme: Modern and Linear Algebra

Presumed knowledge
Equivalent to an introductory tertiary-level course in matrix algebra.

Program of study
34700  Discrete Mathematics (4cp)
34802  Algebra 2 (4cp)
34803  Algebra 3 (4cp)

Sequence C
Theme: Analysis with applications to Probability Theory

Presumed knowledge
Equivalent to tertiary-level courses in analysis, (ordinary) differential equations, and linear algebra.

Program of study
34812  Analysis 2 (4cp)
34913  Modern Analysis (4cp)
34914  Measure Theory (4cp)

Sequence D
Theme: Mathematical Control Theory

Presumed knowledge
Equivalent to introductory tertiary-level courses in calculus and linear algebra.

Program of study
34815  Ordinary Differential Equations (4cp)
34817  Vector Calculus (4cp)
34927  Deterministic Optimal Control (4cp)

OPERATIONS RESEARCH

Sequence A
Theme: Financial Modelling

Presumed knowledge
Equivalent to introductory tertiary-level courses in statistics and calculus.

Program of study
34740  Introduction to Operations Research Models (4cp)
34936  Decision Theory (4cp)
34938  Financial Modelling Techniques (4cp)

Sequence B
Theme: Techniques of Mathematical Programming

Presumed knowledge
Equivalent to introductory tertiary-level courses in statistics, calculus and matrix algebra.

Program of study
34740  Introduction to Operations Research Models (4cp)
34931  Linear Programming (4cp)
34932  Optimisation Techniques (4cp)
Sequence C  
Theme: Simulation and Decision Support  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics and elementary scientific computing.

Program of study  
34740 Introduction to Operations Research Models (4cp)  
34930 Simulation Techniques (4cp)  
34936 Decision Theory (4cp)

Sequence D  
Theme: Optimisation and Applications  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics, matrix algebra and operations research models, together with knowledge of computerised simulation (as in 34930 Simulation Techniques).

Program of study  
34931 Linear Programming (4cp)  
34934 Network Optimisation (4cp)  
34935 Inventory Control (4cp)

STATISTICS  
Sequence A  
Theme: Analysis of Experimental Data  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics and calculus.

Program of study  
34852 Statistics 2 (4cp)  
34955 Regression Analysis (4cp)  
34956 Design of Experiments (4cp)

Sequence B  
Theme: Industrial Applications of Statistics  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics and calculus.

Program of study  
34852 Statistics 2 (4cp)  
34955 Regression Analysis (4cp)  
34957 Quality Control (4cp)

Sequence C  
Theme: Stochastic Modelling  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics and calculus.

Program of study  
34852 Statistics 2 (4cp)  
34960 Probability (4cp)  
34961 Stochastic Processes 1 (4cp)

Sequence D  
Theme: Mathematical Statistics  

Presumed knowledge  
Equivalent to introductory tertiary-level courses in statistics and calculus.

Program of study  
34852 Statistics 2 (4cp)  
34953 Statistical Inference (4cp)  
34960 Probability (4cp)
NUMERICAL LISTING OF SUBJECTS

The following table indicates for each subject its number and name, the semester or semesters in which it is offered (these are subject to change), the credit point value, the number of contact hours, and prerequisites and corequisites (indicated by c). The letters A and S refer to Autumn and Spring semesters, respectively, and Y is used for a year-long subject. As a general guide, three contact hours suggests two hours of lectures and one tutorial hour per week, and five contact hours suggests a further two hours of laboratory work per week.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Subject Name</th>
<th>Semester Offered</th>
<th>Credit Points</th>
<th>Contact Hours</th>
<th>Prerequisite</th>
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Macroeconomics 25209
Microeconomic Policy 25210
Microeconomics 25110
Thesis 25910

SUBJECT DESCRIPTIONS

Guide to subject descriptions

The subject descriptions shown below indicate the subject number and name, the number of credit points for the subject (eg, 4cp), and the number of formal contact hours per week (eg, 3 hpw). Also shown are the prerequisites or corequisites, if any, and a brief outline of the content.

Prerequisites are subjects which must be completed before taking the subject to which they refer. Corequisites may be completed before or be taken concurrently with the subject to which they refer.

34013 MODERN ANALYSIS (HONOURS)
(4cp); 3 hpw
prerequisite 34812 Analysis 2, 34802 Algebra 2
As for 34913 Modern Analysis. Additional content: topological spaces, continuous functions, compactness, separation properties.

34014 MEASURE THEORY (HONOURS)
(4cp); 3 hpw
prerequisite 34013 Modern Analysis (Honours)
As for 34914 Measure Theory. Additional content: the pi-lambda theorem, Fubini’s theorem, Hahn decomposition, Radon-Nikodym theorem and conditional probability.

34019 FUNCTIONAL ANALYSIS
(4cp); 3 hpw
prerequisite 34014 Measure Theory (Honours)

34023 PARTIAL DIFFERENTIAL EQUATIONS 3
(4cp); 3 hpw
prerequisite 34922 Partial Differential Equations 2

34026 FRACTAL GEOMETRY
(4cp); 3 hpw
prerequisite 34014 Measure Theory (Honours)
34028 STOCHASTIC OPTIMAL CONTROL

(4cp); 3 hpw
prerequisites 34927 Deterministic Optimal Control, 34062 Stochastic Processes 2

34029 NONLINEAR DYNAMICAL SYSTEMS

(4cp); 3 hpw
prerequisites 34815 Ordinary Differential Equations, 34013 Modern Analysis (Honours)

34031 LARGE-SCALE MATHEMATICAL PROGRAMMING

(4cp); 3 hpw
prerequisite 34932 Optimisation Techniques
Theory and computational methods for optimising large-scale linear and nonlinear programs; variance of the simplex method and approximation approaches to the solution of large-scale linear programs, decomposition (Dantzig-Wolfe and Bender's), exploitation of sparsity, combinatorial problems, methodology.

34033 DYNAMIC OPTIMISATION

(4cp); 3 hpw
prerequisites 34790 Numerical Computing, 34931 Linear Programming, 34961 Stochastic Processes I

34036 STOCHASTIC MODELS IN OPERATIONS RESEARCH

(4cp); 3 hpw
prerequisites 34931 Linear Programming, 34033 Dynamic Optimisation, 34961 Stochastic Processes I
Stochastic linear programming (two-stage linear programming formulations and change-constrained programming). Finite horizon probabilistic dynamic programming. Markov chains and Markovian decision processes and probabilistic inventory models (infinite horizon continuous review).

34038 CORPORATE AND FINANCIAL DECISIONS AND INVESTMENT ANALYSIS

(4cp); 3 hpw
prerequisite 34938 Financial Modelling Techniques

34039 SEMINAR: APPLICATIONS IN OPERATIONS RESEARCH

(4cp); 3 hpw
prerequisite by consent
Recognition of problem areas suited to the application of operations research techniques such as simulation, queueing theory, mathematical programming and inventory control. Human resources planning and scheduling in companies and facilities. Cohort analysis, Markov-based examples, effects of computerisation and technological change. Application to areas of the public sector including location of emergency services, capacity planning over time and service level decisions. Class discussion of ongoing and prospective applications of operations research.

34040 OPERATIONS RESEARCH MODELS AND METHODOLOGY

(4cp); 3 hpw
prerequisite by consent
Critical analysis of recent studies from the literature, from the point of view of the OR methodology used. Development of alternative formulations of problems and their solutions. Case studies of the basic model prototypes (linear, network, dynamic and stochastic). At least one case study will
involve the use of continuous and/or
discrete event simulation using a high level
language such as SimScript II.5.

34062 STOCHASTIC PROCESSES 2
(4cp); 3 hpw
prerequisites 34960 Probability, 34961
Stochastic Processes I, 34014 Measure
Theory (Honours)
Formal definitions of probability space and
and stochastic processes. Martingales. Riemann-
Stieltjes integration. Brownian motion and
related processes. Stochastic calculus and
stochastic differential equations. Financial
applications.

34065 TIME SERIES ANALYSIS
(4cp); 3 hpw
prerequisites 34960 Probability, 34961
Stochastic Processes I
Model identification, estimation, diagnostic
examination and forecasting for time series.
Nonseasonal/seasonal, stationary/
nonstationary and linear/nonlinear time
series are considered. Models covered are
Box-Jenkins, time series regression, expo-
nential smoothing, transfer functions and
classical regression.

34066 NONLINEAR STATISTICAL
MODELS
(4cp); 3 hpw
prerequisites 34955 Regression Analysis, 34065 Time Series Analysis
Nonlinear regression; least squares estima-
tion; hypothesis testing. Use of SAS.
Multivariate nonlinear regression.
Nonlinear simultaneous equation models;
method of moment estimators.

34067 MULTIVARIATE STATISTICS
(4cp); 3 hpw
prerequisite 34953 Statistical Inference, 34955 Regression Analysis
Multivariate normal distribution: defini-
tion; moments; characteristic function;
estimation of mean and covariance matri-
ces; Wishart distribution; Hotelling’s T^2.
Multivariate linear regression; principal
components. Factor analysis. Cluster
analysis.

34068 STATISTICAL MODELLING
(4cp); 3 hpw
prerequisite 34956 Design of Experiments
Revision of linear models and exponential
families. Generalised linear models. Ap-
plications including logistic regression and
contingency tables. Modelling using statisti-
cal distributions; continuous distribution
models; discrete distribution models.

34069 LINEAR MODELS AND
EXPERIMENTAL DESIGN
(4cp); 3 hpw
prerequisites 34956 Design of Experiments, 34067 Multivariate Statistics
Linear models; the linear model of less than
full rank, the analysis of variance, com-
pletely randomised and randomised block
designs. Response surfaces. Incomplete block
designs. Repeated measures designs.

34087 ANALYTIC NUMBER THEORY
(4cp); 3 hpw
prerequisites 34803 Algebra 3, 34818
Complex Variables
Divisibility, prime numbers and the funda-
mental theorem of arithmetic; arithmetical
functions and Dirichlet multiplication; some
asymptotic analysis involving arithmetical
functions. Characters of finite Abelian
groups; Dirichlet’s theorem on primes in
arithmetic progressions. The Riemann zeta
function; analytic proof of the prime number
theorem.

34091 HONOURS SEMINAR 1
(4cp); 3 hpw
prerequisite by consent
This subject will provide an opportunity for
students to benefit from the specialist
knowledge of a visitor to the School or to
undertake a course in an area of specific staff
research or knowledge.

34092 HONOURS SEMINAR 2
(4cp); 3 hpw
prerequisite by consent
As for 34091.
34096 CONVEXITY AND OPTIMISATION (HONOURS)
(4cp); 3 hpw
prerequisite 34013 Modern Analysis (Honours)
As for 34996 Convexity and Optimisation. Additional content: general constrained optimisation theory, application to calculus of variations, introduction to applications in optimal control theory.

34097 REPORT
(12cp); 9 hpw
prerequisite by consent
An applied or theoretical study in an area chosen in consultation with the project supervisor who will be appointed by the Head of School. This is a year-long subject. Students are expected to spend three hours per week on their project in Autumn semester and six hours per week in Spring semester.

34098 PROJECT (HONOURS)
(12cp); 9 hpw
prerequisite by consent
Students will perform an independent investigation of an area of the mathematical sciences chosen in consultation with a supervisor who will be appointed by the Head of School. This is a year-long subject. Students are expected to spend three hours per week on their project in Autumn semester and six hours per week in Spring semester.

34692–34696 PROJECT
(2–6cp); 1–5hpw
prerequisite by consent
An investigation of a topic selected by the student with the approval of the Director of Undergraduate Studies (or nominee).

34700 DISCRETE MATHEMATICS
(4cp); 3 hpw

34701 ALGEBRA 1
(4cp); 3 hpw
Complex numbers; polar form, de Moivre’s theorem, exponential form, regions in the complex plane. Polynomials; remainder and factor theorems, synthetic division, Descartes’s Rule of Signs, relations between roots and coefficients. Systems of linear equations; Gaussian elimination, homogeneous systems. Matrices; matrix algebra, elementary matrices, inverse matrix, application to systems of linear equations, LU decomposition. Determinants; definition and properties, methods of evaluation. Cramer’s Rule, adjoint form for inverse matrix, characteristic equation. Vectors; algebra of vectors, dot and cross products, triple products, applications to trigonometry and three-dimensional coordinate geometry.

34710 CALCULUS
(8cp); 6 hpw

34711 ANALYSIS 1
(4cp); 3 hpw
Convergence of sequences, limit theorems. Point sets; the least upper bound axiom, nested interval property and Bolzano-Weierstrass theorem; application to sequences. Limit of a function; limit theorems, continuity, discussion in terms of sequences. Properties of continuous functions on a closed interval. Differentiation; the Mean Value Theorem. Taylor’s Theorem with remainder; L’Hospital’s rule. Infinite series; convergence tests for series of positive terms, absolute and conditional convergence, alternating series. Improper integrals; convergence tests. Power series and radius of convergence. Taylor and Maclaurin series; associated numerical problems.
34740 INTRODUCTION TO OPERATIONS RESEARCH MODELS
(4cp); 3 hpw
corequisite 34751 Statistics I
Formulation of problems and construction of models. Examples from linear and other mathematical programming, network models, dynamic programming, inventory control, Bayesian decision analysis, financial techniques, stochastic processes, simulation, heuristics, game theory and queueing theory.

34751 STATISTICS I
(4cp); 3 hpw
prerequisite 34710 Calculus

34770 COMPUTING 1A
(5cp); 5 hpw
corequisite 34700 Discrete Mathematics
Problem-solving and algorithm development using a modern functional programming language (Miranda). Informal introduction to algebraic methods of specification, development and proof of programs. Use of Miranda to implement equational specifications: guarded equations, block structure, lists and list comprehensions, types, polymorphism, abstract data types, currying and higher order functions (map, filter, fold), lazy evaluation and infinite lists.

34771 COMPUTING 1B
(5cp); 5 hpw
corequisite 34781 Mathematical Foundations of Computing I
Problem solving and algorithm development using a functional language (Miranda) and an imperative language (Modula-2). Syntactic and semantic features of Miranda and Modula-2. Control structures in Modula-2: external modules, procedures, scope of identifiers, scalar and elementary structured data types. Formal specification and refinement techniques. Modular design. Investigation of a range of algorithms and recursively defined data types.

34781 MATHEMATICAL FOUNDATIONS OF COMPUTING 1
(4cp); 3 hpw
prerequisites 34700 Discrete Mathematics, 34770 Computing 1A
Historical overview of computing machinery. Introduction to deterministic finite automata. Design of combinatorial circuits and cycled sequential circuits. The von Neumann architecture. Elementary data types; representation of values and realisation of operators. Registers, arithmetic and logic units, data path. The fetch-execute cycle. Introduction to the theory of computation; algorithms as function definitions, the halting problem, Church's thesis. Introduction to the lambda calculus.

34790 NUMERICAL COMPUTING
(4cp); 5 hpw
prerequisite 34710 Calculus;
corequisite 34711 Analysis I
Elements of the C language including control structures, functions, arrays and I/O. Basic program design techniques and their implementation in C. Preprocessor facilities, standard libraries, function prototyping and restricted identifier scope. Introduction to numerical computing. Treatment of errors. Solution of nonlinear equations in one variable; bisection and Newton's methods. Linear equations in several variables; Gaussian elimination, iteration. Numerical integration; trapezoidal and Simpson's rules, extrapolation. Non-numerical applications; sorting, searching, text processing.

34802 ALGEBRA 2
(4cp); 3 hpw
prerequisite 34701 Algebra I
34803 ALGEBRA 3
(4cp); 3 hpw
prerequisite 34802 Algebra 2

34807 HISTORY OF MATHEMATICS
(4cp); 3 hpw
Greek mathematics and the works of Eudoxus, Euclid, Archimedes, Appolonius and Pappus. Renaissance mathematics; cubics and quartics. The rise of analysis; Newton, Leibnitz, the Bernoullis, Euler. Early modern mathematics; Lagrange, Laplace, Legendre, Carnot, Desargues. The 19th century; Gauss to Klein. Some 20th century developments.

34812 ANALYSIS 2
(4cp); 3 hpw
prerequisite 34711 Analysis I; corequisite 34821 Partial Differential Equations
Cauchy sequences; cluster points of sequences, convergence of Cauchy sequences, sequential compactness of the real line. Continuous and uniformly continuous functions; further properties of continuous functions on a closed interval. Mean Value Theorem and Fundamental Theorem of Calculus. Sequences and series of functions; uniform convergence, continuity, integrability and differentiability of series of functions; Weierstrass M-test. Power series. Fourier series; applications to ordinary differential equations and boundary value problems.

34815 ORDINARY DIFFERENTIAL EQUATIONS
(4cp); 3 hpw
prerequisite 34710 Calculus; corequisite 34802 Algebra 2

34817 VECTOR CALCULUS
(4cp); 3 hpw
prerequisite 34710 Calculus

34818 COMPLEX VARIABLES
(4cp); 3 hpw
prerequisites 34711 Analysis I, 34817 Vector Calculus

34821 PARTIAL DIFFERENTIAL EQUATIONS 1
(4cp); 3 hpw
prerequisite 34815 Ordinary Differential Equations; corequisite 34817 Vector Calculus

34852 STATISTICS 2
(4cp); 3 hpw
prerequisite 34751 Statistics I

34872 COMPUTING 2
(4cp); 5hpw
prerequisite 34771 Computing IB
Specification, design, implementation and testing of software using imperative and functional languages. Further investigation of abstract data types (ADTs) (list, stack, queue, dequeue, tree, graph, etc); formal specification of ADTs, static and dynamic
implementation in an imperative language, requisite features of C and C++. Introduction to order notation and efficiency considerations. Algorithm analysis, searching and sorting algorithms. Further investigation of functional programming; functional implementation of ADTs, recursion and induction on lists.

34873 COMPUTING 3
(4cp); 3 hpw
prerequisites 34711 Analysis I, 34872 Computing 2; corequisite 34803 Algebra 3
Further work on specification of abstract data types and advanced implementation issues. Systematic techniques of algorithm design and analysis; associated mathematical methods, complexity, efficiency, program verification. Applications. Object-oriented programming; implementation of flexible and reliable software.

34891 NUMERICAL METHODS A
(4cp); 3 hpw
prerequisites 34711 Analysis I, 34790 Numerical Computing, 34815 Ordinary Differential Equations

34894 MATHEMATICAL AND BUSINESS MODELLING
(4cp); 5 hpw
prerequisites 34751 Statistics I, 34790 Numerical Computing
Modelling; linear programming, simulation, project management, decision trees, input-output tables, elementary financial modelling. Application to decision making in business and other areas. Use of spreadsheets for numerical modelling; high level features, graphics, optimisation functions, regression functions, database facilities. Programming in the macro language.

34904 ALGEBRA 4
(4cp); 3 hpw
prerequisite 34803 Algebra 3
Polynomials in splitting fields; Euclidean constructions, finite fields, normal extensions, Galois fields, primitive and cyclotomic polynomials. Latin squares. Modular arithmetic. Elements of graph and coding theories.

34906 DIFFERENTIAL GEOMETRY
(4cp); 3 hpw
prerequisites 34802 Algebra 2, 34815 Ordinary Differential Equations, 34817 Vector Calculus

34909 SEMINAR: MATHEMATICS
(4cp); 3 hpw
prerequisite by consent
Group studies of selected topics in mathematics. The topics will vary from year to year and will be chosen in accordance with student interest and staff availability.

34913 MODERN ANALYSIS
(4cp); 3 hpw
prerequisites 34802 Algebra 2, 34812 Analysis 2
34914 MEASURE THEORY
(4cp); 3 hpw
prerequisite 34913 Modern Analysis

34916 MATHEMATICAL METHODS
(4cp); 3 hpw
prerequisite 34922 Partial Differential Equations 2

34920 INTEGRAL EQUATIONS
(4cp); 3 hpw
corequisite 34913 Modern Analysis

34922 PARTIAL DIFFERENTIAL EQUATIONS 2
(4cp); 3 hpw
prerequisites 34818 Complex Variables, 34821 Partial Differential Equations 1

34924 MECHANICS
(4cp); 3 hpw
prerequisites 34815 Ordinary Differential Equations, 34817 Vector Calculus

34925 WAVE THEORY
(4cp); 3 hpw
prerequisite 34922 Partial Differential Equations 2

34927 DETERMINISTIC OPTIMAL CONTROL
(4cp); 3 hpw
prerequisites 34815 Ordinary Differential Equations, 34817 Vector Calculus

34930 SIMULATION TECHNIQUES
(4cp); 3 hpw
prerequisite 34751 Statistics I; corequisite 34790 Numerical Computing

34931 LINEAR PROGRAMMING
(4cp); 3 hpw
prerequisite 34740 Introduction to Operations Research Models; corequisite 34802 Algebra 2

**34932 OPTIMISATION TECHNIQUES**

(4cp); 3 hpw  
prerequisites 347II Analysis I, 34931 Linear Programming  

**34934 NETWORK OPTIMISATION**

(4cp); 3 hpw  
corequisite 34931 Linear Programming  

**34935 INVENTORY CONTROL**

(4cp); 3 hpw  
corequisite 34930 Simulation Techniques  

**34936 DECISION THEORY**

(4cp); 3 hpw  
prerequisite 34751 Statistics I  

**34938 FINANCIAL MODELLING TECHNIQUES**

(4cp); 3 hpw  
prerequisites 347II Analysis I, 34751 Statistics I  
Introduction to models of the standard problems of financial management and the mathematical techniques for their solution; asset and liability management, planning day-to-day operations and the firm's financing and investment decisions. Net-present value. Capital budgeting problem; investment under certainty, investment decisions under uncertainty. The debt-capacity decision; debt maturity and timing decisions, dividend policy, internal financing and growth.

**34939 SEMINAR: OPERATIONS RESEARCH**

(4cp); 3 hpw  
prerequisite by consent  
Group studies of selected topics in operations research. The topics will vary from year to year and will be chosen in accordance with student interest and staff availability.

**34953 STATISTICAL INFERENCE**

(4cp); 3 hpw  
prerequisite 34852 Statistics 2  
Estimation; sufficiency, completeness. Hypothesis testing; decision problems, Neyman-Pearson lemma, best tests, uniformly most powerful tests, sequential probability ratio test, minimax and Bayesian tests. Distribution free methods; estimation and hypothesis testing. Further theory of inference.

**34955 REGRESSION ANALYSIS**

(4cp); 3 hpw  
prerequisite 34852 Statistics 2  
Simple linear regression. Analysis of variance. Multiple regression. Polynomial regression. Regression diagnostics. Model building. Introduction to generalised linear models. Use of computer packages such as SAS, SPSS, MINITAB and GLIM, and the use of APL.

**34956 DESIGN OF EXPERIMENTS**

(4cp); 3 hpw  
prerequisite 34955 Regression Analysis  
Single factor analysis of variance; completely randomised design, fixed effects model, expected mean squares, relation to multiple regression model, random effects
model. Further analysis; orthogonal contrasts, multiple range tests. Randomised block design. Latin squares. Factorial (crossed) experiments; interaction, mixed models. Nested factors. Cross-nested designs; 2^f factorials, Yates' method, confounding, fractional replication. Further topics; analysis of covariance, split-plots, power. Use of computer packages MINITAB, SPSS, SAS and GLIM.

34957 QUALITY CONTROL
(4cp); 3 hpw
prerequisite 34852 Statistics 2

34959 SEMINAR: STATISTICS
(4cp); 3 hpw
prerequisite by consent
Group studies of selected topics in statistics. The topics will vary from year to year and will be chosen in accordance with student interest and staff availability.

34960 PROBABILITY
(4cp); 3 hpw
corequisite 34852 Statistics 2

34961 STOCHASTIC PROCESSES 1
(4cp); 3 hpw
prerequisite 34852 Statistics 2

34975 COMPUTER GRAPHICS
(4cp); 3 hpw
prerequisites 34790 Numerical Computing, 34802 Algebra 2
Hardware; capabilities of typical devices such as plotters and raster scan instruments. Standard system software including point plotting and line drawing (Bresenham's algorithm), transformations (scaling, translations, rotations) in two dimensions, clipping and windowing. Area filling algorithms; flood-fill, raster scan. Three-dimensional drawing; transformations, projections (orthogonal and perspective), homogeneous coordinates, floating horizon hidden surface algorithm. Curve and surface interpolation – cubic splines, Bezier curves and surfaces, B-splines. Graphic standards; GKS, PHIGS.

34976 NEURAL NETWORKS
(4cp); 3 hpw
prerequisites 34751 Statistics I, 34790 Numerical Computing, 34802 Algebra 2, 34817 Vector Calculus
Fundamental concepts; theories of mind and brain (ancient to modern), cybernetics (deterministic systems, feedback, communication, control, adaptation), brain theory (neurons, brain structures, representation), rise of connectionism (the von Neumann bottleneck, the parallel distributed processing paradigm). Neural network models and learning algorithms; associative nets (Hebbian learning), the Perceptron (error-correcting rule), multi-layer networks (back-propagation, Boltzmann machines), interactive activation and Grossberg models (competitive learning), Barto model (reinforcement learning). Applications; traveling salesman problem, NETtalk (a network that learns to talk).

34977 FORMAL SPECIFICATION
(4cp); 3 hpw
prerequisite 34982 Mathematical Foundations of Computing 2
Introduction to the mathematical basis of formal specification theory. Linguistic systems and models of specification systems. Software development by linguistic transformations. A comparative study of the principles and practices of important formal specification methods used in modern software construction; algebraic specification, the Vienna Development Method, Z.

34979 SEMINAR: COMPUTING
(4cp); 3 hpw
prerequisite by consent
Group studies of selected topics in computing. The topics will vary from year to year and will be chosen in accordance with student interest and staff availability.
34982 MATHEMATICAL FOUNDATIONS OF COMPUTING 2
(4cp); 3 hpw
prerequisites 34803 Algebra 3, 34873 Computing 3
Introduction to the logical, foundations of formal program semantics; associated verification methods, operational and denotational semantics. Lambda and combinatorial calculi, applications to functional programming languages.

34983 MATHEMATICAL FOUNDATIONS OF COMPUTING 3
(4cp); 3 hpw
prerequisite 34982 Mathematical Foundations of Computing 2
corequisite 34984 Language Theory
Additional topics in the denotational semantics of applicative and imperative programming languages. Algebraic semantics; initial and final algebra approaches to specification of data types, initial algebraic specification of languages. Theory of computation; computability, Turing machines, the Church-Turing thesis, decidability, complexity issues, completeness and tractability.

34984 LANGUAGE THEORY
(4cp); 3 hpw
prerequisite 34982 Mathematical Foundations of Computing 2
Chomsky’s categorisation of grammars; regular and context-free grammars and languages. Finite state recognisers. Parsing strategies; recursive descent and table-driven parsers. Operational semantics and program transformation; language design, translation and implementation of a simple, block-structured imperative language. Issues in the implementation of functional languages; combinator compilation, strict and lazy evaluation, supercombinators.

34985 DIGITAL IMAGE PROCESSING
(4cp); 3 hpw
prerequisites 34802 Algebra 2, 34790 Numerical Computing
Preliminaries; human vision, digital image models, image geometry and transformations, display devices. Image transforms; the Fourier transform, convolution, cross correlation and auto correlation, basic transform theorems. The discrete Fourier transform and its properties; fast Fourier transform implementation, aliasing, leakage. The two-dimensional transform and its implementation. Image enhancement and restoration; histogram modification techniques, low, high and band-pass filters, image sharpening and smoothing, pseudo-colouring. Models of degradation, inverse filtering, removal of linear blur, frequency modification. Image segmentation; point, line and edge detection, the Hough transform, thresholding and region segmentation.

34986 CRYPTOLOGY
(4cp); 3 hpw
prerequisite 34790 Numerical Computing
Divisibility and prime numbers; the fundamental theorem of arithmetic, congruences, applications, Fermat’s Theorem. Applications to primality testing and factorisation; Fermat’s and Pollard’s p-1 methods. Multiplicative functions; Euler’s function, sum and number of divisors, perfect numbers. Cryptology; block ciphers, exponentiation ciphers, public key cryptography, knapsack ciphers. Continued fractions, application to factorisation.

34992 NUMERICAL METHODS B
(4cp); 3 hpw
prerequisites 34790 Numerical Computing, 34821 Partial Differential Equations I

34995 ADVANCED NUMERICAL ANALYSIS
(4cp); 3 hpw
prerequisite 34913 Modern Analysis
34996 CONVEXITY AND OPTIMISATION

(4cp); 3 hpw
prerequisite 34913 Modern Analysis

34997 PROJECT (GRADUATE DIPLOMA)

(8cp); 6 hpw
prerequisite by consent

An applied study in an area chosen in consultation with a project supervisor appointed by the Head of School.

Subjects offered by other faculties

Students should consult the relevant Faculty and its handbook for any late changes to subject information.

22105 ACCOUNTING A

(5cp); 3 hpw

Introduction, setting out the nature of accounting and its relationships together with double entry bookkeeping's unique ability to record market activity. The body of the course, dealing with the accounting process (journals to ledger), double entry bookkeeping, definition of the elements of financial statements, using control accounts, control of cash, using accrual accounting, inventory, non-current assets, preparation of financial statements and the so-called limitations of the historical cost model.

25110 MICROECONOMICS

(5cp); 3 hpw


25209 MACROECONOMICS

(5cp); 3 hpw
prerequisite 25110 Microeconomics

25210 MICROECONOMIC POLICY

(5cp); 3 hpw
prerequisite 25110 Microeconomics

25308 FINANCIAL INSTITUTIONS AND MARKETS

(5cp); 3 hpw
prerequisite 25209 Macroeconomics

25314 BUSINESS FINANCE 1

(5cp); 3 hpw
prerequisites 22105 Accounting A, 34751 Statistics I;
corequisite 25308 Financial Institutions and Markets
Consumption/investment decision; investment decision and techniques for evaluation. Factors affecting investment; the concept of risk, the pricing of risk, investment decisions under risk; the financing decision. Sources of finance, leasing. Capital structure theories, dividend policy.
25421 INTERNATIONAL FINANCIAL MANAGEMENT
(5cp); 3 hpw
prerequisites 25314 Business Finance I, 25308 Financial Institutions and Markets
International financial management; mechanics and functions of foreign exchange markets, exchange rate determination and parity relationships, forecasting, measurement of foreign exchange risk, multinational working capital management, trade finance, financing foreign operations, long-term asset and liability, international taxation management.

25502 CURRENT ISSUES IN FINANCE
(5cp); 3 hpw
prerequisite 25314 Business Finance I

25606 FINANCIAL TIME SERIES ANALYSIS
(5cp); 3 hpw
prerequisites 34817 Vector Calculus, 34955 Regression Analysis

25905 ASSET PRICING AND CAPITAL MARKETS STUDIES (HONOURS)
(5cp); 3 hpw
prerequisite 25314 Business Finance I
The contribution of Markowitz and others to modern portfolio theory and the CAPM, including market equilibrium and efficient market assumptions; empirical tests. Relating to the CAPM and its derivatives. Arbitrage pricing theory. Pricing models for contingent claims, options and futures. Efficient capital markets, theory and evidence.

25906 INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT (HONOURS)
(5cp); 3 hpw
prerequisite 25905 Asset Pricing and Capital Markets Studies (Honours)

25907 ADVANCED MICROECONOMICS
(4cp); 3 hpw
prerequisite by consent

25908 FUTURES AND OPTIONS
(4cp); 3 hpw
prerequisite by consent

25909 ADVANCED CORPORATE FINANCE
(4cp); 3 hpw
prerequisite by consent
A selection of the classic papers in corporate finance. Current research work, Australian empirical work. Major issues involved in the firm’s investment and financing decisions, the interaction of these activities and investor behaviour in the markets for the firm’s securities.

25910 THESIS
(12cp); 9 hpw
prerequisite by consent
A thesis on a topic chosen by the student in consultation with his/her supervisor.

79101 LAW FOR BUSINESS
(5cp); 3 hpw
Legal philosophy. Legal history. Constitutional law; torts, crime, property, contracts, consumer protection.
SCHOOL OF COMPUTING SCIENCES

The School offers the following courses:

Undergraduate courses
Bachelor of Science in Computing Science
Bachelor of Information Technology

Postgraduate courses
Graduate Diploma in Data Processing
Graduate Diploma in Information Technology Management
Master of Business in Information Technology Management
Master of Science in Computing (by coursework)
Master of Science in Computing (by thesis)
Doctor of Philosophy

Graduate Certificates
City campus
Graduate Certificate in Advanced Information Technology
Graduate Certificate in Computer Science
Graduate Certificate in Human-Computer Interaction
Graduate Certificate in Information Systems
Graduate Certificate in Information Technology Management
Graduate Certificate in Software Quality Assurance

Kuring-gai campus
Graduate Certificate in Applied Computing
Graduate Certificate in Programming Practice

ACADEMIC ADVISERS FOR 1994

UNDERGRADUATE COURSES

Bachelor of Science in Computing Science
Mr John Tu 523 1856
Dr Sattiraju Prabhakar 515 1851
Ms Janet Smith 362 1833
Mr Jim Underwood 356 1831

Bachelor of Information Technology
Mr Chris Johnson 360 1834

Projects Coordinator
Mr Peter Bebbington 353 1828

Academic Liaison Officer (Special Conditions, Disability)
Mr Peter Bebbington 353 1828

Electives Coordinator
Mr Chris W Johnson 522 1855

POSTGRADUATE COURSES

Graduate Diploma in Data Processing
Ms Jean Robb 364 1836

Master of Science in Computing
Professor John Debenham 437 1837

Master of Business in Information Technology Management and articulated courses
Ms Jean Robb 364 1836

International Programs
Ms Judy Hammond 359 1822

Each adviser has specific consultation times. These are displayed on the ground floor noticeboards.

COMPUTING FACILITIES

All laboratory computing equipment within the School is inter-connected via an Ethernet Local Area Network (LAN). The communication protocol used is Transmission Control Protocol/Internet Protocol (TCP/IP).

The School is equipped with a number of network servers as described in the following table.
Ultimo also acts as the print server for the IBM 9375 minicomputer.

The diverse range of computing equipment available to students within the School includes:

- UNIX workstations from Sun Microsystems and Silicon Graphics
- PC compatible microcomputers
- Macintosh microcomputers
- Applix 1616 microcomputers
- IBM minicomputer using VSE/SP VM/SP
- ASCII terminals
- X-terminals

Other specialised computing equipment such as INMOS Transputer systems, computer video interfacing and graphics plotters are available to advanced students.

As an aid to all users of the School's computing resources, a Help Desk service is maintained. Staff are available for consultation during normal laboratory hours and are located in Room 4/447. They may also be contacted by telephone on 330 1842.

Access to computing laboratories

Access to the School's computing laboratories is directly related to courses undertaken by students or specific research activities as determined by the coordinating supervisor and School requirements.

Access privileges to the School's computing laboratories can be categorised as follows:

General access
Limited access
Restricted access

To ensure maximum utilisation of the School's computing laboratories and to provide students extended hours of access, numerous laboratories have been equipped with electronic security doors, commonly referred to as 'E-Doors'. To gain access to these laboratories a special card, referred to as an 'E-Card', is required. It is similar to the student identification card, containing a photographic image and other details.

E-Cards are issued to everyone who is required to utilise the School's computing laboratories. These can be obtained at the commencement of each semester. Registration takes place at the Systems Resource Centre on the fourth floor of Building 4.

Normal hours of access to computing laboratories during semesters are 9.00 am to 9.00 pm. Restricted hours are in effect during examination times and between semesters.

Students should note that it is an offence to eat or drink in the laboratories. Students found doing so will be requested to leave the laboratory and disciplinary action may be initiated by the School for repeated offences.

General access computing laboratories

General access computing laboratories are available for general use by all students enrolled in the School of Computing Sciences.

<table>
<thead>
<tr>
<th>Level</th>
<th>Room No</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>230</td>
<td>Macintosh Laboratory</td>
</tr>
<tr>
<td>4</td>
<td>442</td>
<td>PC Laboratory</td>
</tr>
<tr>
<td>4</td>
<td>443</td>
<td>Sun Laboratory</td>
</tr>
</tbody>
</table>

The Sun Laboratory currently contains X-terminals, IBM Terminals and PC compatible computers. This may change as equipment is upgraded.
Limited access computing laboratories

Limited access computing laboratories are available to students undertaking courses specifically requiring the facilities of those laboratories. These laboratories are frequently booked by teaching staff presenting specialised computing courses and are unavailable for general student activity during this period.

<table>
<thead>
<tr>
<th>Level</th>
<th>Room No</th>
<th>Laboratory</th>
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<tbody>
<tr>
<td>2</td>
<td>226</td>
<td>Advanced PC Laboratory</td>
</tr>
<tr>
<td>2</td>
<td>229</td>
<td>Sun 386i Laboratory</td>
</tr>
<tr>
<td>2</td>
<td>233</td>
<td>Sun SLC Laboratory</td>
</tr>
<tr>
<td>2</td>
<td>234</td>
<td>Experimental System Labora-</td>
</tr>
</tbody>
</table>

Restricted access computing laboratories

Access is offered to individual students as determined by teaching staff coordinating courses specifically requiring the facilities of the laboratory. These laboratories are generally restricted to research students and students undertaking special projects. They have been developed and equipped in conjunction with the Key Centre for Advanced Computing Sciences, a teaching and research centre funded by the Australian government.

<table>
<thead>
<tr>
<th>Level</th>
<th>Room No</th>
<th>Laboratory</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>235</td>
<td>Parallel Processing Labora-</td>
</tr>
<tr>
<td>2</td>
<td>237</td>
<td>Distributed Database Labora-</td>
</tr>
<tr>
<td>2</td>
<td>239</td>
<td>Computer Graphics Laborato-</td>
</tr>
</tbody>
</table>

ITD computing laboratories

The Information Technology Division (ITD) maintains three laboratories within the School of Computing Sciences. Support staff of the School manage the consumables and deliver printouts. Equipment maintenance and similar services are provided by the ITD.

<table>
<thead>
<tr>
<th>Level</th>
<th>Room No</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>438</td>
<td>Amdahl Terminal Room (not in use)</td>
</tr>
<tr>
<td>4</td>
<td>440</td>
<td>ITD Workstation Laboratory</td>
</tr>
<tr>
<td>4</td>
<td>444</td>
<td>ITD PC Laboratory</td>
</tr>
</tbody>
</table>

STAFF CONTACT LIST

All staff in the School of Computing Sciences are located in Building 4, City campus, with the exception of those with room numbers starting with 'K' (located at Kuring-gai campus).

1 Academic staff on leave during Autumn 1994

2 Academic staff on leave during Spring 1994

<table>
<thead>
<tr>
<th>Name</th>
<th>Extn</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Peter Bebbington</td>
<td>1828</td>
<td>353</td>
</tr>
<tr>
<td>Director, Undergraduate Studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr Jeff Clark</td>
<td>1827</td>
<td>355</td>
</tr>
<tr>
<td>Mr John Colville</td>
<td>1854</td>
<td>524</td>
</tr>
<tr>
<td>Mr Brent Curtis</td>
<td>1860</td>
<td>532</td>
</tr>
<tr>
<td>Professor John Debenham</td>
<td>1837</td>
<td>437</td>
</tr>
<tr>
<td>Director, Postgraduate Studies, and Director, Key Centre for Advanced Computing Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assoc Prof Jenny Edwards</td>
<td>1844</td>
<td>340</td>
</tr>
<tr>
<td>Head of School</td>
<td></td>
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<tr>
<td>Mr Jamal El-Den</td>
<td>1830</td>
<td>366</td>
</tr>
<tr>
<td>Dr George Feuerlicht</td>
<td>1835</td>
<td>363</td>
</tr>
<tr>
<td>Head, Information Technology Unit</td>
<td></td>
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<tr>
<td>Assoc Prof Michael Fry</td>
<td>1821</td>
<td>630</td>
</tr>
<tr>
<td>Director, External Development</td>
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</tr>
<tr>
<td>Mrs Judy Hammond</td>
<td>1822</td>
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<tr>
<td>Professor Igor Hawryszkiewycz</td>
<td>1809</td>
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<tr>
<td>Professor Brian Henderson-Sellers</td>
<td>1189</td>
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<tr>
<td>Assoc Prof Tom Hintz</td>
<td>1865</td>
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<tr>
<td>Alternate Head of School</td>
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<td></td>
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<tr>
<td>Dr Bruce Howarth</td>
<td>1859</td>
<td>530</td>
</tr>
<tr>
<td>Head, Computer Systems Unit</td>
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<td></td>
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<tr>
<td>Dr Barry Jay</td>
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<td>514</td>
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<tr>
<td>Mrs Sharyn Jenner</td>
<td>1805</td>
<td>337</td>
</tr>
<tr>
<td>School Administrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr Sanjay Jha</td>
<td>1858</td>
<td>526</td>
</tr>
<tr>
<td>Ms Deidrie Jinks</td>
<td>1826</td>
<td>369</td>
</tr>
</tbody>
</table>
UNDERGRADUATE PROGRAMS

Bachelor of Science in Computing Science (BSc)

Course code MCO2

The aim of the course is to provide a sound education in all aspects of computing for students who intend to make a career in the profession. It is intended that the course will provide a suitable background covering all aspects of computing science, short of the actual design and construction of ‘hardware’ systems.

The course has been designed to provide for an in-depth study of computing science and its applications, and, in addition, support subjects are included to enable the graduate to fulfil an appropriate function in the sphere of business activity. It is intended that the formal studies will be treated in a manner which will encourage initiative. Not only will the course provide a suitable framework for a professional career, it will also form a basis from which postgraduate studies may begin.

The course consists of six academic semesters of full-time study or the equivalent in part-time attendance and a period of Industrial Training.

Holders of the degree are granted exemption from the Associate examinations of the Australian Computer Society.

GRADING OF THE BSc

The School of Computing Sciences grades students for awards by a two-stage process involving first qualifying, and then grading students.

The subjects to be included in the grading process are the core subjects, excluding those normally taken during Stages 1 and 2 of the part-time course or first year of the full-time course. All core subjects must be passed. Any of those subjects which have been failed and subsequently passed will be included with a raw mark of 50 per cent.

QUALIFYING

Pass degree

A student with an average raw mark of 50 per cent or greater will qualify for a Pass degree.
GRADING
Honours degree

The raw marks required to achieve the Honours grades in 1992 and 1993 were:

First Class Honours 75 per cent
Second Class Honours 68 per cent

The grading of qualifying students is carried out by the School’s Examination Review Committee on an individual basis. The Committee is provided with the following information on each qualifier:

• any failures, including subject details and whether or not a failure was of a technical nature;
• the subject details and marks for all electives undertaken;
• the time taken to complete the course in terms of stages, excluding periods of leave of absence; and
• the average mark for each stage during the course.

The policy for awarding Honours is currently under review.

INDUSTRIAL TRAINING

All students in the BSc(Computing Science) are required to pass the two Industrial Training subjects. There are a substantial number of prerequisites for Industrial Training which are noted in the Subject Description section. Full-time students normally undertake Industrial Training after completing Stage 2 of the course, part-time students, after completing Stage 4.

To gain credit for Industrial Training, students are required to obtain an approved, full-time job within the information industry. The duration of Industrial Training is nine months for full-time students and 18 months for part-time students. During Industrial Training students are required to behave in a professional manner, and are required to keep the School informed of the status of their employment at all times so that the School is able to assess their experience. Each year the School of Computing Sciences publishes an Industrial Training Student Guide (for full-time students) which sets out in detail what is required to pass the subject. Students are advised to obtain a copy of this guide from the School Office and to study it carefully.

Although the securing of suitable employment during Industrial Training is the student’s responsibility, the School provides assistance to all Industrial Training students. Students who wish to benefit from the direct assistance of the School in finding an Industrial Training position should refer to the Industrial Training Student Guide (available in April) for the procedure to be followed.

Those who wish to seek an Industrial Training position without the direct assistance of the School should first make an appointment to see the School’s Cooperative Education Officer, who will provide a description of the requirements of an Industrial Training position. If a student finds employment, a second appointment must be made to see the School’s Cooperative Education Officer to obtain certification that the employment is suitable for Industrial Training.

Full-time Industrial Training students are assessed by members of the academic staff who normally visit students during the first semester of their employment.

In general, students find Industrial Training extremely beneficial in relating the final year of coursework to the practical needs of the information industry, and this experience can be cited when applying for graduate career positions.

LABORATORY SESSIONS

Laboratory sessions are designed to give students formal tuition in using computer systems and to give practical experience of the coursework. Every laboratory session is attached to a specific subject. (For example, Commercial Programming Development involves five hours attendance each week, lectures and tutorials for three hours and the laboratory session for two hours.) Full-time students normally have laboratory sessions totalling six hours per week scheduled in each semester, excluding the Industrial Year; and part-time students normally have laboratory sessions of three hours per week scheduled in each semester.
EXEMPTIONS

Exemptions may be granted on the basis of recent academic study (within the last five years) towards a degree. Students must be able to demonstrate that the knowledge is current. Exemption from core subjects may be granted where subjects successfully completed previously coincide with BSc subjects.

Exemptions are usually processed by the School immediately following enrolment.

Exemptions for holders of TAFE Associate Diplomas

Holders of TAFE Associate Diplomas who are admitted to the course will be eligible for the following exemptions.

**Associate Diploma of Business (Commercial Data Processing)**

- 31611 Information Systems (4cp)
- 2402C Systems Analysis and Design 1
- 2402D Computing 1
- 51370 Human Communication (3cp)
- 8559C Business Communication
- 31669 Social Implications of Computers (3cp)
- 2402Y Computers in Business and Society
- 31622 Commercial Programming Development (4cp)
- 2402A Programming Concepts
- 2402B COBOL 1
- 2402E COBOL 2
- 2402J Programming Workshop
- 31648 Business Tools and Applications (4cp)
- 2402K Development Tools 1
- 2402H Microcomputer Packages
- 2402S Database Systems
- 31621 Systems Analysis (4cp)
- 2402F Systems Analysis and Design 2
- 2402R Systems Analysis and Design 3
- 31641 Systems Design (4cp)
- 2402R Systems Analysis and Design 3
- 2402X Systems Development Workshop
- Unspecified IS/CS electives (16cp)
- TOTAL 42cp

**Associate Diploma of Business (Microcomputer Systems)**

- 31611 Information Systems (4cp)
- 8519K Business Systems
- 2403AG Data Fundamentals
- 31648 Business Tools and Applications (4cp)
- 2403AA Microcomputer Systems Usage
- 2403AC Single-user Operating Systems
- 2403AD Electronic Spreadsheets
- 2403AE Database Packages
- 51370 Human Communications (3cp)
- 8559H Business Communication Writing
- 8559J Business Communication Organisational
- Unspecified electives (24cp)
- TOTAL 35cp

**Associate Diploma of Business (Records and Information Systems)**

- 31611 Information Systems (4cp)
- 2402H Microcomputing
- 2421M Business Information Flows
- 2421P Information Retrieval
- 2421U Data Collection and Analysis
- 51370 Human Communications (3cp)
- 8559H Business Communication Writing
- 8559J Business Communication Organisational
- Unspecified electives (24cp)
- TOTAL 31cp

**Associate Diploma of Engineering (Electrical Engineering)**

- 31613 Computer Systems Architecture 1 (4cp)
- 2840BC Computer Principles
- 2840CN Digital Computers 1
- 2840CP Digital Computers 2
- 31632 Communications and Networks (4cp)
- 2840AL Electronic Communications Systems
- 2840BB Computer and Data Communications 1
- 2840CG Computer and Data Communications 2
- 31888 Logic Design (4cp)
- 2840AE Digital Electronics 1
- 2840BG Digital Electronics 2
- 51370 Human Communication (3cp)
- 6990R Vocational Communication
- 6990S Industrial Communication
- Unspecified electives (24cp)
- TOTAL 39cp

Elective exemptions

Exemption from electives may only be granted on the basis of recent academic study towards a degree, except for TAFE
award holders. Students must be able to demonstrate to the Subject Coordinators that their knowledge is current.

At the discretion of the Director of Undergraduate Studies, exemption from some electives may be granted where a student has successfully completed:

- specific computing elective subjects where either the subject was previously completed at UTS, or the subject is substantially the same as a UTS subject in content and level;

- subjects which correspond in content and level to some subjects in a formal UTS sub-major provided that the remaining subjects in the sub-major are taken to a total of 24 credit points;

- subjects which correspond in content and level to some subjects in a coherent staged group of UTS subjects in another discipline, provided that the remaining subjects in the group are taken to a total of 20 credit points in the discipline; or

- a coherent staged group of elective subjects to which there is no equivalent at UTS.

Pre-1989 course

A list of equivalents for the pre-1989 (old) course is given below. Note that the list is in the order of the old course structure and that the equivalent subjects may not necessarily be available in the same semester. Students should check the new course program listed over page (full-time and part-time) for availability.

<table>
<thead>
<tr>
<th>Pre-1989 subject</th>
<th>Hours</th>
<th>Equivalents</th>
<th>CP</th>
<th>HPW</th>
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<td>31902 Auditing the Computer</td>
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<td>31647 Management Control Systems</td>
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<td>31133 Social Implications of Computers¹</td>
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<td>31669 Social Implications of Computers</td>
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<td>31834 Economic and Industrial Analysis¹</td>
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<td>23105 Microeconomics (Business Faculty)</td>
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<td>31847 Performance Evaluation (Lab)</td>
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<tr>
<td>Elective</td>
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</tbody>
</table>

¹ Students who have done 31133 Social Implications of Computers but NOT 31834 Economic and Industrial Analysis, must take 23105 Microeconomics in the Faculty of Business.

² 31658 Project Management – Autumn semester only.
STANDARD FULL-TIME PROGRAM
FOR THE FINAL YEAR OF A PRE-1989 COURSE

Autumn semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>CP</th>
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<tr>
<td>31636</td>
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</tbody>
</table>

Elective/s

Total 24 25

Spring semester

31669 Social Implications of Computers 3 3
31662 Information Systems Case Study 5 6
31666 Performance Evaluation 4 6

Elective/s

Total 24 24

Electives (for pre-1989 students)

Students are required to complete a total of 32 credit points of approved electives as part of their degree course. These will normally be taken as two elective subjects per semester for full-time students (after Year 1) and one per semester for part-time students (after Year 2). Students may take their electives from other faculties. A minimum of 20 credit points must be taken in an approved sequence or sub-major from within the School of Computing Sciences or from another school or faculty in the University. The remaining 12 credit points may be taken from further courses within the School or elsewhere.

For the purposes of determining completion of elective requirements, the School will award four credit points for every three hours of electives completed up until the end of 1992.

Students in the School of Computing Sciences are not permitted to enrol in certain subjects as electives where there is a substantial overlap with any core subjects. In general, this applies to any service subject taught by the Faculty of Mathematical and Computing Sciences. Some examples of non-approved subjects are Simulation Techniques, Statistics 1, Computing 1, etc. If you are in any doubt, you should consult an Academic Adviser or the Electives Coordinator.

Recommended full-time program

Credit point values are shown in parentheses.

Year 1

Autumn semester

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
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<td>31617</td>
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<td>51370</td>
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</table>

Spring semester

31621 Systems Analysis (4cp)
31622 Commercial Programming Development (4cp)
31623 Computer Systems Architecture 2 (4cp)
31624 Data Structures and Algorithms (4cp)
31625 Software Engineering (4cp)
31626 Probability and Statistics (4cp)

Year 2

Autumn semester

<table>
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<tbody>
<tr>
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</table>

Spring semester

31641 Systems Design (4cp)
31642 On-line Systems (4cp)
31647 Management Control Systems (4cp)
31648 Business Tools and Applications (4cp)

Year 3

Autumn semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>CP</th>
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<tbody>
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Spring semester

31697 Industrial Training (0cp)

Year 4

Autumn semester

<table>
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<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>CS/IS Elective 3 (4cp)</td>
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</table>
**Spring semester**  
31662 Information Systems Case Study (5cp)  
31666 Performance Evaluation (4cp)  
31669 Social Implications of Computers (3cp)  
CS/IS Elective 4 (4cp)  
Elective 5 (4cp)  
Elective 6 (4cp)

**Recommended part-time program**

**Year 1**

**Autumn semester**

31611 Information Systems (4cp)  
31615 Discrete Mathematics (4cp)  
31617 Accounting Fundamentals (4cp)

**Spring semester**

31613 Computer Systems Architecture 1 (4cp)  
31614 Programming Principles (5cp)  
51370 Human Communication (3cp)

**Year 2**

**Autumn semester**

31621 Systems Analysis (4cp)  
31622 Commercial Programming Development (4cp)  
31623 Computer Systems Architecture 2 (4cp)

**Spring semester**

31624 Data Structures and Algorithms (4cp)  
31625 Software Engineering (4cp)  
31631 Database (4cp)

**Year 3**

**Autumn semester**

31632 Communications and Networks (4cp)  
CS/IS Elective 1 (4cp)  
Elective 1 (4cp)

**Spring semester**

31633 Operating Systems (4cp)  
31648 Business Tools and Applications (4cp)  
31626 Probability and Statistics (4cp)

**Year 4**

**Autumn semester**

31641 Systems Design (4cp)  
31642 On-line Systems (4cp)  
CS/IS Elective 2 (4cp)

**Spring semester**

31636 Simulation and Modelling (4cp)  
31647 Management Control Systems (4cp)  
Elective 2 (4cp)

**Year 5**

**Autumn semester**

31655 Theory of Computer Science (4cp)  
31658 Project Management (4cp)  
CS/IS Elective 3 (4cp)  
31698 Industrial Training (0cp)

**Spring semester**

31653 Communications Software (4cp)  
Elective 3 (4cp)  
Elective 4 (4cp)  
31698 Industrial Training (0cp)

**Year 6**

**Autumn semester**

31669 Social Implications of Computers (3cp)  
31666 Performance Evaluation (4cp)  
CS/IS Elective 4 (4cp)  
31699 Industrial Training (0cp)

**Spring semester**

31662 Information Systems Case Study (5cp)  
31699 Industrial Training (0cp)  
Elective 5 (4cp)  
Elective 6 (4cp)

**ELECTIVES**

Electives provide the opportunity for students to include in their program some advanced computing subjects, subjects of personal interest which need not be related to computing, or subjects to form a sub-major in another discipline. A total of 40 credit points is allocated to elective subjects.

A student is required to take:

1. A computing elective stream of 16 credit points. These may be chosen from the Information Systems Department or the Computer Science Department, or both. However, a strand taken predominantly from a single department is preferred over a collection of unrelated subjects.
2. A further stream of 24 credit points which will be one of the following:

a) a formal sub-major of 24 credit points from a UTS faculty

or

b) at the discretion of the Director of Undergraduate Studies or the Electives Coordinator, a number of subjects from another UTS discipline or another institution, at least 20 credit points of which form a coherent staged group. A staged group is one where there is a pattern of prerequisites between the subjects that shows progression of at least three levels. A coherent group is one in which all subjects are from the one area of knowledge. This may leave the student with four credit points to take a 'free' subject from any discipline. (Special arrangements may be made for the study of a foreign language at another University.)

or

c) at least 16 credit points of electives from the School of Computing Sciences (in addition to the 16 compulsory School of Computing Sciences elective credit points already taken as part of '1' above). This choice will leave students with up to eight 'free' credit points to complete the 24 credit points of 'other' electives required to complete Part 2.

Electives from other universities

Students wishing to do electives outside the University must see the Electives Coordinator to discuss the proposal. Special approval must be sought well before the intended semester of study. You may undertake subjects outside the University as electives only if no comparable subject is offered by the University.

PROJECTS

In lieu of elective(s) students may take one four-credit point project, two four-credit point projects, or one eight-credit point project over one, or two, semesters. In many cases, these projects may be completed over the Christmas or between-semester breaks, if desired. Please note that a maximum of eight credit points may be taken as project.

A list of projects nominated by various staff members may be viewed on the Suns, by logging in as projects and following the instructions. Students should also fill out a Project Registration form, available from the Projects Coordinator, who will answer any enquiries. Students who have their own ideas for projects may approach relevant staff members to be their supervisors and must also see the Projects Coordinator for approval.

Students may not use as a project work done in the normal course of duties as an Industrial Training student or as a part-time student. However, a student may do a project which is related to work if it is carried out outside of normal work hours. In this case, the student's work supervisor would probably become a joint supervisor of the project.

As a general guide, a student doing a four credit point project is expected to spend a minimum of eight hours a week on the project.

Refer to the Bachelor of Science prerequisite chart on the next page.
Prerequisites for Industrial Training are that four fulltime semesters or equivalent should have been completed and, before registering, students must have passed (or been exempted from) a minimum of thirteen core subjects including Systems Analysis, Commercial Programming Development, Operating Systems, Data Structures & Algorithms, Human Communications and all their prerequisites.

A horizontal arrow Subject 2 ➡️ Subject 1 means that Subject 2 cannot be done before Subject 1.

**Prerequisites for Industrial Training are that four fulltime semesters or equivalent should have been completed and, before registering, students must have passed (or been exempted from) a minimum of thirteen core subjects including Systems Analysis, Commercial Programming Development, Operating Systems, Data Structures & Algorithms, Human Communications and all their prerequisites.**
**SUB-MAJORS**

**Mathematics**

Credit points: 24 (minimum)
Contact person: Mr J Hogg
Phone: 330 2238 Room: 1522

- **Mathematics - Operations Research (OR)(24 credit points)**

<table>
<thead>
<tr>
<th>Subject name</th>
<th>Subject number</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
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<tr>
<td>Introduction to Operations Research Models</td>
<td>34740</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Linear Programming</td>
<td>34931</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

*Choose 12 credit points, subject to prerequisite rules*

<table>
<thead>
<tr>
<th>Subject name</th>
<th>Subject number</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision Theory</td>
<td>34936</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Network Optimisation</td>
<td>34934</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Financial Modelling Techniques</td>
<td>34938</td>
<td>A</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Inventory Control</td>
<td>34935</td>
<td>A</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Optimisation Techniques</td>
<td>34932</td>
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</table>

- **Mathematics - Statistics (28 credit points)**

<table>
<thead>
<tr>
<th>Subject name</th>
<th>Subject number</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compulsory subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Mathematics</td>
<td>31885</td>
<td>A</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Statistics 2</td>
<td>34852</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Probability</td>
<td>34960</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Regression Analysis</td>
<td>34955</td>
<td>A</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Quality Control</td>
<td>34957</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Design of Experiments</td>
<td>34956</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Stochastic Processes 1</td>
<td>34961</td>
<td>A,S</td>
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</tbody>
</table>

- **Mathematics - Operations Research/Statistics (24 credit points)**

<table>
<thead>
<tr>
<th>Subject name</th>
<th>Subject number</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compulsory subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Mathematics</td>
<td>31885</td>
<td>A</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Statistics 2</td>
<td>34852</td>
<td>S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Probability</td>
<td>34960</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Operations Research Models</td>
<td>34740</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Linear Programming</td>
<td>34931</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Stochastic Processes 1</td>
<td>34961</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Students who have passed 31615 Discrete Mathematics, 31626 Probability and Statistics and 31885 Advanced Mathematics in the School of Computing Sciences are deemed to have satisfied the knowledge requirement for any subjects which have prerequisites of 34701 Algebra 1, 34710 Calculus, and 34751 Statistics 1.
Note that 31885 Advanced Mathematics is a compulsory prerequisite for any subject to be undertaken from the School of Mathematical Sciences. Furthermore, 34740 Introduction to Operations Research Models must be taken before any other operations research subject.

With the exception of the subject pair Advanced Mathematics and Introduction to Operations Research Models, students are not permitted to take individual subjects from the School of Mathematical Sciences but must enrol for a sub-major.

**Humanities**

Credit points: 24 (minimum)

Contact person: Ms K Fry

Phone: 330 2291 Room: 408

The School of Humanities offers the following sub-majors to Computing Science students. These sub-majors are structured into two levels. Students must take the compulsory introductory three credit point unit, and at least 24 credit points drawn from Level 200 and Level 300. At least six credit points must be at Level 200 and at least six credit points must be at Level 300.

Students who commenced Humanities sub-majors before 1993 should consult the School of Humanities concerning equivalents.

- **Communication, History, Politics And Society**

  **Introductory Level**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>51370</td>
<td>Human Communication</td>
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**200 Level**

<table>
<thead>
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<th>Title</th>
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<tbody>
<tr>
<td>51369</td>
<td>Technical and Professional Communication</td>
<td>6</td>
<td>3</td>
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<tr>
<td></td>
<td>or</td>
<td></td>
<td></td>
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<tr>
<td>50712</td>
<td>Communication Skills in English</td>
<td>6</td>
<td>3</td>
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<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>59326</td>
<td>Professional Communication</td>
<td>4</td>
<td>3</td>
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<tr>
<td>59325</td>
<td>Science, Technology and Human Values</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59324</td>
<td>Issues in Science, Technology and Human Values</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>53203</td>
<td>Communication and Control</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53204</td>
<td>Social and Political Theory</td>
<td>8</td>
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</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
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<tbody>
<tr>
<td>53205</td>
<td>Australian Politics</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53208</td>
<td>Energy and Environment</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53209</td>
<td>Culture, Race and Ethnicity</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53211</td>
<td>Urban Culture</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53212</td>
<td>Australian History</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53219</td>
<td>Aboriginal Studies</td>
<td>8</td>
<td>3</td>
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</table>

**300 Level**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>51519</td>
<td>Industrial Relations</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59325</td>
<td>Issues in Industrial Relations</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>52029</td>
<td>Organising EEO</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59326</td>
<td>Issues in Organising EEO</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>59630</td>
<td>Social Issues in Health</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51014</td>
<td>Health, Technology and Society</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>50716</td>
<td>Writing for Science and Technology</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>53300</td>
<td>International Aspects of Communication</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53303</td>
<td>Orientalism: Constructs of the East</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53306</td>
<td>History of Social and Political Thought</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53307</td>
<td>Asian and Pacific Politics</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53308</td>
<td>International Politics</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53310</td>
<td>Religion, Magic, Science and the Supernatural</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>53314</td>
<td>Social Policy</td>
<td>8</td>
<td>3</td>
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</tbody>
</table>

- **Public Relations**

  **Introductory Level**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
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<tbody>
<tr>
<td>21125</td>
<td>Australian Business Environment</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Faculty of Bus)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51370</td>
<td>Human Communication</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**200 Level**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>53240</td>
<td>PR: Process and Practice (compulsory unit)</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>50351</td>
<td>PR: Research and Communication</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>50357</td>
<td>Community Relations</td>
<td>6</td>
<td>4</td>
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</table>

**300 Level**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>50352</td>
<td>PR: Issues and Management</td>
<td>6</td>
<td>4</td>
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<tr>
<td>53341</td>
<td>PR in Global Development</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>53342</td>
<td>PR Project</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>
As part of the course requirements in Public Relations, students undertake an internship under the guidance of a public relations professional during the course of study for a sub-major in Public Relations. Details of this should be discussed with the Public Relations Coordinator in the School of Humanities.

Business
The following sub-majors are offered to Computing Science students by the Faculty of Business. Note that Computing Science students are not permitted to take the Business Information Systems sub-major.

Some of the subject numbers may have been changed. Students should check the Business Timetable for such changes at enrolment.

- Advertising Management
Credit points: 25
Coordinator: Mr J Wright
Phone: 330 3536 Room: C226

Students undertaking the Advertising sub-major will be aiming to develop their managerial skills for careers in marketing and advertising. There are specific applications to product management, advertising and advertising planning/strategy for agency executives.

The subjects included in this sub-major take students from an understanding of Buyer Behaviour through Advertising Management to research applications, in the form of Advertising Research Methods. This is followed by the Advertising Project, in which a student, as part of a small team, undertakes a complete brief from an advertising agency or client and uses all the tools learnt in this major, in real-life application.

It also proposes a model by which advertising can be more predictable and successful.

Structure

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>24105 Principles of Marketing</td>
<td>5 3</td>
</tr>
<tr>
<td>24202 Buyer Behaviour (24105)</td>
<td>5 3</td>
</tr>
<tr>
<td>24210 Advertising Management (24202)</td>
<td>5 3</td>
</tr>
<tr>
<td>26122 Business Statistics</td>
<td>5 3</td>
</tr>
<tr>
<td>24510 Advertising Research Methods (26122, 24210)</td>
<td>5 3</td>
</tr>
</tbody>
</table>

- Economics
Credit points: 25
Coordinator: Associate Professor H Pritchard
Phone: 330 5451 Room: 4.415

Structure

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP HPW</th>
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<tbody>
<tr>
<td>25110 Microeconomics</td>
<td>5 3</td>
</tr>
<tr>
<td>25209 Macroeconomics</td>
<td>5 3</td>
</tr>
</tbody>
</table>

plus any three of the following (subject to prerequisite rules)

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP HPW</th>
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</thead>
<tbody>
<tr>
<td>25304 Asian-Australian Economic Relations 1 (25110, 25209)</td>
<td>5 3</td>
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<tr>
<td>25322 Comparative Economic Systems 2 (25209)</td>
<td>5 3</td>
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<tr>
<td>25303 Industry Economics (25210)</td>
<td>5 3</td>
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<tr>
<td>25315 International Economics (25209)</td>
<td>5 3</td>
</tr>
<tr>
<td>25305 Labour Market Economics (25209)</td>
<td>5 3</td>
</tr>
<tr>
<td>25309 Macroeconomic Policy (25209)</td>
<td>5 3</td>
</tr>
<tr>
<td>25210 Microeconomic Policy (25110)</td>
<td>5 3</td>
</tr>
<tr>
<td>25307 Public Finance 2 (25209)</td>
<td>5 3</td>
</tr>
<tr>
<td>25306 Resource Economics 1 (25110, 25209)</td>
<td>5 3</td>
</tr>
<tr>
<td>25320 Underdeveloped Economies 1 (25209)</td>
<td>5 3</td>
</tr>
</tbody>
</table>

1 Available at the City campus only.
2 Available at the Kuring-gai campus only.

- Human Resources Management
Credit points: 25 (minimum)
Coordinator: Mr B Connor
Phone: 330 3645 Room: C438

Structure

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>21125 Australian Business Environment</td>
<td>5 3</td>
</tr>
<tr>
<td>21306 Employment Relations</td>
<td>5 3</td>
</tr>
</tbody>
</table>

plus any three of the following four subjects

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>21430 Advanced Industrial Relations (21306)</td>
<td>5 3</td>
</tr>
</tbody>
</table>
21407 Strategic Human Resource Management (21306) 5 3 24517 Contemporary Issues in International Marketing (24220) 5 3
79270 Industrial and Labour Law (79101) 5 3 24607 International Marketing Management Project (24517, 24220) 5 3
21408 Employment Relations Skills (21306) 5 3 21517 International Management 5 3

• International Business

Credit points: 25
Coordinator: Mr C Hall
Phone: 330 5324 Room: K4-414

Structure
The sub-major consists of five units as follows:

Compulsory subjects CP HPW
25209 Macroeconomics 5 3
24105 Principles of Marketing 5 3
25315 International Economics (25209) 5 3
24220 International Marketing (24105) 5 3

plus choose one of the following (subject to prerequisite rules)
21591 International Management 5 3
or
25304 Asian Australian Economic Relations 5 3

• International Marketing

Credit points: 25
Coordinator: Mr R Fletcher
Phone: 330 5111 Room: K5.218

Structure
The International Marketing Country Study is an elective subject offered over two semesters involving considerable commitment on the student's part. There are therefore two options within the International Marketing sub-major.

Compulsory subjects CP HPW
Option 1 (for students not electing to do the International Marketing Country Study)
24105 Principles of Marketing 5 3
24220 International Marketing 5 3
24517 Contemporary Issues in International Marketing (24220) 5 3
24607 International Marketing Management Project (24517, 24220) 5 3
21517 International Management 5 3

Option 2 (for students electing to do the International Marketing Country Study)
24105 Principles of Marketing 5 3
24220 International Marketing 5 3
24517 Contemporary Issues in International Marketing (24220) 5 3
24518 International Marketing Country Study 1 (24220) 10 3

1 This subject is a full year subject, commencing in the Autumn (1st) semester and extending till the end of the Spring (2nd) semester in the same year.

• Leisure Studies

Credit points: 25
Coordinator: Mr B Hayllar
Phone: 330 5111 Room: K5.218

Structure

Compulsory subjects CP HPW
27126 Leisure in Australia 5 3
27216 Leisure Services Management 5 3

plus choose any three of the following (subject to prerequisite rules)
27523 Leisure and Public Policy 5 3
27628 Law for Leisure, Sport and Tourism 5 3
27523 Leisure and Tourism Planning 5 3
36613 Contemporary Management Practice 5 3
27610 Recreation Facility Design and Management 5 3
27132 Community Fitness and Lifestyle 1 5 3
27223 Leisure Program Planning 5 3

Other leisure studies subjects taught within the School of Leisure and Tourism Studies may be substituted for the above electives with the approval of the Head of School.
• Management
Credit points: 25
Coordinator: Mr N Barnwell
Phone: 330 3612 Room: C409

Structure
Compulsory subjects CP HPW
21125 Australian Business Environment 5 3
21130 Organisational Behaviour 5 3

plus choose any three of the following (subject to prerequisite rules)
21131 Operations Management 5 3
21306 Employment Relations 5 3
21210 Business and Government (21125) 5 3
21221 Organisational Design and Change (21130) 5 3
21591 International Management 5 3
21130 Organisational Behaviour 5 3

Law
• Business Law
Credit points: 28
Coordinator: Associate Professor K Curbush-Sabine
Phone: 330 3442 Room: B336

The purpose of this sub-major is to enable students to gain recognition for acquiring detailed knowledge in a group of specialist subjects with direct relevance to business. Such a concentrated course of learning develops a better understanding of intricate legal issues and facilitates planning of current and future commercial strategy.

Structure
Compulsory subjects CP HPW
79101 Law for Business 5 3
79267 Commercial Law 5 3

Plus choose any three of the following (subject to prerequisite rules)
79265 Administrative Law 1 6 3
79266 Administrative Law 2 (79101) 6 3
79666 Advanced Income Tax Law 6 3
79366 Banking Law (79101) 6 3
79368 Commercial Contracts (79101, 79267) 6 3

79365 Company Law (79267) 6 3
79411 Advanced Companies and Securities Law (79101) 6 3
79612 Corporate Control and Power (79101) 6 3
79667 Indirect Taxation (79101) 6 3
79360 Insurance Contracts (79101, 79267) 6 3
79270 Industrial and Labour Law (79101) 6 3
79364 Advanced Industrial and Labour Law (79101) 6 3
79363 Life Insurance Law (79101) 6 3
79263 Marketing and Consumer Protection (79101) 6 3
79466 Trade Law (79101) 6 3
79369 Elements of Contract 6 3
79468 Equity and Trusts 6 3

• Finance Law (Faculty of Law and Legal Practice and School of Finance and Economics)
Credit points: 26
Coordinator: Mr J Taggart
Phone: 330 3451 Room: C314

The objectives of the Finance Law sub-major are:

1. To develop specialist knowledge of the legal framework regulating the finance industry.

2. To provide students with a practical knowledge of existing regulations and an understanding of the legal ramifications of financial transactions, to enable them to fulfil their legal responsibilities with the finance industry.

3. To appreciate the dynamic nature of the development of laws and regulations within the finance industry in a practical context and to enable informed discussion in respect of future reforms.

Structure
In addition to 79101 Law for Business (5cp) students are required to take the following four units:

<table>
<thead>
<tr>
<th>CP</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>79502 Law and Finance</td>
<td>5 3</td>
</tr>
<tr>
<td>25607 Securities Market Regulation (School of Finance and Economics, and Faculty of Law) (25314, 79101)</td>
<td>5 3</td>
</tr>
<tr>
<td>79366 Banking Law (79101)</td>
<td>6 3</td>
</tr>
<tr>
<td>79462 Revenue Law (79101)</td>
<td>5 3</td>
</tr>
</tbody>
</table>
Physics
Credit points: 24 (minimum)
Coordinator: Dr G Anstis
Phone: 330 2193 Room: 1/1118

Students who commenced Physics sub-majors before 1993 should contact Dr G Anstis in the Department of Physics, Faculty of Science, for details of transitional arrangements due to the introduction of credit points. Remember that four credit points will be awarded for every three hours of electives completed up to the end of 1992. The Department of Physics offers two sub-majors to Computing Science students. Interested students should first study this section and then if further advice is needed, consult Dr Anstis.

Registration
At the beginning of each semester in which a student takes a Physics subject, he/she should register with the Department of Physics by completing a form on or before re-enrolment day at the office of the Physics Sub-major Coordinator.

Students will also need to officially enrol in the subject(s); this is done on re-enrolment day through the School of Computing Sciences.

Students should remember when planning ahead that some subjects are available in one semester only.

• Physics (General)
This sub-major provides the grounding in general physics or the possibility of advanced study in a specialised area such as materials physics or solid state physics. The sub-major is of benefit to students contemplating a career in programming of scientific and engineering problems.

The minimum of 24 credit points may be made up as follows:

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>68711</td>
<td>Physics 1 S</td>
<td>A,S</td>
<td>8</td>
<td>6</td>
<td>Physics 1 or permission</td>
</tr>
<tr>
<td>68721</td>
<td>Physics 2 S</td>
<td>A,S</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>plus choose at least eight credit points from the following</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68731</td>
<td>Physics 3 S</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>Physics 2 S or Engineering Physics (Civil) S</td>
</tr>
<tr>
<td>68732</td>
<td>Applied Optics S</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>Physics 2 S or Engineering Physics (Civil) S</td>
</tr>
<tr>
<td>68743</td>
<td>Thermodynamics and Energy S</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>Physics 2 S or Engineering Physics (Civil) S</td>
</tr>
<tr>
<td>68751</td>
<td>Nuclear Physics S</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>Quantum Physics 1 S</td>
</tr>
<tr>
<td>68741</td>
<td>Quantum Physics 1 S</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>Quantum Physics 1 S Mathematics</td>
</tr>
</tbody>
</table>
• **Electronics**

This sub-major enables students to complement knowledge of software with a knowledge of hardware. It is useful to students contemplating a career in the areas of microprocessors and computer interfacing.

The minimum of 24 credit points may be made up as follows:

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>68713</td>
<td>Physics for Electronics S</td>
<td>A</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>plus choose at least eight credit points from the following</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68734</td>
<td>Electronics 1 S</td>
<td>A</td>
<td>8</td>
<td>6</td>
<td>Physics 2 S or Electronics 1 S or</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Eng Physics (Civil) S</td>
</tr>
<tr>
<td>68744</td>
<td>Electronics 2 S</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>Electronics 1 S or 31613, 31623</td>
</tr>
<tr>
<td>31888</td>
<td>Logic Design</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>68754</td>
<td>Microprocessors in Instrumentation S</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>Electronics 2 S or Electronics 1 S and Logic Design 1</td>
</tr>
<tr>
<td>68764</td>
<td>Principles of Instrumentation</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Logic Design is taught by the School of Computing Sciences.

Electronics 2 S is the preferred subject because it emphasises hardware. Full-time students with an average mark below 55 can only do Electronics 2 S in their Industrial year. Since Logic Design has no Physics prerequisites it can be taken early in the course.

Advanced Logic Design cannot be credited towards the sub-major in Electronics. Only Microprocessors in Instrumentation S may be taken for credit.

**Electrical Computer Systems**

Credit points: 19

Contact person: Ms E With

Phone: 330 2432 Room: 1-2423

The School of Electrical Engineering offers an Electrical Computer Systems sub-major to Computing Science students.

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31885</td>
<td>Advanced Mathematics</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>31615, 31626</td>
</tr>
<tr>
<td>45113</td>
<td>Digital Techniques</td>
<td>A,S</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>45143</td>
<td>Computer Hardware</td>
<td>A,S</td>
<td>3</td>
<td></td>
<td>45113</td>
</tr>
<tr>
<td>45163</td>
<td>Real Time Software and Interfacing</td>
<td>A,S</td>
<td>3</td>
<td>3</td>
<td>45143</td>
</tr>
<tr>
<td>45372</td>
<td>Computer-Systems Analysis</td>
<td>S</td>
<td>3</td>
<td>3</td>
<td>45143, 31885</td>
</tr>
<tr>
<td>45364</td>
<td>Digital Systems</td>
<td>A,S</td>
<td>3</td>
<td>3</td>
<td>45143</td>
</tr>
</tbody>
</table>

Note that one of the subjects in this sub-major is 31885 Advanced Mathematics offered by the School of Computing Sciences.
The normal program for a full-time student would be:

**Autumn**
- Year 2
  - Advanced Mathematics
  - Digital Techniques

**Year 4**
- Real Time Software and Interfacing

**Spring**

**Year 4**
- Real Time Software and Interfacing

The normal program for a part-time student would be:

**Year 3**
- Advanced Mathematics

**Year 4**
- Computer Hardware

**Year 5**
- Real Time Software and Interfacing

**Year 6**
- Computer-Systems Analysis

### Information Studies
The School of Information Studies at the Kuring-gai campus offers the following sub-majors to Computing students.

- **Information Studies**
  - Credit points: 24
  - Contact person: Ms J Houghton
  - Phone: 330 5462 Room: K2-330

**Compulsory subjects**

- 55040 Information Science 1: Foundations of Information Science 5 cp
- 55041 Information Science 2: User Behaviour 6 cp
- _plus one of the following groups of subjects_
  - 55042 Information Science 3: Organisation of Information 6 cp
  - 55043 Information Science 4: Information Retrieval or
    - 55024 Information Production 6 cp
  - 55075 Information Resources and Collections or
    - 55010 Psychology 4 cp
  - 51103 Work, Organisation and Society 4 cp

### Communication Studies
- Credit points: 24
- Contact person: Ms C Bailey
- Phone: 330 5221 Room: K2-467

**Compulsory subjects**

- 56001 Communication 1: Foundations of Communication 5 cp
- 56002 Communication 2: Group Communication 6 cp
- _plus one of the following groups of subjects_
  - 56003 Communication 3: Organisational Communication 6 cp
  - 56004 Communication 4: Public Communication or
    - 56008 Public Relations Practice 6 cp
  - 56007 Public Relations Principles or
    - 55010 Psychology 4 cp
  - 51103 Work, Organisation and Society 4 cp
Communication and Information Skills  4 cp
or
Video Production  6 cp
Publishing  6 cp

Bachelor of Information Technology (BInfTech)

Course code MCO3
This course is a cooperative education program in computer information systems and has been developed by the School of Computing Sciences in cooperation with a group of private and public sector employers. The course is of three years' duration and involves four semesters of full-time study at the University and two semesters of full-time study and practical experience in industry. The industry semesters are of 24 weeks' duration, and a 42-week academic year is the norm for the course.

Year  Semester 1  Semester 2
1  UTS  Industry
2  UTS  UTS
3  Industry  UTS

The program differs from existing cooperative education courses in that, during the industry-based semesters, students will follow a structured program designed jointly by the University and the employer group, including formal coursework taught in industry. This coursework is assessed to University and business standards and familiarises students with business needs and requirements. During the industry periods students will be exposed to real problems within an environment quite different from that of the University. The resources of industry will be available to support the education of students.

The central curriculum of the course is information systems; this is supported by studies in management, accounting, finance and marketing as well as the necessary background subjects in computing science and programming. The active participation of industry practitioners in course design and course delivery will further ensure that graduates of the course are well equipped with skills relevant to present and future industry needs.

The two industry semesters will be spent with two different companies. Students are not employees of the company, and will not be obliged to find employment with a given company on completion of their studies.

Nevertheless students are encouraged to find employment within the group of sponsoring employers.

The number of students admitted each year will be limited by the number of sponsorship commitments secured from employers, to a maximum of 50 places.

Each student admitted to the course will receive a scholarship for the duration of the course, subject to satisfactory performance and to certain conditions detailed further in this handbook. Each of the industry partners undertakes to sponsor a stated number of students, and contributes the full amount of their scholarship to a fund administered by the University.

Each company also provides the industry semester facilities for the number of students being sponsored.

Selection to the course is based on HSC results and on performance at an interview. Interviews are conducted by panels comprising representatives of the University and the industry group. Applicants will be assessed for their suitability to the industrial as well as the academic components of the course.

RECOMMENDED PROGRAM

Year 1
Autumn semester—UTS
31611 Information Systems (4cp)
31613 Computer Systems Architecture 1 (4cp)
31614 Programming Principles (5cp)
31615 Discrete Mathematics (4cp)
31617 Accounting Fundamentals (4cp)
31621 Systems Analysis (4cp)

Spring semester—Industry
31722 Commercial Programming (5cp)
31770 Industry Project 1 (5cp)
31771 Business Requirements Analysis (5cp)
31779 Applications of Information Technology 1 (5cp)

Year 2
Autumn semester—UTS
25106 Economics (5cp)
24105 Principles of Marketing (5cp)
31631 Database (4cp)
31632 Communications and Networks (4cp)
31633 Operating Systems (4cp)
Course Steering Committee and the School of Computing Sciences. No industry-based subject can be taken during a university-based semester. The taking of additional subjects during an industry-based semester is seen as unusual and may only be done at the discretion of the Course Steering Committee and the School.

The School will not recommend probation for unsatisfactory academic performance. Instead, the School will recommend to the Faculty Board that a student be excluded under any of the following circumstances:

- a student fails any subject for the second time;
- a student gains less than 50 per cent of the credit points for which he or she is enrolled in that assessment period;
- a student fails any subject that is part of the program of an industry-based semester (there is provision for a supplementary examination to be taken in these subjects following a failure on the first attempt) or a student performs unsatisfactorily during an industry-based semester; or
- a student who, immediately prior to the commencement of an industry-based semester, has still to complete more than one subject in the normal program of the course to that stage.

Appeals against exclusion will be dealt with by the University's Appeals Committee (of the Academic Board), which will take into account the recommendation of the Course Steering Committee.
INDUSTRY SEMESTERS
The dates of the industry-based semesters for 1994 are as follows:

Autumn semester (3rd-year students)
Monday 17 January 1994 – Friday 1 July 1994

Spring semester (1st-year students)
Monday 4 July 1994 – Friday 16 December 1994

Students are expected to attend their assigned sponsoring company on a full-time basis throughout these periods. Students cannot expect any absences to be approved during the industry semesters.

PERSONAL DETAILS
Students must inform the University should their name or address details change. BinfTech students must also inform Des Saunders, Cooperative Education Officer, of any changes to personal details. Students who wish to change the method of payment of the scholarship should contact the Salaries Office, Smail Street on 330 2847.

SCHOLARSHIP
The scholarship will be paid at three different and increasing levels; all first-year students will start at Level 1. At the end of each year all BinfTech students with satisfactory progress will move from their current level to the next level.

The levels for 1994 are as follows:
Level 1 $9,000 per annum
Level 2 $9,450 per annum
Level 3 $9,900 per annum

The scholarship paid to BinfTech students has been ruled as tax exempt.

POSTGRADUATE PROGRAMS
Application forms for all postgraduate courses may be obtained from the UTS Information Service. General enquiries should be directed to either the Postgraduate Studies and Scholarships Office (PSSO), telephone 330 1523, or the Faculty Graduate Assistant, telephone 330 1806. All prospective applicants should contact the Faculty Graduate Assistant before submitting an application. Applicants for research degrees should obtain approval either from the Director, Postgraduate Studies or from their chosen supervisor before submitting applications.

POSTGRADUATE RESEARCH DEGREES
Research areas
Areas of particular interest for work towards research degrees in the School of Computing Sciences include:

- operating systems
- computer performance evaluation
- intelligent office automation systems
- computer graphics
- image processing
- artificial intelligence
- expert systems
- knowledge bases,
- local networks and network interface technology
- neural networks
- parallel processing and transputers
- group support systems for workgroup computing
- information modelling
- auditing large databases
- microprocessors and their applications
- distributed databases
- computer systems security
- object-oriented techniques
- usability and human-computer interaction

Computer research laboratories
Within the School, support for a wide range of Computing and Information Technology research is provided by a variety of research laboratories. Graduate research students, academics, visiting researchers and research assistants undertake collaborative research within the laboratories. The research quality and relevance of all laboratories is enhanced by well-established links, both with industry and overseas institutions.

The major laboratories are:

Parallel Processing Laboratory – examines and applies transputer technology to real world tasks, distributed operating systems and compilation. The laboratory is part of the
Australian Transputer Centre (supported by Inmos) that has a configuration of over 40 transputer systems. (Contact: Ury Szewcow)

Computer Graphics Laboratory - using seven Silicon Graphics workstations, this Laboratory develops realistic images and computer animation. Other areas include efficient contour algorithms, human movement image animation and textual modelling. (Contact: Dr Kevin Suffern)

Distributed Database Laboratory - implementation and data modelling of distributed databases client-server computing and cooperative workgroup systems. Development of methods for integrating database with expert systems, modelling of constraints and development of design tools. Integration of groupware with databases. (Contact: Dr George Feuerlicht)

Software Research Laboratory - includes three groups:

Programming Research Group - investigates programming languages and paradigms, concurrency, software engineering and formal methods, category theory;

Artificial Intelligence Group - interests include AI in design, Case Based Reasoning, cognitive modelling, Knowledge Engineering, PROLOG and LISP;

Adaptive Methods Group - applies neural networks, genetic programming and other machine learning methods to problems of varying complexity including image analysis, forecasting and natural language. (Contact: Dr Tom Osborn)

CRC Distributed Systems Technology Laboratory - the primary focus is management security and performance for controlled and efficient access to the resources of distributed systems such as database, collaboration software and distributed software tools. (Contact: Associate Professor Mike Fry)

Distributed Multimedia Laboratory - examines technology, protocols and implementation issues for very high band-width multimedia technology over computer networks. Work includes distance interaction of design editing and performance groups and network traffic performance, supporting diverse components. (Contact: Associate Professor Mike Fry)

Usability laboratory - investigates the methods and measurement techniques for developing effective and usable human-computer interaction methods, for different kinds of operating environments including design and system development. (Contact: Mr David Wilson or Mrs Judy Hammond)

Doctor of Philosophy (PhD)

Course code MCS4

The Doctor of Philosophy is intended for students who wish to pursue research at a high level; such research is expected to demonstrate significant originality and to make a substantial contribution to computing knowledge. For specific areas of interest in research in the School of Computing Sciences see 'Research areas' above.

ATTENDANCE PATTERN

The Doctor of Philosophy degree is available on both a full-time and a part-time basis. Candidates who already possess a degree at the Master's level may be permitted to complete in two years if full-time, and three years, if part-time. The maximum duration of enrolment is four years for full-time students and six years for part-time students.

HOW TO APPLY

Applicants should hold a First Class, or Second Class (Division One), Bachelor's degree with a major computing component, or should hold a Master's degree in an appropriate area, or should have previously undertaken other postgraduate studies in computing. Prospective applicants are expected to have developed interests in a specific area of research, and should have one or more specific proposals for research work in that area. Before submitting a formal application for admission to this degree course, applicants should first seek the approval of the School for their proposed research work. To gain this approval, applicants should initially:

Either send a summary proposal of at least 1,000 words to the Director, Postgraduate Studies, School of Computing Sciences, containing references to seminal works in the area of proposed research. If the proposal is of interest to the School then the Director will refer the applicant to a suitable member of staff for further detailed discussion;

Or approach a suitable member of the School's academic staff directly and discuss the proposed research.

University Rule 3.5.2.2, as amended, provides that every Doctor of Philosophy student at UTS is required to have two supervisors for their research work, one of whom should be an academic staff member of the University and, normally, one of whom should hold a Doctoral degree.
When the applicant's proposed research has been approved by a member of the School's academic staff, and if two members of staff are prepared to supervise the research, then the applicant may formally apply for admission. Formal application for admission should consist of a completed Application for Admission – Doctor of Philosophy form and a completed Details of Proposed Study form which should be signed by both the applicant and one of the proposed supervisors.

COURSE FEES
There are no tuition fees for this course, and students are not required to pay the Higher Education Contribution Scheme fee.

PROGRESS REPORTS
All thesis students are required to submit, in consultation with their supervisors, a progress report at the end of each semester. The Faculty Graduate Assistant contacts each supervisor to initiate this process.

SUBMISSION OF THESIS
Each candidate for the degree of Doctor who is required to submit a thesis should give the Academic Registrar two months' written notice of intention to submit. Appropriate forms and the information brochure Presentation and Submission of Theses for Higher Degrees are available from the Postgraduate Studies and Scholarships Office. There is a different set of rules for Master's and Doctoral students.

RECENT THESIS

Master of Science (by thesis) (MSc)

Course code MC51
The Master of Science (by thesis) degree enables graduates to extend and deepen their knowledge of a specialised area in computing by undertaking research under the supervision of a member of the academic staff. For specific areas of interest in research work in the School of Computing Sciences see 'Research areas' above.

ATTENDANCE PATTERN
This degree is available on a full-time and part-time basis. The normal duration of enrolment for this degree is two years of full-time attendance or three years of part-time attendance. The maximum time to complete the course is three years and four and a half years respectively. The School of Computing Sciences has a strong preference for research work which proceeds at a full-time pace. This preference should not be seen as a deterrent to those students who wish to remain in employment. Students who are working in a full-time job, are encouraged to select a topic for their research which is closely aligned with their professional work. Once such a topic has been selected, the School usually requires that the student's employer provide a statement to the effect that at least half of the student's working week will be devoted to work which is directly relevant to the research. The student is then expected to contribute some of his or her own time to the project which brings the total number of hours devoted to research within that expected of full-time attendance.

HOW TO APPLY
Applicants should hold a first degree with a major computing component or should have previously undertaken other postgraduate studies in computing. Prospective applicants are expected to have developed interests in a specific area of research, and should have one or more specific proposals for research work in that area. Before submitting a formal application for admission to this degree course, applicants should first seek the approval of the School for their proposed research work. To gain this approval, applicants should initially:

Either send a summary proposal of at least 1,000 words to the Director, Postgraduate Studies, School of Computing Sciences, containing references to seminal works in the area of proposed research. If the proposal is of interest to the School then the Director will direct the applicant to a suitable member of staff for further detailed discussion;

Or approach a suitable member of the School's academic staff directly and discuss the proposed research.

When the applicant's proposed research has been approved by a member of the School's academic staff, and if that member of staff is prepared to supervise the research, then the applicant may formally apply for admission. Formal application for admission should consist of a completed Application for Admission – Graduate Courses form and a completed Details of Proposed Study form which should be signed by both the applicant and the proposed supervisor.
Note that all prospective applicants should obtain approval for their proposed research work either from the Director, Postgraduate Studies or from their chosen supervisor before submitting an application form for admission to this course.

COURSE FEES
There are no tuition fees for this course, and students are not required to pay the Higher Education Contribution Scheme fee.

PROGRESS REPORTS
All students are required to submit, in consultation with their supervisor, a progress report at the end of each semester. The Faculty Graduate Assistant contacts each supervisor to initiate this process.

SUBMISSION OF THESIS
Each candidate for the degree of Master who is required to submit a thesis should give the Academic Registrar two months' written notice of intention to submit. Appropriate forms and the information brochure Presentation and Submission of Theses for Higher Degrees are available from the Postgraduate Studies and Scholarships Office. There is a different set of rules for Master's and Doctoral students.

RECENT THESIS
Grattan P J, Personal Computer Data Asset Protection; the End User Environment, 1988
Sifer M J, Structured Planning, 1990
Horn K A, Carvan-ESI: An Expert System for the Interpretation of Thyroid Laboratory Tests, 1991
Huang Y X, Knowledge-based Support for Office Procedures, 1991
Blair A, Managing Business Rules and Integrity Constraints in Relational Database Applications, 1992
Wilson D N, Project Management for a Prototyping Environment, 1993
Phillips M T, Dynamic Load Sharing: A Prototype, 1993

POSTGRADUATE COURSEWORK PROGRAMS
Master of Science in Computing (by coursework) (MSc)

Course code MC53
Until 1993 this course was called the Master of Science in Information Science. A revised course, entitled the Master of Science in Computing, will be introduced in 1994. The information that follows reflects the changes that have been made.

The Master of Science in Computing (by coursework) enables graduates to select a program of study which suits individual career goals. For example, a program may be chosen which develops specialised expertise in computer systems, which provides a general update of information science technology, or one which equips the student for a position in corporate management as an information scientist.

ATTENDANCE PATTERN
The course is offered on a part-time basis only, over six semesters (three years), as it is considered important that students remain in professional employment while undertaking their graduate studies in computing. Attendance is required at lectures for at least two evenings each week. Because the course is only available part-time all timetabled sessions are held in the evenings, usually between 6.00 pm and 9.00 pm.

HOW TO APPLY
The course is intended for computing professionals. Applicants should have both

- a Bachelor's degree from the University of Technology, Sydney or equivalent, preferably with a major computing component. Applicants are required to submit evidence to the effect that the extent of their formal knowledge of computing is equivalent to that of a graduate from the UTS Bachelor of Science in Computing Science; and

- an established professional career within the information industry. As a guide, the extent of the applicant's professional experience should be equivalent to that of an Associate Member of the Australian Computer Society of at least two years' standing.
Each semester the School publishes the MSc (by coursework) in Computing Course Guide. This guide contains much administrative information as well as a detailed statement of the course regulations. Students and prospective applicants are advised to obtain a copy of this guide and to study it carefully. From August an 'Admission package' containing a copy of the guide, the application forms and other relevant information is available from either the UTS Information Service, the Faculty Graduate Assistant, or the University's Postgraduate Studies and Scholarships Office. Please note that completed application forms must be submitted to the University by the last week of October in the year prior to that in which admission is sought.

COURSE FEES
In 1994 tuition fees will be charged for students in the MSc (by coursework) in Computing. These fees have been set at $1,000 per semester for a normal attendance pattern. Students who pay tuition fees will not be liable for HECS (ie, the Higher Education Contribution Scheme).

PREREQUISITE KNOWLEDGE
All subjects in the MSc course are presented at the postgraduate level. Students are expected to be familiar with the undergraduate material which lies behind the postgraduate work.

For the subjects offered by the School of Computing Sciences, before the start of each semester a set of references to the presumed undergraduate material is given by each lecturer. It is important to note that these references are not 'pre-reading', but are a summary of the undergraduate knowledge required for each subject. Students are responsible for ensuring that they are completely familiar with the undergraduate knowledge implied by those references. If they are not, then they should defer their enrolment in that subject and should attend suitable remedial undergraduate lectures; the Director, Postgraduate Studies will advise students on suitable remedial lectures.

For a subject offered by schools other than the School of Computing Sciences, students are advised to contact that subject's co-ordinator, before the start of semester, to determine whether they possess the prerequisite knowledge for that subject. If students do not possess the prerequisite knowledge for subjects offered by other schools or faculties then they should seek advice from those schools or faculties on the feasibility of a remedial program; the Director, Postgraduate Studies will assist in obtaining this advice.

In addition, there are prerequisite requirements within the structure of the course itself (see subject descriptions).

COURSE STRUCTURE
Students are required to complete a total of 72 credit points consisting of 60 points from coursework and 12 points from the Project subject. The Project subject is normally taken in the fifth semester and must be completed by all students. In special circumstances, the Director, Postgraduate Studies may approve a program in which out of the total of 72 credit points 48 points come from coursework, and 24 points come from the 'Project' subject. Students should seek this approval in writing. Students who are allowed to undertake such a 24 credit point project must have the strong support of their Project Supervisor as part of these 'special circumstances'.

Each student's program of study will be subject to approval by the School's Director, Postgraduate Studies. The subjects chosen by a student must form a coherent plan of study and must be consistent with the student's professional career goals. When approving a student's program of study, the Director, Postgraduate Studies will not permit a student to enrol in a subject in the MSc (Computing) if that student has already completed a corresponding subject in another course.

Principal subjects in the Master's are subjects offered by the School of Computing Sciences on a regular basis as subjects in the course. Elective subjects in the Master's are subjects offered by the School of Computing Sciences on a periodic basis as subjects in the course; the elective subjects may vary from year to year depending on the availability of specialist staff.

To gain their credit points from coursework (normally amounting to 60 credit points), students are required to gain at least 36 credit points by passing a selection of principal subjects; with the balance, which will thus be between 0 and 24 credit points, to be made up as follows:
• by passing postgraduate subjects which are made available to students in the MSc (Computing) course by the School of Mathematical Sciences or by other faculties, or
• by passing elective subjects up to a total of 12 credit points only (in special cases, when the student has specific requirements, the Director, Postgraduate Studies may extend this to a total of 18 credit points of elective subjects but no further).

SUBJECT OUTLINE TIMETABLE
The principal subjects in the proposed course are as follows and are grouped under the name of the School’s Unit or Department which will present that subject:

<table>
<thead>
<tr>
<th>Semester CP offered</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Computer Science Department</td>
</tr>
<tr>
<td></td>
<td>32901 Recent Advances in Computer Science 6 Autumnns</td>
</tr>
<tr>
<td>6</td>
<td>Computing Methods Unit</td>
</tr>
<tr>
<td>A95</td>
<td>32106 Object-oriented Software Development</td>
</tr>
<tr>
<td>S94</td>
<td>32108 Specialist Topics in Artificial Intelligence 6</td>
</tr>
<tr>
<td>S95</td>
<td>32107 Formal Reasoning for Software Development</td>
</tr>
<tr>
<td>All</td>
<td>Computing Systems Unit</td>
</tr>
<tr>
<td>6</td>
<td>32307 Operating Systems</td>
</tr>
<tr>
<td>S94</td>
<td>32306 Capacity Management 6</td>
</tr>
<tr>
<td>A95</td>
<td>32302 Computer Architecture 6</td>
</tr>
<tr>
<td>S95</td>
<td>Information Systems Department</td>
</tr>
<tr>
<td>6</td>
<td>32902 Recent Advances in Information Systems</td>
</tr>
<tr>
<td>Autumnns</td>
<td>Information Systems Technology Unit</td>
</tr>
<tr>
<td>6</td>
<td>32204 Advanced Data Management</td>
</tr>
<tr>
<td>A94</td>
<td>32205 Computer Communication Systems</td>
</tr>
<tr>
<td>S94</td>
<td>32206 Advanced Information Systems Modelling 6</td>
</tr>
<tr>
<td>S95</td>
<td>Information Systems Management Unit</td>
</tr>
<tr>
<td>6</td>
<td>32207 Information Management</td>
</tr>
<tr>
<td>A95</td>
<td>32208 Information Processing Strategy 6</td>
</tr>
<tr>
<td>S95</td>
<td>32402 Information Technology Environment 6</td>
</tr>
</tbody>
</table>

School of Computing Sciences
32912 Project 12 All
32924 Project 24 All

Each principal subject is of one semester’s duration. Principal subjects are offered once every two years with the exception of Recent Advances in Computer Science and Recent Advances in Information Systems which are offered each year. At present the intention is to offer the above principal subjects on a two-year cycle; however the Master’s program is constantly under review, and it is expected that the list of principal subjects offered will be expanded, and that the contents and sequence of existing principal subjects may be modified.

The elective subjects in the proposed course will present specialised material and so will depend on the availability of specialist staff. At present it is proposed to offer the following elective subjects:

Elective subjects
32506 Knowledge Systems (6cp)
32507 Performance Evaluation (6cp)
32503 Distributed Databases and Client/Server Computing (6cp)
32504 Tool-based Systems Development (6cp)
32505 Advanced Object-oriented Analysis and Design (6cp)
32501 Computer Graphics (6cp)
32502 Advanced Computer Graphics Techniques (6cp)

Subjects from other schools or faculties
The following subjects from other schools or faculties are available to students in the MSc (Computing):

School of Mathematical Sciences
Advanced Financial Modelling sequence
34936 Decision Theory (4cp)
34938 Financial Modelling Techniques (4cp)
34038 Corporate and Financial Decisions and Investment Analysis (4cp)

Advanced Optimisation Techniques sequence
34932 Optimisation Techniques (4cp)
34934 Network Optimisation (4cp)
34031 Large-scale Mathematical Programming (4cp)
34033 Dynamic Optimisation (4cp)
34927 Deterministic Optimal Control (4cp)
Advanced Experimental Design sequence
34955 Regression Analysis (4cp)
34956 Design of Experiments (4cp)
34067 Multivariate Statistics (4cp)
34069 Linear Models and Experimental Design (4cp)

Advanced Industrial Statistics sequence
34955 Regression Analysis (4cp)
34957 Quality Control (4cp)
34065 Time Series Analysis (4cp)

Advanced Stochastic processes
34013 Modern Analysis (Honours) (4cp)
34014 Measure Theory (Honours) (4cp)
34061 Stochastic Processes 1 (4cp)
34062 Stochastic Processes 2 (4cp)

Other subjects
34985 Digital Image Processing (4cp)
34986 Cryptology (4cp)

Faculty of Business
25706 Economics for Management (6cp)
21710 Quantitative Methods (6cp)
22726 Accounting and Financial Administration (6cp)
21718 Organisation Analysis and Design (6cp)
25742 Financial Management (6cp)
24734 Managerial Marketing (6cp)
21719 Organisational Behaviour (6cp)
22727 Information for Management Decisions (6cp)

Faculty of Law and Legal Practice
77756 Copyright Law (12cp)
77727 Design Law (12cp)
79749 Law for Managers (6cp)
79729 Legal Environment of Business (6cp)
72100 Legal Process (12cp)
79741 Marketing Legislation in Australia (6cp)

Choosing a program in 1994
Students may find the following presentation of planned subject offerings useful when choosing their program. It is usually easiest to choose the principal subjects first because most of these are only available every two years, and then to select the remaining subjects. Students should be sure to take the prerequisites into account. Ideally, there should be two subjects chosen per semester for the first two years. During the final year, students normally take the Project subject and two more coursework subjects.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>A 94</td>
<td>Recent Advances in CS</td>
<td>Capacity Management</td>
<td>Advanced Data Management</td>
<td>Recent Advances in IS</td>
</tr>
<tr>
<td>A 95</td>
<td>Obj-Oriented Software Development</td>
<td>Recent Advances in CS</td>
<td>Recent Advances in IS</td>
<td>Information Management</td>
</tr>
<tr>
<td>A 96</td>
<td>Recent Advances in CS</td>
<td>Capacity Management</td>
<td>Advanced Data Management</td>
<td>Recent Advances in IS</td>
</tr>
<tr>
<td>S 96</td>
<td>Specialist Topics in AI</td>
<td>Operating Systems</td>
<td>Computer Commun. Systems</td>
<td>Information Technology Environment</td>
</tr>
</tbody>
</table>

Note: The program shown for 1996 is provisional only.
The project entails a substantial investigation of a topic, in an area of current research interest in information technology and related to the student’s professional career goals. All students are required to enrol in and pass the project subject. The project is normally undertaken in the final year of study after the completion of at least two years of coursework.

The topic for the project should be of direct interest to the student, and of value to the student’s professional development.

Students may wish to select a topic which is closely related to their current employment or of value to their future career. The project should be a vehicle for importing the knowledge learned from the coursework to the student’s professional life and the topic should be chosen with this professional goal in mind. Students are advised to seek the assistance of the lecturing staff in finalising the topic for their project.

Before beginning the project work a student should obtain the agreement of a member of the lecturing staff to act as project supervisor, and deliver a 500-word description of the project to the Director, Postgraduate Studies for approval.

Once approved, the project will proceed ‘in the manner of a Master’s thesis’, and students are advised to discuss their work with their project supervisor regularly. The role of the project supervisor is to:

- advise on the general direction of the investigation;
- advise on a work schedule;
- advise on a framework for writing up the work, and
- criticise draft sections of work.

Enrolment and assessment of project

It is usual for the project work to extend over more than one semester. Students should enrol in the project for the semester in which they expect to submit their completed project. Note the requirement, stated below, that the project be submitted before the end of the tenth week of the semester in which the student wishes their project to be examined. The examination of the project must be completed before the School’s Examination Review Committee meeting which takes place towards the end of each semester. If students are enrolled in the Project subject at the time of the School’s Examination Review Committee meeting, and if the examination of their project has not been completed in time for that meeting, then their enrolment in project for that semester will be cancelled.

The project will result in the preparation of an extensive written report. Three copies of this report should be lodged with the Director, Postgraduate Studies before the end of the tenth week of the semester in which the student wishes to be examined. The School will retain three copies, one of which will be placed in the University Library. The final version of the report should be typed and bound in accordance with the University’s specification for theses (available from the Postgraduate Studies and Scholarships Office, Academic Office). Students may have their written reports bound before submitting them for examination; alternatively, to avoid the possible expense of rebinding, three copies of a typed but unbound report may be submitted for examination. When submitted, the written report should be accompanied by a Certificate of Originality and a Retention of Report form; these forms are available from the Director, Postgraduate Studies.

There will also be an oral presentation of 40 minutes followed by 20 minutes’ discussion with the examiners. A day will be set for the oral presentations each semester. The oral presentation day will usually be during the last two weeks of semester. The oral presentation should consist of a discussion of the more highly controversial or technical issues within the written report. When delivering the oral presentation, students should assume that their audience is familiar with the contents of their written report.

The project will be examined on the contents and standard of presentation of the written report and the oral presentation. The examiners of the project will be two members of the academic staff.

The result of the examination of the project shall be one of the following:

- outright pass;
- pass subject to minor corrections being made (without general re-typing) to the satisfaction of the project supervisor (or nominee) and without a formal re-examination;
• pass subject to major revisions being made (probably involving substantial re-typing). The student is responsible for making arrangements for these major revisions to be re-examined before the end of the twelfth week of the semester following the semester of the initial examination. The result of such a re-examination shall be 'outright pass' or 'outright failure'; or

• outright failure.

In addition, the examiners will allocate marks to the project.

SUBJECT FAILURE
Students are permitted at the most two failures during the MSc in Computing. Note the resolution of the Faculty Board FBMC/92/70 'that any Master's degree candidate enrolled in the MSc (Computing) who records any three failures will be excluded from the course'. In addition, students are bound by the Rules of the University, and are advised to refer to them.

MINIMUM AND MAXIMUM TIME
There are two important University Rules concerning minimum and maximum time which students should be aware of:

A Master's degree candidate shall not normally be eligible for the award of a Master's degree by coursework until he/she has completed at least six semesters of a part-time course. A student who is specially qualified in a relevant discipline may, with the approval of the Academic Board, be allowed to complete the course in less than the minimum time.

A student who fails to complete all of the work prescribed for the higher degree within nine semesters from the time of his/her registration as a part-time Master's degree candidate will only be permitted to continue with the approval of the Faculty Board.

Master of Business in Information Technology Management
Course code MC85
Graduate Diploma in Information Technology Management
Course code MC75
Graduate Certificate in Information Technology Management
Course code MC63

These are new courses which are expected to be offered for the first time in 1994 subject to Academic Board approval. The new courses form a joint program from the School of Computing Sciences and the Faculty of Business. All administration for these courses is the responsibility of the School of Computing Sciences within the Faculty of Mathematical and Computing Sciences. Enquiries on these courses should be directed to Susan Delaney, Program Manager, on 330 1925 or Jean Robb, Director of Graduate Education on 330 1836.

The courses aim to:

develop professional skills necessary for successfully undertaking the role of manager in terms of people, resources and processes in a variety of organisational contexts (which may include business, community, public, manufacturing, consultancy or professional contexts);

enable the acquisition of conceptual and analytical understanding of the corporate/organisational needs from the differing perspectives of individuals and groups within the organisation, necessary for successful management;

provide a well-balanced selection of subjects from both advanced information technology (IT) and management, in an integrated program which is relevant to the current and future demands of the IT industry;

develop an understanding of the IT business environment and to extend the knowledge and skills in specialist areas of management related to management of IT in business; and

enhance and develop a partnership between UTS and the IT industry.
ADMISSION REQUIREMENTS

Master's
1. A recognised Bachelor's degree (or equivalent) in an appropriate discipline such as Business or Computing, plus a minimum of two years' experience in the IT industry;
   or
2. The prior successful completion of the Graduate Diploma in Information Technology Management (therefore exempt from Semester 1, 2, 3 and 4 subjects);
   or
3. The successful completion of an approved bridging program for non-graduate entry; that is the Graduate Certificate with passes at a credit grade average.

Graduate Diploma
1. A recognised Bachelor's degree (or equivalent) in an appropriate discipline, plus a minimum of two years' experience in the IT industry,
   or
2. The prior successful completion of the Graduate Certificate in Information Technology Management (therefore exempt from Semester 1 and 2 subjects).

Graduate Certificate
1. A recognised Bachelor's degree (or equivalent) in an appropriate discipline, plus a minimum of two years' experience in the IT industry;
   or
2. Evidence of general and professional qualifications, such as other post-secondary school qualifications which can establish their aptitude, knowledge and practical experience, that will satisfy the Faculty Board in Mathematical and Computing Sciences that the applicant possesses the educational preparation and capacity to pursue postgraduate studies. Experience in the IT industry will be especially important in this regard, eg, five years' minimum vocational experience.

PRESUMED KNOWLEDGE AND PREREQUISITES
Subjects in the Graduate Certificate, Graduate Diploma and Master's courses are presented at postgraduate level. Students are expected to be familiar with the undergraduate material on which the postgraduate work is based. For the subjects offered by either the School of Computing Sciences or the School of Management, before the start of each semester a set of references to the presumed undergraduate material is given by each lecturer. It is important to note that these references are not 'pre-reading', but are a summary of the undergraduate knowledge required for each subject. Students are responsible for ensuring that they are completely familiar with the undergraduate knowledge implied by those references. If they are not, then they should seek advice from the Director of Graduate Education in the first instance and may then be advised to contact the subject coordinator, before the start of semester, to determine whether they possess the prerequisite knowledge for that subject.

For subjects offered by schools other than the School of Computing Sciences and the School of Management, students are advised to contact that subject's coordinator, before the start of semester, to determine whether they possess the prerequisite knowledge for that subject. If students do not possess the prerequisite knowledge for subjects offered by other schools or faculties then they should seek advice from that school or faculty on the feasibility of a remedial program; the Director of Graduate Education will assist in obtaining this advice.

In addition, there are prerequisite requirements within the structure of the course itself (see course structure).

FEES
Full tuition fees will be charged for students in the above courses. The fee is $1,500 per subject (module). The tuition fee for the research and development Project undertaken in the Master's course will be higher (subject to final determination).

COURSE STRUCTURE
All subjects will be assessed to the Master's standard, regardless of the course in which a student is enrolled. Hence a student who takes several individual subjects, may later gain credit towards a Graduate Certificate.

The courses have been designed to allow freedom of choice at the individual subject level. The subjects at the Graduate Certificate level aim to teach the student skills and competencies for IT management. At the Graduate Diploma level, the subjects aim to focus on organisational strategies and
planning. At the Master's level, the subjects are related to organisational development and research for the IT industry.

The full Master's degree course is normally completed in three years (six semesters) of part-time study. The Project is normally commenced in the fifth semester, together with one subject related to research methodology and Master's seminars on up-to-date issues in information technology.

Core subjects are to be offered by the Faculties of Mathematical and Computing Sciences, and Business on a regular basis. Additional subjects available on an elective basis will be offered depending on demand and the availability of specialist staff. There may be other postgraduate subjects available to students enrolled in the program, offered by other schools within the Faculties of Mathematical and Computing Sciences and Business, which may be selected by students with the approval of the Director of Graduate Education. The industrially linked Project must build on the core/elective subjects already taken by the student and should ideally be related to his/her place of work.

In all cases the subjects chosen must form a coherent plan of study and must be consistent with the student's professional career goals. Each student's program of study will be discussed with, and approved by, the Director of Graduate Education at the time of entry into a course. If a student has already completed an equivalent core subject in another course, he/she will be required to do an alternate subject from the electives available. Exemptions may only be considered if based on successfully completed subjects from these courses at Level 1 or above.

**Level 1 – No formal qualification**

A student may take any number of subjects relevant to his/her professional needs (subject prerequisites, if any, will need to be taken into account).

All subjects will be presented and assessed to the Master's level. Hence a student who takes several appropriate subjects may later gain credit towards a Graduate Certificate.

No formal qualification will be awarded by UTS.

**Level 2 – Graduate Certificate in Information Technology Management (24cp)**

A student must take the following three core subjects:

- 21789 Contemporary Management Practices (6cp)
- 21788 Effective People Management (6cp)
- 32601 Advanced Project Management (6cp)

A student must take one elective subject selected from:

- 21809 Managerial Analysis and Evaluation of Information Systems (6cp)
- 32602 Impact of Information Technology (6cp)
- 32603 Software Quality Management (6cp)
- 32604 System Integration (6cp)

or an elective approved by the Director of Graduate Education.

**Level 3 – Graduate Diploma in Information Technology Management (48cp)**

A student must complete the requirements for the Graduate Certificate in Information Technology Management (24cp); plus

A student must take the following three core subjects:

- 21806 Managing Organisational Change (6cp)
- 21807 Total Quality and Productivity Management (6cp)
- 21708 Strategic Business Management (6cp)

A student must take one elective subject selected from:

- 24704 Managing Client Relations (6cp)
- 32701 Advances in Information Technology (6cp)
- 32702 Contemporary Telecommunications (6cp)
- 32703 Information Processing Strategy (6cp)

or an elective approved by the Director of Graduate Education.
Level 4 – Master of Business in Information Technology Management (72cp)

A student must complete the requirements for the Graduate Diploma in Information Technology Management (48cp); plus

A student must take the following subjects:

21751 Management Research Methods (6cp)
32818 Project (18cp)

The major Project must involve applied organisational research and development in the IT industry. It must be industrially linked and conducted in conjunction with the student’s industry sponsor.

As part of the Project, a student must also attend associated Master’s seminars. Expert speakers may be available to run seminars on such topics as ‘Major Economic Trends’ or ‘International Competitiveness in the IT industry’.

A student must make one oral presentation of his/her project work at a satisfactory standard during the final year of enrolment in the Master’s course.

A typical outline program of study for the Master’s level course will be as follows:

Year 1

Spring semester
Subject 1 (Core 1/Level 2) (6cp)
Subject 2 (Core 2/Level 2) (6cp)

Year 2

Autumn semester
Subject 3 (Core 3/Level 2) (6cp)
Subject 4 (Elective/Level 2) (6cp)

Spring semester
Subject 5 (Core 1/Level 3) (6cp)
Subject 6 (Core 2/Level 3) (6cp)

Year 3

Autumn semester
Subject 7 (Core 3/Level 3) (6cp)
Subject 8 (Elective/Level 3) (6cp)

Spring semester
Project (Y)

An example of a selected program of study for the Master of Information Technology Management

Year 1

21788 Effective People Management (6cp)
21789 Contemporary Management Practices (6cp)
32601 Advanced Project Management (6cp)

Year 2

21807 Total Quality and Productivity Management (6cp)
21806 Managing Organisational Change (6cp)
21708 Strategic Business Management (6cp)

Year 3

21751 Management Research Methods (6cp)
32818 Project (18cp)

In all cases the subjects chosen must form a coherent plan of study and must be consistent with the student’s professional career goals. Each student’s program of study will be discussed with, and approved by, the Director of Graduate Education at the time of entry into a course. If a student has already completed an equivalent core subject in another course, he/she will be required to do an alternative subject from the electives available.

PROJECT

The project entails a substantial investigation of a topic, in an area of current research interest in information technology and related to the student’s professional career goals. The Project is normally taken in the last part of the Master’s course and must be taken by all Master’s students. All Master’s students are required to enrol in and pass the project subject.

The topic for the project should be of direct interest to the student, and of value to the student’s professional development.

A student may wish to select a topic which is closely related to his/her current employment. Alternatively, a student may
wish to choose a topic which should be of value to his/her future career. The project should be a vehicle for importing the knowledge learned from the coursework to the student's professional life. The topic should be chosen with this professional goal in mind. Students are advised to seek the assistance of the lecturing staff in finalising the topic for their project.

**Graduate Diploma in Data Processing (GradDipDP)**

**Course code MC52**

**Course coordinator: Miss Jean Robb**

This course aims to provide students with the basic knowledge and skills required for a professional career in programming and/or systems work. It is designed for people who have already taken a first degree in which computing has not been included or only covered lightly.

The course is not open to students who have already completed the Bachelor of Science in Computing Science, Diploma of Technology (Information Processing), or a similar course at an equivalent level.

Satisfactory completion of this course leads to the award of Graduate Diploma in Data Processing. Holders of the Graduate Diploma in Data Processing are exempt from the Associate examinations of the Australian Computer Society.

It is anticipated that students entering the course will have previously studied courses from a wide range of disciplines. Some will have graduated with little or no previous contact with computing and data processing, while others will be familiar with computing concepts in areas such as programming, and will be seeking to consolidate their present knowledge by obtaining a formal qualification.

**ADMISSION REQUIREMENTS**

The prerequisites for entry to the Graduate Diploma in Data Processing are a first degree, equivalent to an undergraduate three-year degree from the University of Technology, Sydney, plus a working knowledge of the programming languages COBOL, and either C or Pascal.

Applicants who are in doubt about the ranking of their academic qualifications should contact the Postgraduate Studies and Scholarships Office or the Admissions Branch at the University, or write to the National Office of Overseas Skills Recognition, PO Box 25, Belconnen, ACT, 2616.

Intending applicants who do not have the required knowledge of COBOL and Pascal or C, will need to acquire such knowledge before the close of applications. Courses on these languages are offered by the School of Computing Sciences; for details contact the Key Centre for Advanced Computing Sciences 330 1331. However, applicants are at liberty to present for consideration evidence of successful completion of any COBOL and Pascal or C courses, or of substantial work experience using these languages. The selection committee will assess whether what is presented satisfies the prerequisites for the course. Candidates presenting evidence of fulfilling the requirements will be offered an interview. The number of applicants for the course is always in excess of the number of places, and therefore no guarantee can be given that every candidate meeting the requirements will be successful in gaining admission.

For further information, candidates should telephone the Faculty's Graduate Assistant, Mr B Irvine on 330 1806, or the School Office on 330 1803, or write to:

The Director of Graduate Education
Graduate Diploma in Data Processing
School of Computing Sciences
University of Technology, Sydney
PO Box 123
BROADWAY NSW 2007

All applications should be well documented, including proof of graduate status, the applicant's academic record, and such other documentation as the applicant wishes to provide in support of his/her application.

**COURSE FEES**

Australian citizens and permanent residents will contribute to the cost of the course through HECS (ie. the Higher Education Contribution Scheme).

**MODE AND LENGTH OF STUDY**

The course is normally taken on a part-time attendance pattern over two years (two evenings and one afternoon each week). This will require students to attend the University for at least nine hours a week. Some students may take longer to complete
the course subject to approval. In exceptional circumstances, the course may be undertaken on a full-time attendance pattern over 12 or 18 months.

Students may be permitted to enter the course with advanced standing but, in order to qualify for an award, a student must complete at least 32 credit points of the prescribed 48 credit points for the course. Exemptions from some compulsory subjects will normally only be granted where a student has partially completed a similar Graduate Diploma elsewhere. A maximum of 16 credit points only may be exempted.

Where a student can demonstrate proficiency in a subject area, approval for substitution of Semester 1 and 2 subjects by other approved subjects from the undergraduate course may be granted.

PROGRESSION RULES
All students in the Graduate Diploma in Data Processing course should be aware of the following University Rules under which a student's registration will be discontinued:

MAXIMUM TIME
Failure to complete the course within four semesters from initial registration in the case of a full-time student, or within eight semesters from initial registration in the case of a part-time student. This is not inclusive of periods of approved leave of absence.

UNSATISFACTORY PROGRESS
Unsatisfactory progress, as defined by the Faculty Board in Mathematical and Computing Sciences, is failure in any subject three times. (FBMC/92/71)

COURSE REGULATIONS
To complete the Graduate Diploma students must gain 48 credit points. Since all subjects for this course are four credit point subjects, this means students must complete 12 subjects.

Of these students must take SIX core subjects:

- 31071 Introduction to Information Systems (4cp)
- 31073 Introduction to Computer Systems (4cp)
- 31621 Systems Analysis (4cp)
- 31022 Commercial Program Development (4cp)
- 31631 Database (4cp)
  
  and one of
- 31617 Accounting Fundamentals (4cp)
  or
- 31632 Communications and Networks (4cp)

In addition students must take SIX electives. These are usually chosen from the list given below or from elective subjects in the BSc in Computing Science. Students must have completed the appropriate prerequisites and their choice must be approved by the Director of Graduate Education.

Graduate Diploma electives – usually offered in Autumn

- 31632 Communications and Networks ¹ (4cp)
- 31617 Accounting Fundamentals ¹ (4cp)
- 31615 Discrete Mathematics (4cp)
- 31641 Systems Design (4cp)
- 31642 On-line Systems (4cp)
- 31658 Project Management (4cp)
- 31623 Computer Systems Architecture 2 (4cp)

  ¹ If not taken as a core subject.

Other electives may be available during the day.

Graduate Diploma electives – usually offered in Spring

- 31624 Data Structures and Algorithms (4cp)
- 31025 Introduction to Software Engineering (4cp)
- 31626 Probability and Statistics (4cp)
- 31633 Operating Systems (4cp)
- 31641 Systems Design (4cp)
- 31642 On-Line Systems (4cp)
- 31647 Management Control Systems (4cp)
- 31648 Business Tools and Applications (4cp)
- 31653 Communications Software (4cp)

Other electives may be available during the day.
Indicates must be done before or concurrently

e.g. Introduction to Information Systems must be done before or concurrently with Systems Analysis
RECOMMENDED PART-TIME PROGRAM

**Autumn semester**
31621 Systems Analysis (4cp)
31071 Introduction to Information Systems (4cp)
31073 Introduction to Computer Systems (4cp)

**Spring semester**
31022 Commercial Program Development (4cp)
31631 Database (4cp)

**Autumn semester**
31632 Communications and Networks (4cp)
and/or
31617 Accounting Fundamentals (4cp)
One or two electives

**Spring semester**
Three electives

Note that the hours per week listed in the subject descriptions are lecture and tutorial hours. Students should plan to spend at least the same amount of time again on private study.

Refer to the Graduate Diploma prerequisite chart on page 79.

GRADUATE CERTIFICATES

Graduate Certificate in Advanced Information Technology

Course code MC62
Coordinator: Dr B Howarth

COURSE DESCRIPTION
The course is intended for staff within companies who are specialising in a new direction. The course will allow students to build upon foundations in information systems and/or computer science. The prerequisite for the course will be the Graduate Certificate in Information Systems and/or the Graduate Certificate in Computer Science, or their equivalent. The course will enable students to develop advanced skills in more specialised areas of information technology, and will be the equivalent of one year's part-time study. The course will be offered on a full-fee-paying basis which, it is expected, will typically be met by companies for selected employees. However, the course will be a general qualification, which is not intended to be restricted to the employees of any particular company.

LENGTH
The course will typically be completed over a period of one year, part-time. Nonetheless, depending on demand, the course or individual subjects may be offered in flexible attendance modes.

ATTENDANCE PATTERN
The course may be offered as part of normal programs, provided class space is available. Depending on demand, students may undertake formal studies involving attendance at intensive blocks of lectures with possible additional weekend attendance.

COURSE STRUCTURE AND CURRICULUM
The course will consist of a coherent set of four subjects approved by the School of Computing Sciences. Existing subjects from the Graduate Diploma in Data Processing will be used. A typical selection, permitting a particular specialisation, would be as shown in the table on the next page.
Option 1

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Name</th>
<th>Semester offered</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31073</td>
<td>Introduction to Computer Systems</td>
<td>A94: D</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94: E</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and three of the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31632</td>
<td>Communications and Networks</td>
<td>A94/A95: D&amp;E</td>
<td>31073</td>
</tr>
<tr>
<td>31633</td>
<td>Operating Systems</td>
<td>A94: D</td>
<td>31073</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94/S95: E</td>
<td>31073</td>
</tr>
<tr>
<td>31653</td>
<td>Communications Software</td>
<td>S94/S95: E</td>
<td>31632 &amp; 31633</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A94: D</td>
<td>31632 &amp; 31633</td>
</tr>
<tr>
<td>31666</td>
<td>Performance Evaluation</td>
<td>S94/S95: D</td>
<td>31633</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A95: E</td>
<td>31633</td>
</tr>
<tr>
<td>31904</td>
<td>Systems Programming</td>
<td>A94/A95: D</td>
<td>31633</td>
</tr>
<tr>
<td>31860</td>
<td>Object-oriented Programming and C++</td>
<td>S94/A95: D</td>
<td>31904</td>
</tr>
</tbody>
</table>

Option 1 requires as prerequisite knowledge, programming skills in an Algol-derived programming language such as is covered in Data Structures and Algorithms. That is, the programming and data structures knowledge in the Graduate Certificate in Computer Science is a prerequisite for this Graduate Certificate.

Option 1 may take up to four semesters on a part-time basis only.

Students with specific requirements may request that other subjects be substituted for those in the selection given above.

Option 2

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Name</th>
<th>Semester offered</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31647</td>
<td>Management Control Systems</td>
<td>S94: D&amp;E</td>
<td>31617</td>
</tr>
<tr>
<td>31658</td>
<td>Project Management</td>
<td>A94: D&amp;E</td>
<td>31621 &amp; 31641</td>
</tr>
<tr>
<td>31777</td>
<td>Human-Computer Interaction</td>
<td>A94: E</td>
<td>31641</td>
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<td></td>
<td></td>
<td>S94: D</td>
<td>31641</td>
</tr>
<tr>
<td>31902</td>
<td>Auditing the Computer</td>
<td>A94: E</td>
<td>31617</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94: D</td>
<td>31617</td>
</tr>
<tr>
<td>31931</td>
<td>Software Quality Assurance</td>
<td>S94: E</td>
<td>31621</td>
</tr>
<tr>
<td>31768</td>
<td>Business Planning for IT Professionals</td>
<td>S94: D</td>
<td>G.Cert in IS</td>
</tr>
<tr>
<td>31778</td>
<td>Resources Management for IT Professionals</td>
<td>A94: D</td>
<td>G.Cert in IS</td>
</tr>
</tbody>
</table>

Option 2 requires as prerequisite knowledge, the Graduate Certificate in Information Systems. The prerequisites in Option 2 above imply selectivity in the choice of subjects in the Graduate Certificate in Information Systems.

Students with specific requirements may request that other subjects be substituted for those in the selection given above.

The total requirement for the Graduate Certificate will be 16 credit points.
ADMISSION REQUIREMENTS
Applicants will normally be expected to have completed the Graduate Certificate in Information Systems and/or the Graduate Certificate in Computer Science. Applicants with demonstrable, equivalent backgrounds will be considered on a case-by-case basis.

FEES
The proposed fee for this course for 1994 is $3,600 subject to University approval.

Graduate Certificate in Computer Science
Course code MC60
Coordinator: Dr B Howarth

COURSE DESCRIPTION
The course is intended for staff within companies who are specialising in a new direction. The course will provide students with a foundation in Computer Science. This foundation can later be consolidated via the Graduate Certificate in Advanced Information Technology, and/or complemented by the Graduate Certificate in Information Systems. The course will consist of a coherent set of four subjects from the Computer Science field, and will be the equivalent of one year part-time study. The course will be offered on a full-fee-paying basis which, it is expected, will typically be met by companies for selected employees. However, the course will be a general qualification, which is not intended to be restricted to the employees of any particular companies.

LENGTH
The course will typically be completed over a period of one year, part-time. Nonetheless, depending on demand, the course or individual subjects may be offered in flexible attendance modes.

ATTENDANCE PATTERN
The course may be offered as part of normal programs, provided class space is available. Depending on demand, students may undertake formal studies involving attendance at intensive blocks of lectures with possible additional weekend attendance. The precise attendance pattern will be developed as part of the business plan for any given course offering.

COURSE STRUCTURE AND CURRICULUM
(D=Day, E=Evening)

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31624</td>
<td>Data Structures and Algorithms</td>
<td>S94: D&amp;E</td>
<td>Nil</td>
</tr>
<tr>
<td>31615</td>
<td>Discrete Maths</td>
<td>A94: D</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94: E</td>
<td></td>
</tr>
<tr>
<td>31140</td>
<td>Introduction to Computer Graphics</td>
<td>A94/A95: D</td>
<td>31624</td>
</tr>
<tr>
<td>31240</td>
<td>Topics in Computer Graphics</td>
<td>S94/S95: D</td>
<td>31140</td>
</tr>
<tr>
<td>31163</td>
<td>Knowledge-based Systems</td>
<td>A94/A95: E</td>
<td>31624</td>
</tr>
<tr>
<td>31896</td>
<td>LISP Programming</td>
<td>S94/S95: D</td>
<td>31624</td>
</tr>
<tr>
<td>31901</td>
<td>AI Theory</td>
<td>S94/S95: D</td>
<td>31624</td>
</tr>
</tbody>
</table>

It will take a minimum of three semesters to complete the Graduate Certificate, and is subject to the student being a competent programmer in some language, such as Pascal or C.

If it can be determined that a person has the prerequisite programming skills, then it may be possible for him or her to not take Data Structures and Algorithms, and instead choose say, two Graphics and two AI subjects.
Students with specific requirements may request that other subjects be substituted for those in the selection given above.

The total requirement for the Graduate Certificate will be 16 credit points.

ADMISSION REQUIREMENTS
Applicants with a recognised Bachelor's degree (or equivalent) will normally be deemed eligible for the course. Consideration will be given to applicants whose background does not fit the above requirement provided that a case can be made to establish that their aptitude, knowledge and practical experience is sufficient. Experience in the information technology industry will be especially important in this regard. Nonetheless, to achieve non-graduate entry, applicants may be asked to take an aptitude test or complete an approved bridging program.

FEES
The proposed fee for this course for 1994 is $3,600 subject to University approval.

Graduate Certificate in Human-Computer Interaction
Course code MC65
Coordinator: Mrs J Hammond

COURSE DESCRIPTION
This is a full-fee-paying course designed for professional upgrade. The course provides students with the required knowledge of human-computer interaction and the practical skills that are necessary to effectively achieve better usability in the software and systems design and development process. The course focuses on HCI principles and techniques for improving usability aspects of software and systems, and on operational issues associated with implementing HCI in organisations. The course is one year part-time which has a total of 18 credit points made up of three subjects, each worth six credit points. It will be studied for one evening per week in the first semester and two evenings per week in the second semester. In the second semester, the subject HCI Tools and Techniques will be studied for two evenings a week for six weeks, followed by the subject Implementation of HCI for two evenings for the following six weeks. This pattern is important and follows a natural sequence which culminates in the final subject of the Graduate Certificate. The subject Implementation of HCI integrates what has been studied in the subjects Fundamentals of HCI and HCI Tools and Techniques. It also requires students to complete a practical HCI project on a topic of interest to them.

COURSE STRUCTURE
The structure of the Graduate Certificate in Human-Computer Interaction is:

**Autumn semester**
- 31862 Fundamentals of Human-Computer Interaction (6cp)

**Spring semester**
- 31863 Human-Computer Interaction Tools and Techniques (6cp)
- 31864 Implementation of Human-Computer Interaction (6cp)

FEES
The fee for this course is $2,400 subject to University approval.

Graduate Certificate in Information Systems
Course code MC61
Coordinator: Mr C Richardson

COURSE DESCRIPTION
The course is intended for staff within companies who are specialising in a new direction. The course will provide students with a foundation in information systems. This foundation can be later consolidated via the Graduate Certificate in Advanced Information Technology. The course will consist of a coherent set of four subjects from the information systems field, and will be the equivalent of one year's part-time study. The course will be offered on a full-fee-paying basis which, it is expected, will typically be met by companies for selected employees. However, the course will be a general qualification, which is not intended to be restricted to the employees of any particular company.

LENGTH
The course will typically be completed over a period of one year, part-time. Nonetheless, depending on demand, the course or individual subjects may be offered in flexible attendance modes.
ATTENDANCE PATTERN
The course may be offered as part of normal programs, provided class space is available. Depending on demand, students may undertake formal studies involving attendance at intensive blocks of lectures with possible additional weekend attendance. The precise attendance pattern will be developed as part of the business plan for any given course offering.

COURSE STRUCTURE AND CURRICULUM
The total requirement for the Graduate Certificate in Information Systems will be 16 credit points. Students should select any four subjects, with the prerequisite requirements being met, from the following. Each subject attracts four credit points.

(D=Day, E=Evening)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Subject Name</th>
<th>Semester offered</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31071</td>
<td>Intro. to Information Systems or Information Systems</td>
<td>A94: E</td>
<td>Nil</td>
</tr>
<tr>
<td>31611</td>
<td>Accounting Fundamentals</td>
<td>A94: D</td>
<td>Nil</td>
</tr>
<tr>
<td>31617</td>
<td>Systems Analysis</td>
<td>A94: D&amp;E</td>
<td>Nil</td>
</tr>
<tr>
<td>31621</td>
<td>Database</td>
<td>A94: E</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94: D</td>
<td>Nil</td>
</tr>
<tr>
<td>31631</td>
<td>Database</td>
<td>A95: D</td>
<td>31621</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94/S95: E</td>
<td>31621</td>
</tr>
<tr>
<td>31022</td>
<td>Comm. Program Development</td>
<td>S94/S95: E</td>
<td>31071 or 31611, COBOL</td>
</tr>
<tr>
<td>31641</td>
<td>Systems Design</td>
<td>A95: E</td>
<td>31631</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S94/S95: D</td>
<td>31631</td>
</tr>
<tr>
<td>31648</td>
<td>Business Tools and Applications</td>
<td>S94/S95: D&amp;E</td>
<td>31631</td>
</tr>
</tbody>
</table>

Students should note the following:

A choice of either Information Systems or Introduction to Information Systems together with Systems Analysis are considered to be the basic subjects for a Graduate Certificate in Information Systems.

Database could be taken concurrently (corequisite) with Systems Design.

Business Tools and Applications could be taken concurrently (corequisite) with Database or Systems Design.

Depending on the choice of subjects, and the attendance pattern, it may take a minimum of three semesters to complete this Graduate Certificate.

Commercial Program Development can only be selected subject to the student being a competent programmer in COBOL.

Some previous experience in Information Systems may allow a selection of subjects without including Information Systems or Introduction to Information Systems.

Students with specific requirements may request that other subjects be substituted for those in the selection given above.

ADMISSION REQUIREMENTS
Applicants with a recognised Bachelor's degree (or equivalent) will normally be deemed eligible for the course. Consideration will be given to applicants whose background does not fit the above requirement provided that a case can be made to establish that their aptitude, knowledge and practical experience is sufficient. Experience in the information technology industry will be especially important in this regard. Nonetheless, to achieve non-graduate entry, applicants may be asked to take an aptitude test or complete an approved bridging program.

FEES
The proposed fee for this course for 1994 is $3,600 subject to University approval.
Graduate Certificate in
Software Quality Assurance

Course code MC56
Coordinator: Mr B Wong

COURSE DESCRIPTION
This is a full-fee-paying course designed to provide a professional upgrade. It will provide students with the practical knowledge and skills that are necessary to effectively measure and control the quality of software products. The course focuses on the procedures and disciplines of a software quality system and the operational issues associated with implementing such a system in an organisation. Students who are members of the Australian Computer Society will be credited with FCP points on completion of the certificate.

LENGTH
The course will be one year part-time.

ATTENDANCE PATTERN
Students will undertake formal studies for two evenings per week in the first semester and one evening per week in the second.

PROJECTED ENROLMENT
Enrolment will be limited to 20 students for each offering.

RATIONALE AND AIMS
A primary objective of this course is to assist computing professionals to implement a software quality system that complies with Australian Standard AS3563.

On successful completion of this subject, students will be able to:-

1. understand the need for quality assurance of software products;
2. specify the role of the quality assurance function in software development and maintenance;
3. understand the nature of software quality and the problems of assessing the level and presence of software quality;
4. ensure adequate quality control of software development is achieved; and
5. produce and implement a quality assurance plan for software.

COURSE STRUCTURE AND CURRICULUM
The course will comprise formal studies for two evenings per week in the first semester and one evening per week in the second. The three subjects that comprise the formal studies are as follows:

- 31855 Software Quality Assurance Principles (4cp)
- 31856 Quality and Software Engineering (4cp)
- 31857 Software Quality Techniques (4cp)

Each subject carries four credit points, three semester hours. Thus the total course requirement is 12 credit points.

ADMISSION REQUIREMENTS
The course is intended for information technology professionals and applicants should have both:

1. a Bachelor's degree from UTS, or equivalent, preferably with a major computing component. Applicants whose degrees do not have a major computing component will be required to submit evidence to the effect that the extent of their formal knowledge of computing is equivalent to that of a graduate from the University's Bachelor of Science in Computing Science;
2. an established professional career within the information technology industry. As a guide, the extent of the applicant's professional experience should be equivalent to that of an Associate Member of the Australian Computer Society of at least two years' standing.

Consideration will be given to applicants whose backgrounds do not fit these requirements, provided that a case can be made to establish that their computing knowledge and practical experience is equivalent to the above.

FEES
The fee for this course for 1994 is $2,100 subject to University approval.
**Graduate Certificate in Applied Computing**

Course code MC57  
Coordinator: Ms E Lawrence

**COURSE DESCRIPTION**  
The course will provide students with the practical skills and knowledge that are necessary to operate effectively at entry level in a computing environment.

On completion of the three subjects, graduates will have acquired sound knowledge of, and experience and skills in: Foundations of Computing and Programming; Systems Analysis and Design; and Database. Each of these subjects has a weighting of six credit points, four semester hours.

It is anticipated that graduates may wish to further their knowledge by attending follow-on Graduate Certificates offered by the School of Computing Sciences.

**LENGTH**  
The course will be one year part-time, that is, four semester hours per week per six credit point subject, or the equivalent part-time attendance.

**ATTENDANCE PATTERN**  
The course may be offered as part of the School's normal program at the Kuring-gai campus subject to availability of class places.

**PROJECTED ENROLMENT**  
Enrolment will be limited to 20 students for each offering.

**COURSE STRUCTURE AND CURRICULUM**  
The course may be offered as part of the School's normal program. The subjects to be taken are as follows:

- 31521 CIT 2 - Foundations of Computing and Programming (6cp)
- 31531 CIT 3 - Systems Analysis and Design (6cp)
- 31551 CIT 5 - Database (6cp)

**ADMISSION REQUIREMENTS**  
The course is intended for non-computing professionals. Applicants should have, from a recognised University, a Bachelor's degree (or equivalent), with no major computing content. Consideration will be given to applicants whose background does not fit the above requirements, provided that a case can be made to establish that their knowledge and practical experience is equivalent to that which is implied by these requirements.

**FEES**  
The fee for this course for 1994 is $1,800 subject to University approval.

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**Graduate Certificate in Programming Practice**

Course code MC64  
Coordinator: Ms E Lawrence

**COURSE DESCRIPTION**  
The course will address modern business programming theory and practice and the commercial issues of data communications. It has been designed as a follow-on from the Graduate Certificate in Applied Computing. Students will study Commercial Programming and Data Communications, both of which have a weighting of six credit points.

**LENGTH**  
The course will be one year part-time, that is, six semester hours per week per six credit point subject, or the equivalent part-time attendance.

**ATTENDANCE PATTERN**  
The course may be offered as part of the School's normal program at the Kuring-gai campus subject to availability of class places.

**PROJECTED ENROLMENT**  
Enrolment will be limited to 20 students for each offering.

**COURSE STRUCTURE AND CURRICULUM**  
The course may be offered as part of the School's normal program. The subjects to be taken are as follows:

- 31541 CIT 4 - Commercial Programming (6cp)
- 31561 CIT 6 - Data Communications (6cp)

**ADMISSION REQUIREMENTS**  
The course is intended for non-computing professionals. Applicants should have, from a recognised university, a Bachelor's degree (or equivalent), with no major computing content. Consideration will be given to applicants whose background does not fit the above requirements, provided that a case can be made to establish that their knowledge and practical experience is equivalent to the above.

**FEES**  
The fee for this course for 1994 is $1,200 subject to University approval.
**NUMERICAL LISTING OF SUBJECTS (INCLUDING SEMESTER AND PREREQUISITE INFORMATION)**

**CORE SUBJECTS FOR BSc FROM 1989 ONWARDS**

Explanatory notes
1. Should be done before or concurrently.
2. This subject must be done for 2 semesters.

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31611</td>
<td>Information Systems</td>
<td>A</td>
<td>4</td>
<td>4</td>
<td>Nil</td>
</tr>
<tr>
<td>31613</td>
<td>Computer Systems Architecture 1</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
<td>Nil</td>
</tr>
<tr>
<td>31614</td>
<td>Programming Principles</td>
<td>A,S</td>
<td>5</td>
<td>7</td>
<td>Nil</td>
</tr>
<tr>
<td>31615</td>
<td>Discrete Mathematics</td>
<td>A</td>
<td>4</td>
<td>5</td>
<td>Nil</td>
</tr>
<tr>
<td>31617</td>
<td>Accounting Fundamentals</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>Nil</td>
</tr>
<tr>
<td>31621</td>
<td>Systems Analysis</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
<td>31611</td>
</tr>
<tr>
<td>31622</td>
<td>Commercial Programming Development</td>
<td>A,S</td>
<td>4</td>
<td>5</td>
<td>31611, 31614</td>
</tr>
<tr>
<td>31623</td>
<td>Computer Systems Architecture 2</td>
<td>A,S</td>
<td>4</td>
<td>5</td>
<td>31613, 31614</td>
</tr>
<tr>
<td>31624</td>
<td>Data Structures and Algorithms</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>31614, 31615, 31625 1</td>
</tr>
<tr>
<td>31625</td>
<td>Software Engineering</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>31614, 31615</td>
</tr>
<tr>
<td>31626</td>
<td>Probability and Statistics</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>Nil</td>
</tr>
<tr>
<td>31631</td>
<td>Database</td>
<td>A,S</td>
<td>4</td>
<td>4</td>
<td>31621</td>
</tr>
<tr>
<td>31632</td>
<td>Communications and Networks</td>
<td>A</td>
<td>4</td>
<td>5</td>
<td>31611, 31613</td>
</tr>
<tr>
<td>31633</td>
<td>Operating Systems</td>
<td>A,S</td>
<td>4</td>
<td>5</td>
<td>31613</td>
</tr>
<tr>
<td>31636</td>
<td>Simulation and Modelling</td>
<td>A,S</td>
<td>4</td>
<td>4</td>
<td>31624, 31626</td>
</tr>
<tr>
<td>31641</td>
<td>Systems Design</td>
<td>A,S</td>
<td>4</td>
<td>4</td>
<td>31631</td>
</tr>
<tr>
<td>31642</td>
<td>On-line Systems</td>
<td>A,S</td>
<td>4</td>
<td>5</td>
<td>31622, 31632, 31641 1</td>
</tr>
<tr>
<td>31647</td>
<td>Management Control Systems</td>
<td>S</td>
<td>4</td>
<td>4</td>
<td>31617</td>
</tr>
<tr>
<td>31648</td>
<td>Business Tools and Applications</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>31631</td>
</tr>
<tr>
<td>31653</td>
<td>Communications Software</td>
<td>A,S</td>
<td>4</td>
<td>6</td>
<td>31632, 31633</td>
</tr>
<tr>
<td>31655</td>
<td>Theory of Computer Science</td>
<td>A</td>
<td>4</td>
<td>4.5</td>
<td>31624, 31625</td>
</tr>
<tr>
<td>31658</td>
<td>Project Management</td>
<td>A</td>
<td>4</td>
<td>4.5</td>
<td>31696–7 or 31698–9</td>
</tr>
<tr>
<td>31662</td>
<td>Information Systems Case Study</td>
<td>S</td>
<td>5</td>
<td>6</td>
<td>31641, 31642, 31658 1, 31666 1</td>
</tr>
<tr>
<td>31666</td>
<td>Performance Evaluation</td>
<td>A,S</td>
<td>4</td>
<td>6</td>
<td>31636</td>
</tr>
<tr>
<td>31669</td>
<td>Social Implications of Computers</td>
<td>A,S</td>
<td>3</td>
<td>3</td>
<td>31696–7 or 31698–9</td>
</tr>
<tr>
<td>31696</td>
<td>Industrial Training F/T</td>
<td>A</td>
<td>0</td>
<td>6</td>
<td>31621, 31622, 31624, 31633, 51370</td>
</tr>
</tbody>
</table>

**plus at least eight other core subjects from the BSc**

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31697</td>
<td>Industrial Training F/T</td>
<td>A</td>
<td>0</td>
<td>6</td>
<td>31696</td>
</tr>
<tr>
<td>31698</td>
<td>Industrial Training P/T 2</td>
<td>A,S</td>
<td>0</td>
<td>3</td>
<td>31621, 31622, 31624, 31633, 51370,</td>
</tr>
</tbody>
</table>

**plus at least eight other core subjects from the BSc**

<table>
<thead>
<tr>
<th>Subject number</th>
<th>Subject name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
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<tbody>
<tr>
<td>31699</td>
<td>Industrial Training P/T 2</td>
<td>A,S</td>
<td>0</td>
<td>3</td>
<td>31698</td>
</tr>
<tr>
<td>51370</td>
<td>Human Communication</td>
<td>A,S</td>
<td>3</td>
<td>2</td>
<td>Nil</td>
</tr>
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</table>
### UNDERGRADUATE ELECTIVES

**Explanantory note**


<table>
<thead>
<tr>
<th>Subject number</th>
<th>Name</th>
<th>Semester offered</th>
<th>CP</th>
<th>HPW</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>31140</td>
<td>Introduction to Computer Graphics</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>31624</td>
</tr>
<tr>
<td>31163</td>
<td>Knowledge-based Systems</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>31624, 31625</td>
</tr>
<tr>
<td>31240</td>
<td>Topics in Computer Graphics</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>31140</td>
</tr>
<tr>
<td>31350</td>
<td>Project (2 sem)</td>
<td>A,S</td>
<td>8</td>
<td>6</td>
<td>31641</td>
</tr>
<tr>
<td>31351</td>
<td>Project (1 sem)</td>
<td>A,S</td>
<td>8</td>
<td>6</td>
<td>31641</td>
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<tr>
<td>31352</td>
<td>Project</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
<td>31641</td>
</tr>
<tr>
<td>31654</td>
<td>Languages and Translators</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>31613, 31624</td>
</tr>
<tr>
<td>31738</td>
<td>Management Principles for IT Professionals</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>51370</td>
</tr>
<tr>
<td>31768</td>
<td>Business Planning for IT Professionals</td>
<td>S</td>
<td>4</td>
<td>3</td>
<td>51370</td>
</tr>
<tr>
<td>31777</td>
<td>Human-Computer Interaction</td>
<td>A,S</td>
<td>4</td>
<td>3</td>
<td>31641</td>
</tr>
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# Bachelor of Information Technology

**Explanatory Notes**

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2. Winter

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## GRADUATE DIPLOMA IN DATA PROCESSING

Explanatory notes

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<sup>1</sup>Name and number are subject to approval by the Faculty Board
# ALPHABETICAL LISTING OF SUBJECTS

## UNDERGRADUATE COMPUTING SUBJECTS

Explanatory notes:

1. Serviced by other faculties
2. BInfTech only
3. Grad Dip DP only
4. Elective subject for BSc
5. Not offered 1994
6. Graduate Certificate only
7. Not to be taken with 21130 Organisational Behaviour
8. Not to be taken with 21221 Organisation Design and Change
9. BSc only.

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**POSTGRADUATE COMPUTING SUBJECTS**

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SUBJECT DESCRIPTIONS

Guide to subject descriptions
The subject descriptions shown below indicate the subject number and name, the number of credit points for the subject (eg, 3cp), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (eg, 4hpw); for some subjects, there may also be practical components off-campus, and this is indicated in the text. Also shown are the prerequisites or corequisites if any, the method of assessment and name of the subject coordinator, if known, and a brief outline of the content.

Prerequisites are subjects which must be completed before taking the subject to which they refer. Corequisites may be completed before or be taken concurrently with the subject to which they refer.

31022 COMMERCIAL PROGRAM DEVELOPMENT
(4cp); 3 hpw
prerequisites 31071 Introduction to Information Systems, COBOL
coordinator Mr R Raban
Structured design techniques and their application to COBOL programming in an off-line commercial environment. Advanced program design techniques are presented to give the student a knowledge of how to address a wide range of programming tasks.

31025 INTRODUCTION TO SOFTWARE ENGINEERING
(4cp); 3 hpw
prerequisite 31615 Discrete Mathematics
coordinator Dr J Potter
An introduction to the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, program development via refinement of specifications, programs correctness, machine executable specifications, an overview of software testing and reliability.

31071 INTRODUCTION TO INFORMATION SYSTEMS
(4cp); 3 hpw
coordinator Mrs J Hammond
A foundation for understanding information systems and their applications to common computer-based practices and procedures used in organisations today. Elementary system models, typical business systems development life cycles and applications, and a range of techniques and resources used to develop and design information systems are examined.

31073 INTRODUCTION TO COMPUTER SYSTEMS
(4cp); 3 hpw
coordinator Mr J Tu
Provides students with a model of computer hardware they will be able to use as a basis for understanding the actual computer platform for the software they will study and develop in the remainder of the course.

31140 INTRODUCTION TO COMPUTER GRAPHICS
(4cp); 3 hpw
prerequisite 31624 Data Structures and Algorithms
coordinator Dr K Suffern
Provides a thorough introduction to the computer representation, manipulation and display of pictorial information. Topics covered include passive and interactive graphics hardware devices and programming; mathematical tools for two and three dimensional graphics; two and three dimensional graphics, algorithms; graphics standards; human-computer interaction, graphical design; application areas of computer graphics.

31163 KNOWLEDGE-BASED SYSTEMS
(4cp); 3 hpw
prerequisites 31624 Data Structures and Algorithms, 31625 Software Engineering
coordinator Dr S Prabhakar
An introduction to recent developments in artificial intelligence, based on the representation and manipulation of knowledge. The student will obtain an understanding of the principles of expert systems together with some experience constructing small knowledge-based systems with the aid of current development tools. Topics: representation of knowledge; plausible reasoning; knowledge acquisition; development methodologies; evaluation of current tools.
31240 TOPICS IN COMPUTER GRAPHICS

(4cp); 3 hpw
prerequisite 31140 Introduction to Computer Graphics
coordinator Dr K Suffern
For students who have passed 31140, this subject provides a study of several additional computer graphics topics, with an emphasis on image synthesis techniques. Topics covered include fractals, illumination models, ray tracing, textures, antialiasing, halftoning and ordered dither, hidden line and surface removal algorithms, computer animation and radiosity.

31350 PROJECT (2 SEM)

(8cp); 6 hpw
prerequisite 31641 Systems Design
coordinator Mr P Bebbington

31351 PROJECT (1 SEM)

(8cp); 6 hpw
prerequisite 31641 Systems Design
coordinator Mr P Bebbington

31352 PROJECT

(4cp); 3 hpw
prerequisite 31641 Systems Design
coordinator Mr P Bebbington
A project is intended to give a student experience in working independently, and responsibility for scientific research or the development of a small system from initial analysis to user documentation. Projects may be drawn from any area of computer science or information systems. Each project is supervised by a member of academic staff.

31521 CIT 2 – FOUNDATIONS OF COMPUTING AND PROGRAMMING

(6cp); 4 hpw
coordinator Mr L Smith
Provides an understanding of the basic concepts of hardware design, data storage and transmission, and introduces third generation language programming in file processing and report production applications.

31531 CIT 3 – SYSTEMS ANALYSIS AND DESIGN

(6cp); 4 hpw
coordinator Mr L Smith
Concerned with the systems development life cycle, and the tools and techniques used in the analysis of systems requirements and the determination of alternate implementation strategies.

31541 CIT 4 – COMMERCIAL PROGRAMMING

(6cp); 6 hpw
prerequisite Graduate Certificate in Applied Computing
coordinator Mr L Smith

31551 CIT 5 – DATABASE

(6cp); 4 hpw
prerequisite 31531 CIT 3 – Systems Analysis and Design
coordinator Mrs E Lawrence
Introduces database models and the principles of database design and management. Practical experience is given in designing and implementing a database using commercial packages such as Oracle.

31561 CIT 6 – DATA COMMUNICATIONS

(6cp); 4 hpw
prerequisite Graduate Certificate in Applied Computing
coordinator Ms D Jinks

31611 INFORMATION SYSTEMS

(4cp); 4 hpw
coordinator Mr J Underwood
An introduction to the idea of an information system and its importance in modern organisations. An information system is defined as a system which processes data to produce information for people. We introduce techniques for analysing user requirements and for structuring data so that they
may be used more effectively and efficiently. Systems development life cycles and prototyping are discussed and the later stages of system design are outlined. Examples from typical information systems are used to illustrate the concepts.

31613 COMPUTER SYSTEMS ARCHITECTURE 1
(4cp); 3 hpw
coordinator Mr J Tu
Provides students with a model of computer hardware they will be able to use as a basis for understanding the actual computer platform for the software they will study and develop in the remainder of the course.

31614 PROGRAMMING PRINCIPLES
(5cp); 7 hpw
coordinator Dr K Suffern
An introduction to problem analysis and solution on the computer. Students gain experience at using the UNIX operating system and developing programs with the two major software development methodologies. The principles of object-oriented design and programming are introduced using the language EIFFEL; the principles of top-down structured design and programming are introduced using the language Pascal. Methods of pseudo-coding, coding, debugging, testing, and documentation are discussed.

31615 DISCRETE MATHEMATICS
(4cp); 5 hpw
coordinator Dr T Osborn
Develops the mathematics of discrete objects and models. Logic: propositions, truth tables, predicate logic, proof techniques. Set theory: sets, relations, relational algebra, functions, iteration, recursive definitions and inductive proof, partial orders and equivalence relations. Discrete structures: natural numbers, lists, trees. Functional programming (Miranda) is used to illustrate the mathematical concepts introduced.

31617 ACCOUNTING FUNDAMENTALS
(4cp); 3 hpw
coordinator Mr B Wong
A general introduction to financial accounting and business law. Accounting related applications are the backbone of many commercial computing systems, and an understanding of business law facilitates the study of business methods. Students will also develop an awareness of computer systems in the accounting discipline – looking at how computers are used, how systems have been designed, and examples of accounting systems.

31621 SYSTEMS ANALYSIS
(4cp); 3 hpw
prerequisite 31611 Information Systems
coordinator Mr J El-Den
Introduces systems concepts and a range of techniques used in systems analysis. Covers the techniques used to analyse all discrete systems data functions and flows inclusive of data flow diagrams, relational analysis and normalisation and E-R modelling. Describes systems life cycles and the role of these techniques within life cycles in evaluating requirements and proposals and setting objectives for new systems.

31622 COMMERCIAL PROGRAMMING DEVELOPMENT
(4cp); 5 hpw
prerequisites 31611 Information Systems, 31614 Programming Principles
coordinator Miss J Robb
Structured design techniques and their application to COBOL programming in an offline commercial environment.

31623 COMPUTER SYSTEMS ARCHITECTURE 2
(4cp); 5 hpw
prerequisites 31613 Computer Systems Architecture 1, 31614 Programming Principles
coordinator Mr C W Johnson
A continuation of Computer Systems Architecture 1. The concepts introduced there are elaborated upon, and study of CPU internals is facilitated by use of assembler language on a real machine. Additional requirements of architectures for performance enhancement and support of high-level languages and operating systems are discussed.

31624 DATA STRUCTURES AND ALGORITHMS
(4cp); 5 hpw
prerequisites 31614 Programming Principles, 31615 Discrete Mathematics
corequisite 31625 Software Engineering
coordinator Dr R Rist
Structured approach to software development: modular design, step-wise refinement, top down design, documentation and
layout, complexity analysis, program correctness and program testing strategies. The data structures covered include sets, files and dynamic data structures: stacks, queues, lists and binary trees. Each data structure is presented as an abstract data type, and then discussed at the implementation and application levels. Hashing and common searching and sorting algorithms are also discussed.

31625 SOFTWARE ENGINEERING
(4cp); 3 hpw
prerequisites 31614 Programming Principles, 31615 Discrete Mathematics
coordinator Dr J Potter
Introduces the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, program development via refinement of specifications, program correctness, machine executable specifications, an overview of software testing and reliability.

31626 PROBABILITY AND STATISTICS
(4cp); 3 hpw
coordinator Dr T Osborn

31632 COMMUNICATIONS AND NETWORKS
(4cp); 5 hpw
prerequisites 31611 Information Systems, 31613 Computer Systems Architecture I
coordinator Ms D Links
Introduces communication concepts and terminology, and describes the problems involved in the physical and data link layers of communication and their solutions. The subject discusses network architectures, topologies and carrier services.

31633 OPERATING SYSTEMS
(4cp); 5 hpw
prerequisite 31613 Computer Systems Architecture I
coordinator Mr U Szewcow
An introduction to the concepts and facilities available in computer operating systems. The subject includes scheduling, multiprogramming, protection and resource control.

31636 SIMULATION AND MODELLING
(4cp); 4 hpw
prerequisites 31624 Data Structures and Algorithms, 31626 Probability and Statistics
coordinator Dr T Osborn
Principles and practice of modelling: analysis, data gathering, solution, validation, implementation. Modelling in and of computer systems, queueing theory, continuous simulation, languages, corporate modelling, and inventory.

31641 SYSTEMS DESIGN
(4cp); 4 hpw
prerequisite 31631 Database
coordinator Mr R Raban
Focuses on the user and business aspects of systems design. User interface issues cover dialogue, screen, report and forms design as well as designing and writing user documentation. Integration with business environment includes business procedures, security, control and implementation. A variety of design and implementation strategies are introduced, such as prototyping, CASE tools and 4GLs.
31642 ON-LINE SYSTEMS
(4cp); 4 hpw
prerequisites 31622 Commercial Programming Development, 31632 Communications and Networks;
corequisite 31641 Systems Design
coordinator Mr C Richardson
Aspects of systems development that are specific to on-line application systems. Real time and distributed systems are also covered with respect to their impact on the development of application systems. Practical work involves developing a series of programs in an on-line transaction processing environment. A research report is also included in the assessment for the subject.

31647 MANAGEMENT CONTROL SYSTEMS
(4cp); 4 hpw
prerequisite 31617 Accounting Fundamentals
coordinator Mr P Bebbington
The principles and techniques of cost accounting, budgeting and financial planning and their use in computer-based accounting and business decision-making systems.

31648 BUSINESS TOOLS AND APPLICATIONS
(4cp); 5 hpw
prerequisite 31631 Database
coordinator Mr B Wong
Gives students familiarity with microcomputers in the office and business environment and as stand alone machines or workstations. The use of database and file management programs and the physical operation of microcomputers are discussed. Students will become familiar with specific packages such as business databases, spreadsheets and program development aids.

31653 COMMUNICATIONS SOFTWARE
(4cp); 6 hpw
prerequisites 31632 Communications and Networks, 31633 Operating Systems
coordinator Mr S Jha
Discusses the higher layer problems of communications systems using as a reference model the ISO definitions of OSI (Open Systems Interconnection) seven-layer protocols. Major emphasis is placed on presentation and application layer issues.

31654 LANGUAGES AND TRANSLATORS
(4cp); 3 hpw
prerequisites 31613 Computer Systems Architecture I, 31624 Data Structures and Algorithms
coordinator Mr J Colville

31655 THEORY OF COMPUTER SCIENCE
(4cp); 4.5 hpw
prerequisites 31624 Data Structures and Algorithms, 31625 Software Engineering
coordinator Dr B Jay
Topics from the theory of machines, the theory of languages—syntax and semantics, the theory of processes, the theory of data, the complexity of problems. Applications of the theory particularly in the area of language translation and compiler writing.

31658 PROJECT MANAGEMENT
(4cp); 4.5 hpw
prerequisite 31696–7 or 31698–9 Industrial Training
coordinator Mr D Wilson
Provides students with the practical knowledge and skills that are necessary to effectively manage project teams and software development projects. The major topics are: planning a software project, software time and cost estimation, controlling a software project, development aids and alternatives, leadership and people management. In summary, this subject will provide an essential understanding of project management issues and identify the knowledge required of a project manager in the IT industry.
31662 INFORMATION SYSTEMS CASE STUDY  
(5cp); 6 hpw  
coordinator Mr J Underwood  
This case study deals with the issues involved in strategic level analysis and design in a corporate wide information systems environment. It reinforces material previously studied while giving groups of students scope to use their own judgment in applying their knowledge. It stresses the development and assessment of alternative approaches to a system strategy. Senior management communication skills are also developed.

31666 PERFORMANCE EVALUATION  
(4cp); 6 hpw  
prerequisite for BSc 31636 Simulation and Modelling; for GradCert 31633 Operating Systems  
coordinator Dr B Howarth  
Reviews considerations involved in configuring, selecting or upgrading a computer system in the most cost-effective way. Operating systems and other software factors affecting computer performance are also studied. Measurement and modelling techniques are emphasised.

31669 SOCIAL IMPLICATIONS OF COMPUTERS  
(3cp); 3 hpw  
prerequisite 31696–7 or 31698–9 Industrial Training  
coordinator Dr R Rist  
Aims at identifying areas of society where the use of computer technology is of concern, and to apply an understanding of the social issues to the actual work situation. Topics include: history of computing (social and economic factors), effects on workforce, professionalism and ethics, social responsibility of computer practitioners, privacy, the DP workforce. These areas are discussed in the context of contemporary issues.

31696 INDUSTRIAL TRAINING F/T  
(0cp); 6 hpw  
prerequisites 31621 Systems Analysis, 31622 Commercial Programming Development, 31624 Data Structures and Algorithms, 31633 Operating Systems, 51370 Human Communication plus at least eight other core subjects from the BSc program  
coordinator Associate Professor M Fry  

31697 INDUSTRIAL TRAINING F/T  
(0cp), 6hpw  
prerequisites 31696 Industrial Training (F/T first semester)  
coordinator Associate Professor M Fry  
The first and second semesters of Industrial Training are a compulsory requirement for the course. All full-time students must enrol in these subjects and obtain a minimum of nine months’ of full-time employment. Students must normally have completed the equivalent of at least four full-time semesters before obtaining employment.

31698 INDUSTRIAL TRAINING P/T  
(0cp); 3 hpw  
prerequisites 31621 Systems Analysis, 31622 Commercial Programming Development, 31624 Data Structures and Algorithms, 31633 Operating Systems, 51370 Human Communication plus at least eight other core subjects from the BSc program  
coordinator Associate Professor M Fry  

31699 INDUSTRIAL TRAINING P/T  
(0cp); 3 hpw  
prerequisite 31698 Industrial Training (P/T first semester)  
coordinator Associate Professor M Fry  
The first and second years Industrial Training are a compulsory requirement for the course, normally taken for a total of four semesters in Stages 5 and 6. All part-time students must enrol in these subjects and obtain a minimum of 18 months of full-time employment.

31722 COMMERCIAL PROGRAMMING  
(5cp); 5 hpw  
prerequisites 31611 Information Systems, 31614 Programming Principles  
coordinator Mr C Richardson  
Commercial structured design techniques and commercial programming in either a batch or on-line environment. Students will
be taught the design technique and language of the particular industry organisation using approved assignment work.

31725 SOFTWARE ENGINEERING
(4cp); 6 hpw
prerequisites 31614 Programming Principles, 31615 Discrete Mathematics
 coordinator Dr J Potter
Introduces the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, program development via refinement of specifications, program correctness, machine executable specifications, an overview of software testing and reliability.

31738 MANAGEMENT PRINCIPLES FOR IT PROFESSIONALS
(4cp); 3 hpw
prerequisite 51370 Human Communication or equivalent
 coordinator Mr J Clark
The environment of business organisations and the challenges facing large and small business. Management theory, evolution and schools of thought. Management principles, style, decision making, mechanistic and organic systems. Personnel management, planning, job analysis and design, selection and training, career planning, appraisal and counselling, compensation and incentives. Operations management.

31756 PROJECT MANAGEMENT
(5cp); 3 hpw
prerequisite 31788 Organisation Theory for IT Professionals
 coordinator Mr D Wilson
Provides students with the practical knowledge and skills that are necessary to effectively manage project teams and software development projects. The major topics are: planning a software project, software time and cost estimation, controlling a software project, development aids and alternatives, leadership and people management. This subject will provide an essential understanding of project management issues and identify the knowledge required of a project manager in the IT industry.

31762 TECHNOLOGY PLANNING
(5cp); 6 hpw
prerequisites 31642 On-line Systems, 31781 Business Systems Design; corequisite 31766 Performance Modelling and Management
 coordinator Mr J Underwood
This case study deals with the issues involved in strategic level analysis and design in a corporate wide information systems environment. It reinforces material previously studied while giving groups of students scope to use their own judgment in applying their knowledge. It stresses the development and assessment of alternative approaches to a system strategy. Communication skills with senior management are developed.

31766 PERFORMANCE MODELLING AND MANAGEMENT
(4cp); 6 hpw
prerequisites 31626 Probability and Statistics, 31633 Operating Systems
 coordinator Dr B Howarth
Understanding the basic techniques of system performance modelling and the application of systems modelling techniques to the assessment of present and future required system capacity; basic principles of capacity management and its importance to IS management and senior management. Simple queueing theory and operational analysis modelling techniques; systems performance analysis – measurement and models; modelling and analysis of on-line systems; workload characterisation; workload forecasting; relations between capacity planning, IS management, corporate planning and corporate management.

31768 BUSINESS PLANNING FOR IT PROFESSIONALS
(4cp); 3 hpw
prerequisite 51370 Human Communication or equivalent
 coordinator Mr J Underwood
Provides students with an awareness of the problems in developing corporate strategies, in general, and information technology strategies, in particular; also, develops skills in the selection and use of appropriate techniques. Major topics are: business planning/strategic planning, analysing business priorities and objectives, long-term planning, models, tools and techniques; information technology planning, major
tools and techniques and the changing role of the information systems manager; corporate needs for information technology.

31770 INDUSTRY PROJECT 1
(5cp); 14 hpw
coordinator Mr B Wong
Provides students with an understanding of the function of the Information Systems Department in an organisation and also of at least one user business function serviced by IS. Understanding is via a number of strategies such as interviewing, observation and work experience. Students will be taught human communication skills in conjunction with the project work, with special emphasis on oral and written communication. Training will also be provided in a variety of development tools used in the information systems development process in order to build up a defined skills profile in conjunction with the subject Industry Project 2.

31771 BUSINESS REQUIREMENTS ANALYSIS
(5cp); 3 hpw
prerequisite 31621 Systems Analysis
coordinator Mr J Clark
Applications of systems analysis (data flow diagrams, relational modelling, etc) in a business setting; the roles of the business analyst and the systems analyst; systems research and requirements analysis (interviewing, document analysis, etc) for data processing, management information systems, etc; top-down enterprise-wide perspective; evolution of the business environment; business, product and other life cycles. Industry case studies.

31777 HUMAN-COMPUTER INTERACTION
(4cp); 3 hpw
prerequisite 31641 Systems Design
coordinator Mrs J Hammond
Focuses on human factors and management aspects of user-centred systems development and design. It provides students with HCI principles, concepts, tools and techniques needed to build user-centred systems, particularly in terms of the design of interfaces that satisfy user needs and create usable products that support user tasks and goals. Major topics include: role and scope of HCI, methodologies such as requirements analysis, task analysis and usability testing, usability evaluation, user-centred design support and user interface management systems.

31778 RESOURCE MANAGEMENT FOR IT PROFESSIONALS
(4cp); 3 hpw
prerequisite 51370 Human Communication
coordinator Mr P Bebbington
Aims to instil the knowledge and skills required for effective management of hardware and software resources within an information system organisation. The major topics: resource acquisition, developing software, workplace environment, hardware and software security, operations management, EDP accounting.

31779 APPLICATIONS OF INFORMATION TECHNOLOGY 1
(5cp); 3 hpw
prerequisite 31611 Information Systems
coordinator Mr C S Johnson
Formal and practical exposure to, and understanding of, a variety of specific applications of information technology, such as management information systems, database, decision support systems, process control, graphics, etc. Subject material will complement that of 31789 Applications of Information Technology 2 to ensure a common level of experience for all students.

31780 INDUSTRY STUDIES
(5cp); 4 hpw
prerequisite 31770 Industry Project 1
coordinator Mr B Wong
Students undertake surveys of industry sponsors of the BinfTech program investigating contemporary topics in the field of information systems. Students may also be required to undertake other formal activities to complement the industry objectives of the BinfTech program.

31781 BUSINESS SYSTEMS DESIGN
(5cp); 3 hpw
prerequisites 31641 Systems Design, 31771 Business Requirements Analysis
coordinator Mr J Underwood
Understanding systems design in a business setting; performance and quality criteria; alternative implementation strategies; approaches to systems construction and estimation (including package evaluation and prototyping); implementation issues; productivity issues; methods engineering;
information technology in business; industry and product differences. Case studies.

31788 ORGANISATION THEORY FOR IT PROFESSIONALS
(4cp); 3 hpw
prerequisite 31370 Human Communication or equivalent coordinator Mr J Underwood
This subject examines the structural and sociological aspects of organisations. Topics include: the nature of organisation theory; organisation effectiveness; structure and technology; structure and environment; typical organisation structures; organisations as social systems; work groups and job design; organisational learning; cultures and organisations; information technology in organisations.

31789 APPLICATIONS OF INFORMATION TECHNOLOGY 2
(5cp); 3 hpw
prerequisite 31779 Applications of Information Technology 1 coordinator Mr C S Johnson
Formal and practical exposure to and understanding of a variety of specific applications of information technology, such as management information systems, database, decision support systems, process control graphics, etc. Subject material will complement that of 31779 Applications of Information Technology 1 to ensure a common level of experience for all students.

31790 INDUSTRY PROJECT 2
(5cp); 14 hpw
prerequisite 31770 Industry Project 1 coordinator Mr B Wong
Students gain practical 'hands on' experience of the role of members of an information systems development team in relation to business organisational goals and objectives; students are incorporated as members of a project team in a sponsoring company. Training will also be provided in a variety of development tools in order to build up a defined skills profile in conjunction with the subject 31770 Industry Project 1.

31853 OFFICE AUTOMATION
(4cp); 3 hpw
prerequisite 31621 Systems Analysis coordinator Mr C S Johnson
Covers the advanced concepts of office automation and the impact on the organisational structure. Analysis of the social issues of the implementation of office automation systems into the corporate structure and the current information systems. The management of office automation systems is discussed. Current research issues in office automation are presented by the researchers. Practical exposure is given in the requirements stage of office automation.

31854 DISTRIBUTED DATABASES
(4cp); 3 hpw
prerequisites 31631 Database, 3632 Communications and Networks coordinator Dr G Feuerlicht
Addresses both the theoretical and practical issues associated with design and implementation of distributed database and client/server systems. Relational database concepts will form the basis for the theoretical material presented in this course. The object-oriented approach to distributed computing is also briefly covered. The material presented in lectures will be supported by practical assignment work using a commercially available distributed database management system.

31855 SOFTWARE QUALITY ASSURANCE PRINCIPLES
(4cp); 3 hpw
goordinator Mr D Wilson
Provides students with the practical knowledge and skills in the definition of quality for software products, quality characteristics and their relationships, setting measurable and testable quality attributes, the importance of being able to measure quality, different approaches to quality metrics, methods of defining suitable metrics, examples of typical metrics and the relationship between the QA Function, Software Developers and Management. The major topics are: Total Quality Management, principles of software quality, software metrics and estimation. This is one of three subjects that comprise a full-fee-paying course which is designed for professional upgrade and which leads to the award of a Graduate Certificate.
31856 QUALITY AND SOFTWARE ENGINEERING

(4cp); 3 hpw
prerequisite 31855 Software Quality Assurance Principles
coordinator Mr B Wong
The subject looks at the role of engineering methods and tools in the software development process, advantages and disadvantages of different approaches, contribution of engineering disciplines to the achievement of quality. This is one of three subjects that comprise a full-fee-paying course which is designed for professional upgrade leading to the award of a Graduate Certificate.

31857 SOFTWARE QUALITY TECHNIQUES

(4cp); 3 hpw
prerequisite 31855 Software Quality Assurance Principles
coordinator Mr D Wilson
Provides students with the practical knowledge and skills in Verification, Validation and Test (VV&T) methods and techniques, VV&T tools, relation of VV&T to all phases of the software development life cycle, the processes of VV&T appropriate to each of the life-cycle phases, characteristics and documentation of SQA plans, quality standards, configuration management, quality audit and the effectiveness and cost of SQA. The major topics are: verification, validation and test, configuration management, software quality plans and standards, implementing SQA. This is one of three subjects that comprise a full-fee-paying course which is designed for professional upgrade leading to the award of a Graduate Certificate.

31858 OBJECT-ORIENTED ANALYSIS AND DESIGN

(4cp); 3 hpw
prerequisites 31625 Software Engineering, 31631 Database
coordinator Mr R Raban
Introduces object-oriented methods to analyse the problem domain and to create an implementation independent formal representation of the system requirements. The object-oriented analysis (OOA) utilises the concept of an 'object' to represent the problem and to identify meaningful abstractions within the problem domain. Elements of OOA process, OOA representation and GOA complexity management are introduced, compared with related concepts of structured analysis methodologies, the differences between the two approaches and advantages and disadvantages of each of them are discussed. The use of domain specific libraries of reusable objects is also covered. Different object-oriented modelling techniques including abstract data types are compared and their applicability in different problem domains is assessed. The transition from the implementation independent results of the OOA to the object-oriented design for different implementation platforms is also covered.

31859 COMPUTER ASSISTED SYSTEM DEVELOPMENT ENVIRONMENT

(4cp); 3 hpw
prerequisites 31631 Database, 31641 Systems Design
coordinator Dr G Feuerlicht
The subject will enable the student to understand the role and interaction of various system development tools through the system development life cycle, and gain in-depth understanding of methodologies which are used in conjunction with modern system development tools. Other topics include repositories and the role of international repository standards. Students will gain practical experience with computer assisted tools during the development of a realistic commercial application system.

31860 OBJECT-ORIENTED PROGRAMMING AND C++

(4cp); 3 hpw
prerequisite 31904 Systems Programming
coordinator Dr K Suffern
Review of object-oriented design principles and practices. Objects, classes, run time instantiation, inheritance, information hiding polymorphism and libraries and their implementation in C++. Comparison with the approach in EIFFEL. Contrast with the procedural style of C.

31862 FUNDAMENTALS OF HUMAN-COMPUTER INTERACTION

(6cp); 3 hpw
coordinator Mrs J Hammond
Introduces students to the fundamental knowledge required to understand the nature and scope of HCI, the contribution to HCI of discipline areas involving human factors, language and communication, and ergonomics, and the role of HCI in the
software and systems design and development process. Approaches to incorporate HCI into the software and systems development process will be examined with an emphasis on how HCI can ensure more usable software and systems for mainframes, personal computers and networks.

31863 HUMAN-COMPUTER INTERACTION TOOLS AND TECHNIQUES

(6cp); 3 hpw
prerequisite 31862 Fundamentals of Human-Computer Interaction
coordinator Mrs J Hammond

Introduces students to the knowledge and skills required to use a variety of HCI tools and techniques in all phases of the software and systems development process using mainframes, personal computers an/or networks, and to use methods and metrics for evaluating the usability of software and systems. The role of usability guidelines and standards in the systems design process is examined.

31864 IMPLEMENTATION OF HUMAN-COMPUTER INTERACTION

(6cp); 3 hpw
prerequisite 31862 Fundamentals of Human-Computer Interaction; corequisite 31863 Human-Computer Interaction Tools and Techniques
coordinator Mrs J Hammond

Provides students with the knowledge and practical skills to implement HCI approaches in the software and systems design and development process and integrating them into organisational and business contexts. Students undertake a substantial project to gain practical experience of how HCI can be implemented, and how usability can be measured through testing and evaluation. The implementation of usability guidelines and standards in conjunction with industry-wide quality assurance standards and future trends in HCI is examined.

31875 PARALLEL PROGRAMMING

(4cp); 3 hpw
prerequisites 31624 Data Structures and Algorithms, 31633 Operating Systems
coordinator Dr B Howarth

An introduction to parallel programming covering the following topics: a parallel programming language and program development system; modularising a problem into a set of cooperating sequential processes running in parallel; the prevention of deadlock; orderly termination of a set of parallel processes; use of multiple intercommunication processors; comparison of performance under different physical configurations.

31876 OPERATING SYSTEMS FACILITIES

(4cp); 3 hpw
prerequisites 31624 Data Structures and Algorithms, 31633 Operating Systems
coordinator Dr B Howarth

The development of applications to make use of the facilities offered by an operating system offering support for a graphical user interface, such as Microsoft Windows or Macintosh will be covered. Included is the methodology involved in building applications that are driven by user actions such as the mouse as well as input from a keyboard. Issues related to inter-application communication will also be explored.

31882 ADVANCED THEORETICAL COMPUTER SCIENCE

(4cp); 3 hpw
prerequisite 31655 Theory of Computer Science
coordinator to be advised

Reviews advanced work in the theory of machines, theory of languages, theory of programs and theory of data.

Not offered in 1994.

31885 ADVANCED MATHEMATICS

(4cp); 3 hpw
prerequisites 31615 Discrete Mathematics, 31626 Probability and Statistics
coordinator Dr T Osborn

A compulsory prerequisite for a mathematics sub-major or any subjects in the School of Mathematical Sciences.

Linear Mathematics: matrices, determinants, eigenvalues and eigenvectors,
inversion, pivoting and conditioning, complex numbers and functions. Calculus: calculus methods and theory, ordinary and partial differential equations. Analysis: real numbers, real functions, continuity, formal calculus.

31888 LOGIC DESIGN
(4cp); 3 hpw
prerequisite 31613 Computer Systems Architecture I
coordinator Mr J Tu
Provides an introduction to the concepts of logic design, gates, combinational and sequential circuits. The subject is supported by some practical work.

31889 ADVANCED LOGIC DESIGN
(4cp); 3 hpw
prerequisite 31888 Logic Design
coordinator Mr J Tu
A continuation of Logic Design to include the concepts of machine structure as a controlled combination of registers and gates.

31892 LOGIC PROGRAMMING
(4cp); 3 hpw
prerequisite 31624 Data Structures and Algorithms, 31625 Software Engineering
coordinator Dr S Prabhakar
Intended to give the student an understanding of the principles and techniques underlying logic programming. A student should become proficient in PROLOG and its applications to AI problems.

31893 COMPARATIVE PROGRAMMING LANGUAGES
(4cp); 3 hpw
prerequisite 31624 Data Structures and Algorithms
coordinator Dr J Potter
Programming language constructs, their syntax and semantics. A comparative study of different language styles through particular languages, for example PROLOG, LISP, C, MODULA-2, SMALLTALK, OCCAM.

31894 PROJECT
(4cp); 3 hpw
prerequisite 31641 Systems Design
coordinator Mr P Bebbington
A project is intended to give a student experience in working independently and responsibility for scientific research or the development of a small system from initial analysis to user documentation. Projects may be drawn from any area of computer science or information systems. Each project is supervised by a member of academic staff.

31895 NUMERICAL ANALYSIS
(4cp); 3 hpw
prerequisite 31885 Advanced Mathematics
coordinator to be advised
Errors, numerical linear algebra, interpolation and approximation, solution of nonlinear equations in one and many unknowns, numerical differentiation and integration, numerical solution of ordinary and partial differential equations. Computer implementation of numerical algorithms and use of packages.

Not offered in 1994.

31896 LISP PROGRAMMING
(4cp); 3 hpw
prerequisites 31624 Data Structures and Algorithms, 31625 Software Engineering
coordinator Dr R Rist
This subject introduces the student to various aspects of common LISP, their application to AI problems and methodologies, and important programming concepts in LISP. Different aspects of LISP include various data types of LISP, recursion, iteration, functions and macros. AI applications include expert systems, model based reasoning and diagnosis. Programming concepts include variable binding, lexical and dynamic scoping, data and procedure abstractions, and building large programs.

31897 COMPUTER SYSTEMS ARCHITECTURE 3
(4cp); 3 hpw
prerequisite 31633 Operating Systems
coordinator Associate Professor T Hintz
A systematic treatment of more advanced topics in machine organisation and systems architecture. Particular emphasis is placed on parallelism in general and its exploitation in a number of special purpose machines. Some practical work with a distributed parallel system will be included.
31898 MICROPROCESSORS AND APPLICATIONS
(4cp); 3 hpw
prerequisites 31623 Computer Systems Architecture 2, 31888 Logic Design
coordinator Mr J Tu
An examination of the current range of microprocessors and their applications in embedded systems. Emphasis is on interfacing peripheral devices to microcomputers. The subject is supported by some practical work.

31899 SYSTEMS ARCHITECTURE
(4cp); 3 hpw
prerequisite 31897 Computer Systems Architecture 3
coordinator Associate Professor T Hintz
In-depth study at the architectural level of one or more state-of-the-art or experimental computer systems. Some practical work on a state-of-the-art parallel computer will be included.
Not offered in 1994.

31901 ARTIFICIAL INTELLIGENCE THEORY
(4cp); 3 hpw
prerequisites 31624 Data Structures and Algorithms, 31625 Software Engineering
coordinator Dr R Rist
This subject covers Artificial Intelligence to give a professional basis in the basic methods and algorithms of the subject. It includes knowledge representation, machine reasoning, planning, problem solving and research, constraint based systems, learning robotics and computer vision.

31902 AUDITING THE COMPUTER
(4cp); 3 hpw
prerequisite 31617 Accounting Fundamentals
coordinator Mr J Clark
Audit concepts and techniques in the EDP audit field. Control measures that must be embedded in computer accounting and information systems. Different systems of control, administrative, operational and security. Audit techniques and the DP audit function. Risk analysis, quality assurance.
The emphasis is oriented to control measures possible and desirable in various computer systems, eg, billing, creditors, payroll, etc and non-monetary information systems.

31904 SYSTEMS PROGRAMMING
(4cp); 3 hpw
prerequisite 31633 Operating Systems
coordinator Mr U Szewcow
The role of the systems programmer. Comparison of programming languages for systems programming. UNIX operating system. C programming language. Comparison of using tools vs writing a new program.

31916 COGNITIVE MODELLING
(4cp); 2.5 hpw
coordinator Dr T Osborn
Designed to prove an overview of recent developments in the exciting field of cognitive science. Bringing together work from several disciplines including psychology, neurophysiology, philosophy and AI, this subject will investigate the biological mechanisms underlying human intelligence in order to provide a theoretical model for emulating such behaviour artificially. Topics include philosophy of mind, memory systems, selective attention, learning, and emerging AI technologies such as neural networks.

31931 SOFTWARE QUALITY ASSURANCE
(4cp); 3 hpw
prerequisite 31621 Systems Analysis
coordinator Mr C S Johnson
Aims to provide students with the practical knowledge and skills that are necessary to effectively measure and control the quality of software products. Major topics are quality assurance principles, quality metrics, verification, validation and test, implementing quality assurance, software engineering methods and tools.

32106 OBJECT-ORIENTED SOFTWARE DEVELOPMENT
(6 cp); 3 hpw
coordinator Dr J Potter
Basic principles of object-oriented software development. Classes as modules and classes as types. OO analysis and design. Software design as object modelling through abstract data type definition. Design by contract and subcontracting. The different forms of inheritance. OO programming. Static vs dynamic typing; static vs dynamic binding. Comparison of OO programming languages. Software development environments. Support for OO methods and techniques. OO models of the software development process. Project
management for OO. Designing for reus-
ability. Abstraction and generalisation.
Models of application domains as the basis
for OO frameworks for fast application
development.

32107 FORMAL REASONING FOR
SOFTWARE DEVELOPMENT
(6 cp); 3 hpw
coordinator Dr B Jay
Promote a methodology where correctness
is established before efficiency is consid­
ered. Specification languages allow the
precise description of systems, while
abstracting away from implementation
concerns. Formal refinement allows pro­
grams to be developed from specifications,
while preserving correctness. Semantics of
languages provide a basis for reasoning
about their correct implementation. Reason­
ing about concurrency is difficult; formal
models of concurrency will be introduced.

32108 SPECIALIST TOPICS IN
ARTIFICIAL INTELLIGENCE
(6 cp); 3 hpw
coordinator Dr S Prabhakar
This subject covers some important areas of
Artificial Intelligence and their applica­
tions. These areas include, broadly, Knowl­
edge Representation, Problem Solving,
Planning, Knowledge-based Systems,
Dealing with Uncertainty, Explanation
Facilities, Machine Learning, and Applica­
tions of AI. The subject quickly introduces
to students the basic AI techniques and then
deals with individual topics in depth. The
subject may specialise in one or more sub­
areas of AI.

32204 ADVANCED DATA
MANAGEMENT
(6 cp); 3 hpw
coordinator Dr G Feuerlicht
The subject covers a range of advanced
topics in database including relational and
object-oriented database systems and
distributed databases. The subject area is
treated mainly from a technology view­
point, but also includes discussions of
management issues.

32206 ADVANCED INFORMATION
SYSTEMS MODELLING
(6 cp); 3 hpw
coordinator Mr R Raban
Information systems requirements can be
modelled in many different ways. The
modeling method used should be suitable
to the class of the system. The modelling
methods differ in terms of their expressive
power and ability to describe requirements
in specific application domains. This
subjects presents and compares the infor­
mation systems modelling methods used in
structured and object-oriented methodolo­
gies. Formal and de facto industry stand­
ards for modelling information systems are
also covered.

32207 INFORMATION MANAGEMENT
(5cp); 4 hpw
coordinator Mr P Bebbington
This subject covers three broad topics:
management of the information resources of
an organisation, management of the develop­
ment and maintenance of systems using
those resources, and management of IT
personnel and users of the information
resources. Management of information
resources requires the calculation of the
costs, and benefits of such resources both in
accounting, and qualitative terms, and the
controlling and recovering of costs so that
services can be used in an efficient and
effective manner. It also includes the
security, privacy, and legal matters which
are part of data management. Management
of system development and maintenance
includes project management and control,
systems development methodologies and
tools, and IT organisation structures. The
emphasis in IT personnel and client re­
lationship management is on the effective
use of IT staff in an increasingly user­
oriented world.

32208 INFORMATION PROCESSING
STRATEGY
(6 cp); 3 hpw
prerequisite 32203 Information Manage­
ment
coordinator Mr D Wilson
Designed to develop knowledge and skills
to carry out strategic planning for corporate
information systems and services. An
introduction to strategic management
models and their application to MIS plan­
ing is followed by an examination of the
applications spectrum and technology
spectrum, of the organisational environ­
ment, and of appropriate management tools
for strategic planning, implementation and
control of information systems. The appli­
cations model and infrastructure model of
MIS planning are contrasted.
32205 COMPUTER COMMUNICATION SYSTEMS
(6 cp); 3 hpw
coordinator Ms D Jinks

32306 CAPACITY MANAGEMENT
(6 cp); 3 hpw
coordinator Dr B Howarth
Introduces students to the concepts of capacity management, and relates this management tool to the broader management areas of corporate planning and systems development.

32307 OPERATING SYSTEMS
(6 cp); 3 hpw
coordinator Dr B Howarth

32308 COMPUTER ARCHITECTURE
(6 cp); 3 hpw
coordinator Associate Professor T Hintz
Current directions in machine architectures, and the relationship between machine architecture, task structure and system performance.

32402 INFORMATION TECHNOLOGY ENVIRONMENT
(6 cp); 3 hpw
coordinator Mr J Underwood
This subject would deal with trends and issues in the management of IT. Typical issues would be: IT within the company – user and expert cultures; competition vs collaboration in the IT industry; relations between suppliers and customers; hardware manufacturers and software houses; downsizing and outsourcing; encouraging innovation; IT as a global industry; social impacts of IT; employment effects; IT as a leading part of the economy.

32501 COMPUTER GRAPHICS
(6 cp); 3 hpw
coordinator Dr K Suffern
Demonstrates why computer graphics is important, and through the lectures and practical work, gives students a working knowledge of elementary two and three dimensional graphics programming.

32502 ADVANCED COMPUTER GRAPHICS TECHNIQUES
(6 cp); 3 hpw
prerequisite 32501 Computer Graphics
coordinator Dr K Suffern
Gives students a working knowledge of ray tracing, which is one of the two major image synthesis techniques. It also gives students practical experience with computer animation and video recording techniques.

32503 DISTRIBUTED DATABASES AND CLIENT/SERVER COMPUTING
(6 cp); 3 hpw
coordinator Dr G Feuerlicht
The subject covers a range of topics in distributed database and client/server computing. The main topics include discussion of distributed database design, distributed transactions and queries, and data replication strategies. The subject area is treated mainly from a technical viewpoint, but also includes discussions of management issues relevant to distributed database and client server computing and commercially available technology.

32504 TOOL-BASED SYSTEMS DEVELOPMENT
(6 cp); 3 hpw
coordinator Dr G Feuerlicht
The current industry trend is away from the traditional programming-oriented approach towards a tool-based approach to system analysis and development. Central to this approach is the use of repositories to define and maintain information about application systems and the use of tools to develop applications. This elective subject focuses on system development methodologies and techniques and the use of commercially available tools for systems development.
32505 ADVANCED OBJECT-ORIENTED ANALYSIS AND DESIGN

(6cp); 3 hpw
coordinator Mr R Raban

This subject introduces object-oriented methods to analyse the problem domain and to create an implementation independent formal representation of the system requirements. The object-oriented analysis (OOA) utilises the concept of 'an object' to represent the problem and to identify meaningful abstractions within the problem domain. As elements of OOA process, OOA representation and OOA complexity management are introduced and they are compared with related concepts of structured analysis methodologies and differences between the two approaches. Advantages and disadvantages of each of them are discussed. The use of domain specific libraries of reusable objects is also covered. Different object-oriented modelling techniques including abstract data types are compared and their applicability in different problem domains is assessed. The transition from the implementation independent results of the OOA to the object-oriented design for different implementation platforms are also covered.

32506 KNOWLEDGE SYSTEMS

(6cp); 3 hpw
coordinator Dr S Prabhakar

Symbol level description of KBS. Knowledge level description of KBS. Problem solving analysis of KBS. Acquisition and characterisation of knowledge. Role of KBS in work environments. Enhancing the capabilities of KBS.

32507 PERFORMANCE EVALUATION

(6cp); 3 hpw
coordinator Dr B Howarth

Introduces students to performance modelling techniques for computers and networks. It is intended for students who have not covered similar material in their undergraduate studies.

32602 IMPACT OF INFORMATION TECHNOLOGY

(6cp); 3 hpw

Reviews the effect of the introduction of computer technology into workplaces, increased efficiency of work organisations, increased occupational health hazards for computer terminal operators, and increased potential for computer crimes. Physical, psychological and environmental factors that contribute significantly to the conditions such as RSI are explained in depth. The effects of information technology on employment patterns are examined. We define and categorise computer crime and discuss difficulties associated with its prevention, detection, and with subsequent legal actions. Measures to ensure the protection of privacy are explained in this unit.

32603 SOFTWARE QUALITY MANAGEMENT

(6cp); 3 hpw
coordinator to be advised

Provides the students with the practical knowledge and skills necessary to manage the quality of software products.

32604 SYSTEMS INTEGRATION

(6cp); 3 hpw
prerequisite 32601 Advanced Project Management
coordinator to be advised

System Integration can be defined as the business of adding value to a specific project, by assuming responsibility for combining information products and services into a specified business solution. The System Integrator takes the responsibility and risk for the project. From the set of user requirements right through to the final output solution, delivered on time, within budget and achieving the expected performance criteria.

32701 ADVANCES IN INFORMATION TECHNOLOGY

(6cp); 3 hpw
coordinator to be advised

Looks at the technology trends affecting information processing and delivery, to provide the student with the vision to ensure that not only is their company well served in the present by its technology environment, but that it is also able to take up the opportunities of the future.
32702 CONTEMPORARY TELECOMMUNICATIONS
(6cp); 3 hpw
coordinator to be advised

32703 INFORMATION TECHNOLOGY STRATEGY
(6cp); 3 hpw
coordinator to be advised
Designed to provide students with an awareness of the problems in developing corporate strategies for information processing and to develop skills in the selection and use of appropriate techniques.

32818 PROJECT
(18cp); hpw to be advised
prerequisite Graduate Diploma in Information Technology Management;
corequisite 21751 Management Research Methods
coordinator to be advised
All students in the MBus in IT Management are required to enrol in and pass the project subject. The project is normally undertaken in the final year of study. The project entails a substantial investigation, under the supervision of a member of the academic staff, and is examined on the quality of both a written report and an oral presentation of the project work. The oral presentation must be made in the final year of enrolment in the Master’s course and must be presented at a satisfactory standard. Expert speakers may be available to present Master’s seminars as required throughout the final year of the course. Students are required to attend the Master’s seminars.

32901 RECENT ADVANCES IN COMPUTER SCIENCE
(6 cp); 3 hpw
coordinator Dr S Prabhakar
Review of key developments in computer science. Selection of topics from: software engineering, artificial intelligence, knowledge processing, computer graphics, theory of computer science, decision support systems, capacity planning, communications, distributed systems, computer architecture.

32902 RECENT ADVANCES IN INFORMATION SYSTEMS
(6 cp); 3 hpw
coordinator Mr J Underwood
Reviews some key developments in the information systems discipline. Some likely topics are: new techniques in database design; automated development methodologies; alternative system modelling techniques; system usability; quality in information systems; organisation wide network design; participative system design; managing the IT function in the next decade; security in information systems; evaluating the economics of information systems; career paths in IT.

32912 PROJECT
(12cp); hpw to be advised
coordinator to be advised

32924 PROJECT
(24cp)
coordinator Professor J Debenham

1 Subject name and number yet to be approved by the Faculty Board
Subjects offered by other faculties

Students should consult the relevant Faculty and its handbook for any late changes to subject information.

21708 STRATEGIC BUSINESS MANAGEMENT

(6cp); 3 hpw
Prerequisites Graduate Certificate in Information Technology Management, 21806 Managing Organisational Change, 24704 Managing Client Relations
coordinator to be advised
The nature of strategic issues; arenas of strategy; the information technology industry: context and issues; concepts of strategy; environmental analysis; capability analysis; development of strategic alternatives; evaluation and choice of strategic alternatives; stability, change and transformation; the process of strategy implementation; strategic control and monitoring.

21751 MANAGEMENT RESEARCH METHODS

(6cp); 3 hpw
prerequisite Graduate Certificate in Information Technology Management
coordinator to be advised
Will familiarise IT managers with a range of approaches used in management research, with an emphasis on approaches commonly used in practical settings. Advantages and limitations of different research approaches will be examined, as well as their applicability in different IT contexts. Experience will be provided in the design of research studies and in the analysis and interpretation of data and report presentation. Participants will acquire skills which will be useful in the conduct of research agendas in their own IT organisations, and in the critical evaluation of other's research work.

21788 EFFECTIVE PEOPLE MANAGEMENT

(6cp); 3 hpw
coordinator Mr R Connor
Deals with a range of critical interpersonal management skills, competencies and understandings necessary for effective people management. It seeks to develop enhanced competence in managing others and recognising the importance of continuing personal learning and development in management, and seeks to develop an increased sensitivity and understanding of self and others in organisational contexts.

21789 CONTEMPORARY MANAGEMENT PRACTICES

(6cp); 3 hpw
coordinator to be advised
Addresses a range of management practices appropriate to contemporary organisations. The unit provides students with an understanding of key aspects of current management practices including managerial relationships; intercultural management; leadership, status and power; negotiation; interviewing; team building; managerial audits; and managerial ethics.

Students explore a range of strategies for handling management issues, eg, competencies relevant to people, organisational structures and issues and working in international environments.

21806 MANAGING ORGANISATIONAL CHANGE

(6cp); 3 hpw
coordinator to be advised
Provides participants with a knowledge of the principles of organisational design and an appreciation of the dynamics underlying organisational change. The role of IT managers in creating adaptive, flexible structures and in maintaining the momentum of the change process will be discussed. Students will be introduced to a variety of techniques for diagnosing the strengths and weaknesses of organisations, and to a range of organisational development interventions suitable for their industry. They will develop useful change agent skills by participating in a group action learning project.

21807 TOTAL QUALITY AND PRODUCTIVITY MANAGEMENT

(6cp); 3 hpw
prerequisite Graduate Certificate in Information Technology Management
coordinator to be advised
Productivity and quality are both key factors in successful performance in the IT industry. This subject aims to develop a clear understanding of the practical and managerial aspects of quality management and productivity management, including the fundamentals of TQM and its relationship to productivity. Students completing this subject will have a sound philosophical
and practical basis for evaluating productivity and quality improvement programs and Total Quality implementation programs.

**21809 MANAGERIAL ANALYSIS AND EVALUATION OF INFORMATION SYSTEMS**

(6cp); 3 hpw
Coordinator to be advised

Presents a range of fundamental accounting, risk analysis and performance criteria for information systems. This subject is intended to provide basic skills in evaluating computer-based information systems. For students who are involved in management, it is important that they are aware of what information systems can provide and how to rate them and how to specify their requirements for their organisation's advantage.

**24704 MANAGING CLIENT RELATIONS**

(6cp); 3 hpw
Coordinator to be advised

Reviews the nature of the business development process through focusing upon the specific needs of clients. It explores the complex issues of determining and focusing on client needs as a key activity for IT managers who wish to maximise their impact. Specific IT based case material will be used throughout the course to ensure that participants recognise the essential relationship between product and client satisfaction.

**25106 ECONOMICS**

(5cp); 3 hpw
Coordinator Mr E Kasamenie

Provides a short, intensive introduction to the two major components of economic theory – microeconomics (which deals with the behaviour of individuals, firms and industries) and macroeconomics (which deals with the behaviour of the national and international economies). Through this introduction, students will begin to acquire a foundation of economic understanding useful in management decision-making. Microeconomics is a major source of techniques used by managerial economists; and both micro and macroeconomics provide insights into the external environment within which firms operate and managers must function.

**24105 PRINCIPLES OF MARKETING**

(5cp); 3 hpw
Coordinator Ms R McGuiggan

To develop an awareness and understanding of marketing concepts and how these concepts apply to profit and not for profit organisations. To provide the foundations from which a more advanced study of marketing may be pursued. To show the relevance of the need for a marketing orientation in a dynamic and changing business environment. To allow students to test and apply marketing concepts in a dynamic simulated business environment. The simulation also highlights the need for group decision making and effective management. To develop and enhance competence in the analysis of 'real world' marketing problems.

**25301 FINANCIAL MANAGEMENT**

(5cp); 3 hpw
Prerequisite 23106 Economics
Coordinator Mr K Chan

Financial Management is a specialised field of study which provides the analytical framework for corporate financial decisions. Its objective is to introduce students to financial theory and to the tools of financial decision making in the context of the Australian institutional environment. Financial Management is concerned primarily with investment project evaluation and determining the financing mix necessary to achieve the firm's financial objectives.

**51370 HUMAN COMMUNICATION**

(3cp); 2 hpw
Coordinator Ms K Fry

Outlines the principles and practice of written and oral reporting and communication within the context of the workplace. It is designed to help students in researching, organising, writing and presenting material appropriate to technical and commercial contexts. Topics covered include adaptation of content and style to suit the medium of communication, eg, letters, memoranda, reports, articles and graphs, tables and diagrams; short talks on technical subjects: visual aids.

Students will investigate various theories of communication and apply these principles to their practical work. Research, organisation, composition and presentation will be developed in the areas of written, spoken and non-verbal communication.
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M L Murray

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V R White

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M J Caden, BAppSc (UTS)

Computer Systems Support Officer
E B Lindsay
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