UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

FACULTY OF MATHEMATICAL AND COMPUTING SCIENCES

HANDBOOK ♦ 1991

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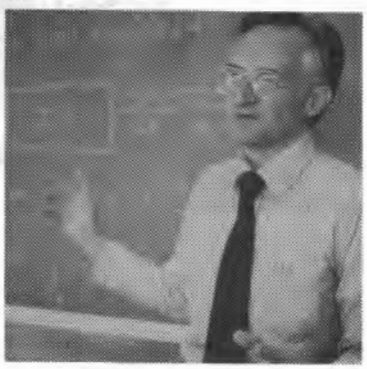

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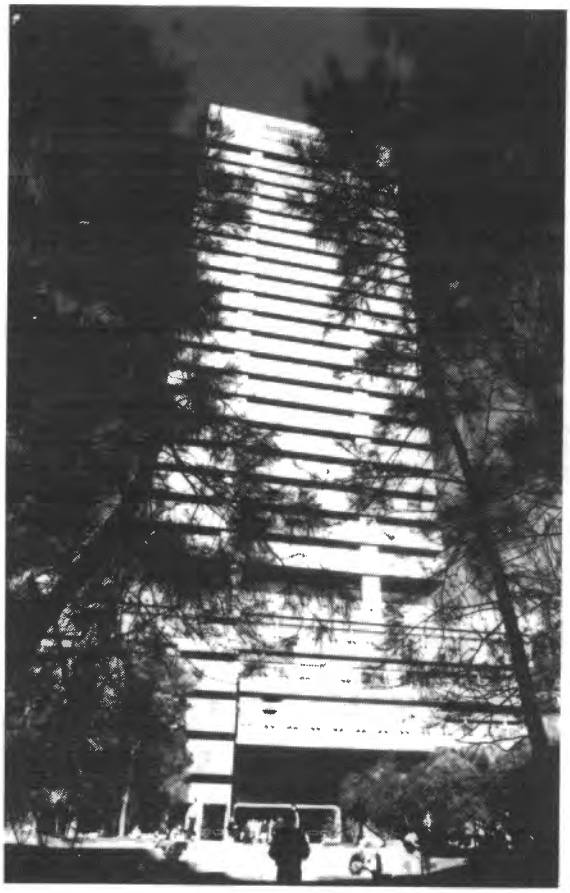
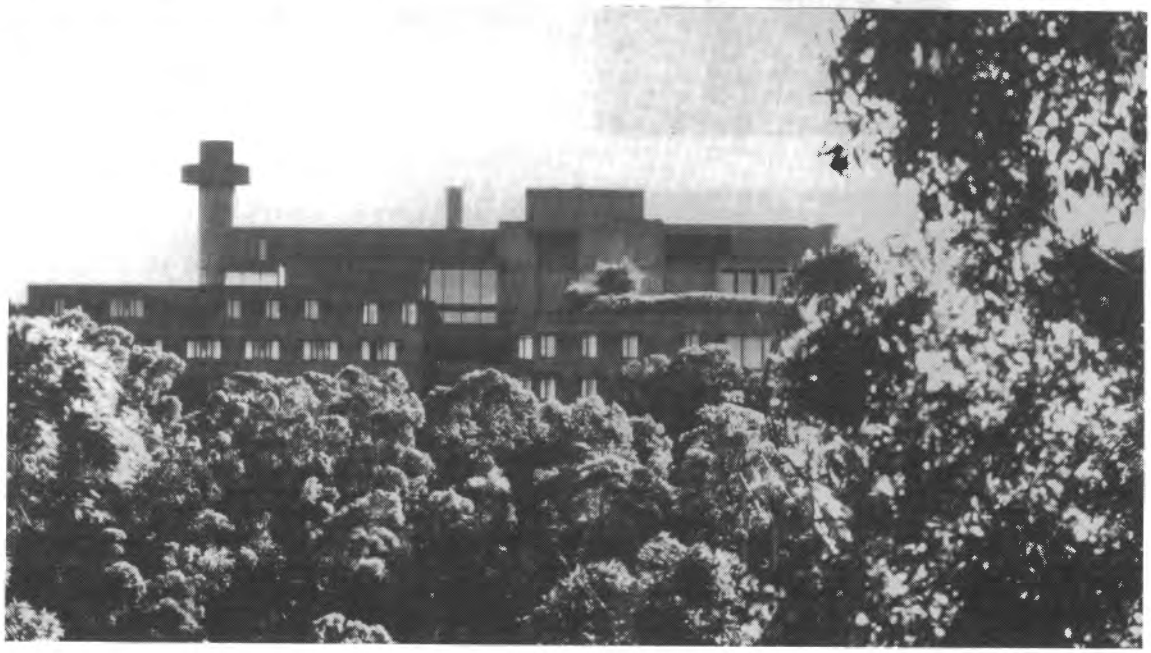




UNIVERSITY OF TECHNOLOGY, SYDNEY

UTS has nine Faculties and each one has a separate Handbook which provides a detailed introduction to the Faculty's Undergraduate Courses.

Each Faculty also has a separate Postgraduate Studies Guide.

Reading these publications will show you how all courses at UTS aim to equip graduates for their professional career. Most courses can be undertaken with part-time attendance. Some are also offered with full-time and sandwich attendance. You do not have to be employed at the time you enrol in a sandwich pattern. And you can usually transfer from one attendance pattern to another at the end of a stage, provided the Head of School approves and there is space available in the class.

UTS does not offer external or correspondence Courses.

Further information

The UTS Information Service is open all year in the Tower building at 15-73 Broadway (near Central Railway). If you can't visit them, write to PO Box 123 Broadway 2007 Australia or telephone (02) 20930.

Representatives of UTS attend Careers Days held in the Sydney region through the year.

The University Open Days - on 24 & 25 May 1991 - are your chance to visit the campus and discuss your career plans and Course preferences with members of the Academic staff.

At Kuring-gai campus there is an Inquiries Desk in the main foyer.

Applications for admission

If you want to be admitted or readmitted to a UTS Undergraduate course, apply to the Universities Admissions Centre by 27 September.

(There are some courses for which you can apply direct to UTS - the deadlines for these are advertised separately.)

If you want to enrol in a Doctoral programme or a Masters by Thesis, UTS will generally accept your application at any time.

For a Master of Arts, Master of Business or other higher degree by Coursework, you should lodge your application with the University by 31 October.

UNIVERSITY E.E.O. POLICY

It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of race, sex, marital status, physical disability or homosexuality.

MISSION

The mission of the University of Technology, Sydney is to provide higher education for professional practice which anticipates and responds to community needs and the effects of social and technological change. The University offers access to its human, physical and technological resources for the advancement of society. It is committed to freedom of enquiry and the pursuit of excellence in teaching, scholarship and research, and to interaction with the practising professions.

The University seeks to accomplish its mission in the following ways:

- by teaching an appropriate range of undergraduate, postgraduate and other educational programmes in a variety of attendance patterns for students wishing to enter the workforce at a professional level, those already employed at that level and those in employment who wish to attain that level.
- by ensuring that its courses are designed to enable graduates to carry out full professional practice in their chosen field. The courses aim to develop students' ability to learn, to solve problems, to adapt to change, and to communicate. Students should gain a broad understanding of social as well as technological issues, and acquire a greater perception of the nature and needs of modern society and of their responsibility to play a leading part in shaping it.
- by recognising that it has been established to serve the community as a major resource in vocational higher education. It therefore makes its technological expertise and facilities available to industry, commerce, government, and professional and community organisations. The means by which this is achieved include co-operative education, continuing education, pure and applied research and development, consulting, technology transfer and management, and contribution to national and regional policy development in education and technology.
- by promoting effective teaching and scholarship, professional activity and research by members of the University community to ensure the maintenance of high educational standards and their recognition at national and international levels.
- by continuing to develop and promote policies that ensure equality of opportunity in all its aspects.
- by seeking effective support for its educational activities
- by conducting regular consultative reviews of its mission and objectives.

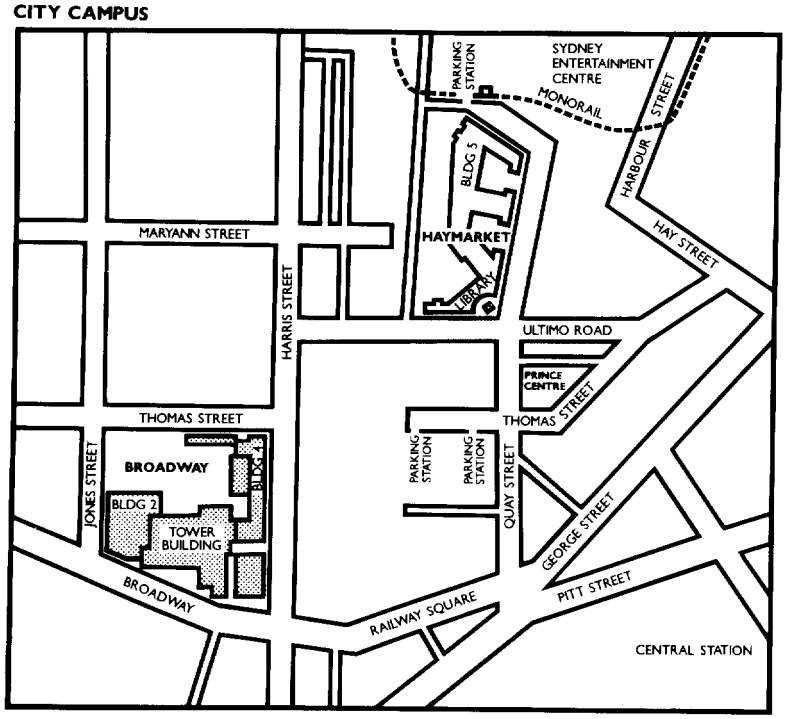
FACULTY LOCATION MAPS

Faculty of Mathematical and Computing Sciences

Faculty Office:
Room G29, Building 4,
Broadway, City Campus

Postal Address:
PO Box 123,
Broadway NSW 2007

CITY CAMPUS



School of Mathematical Sciences
Room 1523, Level 15, Building 1,
Broadway, City Campus,
Telephone: (02) 20930

School of Computing Sciences
Room G30, Building 4,
Broadway, City Campus,
Telephone: (02) 20930

CONTENTS

Information correct at February 1991
Produced by the Publications & Public Affairs Branch
Photography: Sherran Evans

FACULTY OF MATHEMATICAL AND COMPUTING SCIENCES

The Faculty consists of the School of Mathematical Sciences and the School of Computing Sciences. These Schools offer courses leading to the awards of Bachelor of Applied Science (at pass and honours levels), Bachelor of Mathematics and Finance (at pass and honours levels), Bachelor of Information Technology, Graduate Diploma in Data Processing, Graduate Diploma in Operations Research, Master of Applied Science by Thesis, Master of Applied Science (Operations Research) and Master of Applied Science (Information Science) (both by course work), and Doctor of Philosophy.

Admission Requirements

Admission to the courses offered by the Faculty will be in accordance with the general requirements for admission to the University as set out in the University Calendar. There are no formal subject requirements for students with the Higher School Certificate, although a level of 2 Unit Mathematics will be assumed, and 3 Unit Mathematics is recommended. It is recommended that intending students have a combined minimum of 5 units of Mathematics and Science as well as satisfactory results in 2 Unit Contemporary English or its equivalent for courses offered by the School of Mathematical Sciences. The School of Computing Sciences requires a high level of communication skills.

Students may enter the courses with advanced standing. Admission with advanced standing is determined in individual cases on the basis of merit. However, a minimum of two-thirds of the prescribed course must be completed in order to qualify for an award unless prior approval is granted by Academic Board.

Requirements to Graduate

In order to become eligible for any award, students are required to complete satisfactorily the course programme for the course in which they are enrolled by:

(a) obtaining at least pass level grades for all subjects, or

(b) being granted an exemption from subjects on the basis of equivalent study, or

(c) completing approved alternative subjects.

STAFF

Associate Professor and Dean of Mathematical and Computing Sciences
J. Hughes, BSc (Syd), MIEEE, FACS, MBCS

Secretary to the Dean
A. Brooks

Graduate Assistant
B. Irvine, BA (Macq)

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Word Processor Operator
M. Murray

Senior Systems Programmer
M.J. Caden, BAppSc (NSWIT)

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E.B. Lindsay

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R.I. Rozsasi, BSc (Syd), AFIMA

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Head of Department
Vacant

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K. Suffern, BSc (Hons), MSc (Monash), MSc (Corn), PhD (Syd), MACS
V. Tu, BSc, BE (Montr), ME (Hons), MIE Aust, MCSEE

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T. Tan, BSc (Hons), MSc (London), AMBCS, MBIM
D. Walker, BSc (Glasgow), DPhil (Oxon), MSc(Oxon)
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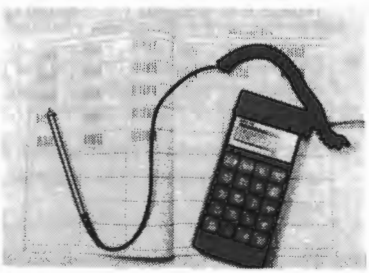
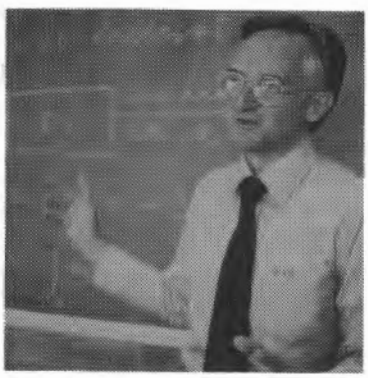
J. Robb, BSc (NSW), MSc (Lond), MBCS, MACS
D. Wilson, BSc (Hons), MBCS, MACS, MACM

Lecturers
P. Bebbington, BSc (Tech), MEngSc, MCom (NSW), MACS
J. Clark, BEcon (JCU), MEcon (New Mex), IASTED, ACM, BIM
J. El-Den, BSc CompEng (METU, Ankara), MSc CompEng (METU, Ankara)
J. Hammond, BA, DipTchg (NZ), MScSoc (NSW), FACS, MBCS, MACE
D. Jinks, BSc (ANU), MACS
C.S. Johnson, BAppSc (HonsCompSc), MPhil (Brunel)
R. Raban, MEng (Warsaw)
C. Richardson, BCommHons (InfoSys) (Wits)
J. Underwood, BSc (NSW), GradDipRecPlan, GradDipAdmin (CCAE)

Tutors
J. Smith, BSc (HonsComp/Maths) (Bristol, UK)
N. Sood, BSc (London), MSc (Leeds)



SCHOOL OF MATHEMATICAL SCIENCES



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

* the Bachelor of Applied Science (Mathematics), which is offered as a three year pass degree and a four 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 or a four year honours degree;
* the Graduate Diploma in Operations Research;
* the Master of Applied Science (Operations Research) by Coursework. Special entrance is permitted to students who have satisfactorily completed the Graduate Diploma in Operations Research (UTS). Prospective applicants should ascertain from the Graduate Studies Officer whether they conform with the general University requirements for admission to this degree programme before consulting with the Head of School about special requirements;
* the Master of Applied Science, which is awarded on the basis of approved research work and presentation of a thesis;
* the Doctor of Philosophy, which is awarded on the basis of research and presentation of a thesis.

POSTGRADUATE RESEARCH DEGREES

The Master of Applied 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:

* Biomedical applications (erythrocyte sedimentation, application of control theory to cancer and diabetes therapy);
* Computing (computer aided instruction, biomedical applications, performance modelling, language theory and implementation, mathematical foundations, neural networks, functional programming);
* Differential geometry (differential manifolds, topology and Ricci curvature);
* Geophysical applications (seismic ray and seismic wave theory, inverse problems);
* Mathematics education (education of industrial mathematicians, impact of technology on mathematics education, language problems in mathematics education);
* Number theory (recurring sequences, odd perfect numbers, computational number theory);
* Numerical analysis (numerical quadrature);
* Operations research (manpower planning, delivery of health services, economic modelling);
* Statistics (medical applications, measurement and test design, permissible statistics, Markov sequences);
* Theoretical physics (optics, electromagnetic diffraction theory, quantum mechanics).

MASTER OF APPLIED SCIENCE (BY THESIS)

Applicants should hold a first degree with a major in Mathematics (or a related field) or should have previously undertaken postgraduate studies in mathematics (or a related field).

Master's degree programmes are normally of two years duration on a full-time basis or three years duration on a part-time basis. In some cases a student with appropriate advanced study and/or relevant experience may be permitted to complete the programme in a reduced period. Applicants who believe that they may be eligible to complete the degree in a shorter time are advised to discuss the matter with the Director of Postgraduate Studies.

Prospective applicants should have considered a possible area of research within the interests of the School before making enquiries about the Master's programme.

DOCTOR OF PHILOSOPHY (BY THESIS)

The degree of Doctor of Philosophy (PhD) requires students to undertake a prescribed programme of research, in one of the areas listed above, under the supervision of a member of academic staff. The research required for the PhD is more extensive in nature than that required for the Master's degree and a higher level of originality in the work is required. The degree programme is available on either a full-time or a part-time basis. The normal enrolment is of three years duration for either pattern and the maximum period of enrolment is five years for full-time students and six years for part-time students.

Applicants should hold a degree with either First Class or Second Class (Division One) Honours in Mathematics (or a related field) or a Master's degree in an appropriate area. Prospective applicants with other qualifications are advised to consult with the Director of Postgraduate Studies. Prospective applicants should initially approach a member of the academic staff of the School of Mathematical Sciences to discuss the proposed research, or send a detailed summary (approximately 500-1000 words) to the Head of School.

Postgraduate Course Work Programmes

GRADUATE DIPLOMA IN OPERATIONS RESEARCH

This course is designed to train practising professional people in the application of operations research principles and methods. The entry requirement to the course is graduate standing or equivalent in any discipline, and a sound working knowledge of calculus and statistics. Because of the possible diversity of backgrounds, each applicant will be assessed by interview prior to enrolment. As a result of this interview and assessment the applicant will be directed to either: (i) undertake any preliminary subjects considered necessary, or (ii) enter the normal course, or (iii) enter the course with advanced standing.

The course is structured for study on a part-time basis over a period of four semesters, each comprising ten hours attendance per week. In the normal course, students undertake a basic core of consolidation subjects followed in the second semester by a study of the mathematical methods required for operations research and model building.

In the third and fourth semesters specific mathematical techniques used commonly in operations research are treated and students undertake a project designed to integrate their knowledge and provide wider experience than is possible on an individual subject basis.

The course programme is flexible in that students may enter the course with advanced standing. Applicants who enter the course at a later stage or who have some formal qualification in one or more of the specified operations research topics may be counselled to select alternative topics from additional electives. Exemptions are permitted up to a maximum of 13 semester hours. Thus a minimum attendance of 27 semester hours is required.

The academic award for satisfactory completion of the course is a graduate diploma with the nomenclature: Graduate Diploma in Operations Research, abbreviated GradDipOR(UTS). The award will be made in one of three grades - Distinction, Credit or Pass - based on the overall level of performance throughout the course. The award with Distinction requires a demonstration of outstanding comprehension and ability in the theory and application of operations research.

A basic programme follows:

Semester 1		*Hours/Week*
33702	Statistical Methods	3
33730	Simulation Techniques	3
33732	Linear Programming	3
33780	Introduction to OR Models	3
Semester 2		
33717	Numerical Methods	3
33736	Decision Theory	3
33747	Stochastic Processes	3
Semester 3		
33734	Network Optimisation	3
33735	Inventory Control	3
33760	Financial Modelling Techniques	3
Semester 4		
33731	Optimisation Techniques	3
33733	Dynamic Optimisation	3
33799	Project	4

Subject to demand, additional elective subjects may be offered each year. Students will be required to indicate in Semester 3 their order of preference from the following topics:

33744 Queuing Theory 3
33745 Design of Experiments 3
33748 Industrial Statistics 3

MASTER OF APPLIED SCIENCE (OPERATIONS RESEARCH)

The objective of this course is to prepare students for high level professional work in the application of operations research techniques to the problems of modern society. Graduates from this course will have gained a sound qualification in a variety of basic disciplines and some of the techniques of operations research and its methodology. The special emphasis of the course is in the application of operations research to the optimal delivery of health services and to manpower planning.

The entry requirement is graduate standing, or equivalent, in an appropriate discipline and the consent of the Director of Postgraduate Studies or his/her nominee. Special entrance is permitted to applicants who have satisfactorily completed the Graduate Diploma in Operations Research (UTS).

The course comprises of a total of 54 semester hours on a part-time basis extending over six semesters. Each semester requires nine hours of attendance per week. The academic award for satisfactory completion of the course is a Master of Applied Science; abbreviated MAppSc(UTS).

The course programme follows:

Semester 1		*Hours/Week*
33830	Simulation Techniques	3
33832	Linear Programming	3
33880	OR Models and Methodology	3
Semester 2		
33831	Optimisation Techniques	3
33833	Dynamic Optimisation	3
33836	Decision Theory	3
Semester 3		
33834	Network Optimisation	3
33835	Inventory Control	3
33847	Stochastic Processes	3
Semester 4		
33850	OR in Health Services 1	3
33855	Manpower Planning	3
	Special Elective	3
Semester 5		
33806	Report	6
33860	Corporate Financial Decision and Investment Analysis	3
Semester 6		
33806	Report	6
33823	Seminar	

Special Electives		
33844	Queuing Systems: Theory and Applications	3
33851	OR in Health Services 2	3
33853	Energy and Environmental Modelling	3
33857	Large-Scale Mathematical Programming	3
33858	Stochastic Models in Operations Research	3
33859	Engineering Applications in Operations Research	3
33861	Operations Research in Public Sector Services	3

In lieu of subjects for which students have been granted exemptions, the following elective subjects may be selected, depending on availability:

Electives		*Hours/Week*
33814	Applied Linear Algebra	3
33817	Numerical Analysis	3
33845	Design of Experiments	3
33848	Industrial Statistics	3
33870	Mathematical Modelling in the Biomedical Sciences	3
33871	Impact of Computers on Traditional Mathematics	3
33872	Data Analysis	3
33873	Modelling with Differential Equations	3

UNDERGRADUATE DEGREE PROGRAMMES

BACHELOR OF APPLIED SCIENCE (MATHEMATICS)

This degree aims to prepare professional people 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 the student acquire sufficient experience and understanding in a broad range of mathematical disciplines to enable him or her to apply mathematical and computing techniques to industrial and commercial problems.

The course operates as either a three year pass degree or a four year honours degree. The basic structure of the pass degree is:

* the 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 programme, is taught during the first two years of the full-time programme;

* a mathematics major - which occupies half of the third year of the full-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 are 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 Finance and Economics 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 the Computing major occupies the entire elective sequence, students who wish to pursue it are advised to commence it in their first year of studies. However, because it is an elective major, students are not obliged to follow it to completion. Those who do, however, are eligible for Associate Membership of the Australian Computer Society.

The course may be attempted on either a full-time or a part-time basis. 1991 will be the final year in which special evening classes will be scheduled for part-time students enrolled in Stages 1 and 2 (the equivalent of the first year of full-time study). From the beginning of 1992 subjects in the first year of the full-time programme will be taught only during the mornings and afternoons. For the subjects in year 2 (of the full-time programme) and later, part-time students will be accommodated by the provision of special evening classes and it is expected that all part-time students will be able to attend classes for one afternoon and two evenings per week.

For the pass degree, a total of 108 semester hours of attendance at lectures and tutorials is required.

NOTE: The BAppSc (Math) degree has been substantially revised in 1990 and the programme listed below reflects the pattern of attendance in 1991 and beyond. Subjects of the former degree programme which have direct equivalences in the new programme are not listed in the Synopsis. Subject descriptions which do not appear may be found in previous editions of the Faculty and School Handbooks and include:

34100 Algebra 1
34101 Calculus 1
34107 Computing 1
34137 Computer Systems 1
34141 Statistics 1
34203 Mechanics
34212 Vector Calculus
34213 Ordinary Differential Equations

34214 Algebra 2
34251 Macroeconomic Models
34342 Statistics 2
34343 Theory of Probability
34419 Complex Variables
34452 Finanial Modelling Techniques
34480 Introduction to OR Models
34524 Wave Theory
34528 Modern Analysis
34531 Optimisation Techniques
34532 Linear Programming
34544 Regression Analysis
34545 Design of Experiments
34547 Stochastic Processes
34548 Industrial Statistics
34553 Multiple Regression Models
34554 Time Series Analysis
34570 Algebra 3
34571 Algebra 4
34572 Fourier Analysis
34621 Mathematical Methods 1
34622 Mathematical Methods 2
34626 Control Theory
34630 Simulation Techniques
34633 Dynamic Optimistion
34634 Network Optimisation
34635 Inventory Control
34636 Decision Theory
34642 Statistics 3
34655 Simultaneous Equation Models
34667 Computer Graphics
34673 Advanced Numerical Methods
34675 Convexity and Optimisation
34677 Integral Equations

FULL-TIME PROGRAMME

YEAR 1

Autumn Semester		*Hours/Week*
34700	Discrete Mathematics	3
34701	Algebra 1	3
34710	Calculus	6
34770	Computing 1A	3
	Electives (+)	3
Spring Semester		
34711	Analysis 1	3
34740	Introduction to OR Models	3
34751	Statistics 1	3
34790	Numerical Computing	3
	Electives (+)	6

YEAR 2

Autumn Semester		*Hours/Week*
34802	Algebra 2	3
34815	Ordinary Differential Equations	3
34817	Vector Calculus	3
34891	Numerical Methods A	3
	Electives (+)	6
Spring Semester		
34803	Algebra 3	3
34812	Analysis 2	3
34818	Complex Variables	3
34821	Partial Differential Equations 1	3
34852	Statistics 2	3
	Electives (+)	3

YEAR 3

Autumn Semester		
	Mathematics Major (++)	9
	Electives (+)	9
Spring Semester		
	Mathematics Major (++)	9
	Electives (+)	9

(+) These electives may be chosen from subjects listed within the University Calendar and acceptable to the School of Mathematical Sciences. The most common choice of elective pattern is the Computing major. Electives are discussed in a later section.

(++) The mathematics majors in the third year consist of prescribed sequences of six 3 semester hour subjects taken from one of the four strands in Statistics, Operations Research and Physical and Modern Applied Mathematics.

PART-TIME PROGRAMME

YEAR 1

Autumn Semester		*Hours/Week*
34700	Discrete Mathematics	3
34710	Calculus	6
Spring Semester		
34701	Algebra 1	3
34711	Analysis 1	3
34770	Computing 1A	3

YEAR 2		*Hours/Week*
Autumn Semester		
34751	Statistics 1	3
	Electives (+)	6
Spring Semester		
34740	Introduction to OR Models	3
	Electives (+)	3
34790	Numerical Computing	3
YEAR 3		
Autumn Semester		
34802	Algebra 2	3
34817	Vector Calculus	3
34891	Numerical Methods A	3
Spring Semester		
34803	Algebra 3	3
34815	Ordinary Differential Equations	3
	Electives (+)	3
YEAR 4		
Autumn Semester		
34812	Analysis 2	3
34821	Partial Differential Equations 1	3
	Electives (+)	3
Spring Semester		
34818	Complex Variables	3
34852	Statistics 2	3
	Electives (+)	3
YEAR 5		
Autumn Semester		
	Mathematics Major (++)	
	Electives (+)	
Spring Semester		
	Mathematics Major (++)	
	Electives (+)	
YEAR 6		
Autumn Semester		
	Mathematics Major (++)	
	Electives (+)	
Spring Semester		
	Mathematics Major (++)	
	Electives (+)	

(+), (++) See the corresponding notes in the preceding section.

Major Areas of Study

Students must complete at least one of the mathematics majors which are offered in the areas of Statistics, Operations Research, Modern Applied Mathematics and Physical Applied Mathematics. Students may also choose to complete the elective major in Computing.

Statistics

FULL-TIME

YEAR 3		
Autumn Semester		*Hours/Week*
34953	Statistics 3	3
34955	Regression Analysis	3
34960	Theory of Probability	3
Spring Semester		
34956	Design of Experiments	3
34957	Industrial Statistics	3
34961	Stochastic Processes 1	3

PART-TIME

YEARS 5 AND 6		
Autumn Semester		
34953	Statistics 3	3
34955	Regression Analysis	3
34961	Stochastic Processes 1	3
Spring Semester		
34956	Design of Experiments	3
34957	Industrial Statistics	3
34960	Theory of Probability	3

Operations Research

FULL-TIME

YEAR 3		
Autumn Semester		
34930	Simulation Techniques	3
34931	Linear Programming	3
34936	Decision Theory	3
Spring Semester		
34938	Financial Modelling Techniques	3
3493*	OR elective (*)	3
34961	Stochastic Processes 1	3

PART-TIME *Hours/Week*

YEARS 5 AND 6
Autumn Semester
34930 Simulation Techniques 3
34936 Decision Theory 3
34961 Stochastic Processes 1 3

Spring Semester
34931 Linear Programming 3
34938 Financial Modelling Techniques 3
3493* OR Elective (*) 3

(*) This subject may be selected from
34932 Optimisation Techniques
34934 Network Optimisation
34935 Inventory Control

Physical Applied Mathematics (**)

FULL-TIME
YEAR 3

PART-TIME
YEARS 5 AND 6 *Hours/Week*
Autumn Semester
34922 Partial Differential Equations 2 3
34924 Mechanics 3
34927 Deterministic Optimal Control 3

Spring Semester
34916 Mathematical Methods 3
34925 Wave Theory 3
34992 Numerical Methods B 3

Modern Applied Mathematics (**)

FULL-TIME
YEAR 3

PART-TIME
YEARS 5 AND 6
Autumn Semester
34904 Algebra 4 3
34913 Modern Analysis 3
34920 Integral Equations 3

Spring Semester
34914 Measure Theory 3
34995 Advanced Numerical Methods 3
34996 Convexity and Optimisation 3

(**) In order to complete the requirements for either of the two Applied Mathematics majors, students must complete at least four subjects from the major of their choice and select the remainder from the alternative major.

Computing

FULL-TIME

YEAR 1
Autumn Semester *Hours/Week*
Comm/IS Elective (#) 3

Spring Semester
34771 Computing 1B 3
34781 Mathematical Foundations of Computing 1 3

YEAR 2
Autumn Semester
34872 Computing 2 3
Comm/IS Elective (#) 3

Spring Semester
34873 Computing 3 3

YEAR 3
Autumn Semester
34982 Mathematical Foundations of Computing 2 3
Elective 1 (##) 3
Comm/IS Elective (#) 3

Spring Semester
34984 Language Theory 3
Elective 2 (##) 3
Comm/IS Elective (#) 3

PART-TIME

YEAR 1
No Computing Major subjects in Year 1.

YEAR 2
Autumn Semester
34781 Mathematical Foundations of Computing 1 3
Comm/IS Elective (#) 3

Spring Semester
34771 Computing 1B 3

YEAR 3 *Hours/Week*

Autumn Semester

No Computing Major subjects in this semester.

Spring Semester

	Comm/IS Elective (#)	3

YEAR 4

Autumn Semester

34872	Computing 2	3

Spring Semester

34873	Computing 3	3

YEARS 5 AND 6

Autumn Semester

34982	Mathematical Foundations of Computing 2	3
	Elective 1 (##)	3
	Comm/IS Elective (#)	3

Spring Semester

34984	Language Theory	3
	Elective 2 (##)	3
	Comm/IS Elective (#)	3

(#) The subjects labelled as Comm/IS Elective are elective subjects oriented towards commercial processes or information systems. At the time of preparation of this Faculty Handbook, the list of such electives was still being completed. For a full list, consult the 1991 School handbook.

(##) In each semester of the final year(s) of study, students will undertake one subject from a choice of two, which will be nominated by the School and drawn from Group 1 for the Autumn Semester and from Group 2 for the Spring Semester. These groups are listed below.

Group 1

34975 Computer Graphics
34976 Neural Networks
34987 Cryptology

Group 2

34977 Formal Specification
34983 Mathematical Foundations of Computing 3
34985 Digital Image Processing

Elective Subjects offered within the BAppSc (Mathematics) Degree

There are 36 semester hours in the BAppSc (Mathematics) programme allocated to elective subjects outside of the Mathematics majors. Students may choose to complete these hours of study in a number of ways:

* by completing one additional mathematics major, leaving 18 unspecified elective hours to be completed in the case of most double majors, and 21 unspecified elective hours 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; or

* by completing a total of 36 hours of 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 Finance, Economics and Physics. However, a student may elect to take any subject, provided that:

  (i) the student has satisfied the prequisites of the chosen subjects;
  (ii) the student's enrolment in a subject is approved by the School which offers that subject, and
  (iii) 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.

34573 History of Mathematics
34668 Computational Number Theory
34681 Special Applications in Operations Research
34682 Special Applications in Computing
34683 Special Applications in Statistics
34684 Special Applications in Physical Applied Mathematics
34685 Special Applications in Modern Applied Mathematics
34691-7 Project

BACHELOR OF APPLIED SCIENCE (MATHEMATICS) (HONOURS)

The honours year provides the opportunity for students to develop considerably their level of competence in the area of mathematics chosen as their major in the BAppSc (Maths) degree. The honours degree is offered only on a full-time basis and consists of advanced coursework (comprising 75% of the programme) and a research project (comprising the remaining 25%). This project component provides the opportunity for students to utilise the expertise developed by their coursework in an area of application. Students who complete the honours year will, accordingly, be well prepared to enter the workforce at a high level or to undertake graduate studies.

Admission to the honours year will be assessed on a case-by-case basis according to the criteria listed in either category below:

* Students who are eligible to graduate from the BAppSc (Maths) degree at UTS with a credit average (i.e. weighted average mark of at least 65) or higher in the second year of the full-time core and in their chosen third year major, together with the satisfactory completion of the third year essay, will be eligible for entry to the honours year, subject only to the approval of the Head of the School of Mathematical Sciences;

* Students who have obtained qualifications equivalent to the BAppSc (Maths) degree will be considered for entry, upon application, by the Head of the School of Mathematical Sciences, on the basis of assessed potential to complete the honours course.

The honours course will require attendance for 18 hours per week over two semesters. Honours will be offered in Mathematics, Statistics and Operations Research and will consist of coursework subjects and a project whose weight is equivalent to three coursework subjects.

Students who elect to enter the honours year will need to make this decision prior to entering their third year of full-time studies. This is to enable them to take appropriate honours units in the third year which are prerequisites to some of the fourth year subjects. Consequently, such students will have to defer some of their third year electives to the fourth year of study.

Students proposing to attempt the honours degree should consult with the Director of Undergraduate Studies (or their nominee) prior to the commencement of their third year of full-time studies. Students who are deemed eligible for admission will then be assigned an honours supervisor who will monitor their progress and supervise their fourth year research project, which will be assessed by a report and seminar. In addition, students will, in their third year, be required to complete an essay in an appropriate area of mathematics. This essay, which will take the form of a survey article, will also be prepared under the guidance of the honours supervisor. Its satisfactory completion will be a prerequisite for the fourth year of study.

The assessment of the student's final result will be based on the two honours level subjects taken in the third year, the seven honours level subjects taken in the fourth year, the third year essay and the fourth year project. Grades of First Class, Second Class (Division 1), and Second Class (Division 2) will be awarded appropriately.

N.B. In view of the third year prerequisites for the honours year, it is not proposed to operate the fourth year of study in 1991. The fourth year programme will commence in 1992.

Course Programme

Listed below are the course programmes for honours in Mathematics, Statistics and Operations Research. In view of the need to take certain honours units in the third year and delay various third year electives until the fourth year, both third and fourth year attendance patterns are listed.

Mathematics Honours

YEAR 3

Autumn Semester		*Hours/Week*
34922	Partial Differential Equations 2	3
34927	Deterministic Optimal Control	3
34961	Stochastic Processes 1	3
	Third year elective	3
	Third year elective	3
34013	Modern Analysis (Hons)	3

Spring Semester		*Hours/Week*
34916	Mathematical Methods	3
34960	Theory of Probability	3
34992	Numerical Methods B	3
	Third year elective	3
	Third year elective	3
34014	Measure Theory (Hons)	3

YEAR 4

Autumn Semester		
	Third year elective	3
34023	Partial Differential Equations 3	3
34026	Fractal Geometry	3
34062	Stochastic Processes 2	3
34096	Convexity and Optimisation (Hons)	3
34098	Project	3

Spring Semester		
	Third year elective	3
34019	Functional Analysis	3
34028	Stochastic Optimal Control	3
34029	Nonlinear Dynamical Systems	3
34099	Project	6

Note: This programme is for students doing the Physical Applied Mathematics major of the BAppSc (Maths) degree. A similar programme, differing in only two subjects, would apply to the Modern Applied Mathematics major. For further details, consult the Director of Undergraduate Studies.

Operations Research Honours

YEAR 3

Autumn Semester		*Hours/Week*
34931	Linear Programming	3
34938	Financial Modelling Techniques	3
34961	Stochastic Processes 1	3
	Third year elective	3
	Third year elective	3
34013	Modern Analysis (Hons)	3

Spring Semester		
34930	Simulation Techniques	3
34932	Optimisation Techniques	3
34936	Decision Theory	3
34960	Theory of Probability	3
	Third year elective	3
34014	Measure Theory (Hons)	3

YEAR 4

Autumn Semester		*Hours/Week*
33880	OR Models and Methodology	3
	Third year elective	3
34033	Dynamic Optimisation	3
34062	Stochastic Processes 2	3
34096	Convexity and Optimisation (Hons)	3
34098	Project	3

Spring Semester		
	Third year elective	3
	Third year elective	3
33857	Large Scale Mathematical Programming	3
33860	Corporate Financial Decisions and Investment Analysis	3
34099	Project	6

Statistics Honours

YEAR 3

Autumn Semester		
34953	Statistics 3	3
34955	Regression Analysis	3
34961	Stochastic Processes 1	3
	Third year elective	3
	Third year elective	3
34013	Modern Analysis (Hons)	3

Spring Semester		
34956	Design of Experiments	3
34957	Industrial Statistics	3
34960	Theory of Probability	3
	Third year elective	3
	Third year elective	3
34014	Measure Theory (Hons)	3

YEAR 4

Autumn Semester		
	Third year elective	3
34062	Stochastic Processes 2	3
34065	Time Series Analysis	3
34067	Multivariate Statistics	3
34096	Convexity and Optimisation (Hons)	3
34098	Project	3

Spring Semester		
	Third year elective	3
34066	Nonlinear Statistical Models	3
34068	Statistical Modelling	3
34069	Linear Models and Experimental Design	3
34099	Project	3

BACHELOR OF MATHEMATICS AND FINANCE

The years since deregulation of the Australian financial system have witnessed many wide 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 1970's. 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 has been jointly developed by the School of Mathematical Sciences and the School of Finance and Economics and will commence operation in the 1991 academic year.

Students graduating from the BMathFin will have undertaken an integrated sequence of study in mathematics, statistics, finance, economics, accounting, business law and computing and will thus 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 operates as both a three year pass degree and a four year honours degree (described later). The pass degree is operated only on a full-time basis and requires 18 hours per week attendance at lectures and tutorials for a period of six semesters (three years).

The course programme is listed below:

YEAR 1

Autumn Semester		*Hours/Week*
34700	Discrete Mathematics	3
34710	Calculus	6
34770	Computing 1A	3
22101	Financial Accounting 1	3
23105	Microeconomics	3

Spring Semester		
34701	Algebra 1	3
34711	Analysis 1	3
34751	Statistics 1	3
34790	Numerical Computing	3
22202	Financial Accounting 2	3
23204	Macroeconomics	3

YEAR 2

Autumn Semester		*Hours/Week*
34802	Algebra 2	3
34815	Ordinary Differential Equations	3
34817	Vector Calculus	3
23310	Microeconomic Policy	3
25301	Financial Management	3
25541	Financial Institutions and Markets	3

Spring Semester		
34812	Analysis 2	3
34821	Partial Differential Equations 1	3
34852	Statistics 2	3
34936	Decision Theory	3
22260	Commerical Law 1	3
254**	Financial Management and Policy (Hons)	3

YEAR 3

Autumn Semester		
34913	Modern Analysis (+)	3
34955	Regression Analysis	3
34960	Theory of Probability	3
22361	Company Law Administration	3
255**	Investment Analysis and Portfolio Management (Hons)	3
25531	International Finance	3

Spring Semester		
34914	Measure Theory (+)	3
34961	Stochastic Processes 1	3
34992	Numerical Methods B	3
22463	Taxation 1	3
25510	Current Issues in Finance	3
256**	Financial Time Series Modelling	3

(+) Note that students proceeding to the honours year will be required to substitute 34013 Modern Analysis (Hons) and 34014 Measure Theory (Hons) in place of the two pass level subjects.

BACHELOR OF MATHEMATICS AND FINANCE (HONOURS)

The provision exists for able students to undertake an additional year of advanced study leading to the award of an honours degree. Graduates from this honours degree would be particularly sought after and the additional skills gained would enable them to compete for the top jobs in the banking sector. Consequently, it is expected that most students will

opt to undertake this additional year comprising nine coursework units in advanced mathematics, statistics and finance and a research project (equivalent to three coursework units).

Admission to the honours year will be assessed on a case-by-case basis according to the criteria listed in either category below:

* students who are eligible to graduate from the BMathFin (pass) degree at UTS with a credit average or higher in the second and third years of the course will be eligible for entry to the BMathFin (Hons), 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 (pass) degree will be considered for entry, upon application, by the Heads of the two participating Schools on the basis of assessed potential to complete the honours course.

The honours year will require attendance for 18 hours per week over two semesters of full-time study. The year comprises nine coursework units of an advanced nature in mathematics, statistics and finance and 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 to a research oriented problem. 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 fourth year 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.

Listed below is the course programme for the BMathFin(Hons) degree.

YEAR 4

Autumn Semester		*Hours/Week*
34927	Deterministic Optimal Control	3
34028	Time Series Analysis	3
34062	Stochastic Processes 2	3
23903	Advanced Microeconomics	3
25***	Thesis	3

Spring Semester		*Hours/Week*
34028	Stochastic Optimal Control	3
34029	Nonlinear Dynamical Systems	3
34066	Nonlinear Statistical Models	3
25902	Advanced Corporate Finance	3
25***	Thesis	3

SYNOPSES

33101 MATHEMATICS 1 (LIFE SCIENCES)
Three semester hours

Graphical procedures, linear, logarithmic, power, exponential and trigonometric functions and their use in developing models of biological systems from data or basic assumptions. The use of differential and integral calculus in investigating such systems.

33103 STATISTICS 1 (LIFE SCIENCES)
Three semester hours

Populations and samples; measures of central tendency and dispersion; probability; binomial. Poisson and normal distributions; standard tests of significance and estimation for means and variances; goodness of fit tests.

33105 INTRODUCTORY BIOMETRICS (LIFE SCIENCES)
Three semester hours

Design and analysis of biological experiments; completely randomised design; regression analysis and correlation; multiple regression; polynomial regression; randomised block and latin square designs; two factor experiments; distribution-free tests.

33120 ENGINEERING MATHEMATICS 1
Six semester hours

Matrices and determinants. Vectors. Limits, continuity and differentiation. Applications of differentiation. Integration and applications. Elementary functions. Methods of integration. Sequences and series. Complex numbers.

33121 ENGINEERING MATHEMATICS 1A
Three semester hours

The syllabus is the first half of that of 33120 Engineering Mathematics 1, up to and including applications of differentiation.

33122 ENGINEERING MATHEMATICS 1B
Three semester hours
Prerequisite: 33121 Engineering Mathematics 1A

This subject is a continuation of 33121. The two subjects cannot be taken concurrently. The syllabus is the second half of that for 33120.

33131 DISCRETE MATHEMATICS
Three semester hours

This subject aims to develop an understanding of formal systems and related proof methods that can be used in various software engineering fields. It introduces the elements of set theory, properties of relations, including equivalence and order relations and appropriate aspects of graph theory. It also introduces concepts and techniques from abstract algebra that are relevant to the formal specification of systems. A range of applications are examined.

33170 BASIC SCIENCE MATHEMATICS
Three semester hours

Basic mathematics for scientists. Quadratic and linear equations. Functions; limits; continuity; derivatives. Trigonometric functions, introduction to integral calculus.

33171 SCIENCE MATHEMATICS 1 F/T
Four semester hours
Prerequisite: 33170 Basic Science Mathematics

A subject which develops the essential mathematical tools used in the physical sciences. Determinants and matrices. Differentiation; trigonometric functions; implicit differentiation. Integration. The natural logarithm and exponential functions. Inverse trigonometric functions. Sequences and series. Complex numbers.

33172 SCIENCE MATHEMATICS 2
Three semester hours
Prerequisite: 33171 Science Mathematics 1

An introduction to areas of application of differential and integral calculus in the physical sciences. Applications of differentiation; maximising functions; Newton's method for finding roots. Applications of integration; areas, volumes, mass centres, arc lengths. Techniques for integrating; integration by parts; use of trigonometric identities; partial fractions. Functions of many variables; partial differentiation; chain rule. Variable separable differential equations; applications.

33173 SCIENCE MATHEMATICS 3
Three semester hours
Prerequisite: 33171 Science Mathematics 1 F/T or 33175 Science Mathematics 1 P/T
Corequisite: 33172 Science Mathematics 2

Mathematical techniques for the physical sciences. Matrices; inverses; eigenvalues and eigenvectors. Three dimensional coordinate geometry; vectors. Hyperbolic and inverse hyperbolic functions. Linear and exact first order differential equations. Infinite sequences and series.

33175 SCIENCE MATHEMATICS 1 P/T (2 SEMESTERS)
Four semester hours (Two semester hours in each semester)
Prerequisite: 33170 Basic Science Mathematics

A subject which develops the essential mathematical tools used in the physical sciences. Determinants and matrices. Differentiation; trigonometric functions; implicit differentiation. Integration. The natural logarithm and exponential functions. Inverse trigonometric functions. Sequences and series. Complex numbers.

33220 ENGINEERING MATHEMATICS 2
Six semester hours
Prerequisite: 33120 Engineering Mathematics 1 or 33122 Engineering Mathematics 1B

Partial derivatives. Double integrals and applications. Triple integrals and applications. Differential equations. Laplace transforms. Series solutions of differential equations. Boundary value problems. Vector calculus.

33221 ENGINEERING MATHEMATICS 2A
Three semester hours
Prerequisite: 33120 Engineering Mathematics 1 or 33122 Engineering Mathematics 1B

The syllabus is the first half of that for 33220, up to and including differential equations.

33222 ENGINEERING MATHEMATICS 2B
Three semester hours
Prerequisite: 33221 Engineering Mathematics 2A

This subject is a continuation of 33221. The two subjects cannot be taken concurrently. The syllabus is the second half of that for 33220.

33330 PHYSICAL MATHEMATICS
Three semester hours
Prerequisite: 33221 Engineering Mathematics 2A

Vector calculus; vector fields. Line and surface integrals. Conservative fields. Green's theorem. Divergence and curl. Gauss's theorem and the equation of continuity. Stokes' theorem and circulation. ODEs: series solutions of linear equations with non-constant coefficients. Legendre's and Bessel's equations and functions. Boundary value problems: one dimensional heat and wave equations. Separation of variables. Fourier sine and cosine series. Vibrating circular membrane.

33702 STATISTICAL METHODS
Three semester hours

Review of basic probability theory, hypothesis testing, standard tests of significance and expectation. Quality control and reliability. Regression analysis. Analysis of variance, Markov chains.

33717 NUMERICAL METHODS
Three semester hours
Prerequisites: 34790 Numerical Computing (or equivalent) 34802 Algebra 2 (or equivalent)
Corequisite: 34815 Ordinary Differential Equations (or equivalent)

Introduction to numerical solutions of problems in science and engineering using digital computers. Solution of linear and non-linear equations. Interpolation and functional approximation. Numerical differentiation and integration. Numerical linear algebra. Solution of ordinary differential equations. Minimisation.

33730 SIMULATION TECHNIQUES
Three semester hours
Prerequisite: 34751 Statistics 1 (or equivalent)
Corequisite: 34790 Numerical Computing (or equivalent)

Introduction to techniques of simulation as used in Operations Research. Special consideration is given to input data analysis, verification, validation and the employment of high-level languages for discrete event simulation. (GASP, SEESIM, SIMSCRIPT II.5).

33731 OPTIMISATION TECHNIQUES
Three semester hours
Prerequisite: 33732 Linear Programming 34711 Analysis 1 (or equivalent)
Review of classical optimisation, theoretical foundations of non-linear programming, Kuhn-Tucker theorem, useful properties of convexity, line search by the Fibonacci method and by curve-fitting methods, steepest ascent, Newton's method, conjugate direction methods, feasible descent algorithms for constrained optimisation, quadratic programming, survey of available computer codes, geometric programming.

33732 LINEAR PROGRAMMING
Three semester hours
Corequisite: 33780 Introduction to OR Models

Formulation of linear programming problems. The simplex method and its variants. Duality theory. Degeneracy and post-optimal analysis. Applications to deterministic systems arising in industry and management. Sensitivity analysis and parametric programming. Integer and quadratic programming. Multiple objective decision making.

33733 DYNAMIC OPTIMISATION
Three semester hours
Prerequisite: 34751 Statistics 1 (or equivalent) 34890 Numerical Computing (or equivalent)

The objectives of this subject are to introduce the elements of dynamic optimisation within a unified framework; to cultivate the art of formulating the solutions of problems in terms of recursive relations; and to outline computer solutions to dynamic optimisation problems.

33734 NETWORK OPTIMISATION
Three semester hours
Prerequisite: 33780 Introduction to OR Models
Corequisite: 33732 Linear Programming

Applications of optimal control network flows, the max-flow minicut theorem. Ford and Fulkerson's labelling method, relations to linear programming, the out-of-kilter algorithm, project management including Critical Path Method, PERT and consideration of project cost curves, applications of graph and network models.

33735 INVENTORY CONTROL
Three semester hours
Corequisite: 33730 Simulation Techniques

Characterisation and development of optimal inventory policies for single-item and multi-inventory models. The deterministic problem. Determination of economic lot sizes. Survey of optimal policies, fixed ordering and probabilistic review policies. Forecasting techniques including general exponential smoothing. Development and use of computer packages relevant to industrial and commercial situations.

33736 DECISION THEORY
Three semester hours
Prerequisite: 33780 Introduction to OR Models

Consideration of the general problem of decision making under risk and uncertainty. Risk analysis. Utility. Decision trees. Bayesian revision. Theory of games. Multiple objective decision making. Goal programming. Multi-attribute utility. Comparison of classical and Bayesian statistics.

33744 QUEUING THEORY
Three semester hours
Prerequisites: 33730 Simulation Techniques 34852 Statistics 2 (or equivalent)

Fundamental results of queuing theory and applications to important systems of delay, analysis of various queuing (waiting line) systems, discrete and continuous time Markov processes, birth-and-death processes, equilibrium results for single and multiple server queues, method of stages, priority queuing, applications to communication systems, data processing systems, queues in networks.

33745 DESIGN OF EXPERIMENTS
Three semester hours
Prerequisite: 34852 Statistics 2 (or equivalent)

Design and analysis of experiments. Completely randomised blocks and latin square designs. Factorial experiments. Hierarchical experiments. Introduction to confounding, split plots, fractional replication, incomplete blocks, analysis of covariance, use of computer packages.

33747 STOCHASTIC PROCESSES
Three semester hours
Prerequisite: 34852 Statistics 2 (or equivalent)

Random walks. Markov chains; classification of states; limit results for irreducible recurrent chains; absorption probabilities. Discrete state Markov processes; Poisson processes; pure birth processes; birth-death processes; application to queuing problems. Stationary processes; moving average and autoregressive models. Introduction to Wiener processes and renewal processes.

33748 INDUSTRIAL STATISTICS
Three semester hours
Prerequisite: 34852 Statistics 2 (or equivalent)

Sampling inspection; acceptance sampling; AOQ curve; the process curve; inspection by variables. Sequential statistical tests. Distribution of order statistics. Control charts; cumulative sum charts. Reliability; reliability of systems.

33780 INTRODUCTION TO OPERATIONS RESEARCH MODELS
Three semester hours
Corequisite: 34751 Statistics 1 (or equivalent)

This subject introduces the basic methodology of Operations Research emphasising the application of the scientific method to problem solving and decision making, and considers the general purpose models and computational methods of Operations Research (linear network, network, financial, dynamic and stochastic models).

33799 PROJECT
Four semester hours
Prerequisite: by consent

An investigation of an approved topic selected by the student and carried out under supervision. The aim is to develop the student's ability in the formulation and solution of an operations research problem from a real-life situation. A formal report of the investigation will be required for satisfactory completion of the project.

33801-33812 REPORT
One to twelve semester hours
Prerequisite: by consent

33814 APPLIED LINEAR ALGEBRA
Three semester hours
Prerequisite: by consent

This is a course in linear algebra motivated by relevant applications from areas such as operations research and modelling in the physical and biological sciences. Topics considered are: concepts of rank, kernel and uniqueness introduced via systems of linear equations and the LU decomposition. Inner products and norms. Condition of linear systems. Perturbed systems of equations. The eigenvalue problem (motivated by examples from discrete and continuous systems modelling). Similarity transformations, unitary matrices. Eigensystems of normal matrices and the least squares problem. Singular value decompositions. The generalised inverse. The Jordan canonical form, matrix exponentials and applications.

33817 NUMERICAL ANALYSIS
Three semester hours
Prerequisites: 33814 Applied Linear Algebra

This course is essentially a more comprehensive and a more analytic treatment of the material in 33717 Numerical Methods. Topics include: computational linear algebra (relying on the foundation supplied by 34814 Applied Linear Algebra): direct and iterative methods (including analysis of convergence); the eigenvalue problem; Jacobi's method; QR methods. Interpolation: use of splines. Solution of non-linear equations: fixed point method, Newton's method, analysis of convergence, algorithms for complex roots. Quadrature: the Newton-Cotes methods, extrapolation methods, error analysis. Solution of ordinary differential equations: series methods, Runge-Kutta methods, predictor-corrector methods, error analysis.

33823 SEMINAR
Three semester hours
Prerequisite: by consent

Application of operations research techniques to a particular field. Depending on staff availability and student demand, applications will be from the following: computing system performance, public sector applications, marketing and health planning.

33830 SIMULATION TECHNIQUES
(See 33730)

33831 OPTIMISATION TECHNIQUES
(See 33731)

33832 LINEAR PROGRAMMING
(See 33732)

33833 DYNAMIC OPTIMISATION
(See 33733)

33834 NETWORK OPTIMISATION
(See 33734)

33835 INVENTORY CONTROL
(See 33753)

33836 DECISION THEORY
(See 33736)

33844 QUEUING SYSTEMS: THEORY AND APPLICATION
Three semester hours
Prerequisite: 34960 Theory of Probability (or equivalent)

Fundamental results of queuing theory and their application to important systems of delay, analysis of various queuing (waiting line) systems, discrete and continuous time Markov processes, birth-and-death processes, equilibrium results for single and multiple server queues, method of stages, priority queuing, applications to communication systems, data-processing systems, queues in networks.

33845 DESIGN OF EXPERIMENTS
(See 33745)

33847 STOCHASTIC PROCESSES
(See 33747)

33848 INDUSTRIAL STATISTICS
(See 33748)

33850 OPERATIONS RESEARCH IN HEALTH SERVICES 1
Three semester hours
Prerequisite: by consent
Corequisite: 33855 Manpower Planning

Recognition of problem areas and specific problems in the health field which can be solved or alleviated by operations research techniques, selection and application (with appropriate adaption) of the appropriate techniques. Methods discussed include queuing theory, decision analysis, mathematical programming, Markov chains, simulation, inventory control. Areas of application include appointment systems, blood banking, manpower planning and scheduling, centralisation versus decentralisation. An important consideration is the quality of health care in terms of efficiency of provision of services.

33851 OPERATIONS RESEARCH IN HEALTH SERVICES 2
Three semester hours
Prerequisite: 33850 OR in Health Services 1

Continuation of OR in Health Services 1 with additional techniques and survey of current literature on recent applications of OR to health services.

33853 ENERGY AND ENVIRONMENTAL MODELLING
Three semester hours
Prerequisite: by consent

Modelling of energy systems on a global and a national (or regional) basis, large system simulation and industrial dynamics, risk-benefit analysis of alternative technologies, problems of pollution and resource exhaustion, demand projections, conservation proposals, environmental trade-offs, interdependence between the energy sector and the economy as a whole, relationship with international trade.

33855 MANPOWER PLANNING
Three semester hours
Prerequisite: by consent

Manpower planning and scheduling in companies and in public facilities such as health systems. Cohort analysis, measures of wastage, continuous methods (renewal equations), discontinuous methods, Markov-based examples, political, economic, social and technological changes, effects of computerisation, Grosch's Law, manpower equivalent of a computer, job displacement, penetration of computers into industries. Gompertz curve, effect of new computer-based technology on public facilities, e.g. a hospital radiology department.

33857 LARGE SCALE MATHEMATICAL PROGRAMMING
Three semester hours
Prerequisite: 34932 Optimisation Techniques

The subject introduces students to the solution of large scale problems using mathematical programming techniques and considers the use of these techniques in a number of case studies and research areas. Topics to be covered include: theory and computational methods for optimising large scale linear and nonlinear programmes, exploitation of special structure, data handling, Dantzig-Wolfe

decomposition. Bender's decomposition, surrogate programming; multidivisional problems, combinatorial problems, stochastic problems and dynamic problems.

33858 STOCHASTIC MODELS IN OPERATIONS RESEARCH

Three semester hours
Prerequisite: by consent

Survey of models, methods for operational problems characterised by uncertainty, including formulation of models, useful special structures, applicable solution approaches, insight gained from analysis of models, and selection between deterministic and stochastic models. Specific topics include stochastic linear programming, two-stage LP formulations and chance-constrained programming, finite horizon probabilistic dynamic programming, Markov chains and Markovian decision processes, and probabilistic inventory models (infinite horizon continuous review).

33859 ENGINEERING APPLICATIONS IN OPERATIONS RESEARCH

Three semester hours
Prerequisite: consent based on relevant engineering background

Depending on demand, selected applications of operations research in specific areas of engineering (electrical, mechanical, etc), to be formulated in consultation with senior members of staff of the Faculty of Engineering.

33860 CORPORATE AND FINANCIAL DECISIONS AND INVESTMENT ANALYSIS

Three semester hours
Prerequisite: 34938 Financial Modelling Techniques (or equivalent)

This subject introduces students to areas of current research in the field of finance theory. Topics to be covered include: Options - concepts and valuation models; current issues and developments. Capital structure and theory of the firm; the effects of personal and corporate tax; current issues. Dividend policy.

33861 OPERATIONS RESEARCH IN PUBLIC SECTOR SERVICES

Three semester hours
Prerequisite: 33855 Manpower Planning (Desirable: 33850 Operations Research in Health Services 1 and 33853 Energy and Environment Modelling)

Applications of operations research to selected service areas of the public sector. Development of economic and quantitative concepts applicable to investment planning for facility systems, problems of location, decisions and capacity planning over time, service level decisions (benefit versus cost), complexities in facilities decisions (benefit versus cost), complexities in facilities decisions (multiple criteria, multiple interests and uncertainty). Topics are selected from local, state and national government levels, including urban service systems, location of emergency services, water resources, transportation systems, environmental considerations.

33870 MATHEMATICAL MODELLING IN THE BIOMEDICAL SCIENCES

Three semester hours
Prerequisite: by consent

Compartment models of diabetes and tumour growth, models of interacting populations, models of protein synthesis. The identification and simulation of such models. The use of control theory ideas.

33871 IMPACT OF COMPUTERS ON TRADITIONAL MATHEMATICS

Three semester hours
Prerequisite: by consent

This course is intended to demonstrate how a number of traditional mathematics courses may be approached by making integrated use of the numerical and symbol manipulation capabilities of modern computers, e.g. traditional calculus is approached through the mechanical paradigms that give rise to the fundamental ideas. By relegating numerical and symbol manipulations to the computer, the student is encouraged to develop an intuitive feel for underlying scientific and technological problems. The need for an approach to mathematics which answers questions that are not answerable on the computer is stressed. Other topics similarly treated include classical control problems and partial differential equations.

33872 DATA ANALYSIS
Three semester hours
Prerequisite: by consent

General ideas of time-series analysis: test of randomness. Trends and moving averages. Spectral analysis. Forecasting by autoprojective methods. Exploratory data analysis: displays, plots, smoothing data and coded tables. Meta-analysis: tests of statistical significance of combined results, coding, estimation of effect sizes; meta-analysis in the biological and social sciences.

33873 MODELLING WITH DIFFERENTIAL EQUATIONS
Three semester hours
Prerequisite: by consent

A look at differential equations from a modern viewpoint which presents a balance between qualitative-geometric solutions on the one hand and numerical solutions on the other. Modelling applications are the threads holding together the various concepts; applications include biological, mechanical and economic models.

33880 OPERATIONS RESEARCH MODELS AND METHODOLOGY
Three semester hours
Prerequisites: All subjects (or their equivalents) from third year major in Operations Research in the Bachelor of Applied Science (Mathematics) degree.

Recent case studies from the literature will be critically examined from the point of view of OR methodology used rather than the OR techniques. Students will be encouraged to adopt an innovative approach to problem solving, and to develop alternative formulations of the problems and their solutions. Cases will be selected to cover the basic model archetypes (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.

34102 CALCULUS 2
Four semester hours
Prerequisite: 34101 Calculus 1

Trigonometric and hyperbolic functions. Methods of integration. Logarithmic and exponential functions. L'Hopital's rule. Improper integrals. Sequences and series. Tests for convergence. Power series. Maclaurin series.

34117 COMMERCIAL COMPUTING 1
Two semester hours

Introduction to data processing in a business environment. Emphasis is given to a structured approach to programme design and development. Practical work involves the implementation of elementary functions of business data processing in COBOL.

34127 INFORMATION SYSTEMS 1
Three semester hours

This subject focuses on the use of computer based systems in an organisational context. Typical computer-based systems; data processing and information systems, office support systems, personal computers, embedded systems. Organisational benefits of computer based systems, objectives, costs and risks. On-line, off-line, real-time systems. Batch, interactive and transaction processing. Description of data flows. Process flow charting. Introduction to simple business applications and system development life cycle. Operational issues.

34217 COMMERCIAL COMPUTING 2
Four semester hours
Prerequisites: 34117 Commercial Computing 1 34127 Information Systems 1

Applications of COBOL to programming in commercial systems. The students design, test and document an integrated, batch-oriented system.

34227 INFORMATION SYSTEMS 2
Three semester hours
Prerequisite: 34127 Information Systems 1

The organisation of records in serial and direct access files. Controls, security, recovery and audit requirements. Capacity and timing calculations. Data capture, entry and display.

34307 COMPUTING 2
Two semester hours
Prerequisites: 34101 Calculus 1 34107 Computing 1

ANSI standard FORTRAN 77. Subroutine packages. File handling, use of terminals and editing. Elementary numerical methods; selection from numerical integration, linear equations, non-linear equations, function evaluation.

34320 PARTIAL DIFFERENTIAL EQUATIONS
Three semester hours
Prerequisites: 34213 Ordinary Differential Equations

Solution of boundary value problems by separation of variables. Sturm Liouville theory. Orthogonality and completeness of eigenfunctions. Special functions. Eigenfunction expansions.

34407 COMPUTING 3
Three semester hours
Prerequisite: 34307 Computing 2

Programming techniques for organisation and manipulation of data in main storage. Emphasis on methodology, i.e. top down approach, structured programming and controlled testing. Topics include: data structures such as lists and trees, sorting and searching techniques.

34417 NUMERICAL METHODS 1
Three semester hours
Prerequisites: 34214 Algebra 2, 34307 Computing 2
Corequisite: 34213 Ordinary Differential Equations

Introduction to numerical solutions of problems in science and engineering using digital computers. Solution of linear and non-linear equations. Interpolation and functional approximation. Numerical differentiation and integration. Numerical linear algebra. Solutions of ordinary differential equations. Numerical functions. Minimisation.

34418 NUMERICAL METHODS 2
Three semester hours
Prerequisites: 34417 Numerical Methods 1, 34213 Ordinary Differential Equations

Advanced numerical methods. Boundary value problems. Approximation of functions. Solution of partial differential equations. Monte Carlo methods. Fast Fourier transforms.

34507 COMPUTING 4
Three semester hours
Prerequiste: 34407 Computing 3

Data structures; implementation of stacks, queues, linked lists, trees etc. in FORTRAN. Sparse matrices: storage and manipulation. Simulation; design and implementation of a discrete event simulator. Recursion: implementation and elimination of recursion. Graphics: 2D function plots, histograms, pie charts, 3D function plots, wire frame shapes. Programming packages: design and implementation of user-friendly interfaces. Particular applications include rational, multiprecision and interval arithmetic and a symbolic polynomial manipulation package.

34517 COMMERCIAL COMPUTING 3
Three semester hours
Prerequisites: 34217 Commercial Computing 2, 34627 Information Systems 3

Programming techniques for the implementation of on-line systems: screen data entry, menu driven programmes, system integrity. Experience in design, testing and maintenance.

34527 REAL VARIABLES
Three semester hours
Prerequisite: 34102 Calculus 2

The real number system. Countability. Limits, continuity and differentiability. The Riemann integral. Review of sequences and series. Taylor's theorem. Series of functions.

34573 HISTORY OF MATHEMATICS
Two semester hours
Prerequisite: by consent

The great mathematicians and the history of mathematics from a problem-solving point of view.

34607 COMPUTING 5
Three semester hours
Prerequisites: 34137 Computer Systems 1, 34507 Computing 4

Topics include: operating systems - structure, resource management and performance, case studies of IBM VM and Unix - user/system interface and JCL. Language structures and compilers - grammars, lexical analysis, parsing and code generation. Design and implementation of a small practical language.

34627 INFORMATION SYSTEMS 3
Three semester hours
Prerequisite: 34227 Information Systems 2

The systems development life cycle. Tools for system and process representation. Analysis of existing information systems. Proposal formulation and feasibility analysis. Logical and physical design, structural design, system implementation, project management.

34628 INFORMATION SYSTEMS 4
Three semester hours
Prerequisite: 34627 Information Systems 3

Principles of database management and organisation. CODASYL and relational models. Experience and evaluation in use of DDL and DML for a database system.

34668 COMPUTATIONAL NUMBER THEORY
Three semester hours
Prerequisite: 34307 Computing 2

Prime numbers, arithmetical functions, congruences. Factorisation and primality testing, applications to cryptography. Quadratic residues. Continued fractions.

34681 SPECIAL APPLICATIONS IN OPERATIONS RESEARCH
Three semester hours
Prerequisite: by consent

34682 SPECIAL APPLICATIONS IN COMPUTING
Three semester hours
Prerequisite: by consent

34683 SPECIAL APPLICATIONS IN STATISTICS
Three semester hours
Prerequisite: by consent

34684 SPECIAL APPLICATIONS IN PHYSICAL APPLIED MATHEMATICS
Three semester hours
Prerequisite: by consent

34685 SPECIAL APPLICATIONS IN MODERN APPLIED MATHEMATICS
Three semester hours
Prerequisite: by consent

34691-34697 PROJECT
One to seven semester hours
Prerequisite: by consent

An investigation of a topic selected by the student with the approval of the Director of Undergraduate Studies or his or her designated representative. A formal report must be submitted and a seminar presented. Although this is a final year subject, consideration should be given to the selection of a topic in the preceding year.

34698 SEMINAR
Two semester hours
Prerequisite: by consent

Group studies of selected topics which may vary from year to year. Topics may include hybrid computation, theory of oscillations, non-linear differential equations or aspects of computer science and operations research.

34700 DISCRETE MATHEMATICS
Three semester hours

Graphs, paths, trees. Set operations. Indexing and recurrence relations. Propositional and predicate calculus. Semi-groups, lattices and Boolean algebras. Permutations, combinations, partitions, counting and allocation problems.

34701 ALGEBRA 1
Three semester hours

Complex numbers: polar form; de Moivre's theorem; exponential form; regions in the complex plane. Polynomials: remainder and factor theorems; synthetic division; Descartes' 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 decompostion. 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.

34710 CALCULUS
Six semester hours

Graphical introduction to limits, continuity and differentiation. Graphical introduction to the Mean Value Theorem. Applications of differentiation. Riemann integration and the Fundamental Theorem of Calculus. Applications of integration to areas, volumes, length of curves and surface areas. Logarithmic and exponential functions. Trigonometric and inverse trigonometric functions. Hyperbolic and inverse hyperbolic functions. Methods of integration. Improper integrals.

34711 ANALYSIS 1
Three semester hours
Prerequisite: 34710 Calculus
Topics to be covered include: convergence of sequences, limit theorems. Points 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'Hopital 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
Three semester hours
Corequisite: 34751 Statistics 1

Formulation of OR problems, construction of models, linear programming, network models, dynamic optimisation, stochastic processes, Bayesian decision analysis, inventory control, waiting line models, simulation, multiple objective decision making, heuristic problem solving.

34751 STATISTICS 1
Three semester hours
Corequisite: 34711 Analysis 1

Descriptive statistics. Probability. Random variables; expectation; standard distributions. Inference on means and variances. Distribution-free tests. Goodness-of-fit tests. Linear regression.

34770 COMPUTING 1A
Three semester hours
Corequisite: 34700 Discrete Mathematics

An introduction to a disciplined approach to problem-solving methods and algorithm development using a modern imperative programming language (Modula-2). The course will cover the essential syntactical features and rules of the language, including sequencing, selection, iteration and decomposition. In addition, modern design techniques involving procedural and data abstraction, and programming from specifications, will be introduced via a range of case studies and programming exercises. An initial repetoire of essential algorithms will be accumulated over the semester. The practical course will involve supervised laboratory classes in which students will learn practical techniques for programme specification and design, coding, debugging, testing and documentation using good programming style.

34771 COMPUTING 1B
Three semester hours
Prerequisites: 34700 Discrete Mathematics, 34770 Computing 1A
Corequisite: 34781 Mathematical Foundations of Computing 1

This subject continues the development of programming skills initiated in the subject 34770 Computing 1A. Topics include: further investigation of the Modula-2 language: sets, multi-dimensional arrays, variant records, pointers, internal modules; formal specification and verification methods; recursive programming; iterative and recursive implementation of simple structured types. Functional programming: basic data types, functions, lists, iteration and recursion; inductive proof methods.

34781 MATHEMATICAL FOUNDATIONS OF COMPUTING 1
Three semester hours
Prerequisites: 34700 Discrete Mathematics, 34770 Computing 1A

The aim of this subject is to introduce the logical and mathematical principles of automatic computation. Topics include: historical overview of computing machinery; introduction to deterministic finite automata; design of combinatorial circuits and clocked 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
Three semester hours
Prerequisites: 34710 Calculus, 34770 Computing 1A
Corequisite: 34711 Analysis 1

Simple programme design techniques. Coverage of the elements of ANSI standard FORTRAN including control structures, subroutines and functions, arrays, formatted I/O, file handling, and string manipulation. An introduction to numerical computing includes treatment of errors, simple algorithms for solving non-linear equations in one variable (bisection and Newton's methods), linear equations in several

variables (Gaussian elimination, iteration), and algorithms for performing numerical integration (trapezoidal and Simpson's rules, extrapolation). Non-numerical applications include sorting, searching, and text processing.

34802 ALGEBRA 2
Three semester hours
Prerequisite: 34701 Algebra 1

Vector spaces: Euclidean and general vector spaces; subspaces; linear independence; basis and dimension; row and column space; inner product spaces; the Gram-Schmidt process; change of basis. Linear transformations. Eigenvalues and eigenvectors: diagonalisation; similarity; symmetric matrices; applications to quadratic forms, conic sections, powers of a matrix and difference equations. Complex vector spaces: complex inner product spaces; unitary, normal and Hermitian matrices.

34803 ALGEBRA 3
Three semester hours
Prerequisite: 34802 Algebra 2

Sets, relations, functions, order relations, po-sets and lattices. Semi-groups, monoids. Groups. Abelian and non-abelian groups. Elementary category theory. Theorems of Lagrange, Cayley, Sylow. Direct products. Fundamental theorem of abelian groups. Normal sub-groups, co-sets, quotient groups. Groups of finite order. Elementary morphism theory. Rings, ideals, quotient rings, integral domains and fields. Elementary field theory. Introduction to coding theory.

34812 ANALYSIS 2
Three semester hours
Prerequisite: 34711 Analysis 1
Corequisite: 34821 Partial Differential Equations

The aim of this subject is to present the analytic theory required to handle boundary value problems by Fourier series methods. Topics include: 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
Three semester hours
Prerequisite: 34710 Calculus
Corequisite: 34802 Algebra 2

First order equations. Theory of linear equations. Auxiliary equations and undetermined coefficients. Variation of parameters. Laplace transforms, step functions, convolution. Eigenvalues and matrix exponentials. Qualitative properties of solutions. Phase plane. Stability. Linear and nonlinear systems. Predator-prey problems.

34817 VECTOR CALCULUS
Three semester hours
Prerequisite:34711 Analysis 1

Partial derivatives. Multiple integrals. Vector fields. Line and surface integrals. Green's, Gauss' and Stokes' theorems.

34818 COMPLEX VARIABLES
Three semester hours
Prerequisites: 34711 Analysis 1, 34817 Vector Calculus

Analytic functions of a complex variable. Cauchy's integral theorem. Laurent series. Singularities of analytic functions. The residue theorem. Contour integration. Conformal mapping.

34821 PARTIAL DIFFERENTIAL EQUATIONS 1
Three semester hours
Prerequisite: 34815 Ordinary Differential Equations
Corequisite: 34817 Vector Calculus

Solution of boundary value problems by separation of variables. Sturm-Liouville theory. Fourier series. Two dimensional problems. Infinite domain problems. Fourier integrals and Fourier transforms. Green's function methods. Laplace transform methods for elementary boundary value problems.

34852 STATISTICS 2
Three semester hours
Prerequisite: 34751 Statistics 1

Random variables. Moments. Moment generating functions. Bivariate distribution. Transformations of random variables. Order statistics. Sampling distributions. Central Limit Theorem. Applications to estimation. Multivariate Normal distribution.

34872 COMPUTING 2
Three semester hours
Prerequisites: 34700 Discrete Mathematics, 34771 Computing 1B

The aim of this subject is to further develop a disciplined approach to the specification, design, implementation and testing of software using imperative and functional languages. Topics include: 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 Modula-2; introduction to order notation and efficiency considerations; algorithm analysis (examples include searching and sorting algorithms). Functional programming: functional implementation of ADTs; recursion and induction on lists.

34873 COMPUTING 3
Three semester hours
Prerequisites: 34700 Discrete Mathematics, 34711 Analysis 1, 34872 Computing 2
Corequisite: 34802 Algebra 3

The course will consolidate and extend the work on specification of abstract data types, together with advanced implementation issues. Systematic techniques of algorithm design and analysis, together with associated mathematical methods, will deal with issues of complexity, efficiency and programme verification. A wide range of advanced applications will be examined via case studies, both in formal lectures and practical assignments. In addition to existing imperative and functional languages, an object-oriented language will be introduced and employed extensively in practical assignments and in the implementation of flexible and reliable software.

34891 NUMERICAL METHODS A
Three semester hours
Prerequisites: 34711 Analysis 1, 34790 Numerical Computing, 34802 Algebra 2

Solution of nonlinear equations, including some revision from 34790 Numerical Computing. Analysis of convergence. Error analysis. Lagrange interpolation, cubic splines, Bezier curves. Numerical differentiation and integration: Newton-Cotes adaptive methods, Gaussian quadrature, methods involving Richardsonian extrapolation. Approximation theory: least squares and orthogonal polynomials, economisation of power series using Chebychev polynomials, rational approximations. Vector and matrix norms. Numerical linear algebra: LU factorisation, iterative methods - Jacobi method. Householder reduction, QR algorithm. Initial value problems for ordinary differential equations: introductory material including Taylor series methods, open Runge-Kutta methods and multistep methods. This course is heavily oriented towards practical applications.

34904 ALGEBRA 4
Three semester hours
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.

34913 MODERN ANALYSIS
Three semester hours
Prerequisites: 34802 Algebra 2, 34812 Analysis 2

Metric space axioms. Open and closed sets. Interior and closure. Sequences in a metric space. Sequential compactness. Contraction mapping theorem. Application to existence theorems for differential equations. Continuous mappings between metric spaces. Normed linear spaces. Banach spaces. Bounded linear maps. Operators and functionals. Dual spaces.

34914 MEASURE THEORY
Three semester hours
Prerequisite: 34913 Modern Analysis

Measures and outer measures. Measure spaces. Lebesgue measure on the real line. Measurable functions. Step functions. Definition of the abstract Lebesgue integral. Monotone convergence theorem. Dominated convergence theorem. Probability spaces. Independence. Borel-Cantelli lemmas. Laws of large numbers.

34916 MATHEMATICAL METHODS
Three semester hours
Prerequisites: 34922 Partial Differential Equations 2, 34924 Mechanics

Theory of distributions. The Fourier transform and applications to partial differential equations. Introduction to the calculus of variations. Euler-Lagrange equations. The brachistochrone problem. Eigenvalue problems. Lagrangian and Hamiltonian mechanics. Lagrange's equations of motion. Hamilton's principle. The principle of least action.

34920 INTEGRAL EQUATIONS
Three semester hours
Prerequisite: 34913 Modern Analysis or 34013 Modern Analysis (Honours)

Existence theory for Fredholm and Volterra integral equations using contraction mappings. Compact integral operators. Green's functions.

34922 PARTIAL DIFFERENTIAL EQUATIONS 2
Three semester hours
Prerequisites: 34818 Complex Variables, 34821 Partial Differential Equations 1

Bessel's equation and Bessel functions. Boundary value problems in partial differential equations involving Bessel's equation. Legendre's equation and Legendre's associated equation. Legendre functions and associated Legendre functions. A thorough treatment of Laplace transforms. Inverse Laplace transforms using complex variable methods.

34924 MECHANICS
Three semester hours
Prerequisites: 34815 Ordinary Differential Equations, 34817 Vector Calculus

Kinematics and dynamics of a particle. Projectile motion. Oscillations. Conservative forces and central forces. Theory of planetary motion.

34925 WAVE THEORY
Three semester hours
Prerequisite: 34922 Partial Differential Equations 2

Acoustic waves in fluids. Waves on a liquid surface. Elastic waves in solids. Electromagnetic waves.

34927 DETERMINISTIC OPTIMAL CONTROL
Three semester hours
Prerequisites: 34815 Ordinary Differential Equations, 34817 Vector Calculus, 34913 Modern Analysis

Introduction to optimal control problems for ordinary differential equations. Linear problems and bang-bang controls. Nonlinear problems and Pontryagin's maximum principle. Necessary condtions. Sufficient conditions. Various endpoint conditions. Calculus of variations. Dynamic programming. Infinite horizon problems. Applications to optimal economic growth and to optimal investment and consumption decisions.

34930 SIMULATION TECHNIQUES
Three semester hours
Prerequisite: 34751 Statistics 1
Corequisite: 34790 Numerical Computing

Introduction to techniques of simulation as used in operations research. Special consideration is given to input data analysis, verification, validation and the employment of computer languages for discrete event simulation (GASP, SEESIM, SIMSCRIPT II.5).

34931 LINEAR PROGRAMMING
Three semester hours
Prerequisite: 34790 Introduction to OR Models
Corequisite: 34802 Algebra 2

Formulation of linear programming problems. The simplex method and its variants. Duality theory, degeneracy and post optimal analysis. Applications to industrial systems, including transportation problems, production scheduling, management games and optimisation problems.

34932 OPTIMISATION TECHNIQUES
Three semester hours
Prerequisites: 34711 Analysis 1, 34931 Linear Programming

A unified treatment of the solution of models derived from real-life situations. Derivation and application of Kuhn-Tucker theorem. Special treatment will include selected algorithms of nonlinear programming.

34934 NETWORK OPTIMISATION
Three semester hours
Prerequisite: 34740 Introduction to OR Models
Corequisite: 34931 Linear Programming

Applications of optimal network flows, shortest path, the max-flow min-cut theorem, Ford and Fulkerson's labelling method, relations to linear programming, the out-of-kilter algorithm, project management including Critical Path Method, PERT and consideration of project cost curves, applications of graph and network models to manpower planning, distribution systems, sequencing, communications.

34935 INVENTORY CONTROL
Three semester hours
Corequisite: 34930 Simulation Techniques

Characterisation and development of optimal inventory policies for single-term and multi-inventory models. The determination problem.

Determination of economic lot sizes. Survey of optimal policies, fixed multi-inventory models. The determination problem. Determination of economic-lot sizes. Survey of optimal policies, fixed ordering and probabilistic review policies. Forecasting techniques including general exponential smoothing. Development and use of computer packages relevant to industrial and commercial situations.

34936 DECISION THEORY
Three semester hours
Prerequisite: 34740 Introduction to OR Models

Consideration of the general problem of decision making under risk and uncertainty. Bayesian decision analysis. Continuous prior distributions. Sampling. Utility. Game theory. Risk analysis. Multi-attribute utility.

34938 FINANCIAL MODELLING TECHNIQUES
Three semester hours
Prerequisites: 34711 Analysis 1, 34751 Statistics 1

Introduction of some stylised models of the standard problems of financial management and the mathematical techniques for their solution. Models covered include asset and liability management, planning day-to-day operations and the firm's financing and investment decisions. Topics include the concept of net-present value, the present value of income streams; the 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.

34953 STATISTICS 3
Three semester hours
Prerequisite: 34852 Statistics 2

Estimation: point estimation; maximum likelihood; method of moments; sufficiency; completeness; exponential class of distributions. Hypothesis testing: decision problems; Neyman-Pearson lemma; best tests; uniformly most powerful tests; sequential probability ratio test; mimax and Bayesian tests. Distribution Free Methods: estimation and hypothesis testing; further theory of inference.

34955 REGRESSION ANALYSIS
Three semester hours
Prerequisite: 34852 Statistics 2

Simple linear regression. Multiple regression. Polynomial regression. Diagnostics and model bulding. Introduction to generalised linear models. Use of computer packages such as SAS, SPSS, MINTAB and GLIM, and the use of APL.

34956 DESIGN OF EXPERIMENTS
Three semester hours
Prerequisite: 34955 Regression Analysis

Design and analysis of experiments. Completely randomised, randomised blocks and latin square designs. Factorial experiments. Hierarchical experiments. Introduction to confounding, split plots, fractional replication, incomplete blocks, analysis of covariance. Use of computer packages MINITAB, SPSS, SAS and GLIM.

34957 INDUSTRIAL STATISTICS
Three semester hours
Prerequisite: 34852 Statistics 2

Sampling inspection; acceptance sampling; inspection by variables. Control charts; cumulative sum charts. Order statistics. Sequential tests. Reliability models.

34960 THEORY OF PROBABILITY
Three semester hours
Corequisite: 34852 Statistics 2

Probability axioms. Combinatorial analysis. Conditional probability and independence. Random variables. Expectations. Limit theorems.

34961 STOCHASTIC PROCESSES
Three semester hours
Prerequisite: 34852 Statistics 2

Random walks. Markov chains: classification of states; limit results for irreducible recurrent chains; absorption probabilities. Discrete state Markov processes: Poisson process; pure birth process; birth-death processes; application to queueing problems. Stationary processes; moving average and autoregressive models. Introduction to Wiener process and renewal processes.

34975 COMPUTER GRAPHICS
Three semester hours
Prerequisites: 34802 Algebra 2, 34891 Numerical Methods A, 34790 Numerical Computing

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
Three semester hours
Prerequisites: 34751 Statistics , 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, the latter in parentheses: 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: travelling salesman problem, NETtalk (a network that learns to talk).

34977 FORMAL SPECIFICATION
Three semester hours
Prerequisite: 34982 Mathematical Foundations of Computing 2

An introduction to the mathematical basis of formal specification theory, including 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, including algebraic specification, the Vienna Development Method and Z.

34982 MATHEMATICAL FOUNDATIONS OF COMPUTING 2
Three semester hours
Prerequisites: 34803 Algebra 3, 34873 Computing 3

This subject, offered in the final year of the computing major, consists of an introductory but systematic survey of the logical algebraic and categorical foundations of formal programme semantics, together with associated verification methods. Operational and denotational semantics, and the axiomatic methods of Floyd, Hoare and Dijkstra will be introduced. The theoretical basis of algebraic semantics will be fully established and its implications considered. The lambda and combinatorial calculi will be developed within the context of the semantics of functional programming languages.

34983 MATHEMATICAL FOUNDATIONS OF COMPUTING 3
Three semester hours
Prerequisite: 34982 Mathematical Foundations of Computing 2
Corequisite: 34984 Language Theory

An important aim of this mainly theoretical subject is to develop an appreciation of current directions in research on the nature of computation, and acquaint students with sources of information in this field. The course will consider additional topics in the denotational semantics of applicative and imperative programming languages, in greater depth than its prerequisite subject. Further topics in algebraic semantics will include initial and final algebra approaches to specification of data types, as well as the initial algebraic specification of languages. Selected topics in the theory of computation will include computability, Turing machines, the Church-Turing thesis, decidability, complexity issues, completeness and tractability.

34984 LANGUAGE THEORY
Three semester hours
Prerequisites: 34873 Computing 3, 34982 Mathematical Foundations of Computing 2

The aim of this subject is to provide students with skills sufficient for the design and implementation of simple problem-oriented languages and environments. Topics include: Chomsky's categorisation of grammars; regular and context-free grammars and languages; finite state recognisers; parsing strategies; recursive and descent and table-driven parsers; operational semantics and programme 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
Three Semester hours
Prerequisites: 34802 Algebra 2, 34890 Numerical Computing

Preliminaries: Human vision, digital image models, image goemetry and transformations, display devices. Image transforms: the Fourier transform, convolution, cross correlation and autocorrelation, basic transform theorems. The discrete Fourier transform and its properties: fast Fourier transform implementation, aliasing, leakage. The 2-dimensional transform and its associated implementation. Image enhancement and restoration: histogram modification techniques, low, high and band-pass filters, image sharpening and smoothing, psuedo-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.

34987 CRYPTOLOGY
Three semester hours
Prerequisite: 34790 Numerical Computing

The subject gives students an elementary understanding of cryptology, including an emphasis on factorisation and primality testing, relevant to public key cryptosystems. Topics covered include: Divisability 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
Three semester hours
Prerequisites: 34790 Numerical Computing, 34821 Partial Differential Equations 1

Solution of ordinary differential equations, including some revision from earlier work. Initial value problems: Single step and multi-step methods. VSVO, extrapolation and implicit methods. Stiff differential equations and methods appropriate thereto. Stability theory. Boundary value problems: shooting, finite difference and finite element methods. Differential eigenvalue problems. Solution of partial differential equations: finite difference and finite element methods. Optimisation: methods for unconstrained nonlinear optimisation, steepest descent, damped Newton-Raphson and matrix updating techniques. Overdetermined systems.

34995 ADVANCED NUMERICAL ANALYSIS
Three semester hours
Prerequisite: 34913 Modern Analysis or 34013 Modern Analysis (Honours)

Differentiation in normed linear spaces. Mean Value Theorem and Taylor's Theorem. Product spaces and partial differentials. Non-linear equations and the Newton-Kantorovich method.

34996 CONVEXITY AND OPTIMISATION
Three semester hours
Prerequisite: 34913 Modern Analysis

Convex sets in a linear space. Affine sets and hyperplanes. Algebraic interior and closure. Separation theorems. Geometric Hahn-Banach theorem. Convex functions. Epigraphs. Subdifferentiability and differentiability. Duality. Polars. Support functions. Linear and convex programming. Kuhn-Tucker conditions.

34013 MODERN ANALYSIS (HONOURS)
Three semester hours
Prerequisites: 34812 Analysis 2, 34802 Algebra 2

As for 34913 Modern Analysis. Additional Content: Topological spaces. Continuous functions. Compactness. Separation properties.

34014 MEASURE THEORY (HONOURS)
Three semester hours
Prerequisite: 34013 Modern Analysis (Honours)

As for 34924 Measure Theory. Additional content: The pi-lambda theorem. Fubini's theorem. Hanh decompostion. Radon-Nikodym theorem and conditional probability.

34019 FUNCTIONAL ANALYSIS
Three semester hours
Prerequisite: 34014 Measure Theory (Honours)

Banach spaces. Bounded linear transformations. Spectrum. Dual space. Adjoint operator. Hahn-Banach theorem. Compact operators. Riesz theory. Fredholm integral equations. Fredholm alternative.

Application to potential theory. Hilbert spaces. Operators and adjoints. Riesz representation theorem. Orthogonality. Orthonormal bases. Abstract Fourier theory. Self-adjoint operators. Projections. Compact operators. Spectral theory for compact operators. Application to Sturm-Liouville theory. Fourier series.

34023 PARTIAL DIFFERENTIAL EQUATIONS 3
Three semester hours
Prerequisite: 34922 Partial Differential Equations 2

First order equations. Classification of second order linear equations. Wave equation. D'Alembert's formula. Poisson's formula. Huygen's principle. Heat Equation. Maximum principles. Regularity of solutions. Nonlinear problems. Laplace's equation. Properties of harmonic functions. Green's function. Method of images. Integral equations. Fredholm theory. Application to Dirichlet and Neumann problems. Introductions to scattering theory. Scattering of plane waves by cylinders.

34026 FRACTAL GEOMETRY
Three semester hours
Prerequisite: 34914 Measure Theory or 34014 Measure Theory (Honours)

Review of relevant aspects of metric space theory, compactness, and contraction mappings. The space of fractals. Collage Theorem. Chaotic dynamics on fractals. Fractal dimension; theoretical and experimental determination. Fractal interpolation. Julia sets; attractors of iterated function systems, applications to Newton's method. Parameter spaces and Mandelbrot sets. Measures on fractals. Application to computer graphics.

34028 STOCHASTIC OPTIMAL CONTROL
Three semester hours
Prerequisites: 34927 Deterministic Optimal Control, 34062 Stochastic Processes 2

Formulation of stochastic control problems. Examples of controls. The Hamilton-Jacobi-Bellman equation. Necessary and sufficient conditions. Reduction to Markov controls. Dynamic portfolio strategies. The optimal portfolio selection problem. Discussion of solutions in various particular cases.

34029 NONLINEAR DYNAMICAL SYSTEMS
Three semester hours
Prerequisites: 34815 Ordinary Differential Equations, 34013 Modern Analysis

Review of linear systems. Nonlinear ystems. Phase plane analysis. Linearisation. Local stability and instability. Global asymptotic stability. Stable and unstable manifolds. Limit cycles and strange attractors. Introduction to chaos theory. Asymptotic methods. The methods of Poincare and Lindstedt. The method of averaging. Applications to finance.

34033 DYNAMIC OPTIMISATION
Three semester hours
Prerequisites: 34890 Numerical Computing, 34931 Linear Programming, 34961 Stochastic Processes

Bellman's principle of optimality. Recursive relations. Resource allocation. Production scheduling. Equipment replacement. Multi-stage processing. Two or more state variables. Continuous state variables. Application to linear and non-linear programming. Computational feasibility. Stochastic dynamic optimisation. Optimisation over an unbounded horizon. Markovian decision processes. Approximation in policy space with discounting.

34062 STOCHASTIC PROCESSES 2
Three semester hours
Prerequisites: 34960 Theory of Probability, 34961 Stochastic Processes 1, 34014 Measure Theory (Honours)

Formal definitions of probability space and stochastic processes. Martingales. Riemann-Stieltjes integration. Brownian motion and related processes. Stochastic calculus and stochastic differential equations. Financial applications.

34065 TIME SERIES ANALYSIS
Three semester hours
Prerequisites: 34960 Theory of Probability, 34961 Stochastic Processes

Systematic treatment of stochastic difference equations. Model selection and dynamic specification. Heteroscedastic disturbances. Maximum likelihood estimation. Simultaneous equation models.

34066 NONLINEAR STATISTICAL MODELS
Three semester hours
Prerequisites: 34955 Regression Analysis, 34065 Time Series Analysis

Nonlinear regression; least squares estimation; hypothesis testing. Use of SAS. Multivariate nonlinear regression. Nonlinear simultaneous equation models; method of moment estimators.

34067 MULTIVARIATE STATISTICS
Three semester hours
Prerequisite: 34955 Regression Analysis

Multivariate normal distribution: definition; moments; characteristic function; estimation of mean and covariance matrices; Wishart distribution; Hotellings' T2. Multivariate linear regression. Principal components. Factor analysis: different models - Spearman, Burt, Thurstone; geometric models; unit rank; invariance.

34068 STATISTICAL MODELLING
Three semester hours
Prerequisites: 34956 Design of Experiments

Revision of linear models and exponential families. Generalised linear models. Applications including logistic regression and contingency tables. Modelling using statistical distributions; continuous distribution models; discrete distribution models.

34069 LINEAR MODELS AND EXPERIMENTAL DESIGN
Three semester hours
Prerequisite 34955 Regression Analysis, 34956 Design of Experiments, 34067 Multivariate Statistics

The subject provides the linear model theory for experimental design models and presents advanced experimental designs. Topics include: Linear Models - the linear model of less than full rank. The analysis of variance. Completely randomised and randomised block designs. Response surfaces. Incomplete block designs. Repeated measures designs.

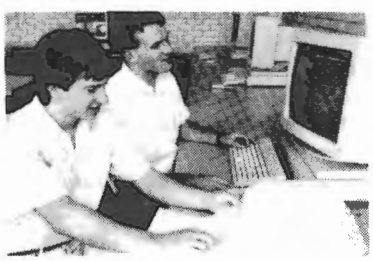
34096 CONVEXITY AND OPTIMISATION (HONOURS)
Three semester hours
Prerequisite: 34013 Modern Analysis (Honours)

As for 34996 Convexity and Optimisation. Additional content includes: application of Kuhn-Tucker theorem to calculus of variations. Introduction to applications in optimal control theory.

34098 PROJECT (HONOURS)
34099 PROJECT (HONOURS)
34098 (Autumn) Three semester hours
34099 (Spring) Six semester hours
Prerequisite: Admission to the BAppSc(Hons) programme

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. The project commences in the Autumn Semester of the honours year and students will enrol in the three hour unit 34098. The project continues in the Spring Semester with the six hour unit 34099. At the end of the Spring Semester identical results will be awarded for both 34098 and 34099 (based on assessment consisting of the presentation of a report and seminar).

SCHOOL OF COMPUTING SCIENCES



The School of Computing Sciences is one of 7 Key Centres for Teaching and Research established by the Federal Government in 1985. It was the first federally funded Centre for Advanced Computing Sciences in Australia.

The School of Computing Sciences offers a degree course in Computing Science leading to the award of Bachelor of Applied Science. In 1988, at the request of government and industry, a new degree course was introduced, leading to the award of Bachelor of Information Technology. In addition, the School offers a graduate course leading to the award of a Graduate Diploma in Data Processing.

The School also offers a three year, part-time course leading to a Master of Applied Science (Information Science) by course work. In addition, the School offers two degrees by research and thesis: the Master of Applied Science (by Thesis) and the Doctor of Philosophy.

The School provides subjects in Computer Science for other Faculties.

Prospective applicants for graduate courses should firstly ascertain from the Graduate Studies Officer whether they conform with the general University requirements for admission before consulting with the School about special requirements.

The School has appointed a number of academic advisors: two for undergraduate full-time students; one for undergraduate part-time students; one for Graduate Diploma students; one for Masters students; and one to advise prospective students.

The functions of the academic advisors are: (i) to advise students regarding course progress and academic progression; (ii) to approve changes to enrolment details; (iii) to advise, when necessary, on personal matters; (iv) to arrange specialist tutorial assistance or counselling.

DOUBLE DEGREE IN BUSINESS AND COMPUTING SCIENCES

From 1989 a double degree in Business and Computing Science will be offered. Students enrol initially in the normal Bachelor of Business degree and take the Computing Science sub-major. On satisfactory completion of the Business Degree and the Computing Science sub-major, a student should then apply to be admitted to the Bachelor of Applied Science (Computing Science). On admittance, the student would be granted advanced standing in view of (a) the student's Computing Science sub-major and (b) part of the student's Business major which would be used in lieu of the requirement for external electives in the B.App.Sc.(Comp.Sc.). Students could expect to complete the double degree in approximately 6 years full-time or equivalent part-time.

DOCTOR OF PHILOSOPHY (BY THESIS)

In general terms, the Ph.D. degree entails a more extensive investigation than the M.App.Sc.(by thesis) degree. In addition, the Ph.D. students are expected to demonstrate significant originality in the conduct of their research work. Areas of particular interest for research towards the Doctor of Philosophy (by thesis) degree 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, Inference
- Local Networks and Network Interface Technology
- Neural Networks
- Parallel Processing and Transputers
- Information Modelling
- Auditing Large Data Bases
- Microprocessors and their Applications
- Distributed Data Bases
- Computer Systems Security
- Object Oriented Techniques.

The Doctor of Philosophy degree is available on both a full-time and a part-time basis. The normal duration of enrolment for this degree is three years on either attendance pattern; however, candidates who already possess a degree at the Masters level may be permitted to complete in two years. The maximum duration of enrolment is five years for full-time students and six years for part-time students.

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 post-graduate 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, Centre for Graduate and External Studies, School of Computing Sciences. This summary proposal should contain 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, which is available from the UTS Information Service, and
* a description of the proposed research of at least 1,000 words which should be signed by both the applicant and the proposed supervisor.

Criteria for admission to the Doctor of Philosophy (by Thesis) support the University's Equal Opportunity policy: "It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of race, sex, marital status, physical disability or homosexuality".

Application forms may be obtained from the UTS Information Service. General enquiries should be directed to either the UTS Information Service, phone 20930 ext. 9071/9072, or the Faculty Graduate Assistant, phone 20930 ext. 9609. Note that all prospective applicants should contact the Faculty Graduate Assistant BEFORE submitting an application to this course.

MASTER OF APPLIED SCIENCE (BY THESIS)

The M.App.Sc.(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. Areas of particular interest for research 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, Inference
- Local Networks and Network Interface Technology
- Neural Networks
- Parallel Processing and Transputers
- Information Modelling
- Auditing Large Data Bases
- Microprocessors and their Applications
- Distributed Database
- Computer Systems Security
- Object Oriented Techniques.

This degree is available on a full-time, part-time and external basis. The normal duration of enrolment for this degree is two years on full-time attendance or three years on part-time attendance. 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. External 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.

There are no tuition fees for this course, and students are not required to pay the HECS (i.e. Higher Education Contribution Scheme). However students are required to pay Students' Association and Student Union fees which are noted herein under "Course Description: Fees" for the Master of Applied Science (by course work) in Information Science.

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, Centre for Graduate and External Studies, School of Computing Sciences. This summary proposal should contain 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, which is available from the UTS Information Service, and
* a description of the proposed research of at least 1,000 words which should be signed by both the applicant and the proposed supervisor.

Criteria for admission to the Master of Applied Science (by Thesis) support the University's Equal Opportunity policy: "It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of race, sex, marital status, physical disability or homosexuality".

Application forms may be obtained from the UTS Information Service. General enquiries should be directed to either the UTS Information Service, phone 20930 ext. 9071/9072, or the Faculty Graduate Assistant, phone 20930 ext. 9609. Note that all prospective applicants should obtain approval for their proposed research work either from the Director, Centre for Graduate and External Studies or from their chosen supervisor BEFORE submitting an application form for admission to this course.

MASTER OF APPLIED SCIENCE (BY COURSE WORK) IN INFORMATION SCIENCE

The M.App.Sc.(by course work) in Information Science enables graduates to select a programme of study which suits individual career goals. For example, a programme 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.

The course is intended for Computing Professionals. Applicants should have both:-

1) a bachelor's degree from the University of Technology, Sydney, or equivalent, preferably with a major computing component. Those 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's degree in Computing Science.

and

2) 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.

The course is offered on a part-time basis only, over 6 semesters (3 years), as it is considered important that students remain in professional employment whilst undertaking their graduate studies in Information Science. Attendance is required for at least two evenings per week for lectures, and at the periodical seminar evenings.

Each semester the School publishes the M.App.Sc.(by course work) in Information Science Handbook. This Handbook 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 Handbook and to study it carefully. An "admission package" containing a copy of the Handbook, the application forms and other relevant information is available from July onwards each year. Prospective applicants may obtain one of these packages by contacting either the Faculty Graduate Assistant (phone 218-9609) or the University's Graduate Studies Office.

Note that completed application forms must be submitted to the University by October 31 in the year prior to that in which admission is sought.

The minimum total duration of the course is 54 semester hours, consisting of the following:

(a) Formal lectures and laboratory requirements will total a minimum of 40 semester hours;
(b) There is a specific requirement for seminar attendance for one hour per week throughout the time the candidate is enrolled. Thus, depending on the duration of the course, this will add a minimum of six semester hours to the total contact time in the course.
(c) The remainder of the course will be comprised of the equivalent of eight semester hours of Project work.

The course work is structured into four "strands". These four strands comprise the fundamental areas of Computer Systems, Information Systems and Computing Methods, as well as a Management strand. Students select a total of ten subjects. This selection will contain at least one subject from each of the four strands, and at least one entire strand.

Students enrol in the Seminar subject each semester, and are required to attend at least 70% of the research seminars presented in any semester to be eligible to take examinations at the end of that semester.

The Project is undertaken during the final year of enrolment.

Any Master's Degree candidate enrolled in the M.App.Sc. (by course work) in Information Science who records two failures at any stage will be excluded from the course absolutely.

General Course Description

Students select a programme from the following subjects:

Computing Methods
32100 Advanced Programming Techniques
32101 Intelligent Systems
32104 Decision Making and Modelling
32105 Specialist Topics in Artificial Intelligence

Information Systems
32200 Information Processing Strategy
32201 Data Base
32202 Communication Systems
32203 Information Management

Computer Systems
32301 Performance Evaluation
32302 Computer Architecture
32304 Computer Languages
32305 Operating Systems

Management
21718 Organisation Analysis and Design
22729 The Legal Environment of Business
32400 Accounting for Management
32401 Management Policy and Strategy

GRADUATE DIPLOMA IN DATA PROCESSING

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 Applied Science (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 Graduate Diploma in Data Processing are granted exemption 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 no previous contact with computing and data processing; some will have had some familiarisation with computing; and others will be familiar with computing concepts in areas such as programming, and will be seeking to consolidate their present knowledge by attaining a formal qualification.

Admission Requirements

The prerequisite for entry to the Graduate Diploma course is a working knowledge of the programming languages PASCAL and COBOL. For intending applicants who do not have the required knowledge of PASCAL and COBOL, extension courses are offered by INSEARCH each semester. There is a cost attached to these which may be ascertained by contacting INSEARCH on 218-9119.

The courses in PASCAL and COBOL are each of 45 hours duration, and have been assessed by the School of Computing Sciences as meeting the standards required to satisfy the language component of the admission criteria. However, the number of applicants for the Graduate Diploma is always in excess of the number of places; therefore completion of these courses does **not guarantee** a place in the Graduate Diploma in Data Processing. Applicants may present for consideration evidence of successful completion of any PASCAL and/or COBOL course, or of substantial work experience using these languages. The committee will assess this evidence and ascertain whether it satisfies the prerequisites for the course. Any PASCAL or COBOL course undertaken should not, as a general rule, be shorter than that offered by INSEARCH.

In addition, applicants should have a first degree, equivalent to an undergraduate 3 year degree from the University of Technology, Sydney. If in any doubt about the ranking of your qualification, you should contact the Graduate Studies Office or the Admissions Branch at the University, or write to the National Office of Overseas Skills Recognition, PO Box 25, Belconnen, ACT, 2616.

For further information, candidates should telephone Bruce Irvine on 218-9609, or the School Office on 218-9425, where a "call back" message may be left, or write to:

The Academic Advisor
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 other documentation the applicant wishes to provide in support of their application.

Course Fees

Australian citizens and permanent residents will contribute to the cost of the course through HECS (i.e. the Higher Education Contribution Scheme). The HECS charge for a part-time student taking three subjects per semester will be approximately $1,000 per annum for 1991.

It is the responsibility of each student to ensure that he/she is correctly enrolled for each subject attempted.

A student will not be credited for any work done in a subject for which he/she is not formally enrolled. No refund of HECS will be given for subjects deleted after March 28 in Autumn semester and August 30 in Spring semester.

In addition to course charges students are required to pay Student's Association fees and University Union fees. In 1991 these should be around $190 per annum.

Mode and length of study

The course is normally taken on a part-time attendance pattern over two years (two evenings and one afternoon per week). However, some students may take longer to complete the course. This is possible, subject to approval, but it must be noted that the attendance pattern in this latter case will require students to attend the University for at least six hours a week, depending upon the times at which subjects are scheduled for a particular semester. In exceptional circumstances, the course may be undertaken on a full-time attendance pattern over one year.

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 twenty four semester hours of the prescribed thirty six hours 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 12 (twelve) semester hours 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.

Unsatisfactory Student Progress

All students in the Graduate Diploma in Data Processing course should be aware that unsatisfactory performance in the course will result in the Faculty Board in Mathematical and Computing Sciences ruling that the student's enrolment is terminated. Any of the following will be taken to indicate unsatisfactory progress.

1. Failure to complete the course in 6 semesters from the time of registration in the case of a part-time student, or in 3 semesters from the time of registration in the case of a full-time student. This is not inclusive of periods of leave of absence.
2. Failure in any subject 3 times.

Course Rules

To complete the Graduate Diploma students must pass 36 semester hours. Since all subjects for this course are 3 semester hour subjects, this means you must complete 12 subjects.

Of these you must take SIX core subjects:

31071 Introduction to Information Systems
31073 Introduction to Computer Systems
31021 Systems Analysis
31022 Commercial Programming Development
31031 Database
and one of
31032 Communications and Networks
or
31017 Accounting Fundamentals

In addition you must take SIX electives. These are usually chosen from the list given below or from elective subjects in the B.App.Sc.(Computing Science). You must have completed the appropriate prerequisites for the electives which you chose and your choice must be approved by the Graduate Diploma Co-ordinator.

Graduate Diploma Electives Usually Offered in Autumn

		Hours/Week
31032 *	Communications and Networks	3
31017 *	Accounting Fundamentals	3
31015	Discrete Mathematics	3
31041	Systems Design	3
31042	On-Line Systems	3
31058	Project Management	3
31023	Computer Systems Architecture 2	3

* If not taken as a core subject.

Other electives may be available during the day.

Graduate Diploma Electives Usually Offered in Spring

		Hours/Week
31024	Data Structures and Algorithms	3
31025	Introduction to Software Engineering	3
31026	Probability and Statistics	3
31033	Operating Systems	3
31041	Systems Design	3
31042	On-Line Systems	3
31047	Management Control Systems	3
31048	Business Tools and Applications	3
31053	Communications Software	3

Other electives may be available during the day.

A RECOMMENDED PART-TIME PROGRAMME

SEMESTER 1 (Autumn)		*Hours/Week*
31021	Systems Analysis	3
31071	Introduction to Information Systems	3
31073	Introduction to Computer Systems	3
SEMESTER 2 (Spring)		
31022	Commercial Programming Development	3
31031	Database	3
	Elective	
SEMESTER 3 (Autumn)		
31032	Communications and Networks	3
	and/or	
31017	Accounting Fundamentals	3
	One or two electives	3 or 6
SEMESTER 4 (Spring)		
	Three electives	9

NOTE that the hours per week are lecture and tutorial hours. Plan to spend at least the same time again on private study.

STUDENTS WHO COMMENCED PRIOR TO 1990 WILL FOLLOW THE PART-TIME PROGRAMME AS SET OUT IN THE SCHOOL OF COMPUTING SCIENCES HANDBOOK FOR THE YEAR IN WHICH THEY ENTERED THE GRADUATE DIPLOMA COURSE.

BACHELOR OF APPLIED SCIENCE (COMPUTING SCIENCE)

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 the study in depth 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, but it will also form a basis from which post-graduate studies may begin.

The course comprises 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.

There were a number of changes to the B.App.Sc. course which came into effect in 1989. Some of these changes may affect students who began the course before 1989. Full details of how the changes affect these students will be given later in this Handbook.

Industrial Training

All students in the B.App.Sc.(Computing Science) are required to enrol in, and pass, the two Industrial Training subjects. There are a substantial number of prerequisites for Industrial Training; these pre-requisites are noted in the subject description section. Full-time students normally undertake Industrial Training after completing Semester 4; the Industrial Training subject numbers for the full-time attendance pattern are 31696 and 31697. Part-time students normally undertake Industrial Training after completing Stage 4; the Industrial Training subject numbers for the part-time attendance pattern are 31698 and 31699.

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 eighteen months for part-time students. During Industrial Training students are required to behave in a professional manner, and, to enable the School to assess their experience, are required to keep the School informed of the status of their employment at all times. Each year the School of Computing Sciences publishes an Industrial Training "Student Guide" which sets out in detail what is required to pass these two subjects; students are advised to obtain a copy of this guide and to study it carefully.

Although the securing of suitable employment during Industrial Training is the student's responsibility, the School will assist students in obtaining a placement.

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 External Liaison Officer who will provide a description of the requirements of an Industrial Training position. If a student finds employment an appointment should be made to see the School's External Liaison Officer and to obtain certification that the employment is suitable for Industrial Training.

Students who wish to benefit from the direct assistance of the School in finding an Industrial Training position should obtain a copy of the Industrial Training "Student Guide" from the School Office and carefully study the procedure to be followed.

Industrial Training students are assessed by senior members of the academic staff.

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

Laboratory Sessions

These sessions are designed to give students formal tuition in using computer systems and to give practical experience of the course work. Every laboratory session is attached to a specific subject. (For example, Commercial Programming Development is 5 semester hours, lectures and tutorials being scheduled for 3 hours and the laboratory session being 2 hours.)

Exemptions

Exemptions may only be granted on the basis of recent academic study towards an incomplete degree. The student must be able to demonstrate that the knowledge is current. Exemptions for core subjects may be granted where subjects successfully studied previously coincide with B.App.Sc. subjects. For further information consult the current School Handbook.

Exemptions are usually processed by the School immediately following enrolment.

A RECOMMENDED FULL-TIME PROGRAMME

YEAR 1

Autumn Semester		*Hours/Week*
31611	Information Systems	4
31613	Computer Systems Architecture 1	3
31614	Programming Principles	7
31615	Discrete Mathematics	5
31617	Accounting Fundamentals	3
51370	Human Communications	2

Spring Semester		
31621	Systems Analysis	3
31622	Commercial Programming Development	5
31623	Computer Systems Architecture 2	5
31624	Data Structures and Algorithms	5
31625	Software Engineering	3
31626	Probability and Statistics	3

YEAR 2

Autumn Semester		
31631	Database	4
31632	Communications and Networks	5
31633	Operating Systems	5
31636	Simulation and Modelling	4
	CS/IS Elective 1	3
	Elective 1	3

Spring Semester		
31641	Systems Design	4
31642	On-Line Systems	5
31647	Management Control Systems	4
31648	Business Tools and Applications	5
	CS/IS Elective 2	3
	Elective 2	3

YEAR 3

31696	Industrial Training	6

Spring Semester		
31697	Industrial Training	6

YEAR 4

Autumn Semester		
31653	Communications Software	6
31655	Theory of Computer Science	4.5
31658	Project Management	4.5
	CS/IS Elective 3	3
	Elective 3	3
	Elective 4	3

Spring Semester		*Hours/Week*
31662	Information Systems Case Study	6
31666	Performance Evaluation	6
31669	Social Implications of Computers	3
	CS/IS Elective 4	3
	Elective 5	3
	Elective 6	3

A RECOMMENDED PART-TIME PROGRAMME

YEAR 1

Autumn Semester		
31611	Information Systems	4
31615	Discrete Mathematics	5
31617	Accounting Fundamentals	3

Spring Semester		
31613	Computer Systems Architecture 1	3
31614	Programming Principles	7
51370	Human Communications	2

YEAR 2

Autumn Semester		
31621	Systems Analysis	3
31622	Commercial Programming Development	5
31623	Computer Systems Architecture 2	5

Spring Semester		
31624	Data Structures and Algorithms	5
31625	Software Engineering	3
31626	Probability and Statistics	3

YEAR 3

Autumn Semester		
31631	Database	4
31632	Communications and Networks	5
CS/IS	Elective 1	3

Spring Semester		
31633	Operating Systems	5
31648	Business Tools and Applications	5
	Elective 1	3

YEAR 4

Autumn Semester		
31641	Systems Design	4
31642	On-Line Systems	5
	CS/IS Elective 2	3

Spring Semester		
31636	Simulation and Modelling	4
31647	Management Control Systems	4
	Elective 2	3

YEAR 5		*Hours/Week*
Autumn Semester		
31655	Theory of Computer Science	4.5
31658	Project Management	4.5
	CS/IS Elective 3	3
	31698 Industrial Training	3
Spring Semester		
31653	Communications Software	6
	Elective 3	3
	Elective 4	3
31698	Industrial Training	3

YEAR 6		
Autumn Semester		
31669	Social Implications of Computers	3
31666	Performance Evaluation	6
	CS/IS Elective 4	3
31699	Industrial Training	3
Spring Semester	*Hours/Week*	
31662	Information Systems Case Study	6
31699	Industrial Training	3
	Elective 5	3
	Elective 6	3

Computing Sciences Electives

Students who do not wish to take a sub-major or strand from another school may choose electives from those offered by the School of Computing Sciences.

In lieu of elective(s) students may take one 3 hour project, two 3 hour projects, or one 6 hour project over one or two semesters.

Students may not use as a project work done in the normal course of duties as an Industrial Training student or as a part-timer. However, a student may do something extra related to work as a project. In this case, his work superior would probably become a joint supervisor.

A student in a 3 hour subject is expected to do at least as much work again at home, so a MINIMUM of six hours a week would be spent on the project.

A list of electives available in 1991 appears in the Subject Synopses section.

BACHELOR OF INFORMATION TECHNOLOGY

This course is a co-operative education programme in computer information systems and has been developed by the School of Computing Sciences in co-operation 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 programme differs from existing co-operative education courses in that, during the industry-based semesters, students will follow a structured programme designed jointly by the University and the employer group, including formal course work taught in industry. This course work 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 fifty 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 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 PROGRAMME

SEMESTER 1 - UTS		*Hours/Week*
31711	Information Systems	4
31713	Computer Systems Architecture	3
31714	Programming Principles	7
31715	Discrete Mathematics	5
31717	Accounting Fundamentals	3
31721	Systems Analysis	3

SEMESTER 2 - INDUSTRY		
31722	Commercial Programming	5
31770	Industry Project 1	14
31771	Business Requirements Analysis	3
31779	Applications of Information Technology 1	3

SEMESTER 3 - UTS		
23106	Economics	3
24201	Principles of Marketing	3
31731	Database	4
31732	Communications and Networks	5
31733	Operating Systems	5
31738	Management Principles for IT Professionals	3

WINTER		
31780	Industry Studies*	6

SEMESTER 4 - UTS		
31725	Software Engineering	6
31726	Probability and Statistics	3
31741	Systems Design	4
31742	On-Line Systems	5
31747	Management Control Systems	3
31788	Organisation Theory for IT Professionals	3

SEMESTER 5 - INDUSTRY		*Hours/Week*
31756	Project Management	3
31781	Business Systems Design	3
31789	Applications of Information Technology 2	3
31790	Industry Project 2	14

SEMESTER 6 - UTS		
25301	Financial Management	3
31762	Technology Planning	3
31766	Performance Modelling and Management	6
31767	Auditing the Computer	6
31768	Business Planning for IT Professionals	3
31769	Social Implications of Computers	3

* This subject requires commitment of time over the winter period, in order to complete the 42 week requirement of the course.

Conditions Relating to Students Enrolled in the Bachelor of Information Technology

Students enrolled in the Bachelor of Information Technology are notified here of certain special conditions.

Leave of absence will not normally be granted to students, except under exceptional circumstances and subject to satisfactory arrangements being possible. Likewise, withdrawal from the course followed by re-admission is not normally granted. Students are reminded that withdrawal without penalty from any course is only possible up to the deadlines imposed by the University. After such deadlines, students are expected to complete all assessment tasks for subjects in which they are enrolled.

Variations to the approved programme of study for the Bachelor of Information Technology are restricted. No industry-based subject may be deleted from the programme, except under extraordinary circumstances and at the discretion of the 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 Steering Committee and the School.

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

* a student fails any subject for the second time
* a student has a Weighted Average Mark of less than 45% at the end of any assessment period
* a student fails any subject that is part of the programme of an industry-based semester (there is provision for a supplementary examination to be taken in these subjects following a failure at the first attempt) or a student performs unsatisfactorily during an industry-based semester
* a student who, immediately prior to the commencement of an industry-based semester, has still to complete more than one subject in the normal programme of the course to that stage.

Appeals against exclusion will be dealt with at the Exclusion Appeals Committee, who will take into account the recommendation of the course Steering Committee.

Industry Semesters
The dates of the industry-based semesters for 1991 are as follows:
Autumn Semester (3rd year students)
Monday, January 21, 1991 - Friday, July 5, 1991
Spring Semester (1st year students)
Monday, July 8, 1991 - Friday December 20, 1991

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.

Scholarship

The scholarship will be paid at three different and increasing levels, Levels 1, 2 and 3, where Level 2 is the average of the three levels. All first year students will start at Level 1; at the end of each year all B.Inf.Tech. students with satisfactory progress will move from their current level to the next level.

The levels for 1991 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 B.Inf.Tech students has been ruled as tax exempt.

Name Change

The Bachelor of Information Technology was formerly known as the Bachelor of Technology (Information Systems). This change is to the name only, the objectives and content of the course remain unchanged.

Extension Courses

The School offers courses which run regularly each semester for fifteen weeks, one evening per week, in:

UNIX/C
COBOL
Pascal

The School also offers other extension courses at various times during the academic year. These include:

Auditing Computer Systems
Database Design
C and UNIX for the Professional
Expert Systems Design
4th Generation Languages and Application Building
Introduction to Capacity Planning
OCCAM and the Transputer
Object Oriented Programming in Eiffel
Object Oriented Design.
Software Quality Assurance
Using Relational and E-R Models

In addition, the School offers weekly "State-of-the-Art" seminars, usually on Wednesday afternoons. Visitors are welcome.

SYNOPSES FOR BACHELOR OF APPLIED SCIENCE 1991

CORE SUBJECTS

31611 INFORMATION SYSTEMS
Four semester hours

This subject focuses on the use of computer based systems in an organisational context. Typical computer based systems: data processing and information systems, office support systems, personal computers, embedded systems. Organisational benefits of computer based systems, objectives, costs and risks. On-line, off-line, real time systems. Batch, interactive and transaction processing. Description of data flows: process flow charting. Introduction to simple business applications and the commercial system development life cycle. Operational issues.

31613 COMPUTER SYSTEMS ARCHITECTURE 1
Three semester hours

This subject is an introduction to computer hardware and software systems. The relationship between hardware and software is discussed by considering the structure of the computer, the inter-relationship of the various components and the processing by the computer of data and programme.

31614 PROGRAMMING PRINCIPLES
Seven semester hours

This subject provides an introduction to problem analysis and solution on the computer. Students gain experience at using the Unix operating system. Methods of problem analysis, pseudocoding, coding, debugging, testing and documentation are introduced through the use of the procedural language Pascal. The concepts of programme compilation and execution, and interactive and noninteractive processing are introduced. The principles of object oriented programming are discussed, and students implement this approach in the language Eiffel.

31615 DISCRETE MATHEMATICS
Five semester hours

This subject 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
Three semester hours

This subject provides 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.

31621 SYSTEMS ANALYSIS
Three semester hours
Prerequisites: 31611 Information Systems

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
Five semester hours
Prerequisites: 31614 Programming Principles, 31611 Information Systems

This subject covers structured design techniques and their application to COBOL programming in an offline commercial environment.

31623 COMPUTER SYSTEMS ARCHITECTURE 2
Five semester hours
Prerequisites: 31613 Computer Systems Architecture 1, 31614 Programming Principles

This subject is 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
Five semester hours
Prerequisites: 31614 Programming Principles, 31615 Discrete Mathematics, 31625 Software Engineering should be done before or concurrently

Structured approach to programming including: abstract modelling, modular design, step-wise refinement, documentation and layout, complexity analysis of algorithms for efficiency, programme correctness. Abstract and dynamic data types are covered notionally and formally, with associated insertion, deletion, selection, searching and sorting methods and algorithms for manipulating data in these structures. Systematic methods for attempting common problems. An object-oriented approach will be given.

31625 SOFTWARE ENGINEERING
Three semester hours
Prerequisites: 31614 Programming Principles, 31615 Discrete Mathematics

This subject introduces the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, programme development via refinement of specifications, programmes correctness, machine executable specifications, an overview of software testing and reliability.

31626 PROBABILITY AND STATISTICS
Three semester hours

Descriptive statistics. Probability theory, random variables, conditional probabilities, independence and Bayes' theorem, and modelling of uncertainty, measures of central tendency and dispersion, moments. Processes and distributions: binomial, Poisson, normal and sampling. Theorems: Chebychev, central limit. Applied statistics: estimation, confidence intervals, hypothesis testing and types of errors; problem solving by theory, statistical tables and machine packages.

31631 DATABASE
Four semester hours
Prerequisites: 31621 Systems Analysis

This subject deals with database design and implementation methodologies. Both entity-relationship and relational models are described and used to facilitate database design. The SQL language is described in detail illustrating database query and update techniques. Traditional database approaches including codasyl and hierarchical databases are described.

31632 COMMUNICATIONS AND NETWORKS
Five semester hours
Prerequisites: 31611 Information Systems, 31613 Computer Systems Architecture 1

This subject introduces communication concepts and terminology. It describes the problems involved in the Physical and Data Link Layers of communication and their solutions. It discusses network architectures, topologies and carrier services.

31633 OPERATING SYSTEMS
Five semester hours
Prerequisites: 31623 Computer Systems Architecture 2, 31624 Data Structures and Algorithms

An introduction to the student of the concepts and facilities available in computer operating systems. The subject includes scheduling, multiprogramming, protection and resource control.

31636 SIMULATION AND MODELLING
Four semester hours
Prerequisites: 31626 Probability and Statistics, 31624 Data Structures and Algorithms

Principles and practice of modelling: analysis, data gathering, solution, validation, implementation. Modelling in and of computer systems, queueing theory, continuous simulation, languages, corporate modelling, forecasting and inventory.

31641 SYSTEMS DESIGN
Four semester hours
Prerequisite: 31631 Database

This subject 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 4GL's.

31642 ON-LINE SYSTEMS
Five semester hours
Prerequisites: 31622 Commercial Programming Development, 31632 Communications and Networks, 31641 Systems Design should be done before or concurrently

This subject covers the life cycle of on-line commercial application systems from a programmer's point of view. It includes design, development, testing, implementation and maintenance issues with particular emphasis on structured design using COBOL. Students work in project teams to produce a working on-line system.

31647 MANAGEMENT CONTROL SYSTEMS
Four semester hours
Prerequisite: 31617 Accounting Fundamentals

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
Five semester hours
Prerequisites: 31631 Database, 31617 Accounting Fundamentals

This subject aims to give students familiarity with microcomputers in the office and business environment and as stand alone machines or workstations. The use of database and file management programmes and the physical operation of microcomputers are discussed. Students will become familiar with specific packages such as business databases and spreadsheets and programme development aids.

31653 COMMUNICATIONS SOFTWARE
Six semester hours
Prerequisites: 31633 Operating Systems, 31632 Communications and Networks

This subject discusses the services provided by the various layers of a communications system and the protocols used to implement these services. Discussion is based, primarily, around the use of the ISO reference model for Open System Interconnection. Some aspects of the effect of design decisions on systems users are also covered.

31655 THEORY OF COMPUTER SCIENCE
Four and one half semester hours
Prerequisites: 31624 Data Structures and Algorithms, 31625 Introduction to Software Engineering

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
Four and a half semester hours
Prerequisite: 31696-7 or 31698 Industrial Training

Provides students with the practical knowledge and skills that are necessary to effectively manage project teams and software development projects. The major topics are: leadership, people management, communication and control; planning a software project, project life cycles, project/milestones and development plans; software time and cost estimation; controlling software projects; development aids and alternatives.

31662 INFORMATION SYSTEM CASE STUDY
Six semester hours
Prerequisites: 31658 Project Management, 31641 Systems Design, 31642 On-Line Systems, 31666 Performance Evaluation - should be done before or concurrently

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 and senior management communication skills.

31666 PERFORMANCE EVALUATION
Six semester hours
Prerequisites: 31636 Simulation and Modelling

This subject 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
Three semester hours
Prerequisite: 31696-7 or 31698 Industrial Training

This subject aims to identify 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, social responsibility of computer practitioners, privacy, the DP workforce.

31696 INDUSTRIAL TRAINING (F/T - FIRST)
Six semester hours
Prerequisites: 31621 Systems Analysis, 31622 Commercial Programming Development, 31624 Data Structures and Algorithms, 31633 Operating Systems, 51370 Human Communications plus at least eight other core subjects from the B.App.Sc. programme.

31697 INDUSTRIAL TRAINING (F/T - SECOND)
Six semester hours
Prerequisites: 31696 Industrial Training

The first and second semesters of the compulsory industrial requirement for the course. ALL F/T students must enrol in these subjects and obtain a minimum of 9 months' of full-time employment. Students must normally have completed the equivalent of at least four F/T semesters before obtaining employment.

31698 INDUSTRIAL TRAINING (P/T - FIRST - STAGE 5).
Three semester hours for two semesters
Prerequisites: 31621 Systems Analysis, 31622 Commercial Programming Development, 31624 Data Structures and Algorithms, 31633 Operating Systems, 51370 Human Communications plus at least eight other core subjects from the B.App.Sc. programme.

31699 INDUSTRIAL TRAINING (P/T - SECOND - STAGE 6)
Three semester hours for 2 semesters
Prerequisites: 31698 Industrial Training

The first and second years of the compulsory industrial requirement for the course, normally taken for a total of four semesters in Stages 5 and 6. ALL P/T students must enrol in these subjects and obtain a minimum of 18 months' of full-time employment.

51370 HUMAN COMMUNICATION
Two semester hours

This subject outlines the principles and practice of written and oral reporting. 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, e.g., 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.

ELECTIVES

Prerequisites are given as the B.App.Sc. subject number. Grad.Dip. students should have the Grad.Dip. equivalent prerequisite.

31140 INTRODUCTION TO COMPUTER GRAPHICS
Three semester hours
Prerequisite: 31624 Data Structures and Algorithms

This subject provides a thorough introduction to the field of computer graphics. Topics covered are: passive and interactive graphics hardware devices and programming; mathematical tools for two and three dimensional graphics; two and three dimensional vector and raster graphics algorithms, colour in computer graphics; graphics standards; graphics packages; applications of computer graphics - business graphics, computer aided design, cartography, animation and advertising.

31163 KNOWLEDGE-BASED SYSTEMS
(not offered 1991)
Three semester hours
Prerequisites: 31901 Artificial Intelligence Theory or 31892 Logic Programming or 31896 Lisp Programming

This subject introduces the student 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
Three semester hours
Prerequisite: 31140 Introduction to Computer Graphics

For students who have passed 31140, this subject provides a study of several additional computer graphics topics, some elementary, and some of a more advanced nature. These topics include: raster algorithms - antialiasing techniques and clipping algorithms; hidden line and surface algorithms; computer animation techniques; realistic image synthesis techniques - illumination and shading models, ray tracing and transparency, texture mapping, modelling of natural phenomena; current research directions in computer graphics.

31350 PROJECT (31350, 31351, 31352 and 31894)
Three or six semester hours
Prerequisite: 31641 Systems Design

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. Students will be required to attend several introductory lectures on research methods, report writing etc. Projects may be drawn from any area of computer science or information systems. Each project is supervised by a member of academic staff.

31738 MANAGEMENT PRINCIPLES FOR IT PROFESSIONALS

See B.Tech synopses of this subject

31768 BUSINESS PLANNING FOR IT PROFESSIONALS

See B.Tech synopses of this subject

31778 RESOURCES MANAGEMENT FOR IT PROFESSIONALS.
Three semester hours
Prerequisite: 51370 Human Communications

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.

31788 ORGANISATIONAL THEORY FOR IT PROFESSIONALS

See B.Tech synopses of this subject

31853 OFFICE AUTOMATION
Three semester hours
Prerequisite: 31621 Systems Analysis

Covers the advanced concepts of office automation at the corporate level. Corporate integration concerns the link between office systems and corporate information systems and databases. Office level issues concern the integration of data from multiple inputs into single documents and the integration of office procedures that lead to the concept of the paperless office. Methods of arranging and designing integrated systems and the hardware and software solutions for such systems will be covered.

31854 DISTRIBUTED DATABASES
Three semester hours
Prerequisite: 31631 Database, 31632 Communications & Networks

Describes the characteristics and methods of designing distributed databases. Covers important distribution issues including location transparency, replication and concurrency and the problems associated with querying and updating distributed databases. Design issues such as conceptual models of distributed databases and systems dictionaries are covered as well as the managerial issues of implementing them. Practical examples of access to distributed databases through high level languages are covered.

31875 PARALLEL PROGRAMMING
Three semester hours
Prerequisites: 31624 Data Structures and Algorithms, 31633 Operating Systems

This subject provides an introduction to parallel programming by covering the following topics: a parallel programming language and programme 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
(not offered 1991)
Three semester hours
Prerequisites: 31623 Computer Systems Architecture 2, 31633 Operating Systems

Students are given the opportunity to become familiar with services offered by operating systems for applications programming. Topics include: specific systems facilities; coding systems calls, introduction to the applications system.

31882 ADVANCED THEORETICAL COMPUTER SCIENCE
(not offered 1991)
Three semester hours
Prerequisite: 31655 Theory of Computer Science

To review advanced work in the theory of machines, theory of languages, theory of programmes and theory of data.

31885 ADVANCED MATHEMATICS
Three semester hours
Prerequisite: 31615 Discrete Mathematics, 31626 Probability and Statistics

This subject is a compulsory prerequisite for a Maths sub-major or any subjects in the School of Mathematics.

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 1
Three semester hours
Prerequisites: 31623 Computer Systems Architecture 2

To provide an introduction to the concepts of logic design, gates, Boolean algebra, combinational and sequential circuits.

31889 LOGIC DESIGN 2
Three semester hours
Prerequisite: 31888 Logic Design 1

A continuation of Logic Design 1 to include the concepts of machine structure as a controlled combination of registers and gates.

31892 LOGIC PROGRAMMING
Three semester hours
Prerequisites: 31625 Software Engineering, 31624 Data Structures and Algorithms

This subject should 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 COMPUTER PROGRAMMING LANGUAGES
(not offered 1991)
Three semester hours
Prerequisite: 31624 Data Structures and Algorithms

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.

31895 NUMERICAL ANALYSIS
(not offered 1991)
Three semester hours
Prerequisite: 31885 Advanced Mathematics

Errors, numerical linear algebra, interpolation and approximation, solution of non-linear 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.

31896 LISP PROGRAMMING
Three semester hours
Prerequisite: 31625 Software Engineering, 31624 Data Structures and Algorithms

The subject should give the student mastery of Lisp and Clos programming and its application to AI problems. It also looks at Knowledge Representation, Frames and Default Reasoning, Language Understanding, Memory Search.

31897 COMPUTER SYSTEMS ARCHITECTURE 3
Three semester hours
Prerequisites: 31633 Operating Systems

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
Three semester hours
Prerequisites: 31888 Logic Design 1

An examination of the current range of microprocessors and their applications in embedded systems. The subject is highly hardware-oriented. Emphasis is on interfacing peripheral devices to microcomputers.

31899 SYSTEMS ARCHITECTURE
(not offered 1991)
Three semester hours
Prerequisite: 31897 Computer Systems Architecture 3

In-depth study at the architectural level of one or more state-of-the-art or experimental computer systems.

31901 ARTIFICIAL INTELLIGENCE THEORY
Three semester hours
Prerequisites: 31625 Software Engineering, 31624 Data Structures and Algorithms

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
Three semester hours
Prerequisites: 31617 Accounting Fundamentals

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.

An introduction to audit concepts and techniques in the EDP audit field of activity. The emphasis is oriented to control measures possible and desirable in various computer systems e.g. Billing, Creditors, Payroll, etc. and Non Monetary Information Systems.

31904 SYSTEMS PROGRAMMING
Three Semester Hours
Prerequisite: 31633 Operating Systems

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 programme.

31931 SOFTWARE QUALITY ASSURANCE
Three semester hours
Prerequisites: 31621 Systems Analysis

This subject 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.

51370 HUMAN COMMUNICATION
Two semester hours

This subject outlines the principles and practice of written and oral reporting. 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, e.g., 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.

SUBJECT SYNOPSES FOR BACHELOR OF TECHNOLOGY IN INFORMATION SYSTEMS

31711 INFORMATION SYSTEMS
Four semester hours

This subject focuses on the use of computer based systems in an organisational context. Typical computer based systems: data processing and information systems, office support systems, personal computers, embedded systems. Organisational benefits of computer based systems, objectives, costs and risks. On-line, off-line, real time systems. Batch, interactive and transaction processing. Description of data flows: process flow charting. Introduction to simple business applications and the commercial system development life cycle. Operational issues.

31713 COMUTER SYSTEMS ARCHITECTURE
Three semester hours

This subject is an introduction to computer hardware and software systems. The relationship between hardware and software is discussed by considering the structure of the computer, the inter-relationship of the various components and the processing by the computer of data and programme.

31714 PROGRAMMING PRINCIPLES
Seven semester hours

This subject provides an introduction to problem analysis and solution on the computer. Students gain experience at using the Unix operating system. Methods of problem analysis, pseudocoding, coding, debugging, testing and documentation are introduced through the use of the procedural language Pascal. The concepts of programme compilation and execution, and interactive and noninteractive processing are introduced. The principles of object oriented programming are discussed, and students implement this approach in the language Eiffel.

31715 DISCRETE MATHEMATICS
Five semester hours

This subject 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.

31717 ACCOUNTNG FUNDAMENTALS
Three semester hours

This subject provides 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.

31721 SYSTEMS ANALYSIS
Three semester hours
Prerequisites: 31711 Information Systems should be done before or concurrently

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.

31722 COMMERICAL PROGRAMMING
Five semester hours
Prerequisites: 31711 Information Systems, 31714 Programming Principles

Commercial structured design techniques and third generation commercial programming in a batch environment. Students will be taught the design technique and language of the particular industry organisation using approved assignment work.

31725 SOFTWARE ENGINEERING
Six semester hours
Prerequisites: 31714 Programming Principles, 31715 Discrete Mathematics

This subject introduces the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, programme development via refinement of specifications, programmes correctness, machine executable specifications, an overview of software testing and reliability.

31726 PROBABILITY AND STATISTICS
Three semester hours

Descriptive statistics. Probability theory, random variables, conditional probabilities, independence and Bayes' theorem, and modelling of uncertainty, measures of central tendency and dispersion, moments. Processes and distributions: binomial, Poisson, normal and sampling. Theorems: Chebychev, central limit. Applied statistics: estimation, confidence intervals, hypothesis testing and types of errors; problem solving by theory, statistical tables and machine packages.

31731 DATABASE
Four semester hours
Prerequisites: 31721 Systems Analysis, 31711 Information Systems

This subject deals with database design and implementation methodologies. Both entity-relationship and relational models are described and used to facilitate database design. The SQL language is described in detail illustrating database query and update techniques. Traditional database approaches including codasyl and hierarchical databases are described.

31732 COMMUNICATIONS AND NETWORKS
Five semester hours
Prerequisites: 31711 Information Systems, 31713 Computer Systems Architecture

This subject introduces communication concepts and terminology. It describes the problems involved in the Physical and Data Link Layers of communication and their solutions. It discusses network architectures, topologies and carrier services.

31733 OPERATING SYTEMS
Five semester hours
Prerequisites: 31713 Computer Systems Architecture

An introduction to the student of the concepts and facilities available in computer operating systems. The subject includes scheduling, multiprogramming, protection and resource control.

31738 MANAGEMENT PRINCIPLES FOR IT PROFESSIONALS
Three semester hours
Prerequisite: 51370 Human Communications or equivalent

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.

31741 SYSTEMS DESIGN
Four semester hours
Prerequisite: 31731 Database, 31721 Systems Analysis

This subject 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 4GL's.

31742 ON-LINE SYSTEMS
Five semester hours
Prerequisites: 31722 Commercial Programming, 31732 Communications and Networks, 31741 Systems Design should be done before or concurrently

This subject covers the life cycle of on-line commercial application systems from a programmer's point of view. It includes design, development, testing, implementation and maintenance issues with particular emphasis on structured design using Cobol. Students work in project teams to produce a working on-line system.

31747 MANAGEMENT CONTROL SYSTEMS
Three semester hours
Prerequisite: 31717 Accounting Fundamentals

The principles and techniques of cost accounting, budgeting and financial planning and their use in computer based accounting and business decision making systems.

31756 PROJECT MANAGEMENT
Three semester hours
Prerequisite: 31788 Organisation Theory for IT Professionals

Provides students with the practical knowledge and skills that are necessary to effectively manage project teams and software development projects. The major topics are: leadership, people management, communication and control; planning a software project, project life cycles, project phases/milestones and development plans; software time and cost estimation; controlling software projects; development aids and alternatives.

31762 TECHNOLOGY PLANNING
Three semester hours
Prerequisites: 31756 Project Management, 31781 Business Systems Design

The various frameworks within which a business and its information system operates, taking into account goals, objectives and strategies. Enterprise business analysis - high level, in terms of mission, goals strategies; enterprise business modelling - top-down development of function and data models; information systems architecture - development of standard policies within which information systems can be established; business systems planning - prioritising information systems projects to best meet the overall needs of an organisation.

31766 PERFORMANCE MODELLING AND MANAGEMENT
Six semester hours
Prerequisites: 31733 Operating Systems, 31726 Probability and Statistics

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.

31767 AUDITING THE COMPUTER
Six semester hours
Prerequisite: 31617 Accounting Fundamentals

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.

31768 BUSINESS PLANNING FOR IT PROFESSIONALS.
Three semester hours
Prerequisite: Human Communications 51370 or equivalent

This subject forms a coherent stream with 31738 Management Principles for ITP, 31788 Organisation Theory for ITP and 31758 Resources Management for ITP; within this stream the subjects are sequenced, and the subject can be taken as a stand-alone elective.
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.

31769 SOCIAL IMPLICATIONS OF COMPUTERS
Three semester hours

This subject aims to identify 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, social responsibility of computer practitioners, privacy, the DP workforce.

31770 INDUSTRIAL PROJECT 1
Fourteen semester hours

Understanding 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
Three semester hours
Prerequisite: 31721 Systems Analysis

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.

31779 APPLICATIONS OF INFORMATION TECHNOLOGY 1
Three semester hours
Prerequisite: 31711 Information Systems

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 Applications of IT 2 to ensure a common level of experience for all students.

31780 INDUSTRY STUDIES
Four semester hours
Prerequisite: 31770 Industry Project 1

Students undertake surveys of industry sponsors of the B.Inf.Tech. programme, 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 B.Inf.Tech. programme.

31781 BUSINESS SYSTEMS DESIGN
Three semester hours
Prerequisites: 31771 Business Requirements Analysis, 31741 Systems Design

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
Three semester hours
Prerequisite: Human Communications 51370 or equivalent

The basic structural forms of business organisations and the behavioural science foundations that are the basis for improving organisation performance and for facilitating change. Organisation theory, and the information resource - architecture and operation. Organisation development. Groups within organisations. The Information Systems organisation.

31789 APPLICATIONS OF INFORMATION TECHNOLOGY 2
Three semester hours
Prerequisite: 31779 Applications of Information Technology 1

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 Applications of IT 1 to ensure a common level of experience for all students.

31790 INDUSTRY PROJECT 2
Fourteen semester hours
Prerequisite: 31770 Industry Project 1

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 Industry Project 1.

SUBJECT SYNOPSES FOR GRADUATE DIPLOMA IN DATA PROCESSING

31015 DISCRETE MATHEMATICS

Five semester hours
Prerequisite: Pascal

This subject 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.

31017 ACCOUNTING FUNDAMENTALS

Three semester hours

This subject provides 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.

31021 SYSTEMS ANALYSIS

Three semester hours
Prerequisites: 31071 Introduction to Information Systems should be done before or concurrently

.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.

31022 COMMERCIAL PROGRAMME DEVELOPMENT

Three semester hours
Prerequisites: 31071 Introduction to Information Systems, Pascal and Cobol

This subject covers structured design techniques and their application to Cobol programming in an offline commercial environment. Advanced features of Cobol are presented to give the student a complete knowledge of the language.

31023 COMPUTER SYSTEMS ARCHITECTURE 2

Three semester hours
Prerequisites: 31073 Introduction to Computer Systems

This subject is a continuation of Computer Systems Architecture 1. The concepts introduced there are elaborated 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.

31024 DATA STRUCTURES AND ALGORITHMS

Three semester hours
Prerequisites: Pascal, 31025 Introduction to Software Engineering should be done before or concurrently

Structured approach to programming including: data abstraction and ADTs, functional specification, implementation, modularity, documentation and layout, complexity analysis of algorithms, programme correctness. Abstract and dynamic data types (files, lists, trees) are covered notionally and formally, and are applied to common problems like sorting and searching, parsing, B trees and memory management.

31025 INTRODUCTION TO SOFTWARE ENGINEERING

Three semester hours
Prerequisites: 31015 Discrete Mathematics

This subject introduces the formal aspects of modern software engineering. Topics: an overview of the software engineering environment, the practice of formal mathematical specification, programme development via refinement of specifications, programmes correctness, machine executable specifications, an overview of software testing and reliability.

31026 PROBABILITY AND STATISTICS

Three semester hours

Descriptive statistics. Probability theory, random variables, conditional probabilities, independence and Bayes' theorem, and modelling of uncertainty, measures of central tendency and dispersion, moments. Processes and distributions: binomial, Poisson, normal and sampling. Theorems: Chebychev, central limit. Applied statistics: estimation, confidence intervals, hypothesis testing and types of errors; problem solving by theory, statistical tables and machine packages.

31031 DATABASE
Three semester hours
Prerequisites: 31021 Systems Analysis

This subject deals with database design and implementation methodologies. Both entity-relationship and relational models are described and used to facilitate database design. The SQL language is described in detail illustrating database query and update techniques. Traditional database approaches including codasyl and hierarchical databases are described.

31032 COMMUNICATIONS AND NETWORKS
Three semester hours
Prerequisites: 31073 Introduction to Computer Systems , 31071 Introduction to Information Systems

This subject introduces communication concepts and terminology. It describes the problems involved in the Physical and Data Link Layers of communication and their solutions. It discusses network architectures, topologies and carrier services.

31033 OPERATING SYSTEMS
Three semester hours
Prerequisites: 31073 Introduction to Computer Systems, 31071 Introduction to Information Systems

An introduction to the student of the concepts and facilities available in computer operating systems. The subject includes scheduling, multiprogramming, protection and resource control.

31041 SYSTEMS DESIGN
Three semester hours
Prerequisite: 31031 Database

This subject 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 4GL's.

31042 ON-LINE SYSTEMS
Three semester hours
Prerequisites: 31022 Commercial Programme Development, 31032 Communications and Networks, Systems Design 31041 - should be done before or concurrently

This subject covers the life cycle of on-line commercial application systems from a programmer's point of view. It includes design, development, testing, implementation and maintenance issues with particular emphasis on structured design using Cobol. Students work in project teams to produce a working on-line system.

31047 MANAGEMENT CONTROL SYSTEMS.
Three semester hours
Prerequisite: 31017 Accounting Fundamentals

The principles and techniques of cost accounting, budgeting and financial planning and their use in computer based accounting and business decision making systems.

31048 BUSINESS TOOLS AND APPLICATIONS
Three semester hours
Prerequisites: 31031 Database, 31017 Accounting Fundamentals

This subject aims to give students familiarity with microcomputers in the office and business environment and as stand alone machines or workstations. The use of database and file management programmes and the physical operation of microcomputers are discussed. Students will become familiar with specific packages such as business databases and spreadsheets and programme development aids.

31053 COMMUNICATIONS SOFTWARE
Three semester hours
Prerequisites: 31033 Operating Systems, 31032 Communications and Networks

This subject discusses the services provided by the various layers of a communications system and the protocols used to implement these services. Discussion is based, primarily, around the use of the ISO reference model for Open System Interconnection. Some aspects of the effect of design decisions on systems users are also covered.

31058 PROJECT MANAGEMENT
Three semester hours
Provides students with the practical knowledge and skills that are necessary to effectively manage project teams and software development projects. The major topics are: leadership, people management, communication and control; planning a software project, project life cycles, project/milestones and development plans; software time and cost estimation; controlling software projects; development aids and alternatives.

31071 INTRODUCTION TO INFORMATION SYSTEMS
Three semester hours

This subject provides a fundamental foundation for the understanding of information systems and their applications to common computer-based business practices and procedures. Elementary system models, and a range of techniques and resources used in developing and designing information systems are examined. Illustrations taken from common business applications are considered.

31073 INTRODUCTION TO COMPUTER SYSTEMS
Three semester hours

An introduction to the internal components of computers, and how these are interrelated. Assembler language is introduced as a vehicle for describing computer organisations.

SYNOPSES OF SUBJECTS - MASTERS DEGREE BY COURSE-WORK (INFORMATION SCIENCE)

21718 ORGANISATION ANALYSIS AND DESIGN
Three semester hours

Frameworks for organisational analysis; organisational effectiveness; structural perspectives; alternative organisational structures; integration, differentiation; control, contingency theory; organisation-environment relations; organisations as political systems; organisations as cultural systems; design for innovation; organisational change.

22729 THE LEGAL ENVIRONMENT OF BUSINESS
Three semester hours

The subject is structured into two distinct strands. Students are free to enrol in either strand depending on their preference, but strand 2 was specifically designed for M.App.Sc. (Computing) students.

Strand 1 covers the basic principles of the legal system in Australia and its impact on business, introduction to legal reasoning, identification of issues and options to dispute resolutions. Key areas include the Constitution, Parliament and government, contract and tort, the law of principal, agent and partnership and the law of international business in Australia.

In Strand 2 the main emphasis is on Computer Law. Key areas covered include the basic principles of law and the legal system in Australia with emphasis on understanding the law of business and the impact of computers including issues relating to intellectual property (such as copyright protection of computer software, etc).

32100 ADVANCED PROGRAMMING TECHNIQUES
Four semester hours

This subject deals with the logical foundation of programming, the structure of programmes, their verification using a logical formalism, correct construction of programmes from first principles, and programme efficiency. A formal specification and development language will be introduced. The process of programme development and transformation will also be studied within the area of logic programming.

32101 INTELLIGENT SYSTEMS
Four semester hours

A subject concentrating on the transfer of research and development in Artificial Intelligence into functional systems. Topics treated include: expert systems, learning systems, natural language understanding, speech recognition and understanding, vision, cognitive modelling, intelligent computer assisted instruction, logic programming, game playing, planning.

32104 DECISION MAKING AND MODELLING
Four semester hours
Prerequisites: Operations Research, Statistics

This subject looks at the theory and practice of both managerial decision making and modelling processes. Application areas for modelling will include networks, queueing models and corporate and financial models. Mathematical programming and simulation tools will be discussed, as will the role of problem formulation, data collection, sampling and sensitive analysis. An analysis of decision processes will include a study of probabilistic modelling techniques, decision making under uncertainty, decision trees, influence diagrams, utility theory and risk analysis.

32105 SPECIALIST TOPICS IN ARTIFICIAL INTELLIGENCE
Four semester hours

A subject offering in-depth coverage of the theory and practice of selected key areas of Artificial Intelligence: expert systems, learning systems, speech recognition, cognition, natural language understanding, logic programming. The subject will be based on two substantial projects and underlying theory.

32200 INFORMATION PROCESSING STRATEGY
Four semester hours
Prerequisite: 32203 Information Management

Designed to develop knowledge and skills required to carry out strategic planning for corporate information systems and services. An introduction to corporate and MIS planning is followed by an examination of the applications spectrum and the technology spectrum supported by examinations of appropriate management tools for strategic planning, modelling and control of information processing.

32201 DATABASE
Four semester hours
Prerequisite: 31631 Database

This subject deals with database design and implementation methodologies. Both entity-relationship and relational models are described and used to facilitate database design. The SQL language is described in detail illustrating database query and update techniques. Traditional database approaches including codasyl and hierarchical databases are described.

32202 COMMUNICATION SYSTEMS
Four semester hours
Prerequisite: 31632 Communications and Networks

This subject is designed to develop: understanding of typical data communication requirements in an organisation, familiarity with computer communication technologies, understanding of existing and evolving standards, proficiency in the requirements specification, design, sizing and acquisition of corporate communication facilities. Topics covered include: historical evolution of computer communication, distributed information systems, ISO-OSI Reference Model, proprietary networking architectures, communication for message transmission, automated offices, etc., local networks, design procedures for corporate communication systems.

32203 INFORMATION MANAGEMENT
Four semester hours

Information as a resource, cost of collection, storage and manipulation, validity and timeliness, security and availability. Consistency and flows of information sets within an organisation, integration of functional systems through common flows, access, authorisation and encryption. Planning and implementation of enhanced information systems. Project control and estimation techniques, overall system design, implementation, testing and maintenance tools. Post implementation reviews and audits.

32301 PERFORMANCE EVALUATION
Four semester hours
Prerequisite: 31666 Performance Evaluation

Revision and extension of queueing theory. Analytic models of computer systems, and their application to performance evaluation. Operational analysis and its application to performance evaluation. Brief revision of E.D.P. planning principles. Application of performance evaluation principles to capacity management - modelling the growing system.

32302 COMPUTER ARCHITECTURE
Four semester hours
Prerequisites: 31633 Operating Systems, 31897 Computer Systems Architecture 3

An examination of the more advanced architectural features available in contemporary computer systems as well as of the likely future implications of current research. The subject will cover such topics as parallelism in processor design, the distribution of

intelligence in storage technology and the incorporation of high-level language capabilities as well as operating systems features in hardware.

32304 COMPUTER LANGUAGES
Four semester hours

Compiler techniques and their impact on programming language design. Concurrency facilities. Approaches to modularisation. List-structured, non-procedural, functional languages. Object-based systems.

32305 OPERATING SYSTEMS
Four semester hours

Topics in modern operating systems. Concurrency in closely coupled and loosely coupled systems. Programming support environments. 'User friendly' system interfaces. Capability systems. Object-based systems. Fault tolerant systems. Secure systems.

32400 ACCOUNTING FOR MANAGEMENT
Four semester hours

The managerial aspects of accounting will be the main area of interest. This will involve consideration of the nature of accounting both in its traditional role and as an aid to management. The nature of costs and the various aspects of cost accounting will be covered in some detail. The effects of inflation on costs, profits and capital replacement decisions will be covered in depth. The use of funds analysis and balance sheet ratios to assess operational efficiency will also be covered.

32401 MANAGEMENT POLICY AND STRATEGY
Four semester hours

Management Policy and Strategy is a subject which considers the essential tasks of management in formulating, organising and implementing strategy. Topics covered include: the perspective of top management; assessing situations; formulating policies; discovering opportunities; estimating risks and planning programmes of action; organising and administering personnel; follow-up and reappraisal; the role of top management in the world of the consumer.

PROJECT AND REPORT
32908 Eight semester hours
32912 Twelve semester hours
32916 Sixteen semester hours

All students in the M.App.Sc.(by Course Work) in Information Science 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. Students normally enrol in the eight semester hour project. In exceptional circumstances, and with the support of the project supervisor, permission may be granted for a student to enrol in the twelve or sixteen hour project. The School publishes a substantial set of guidelines for this subject in the Master's course Handbook.

32999 SEMINAR
One semester hour

All students enrolled in the Master's course must enrol in the Seminar subject each semester. To pass the Seminar subject, students are required to attend the Master's Research Seminars and to make three presentations of a satisfactory standard during their enrolment in the Master's course. Students who have not attended at least 70% of the Research Seminars in any semester will not normally be permitted to sit for examinations in that Semester. The three presentations which students are required to make are a Literature Review, a Research Seminar and an Oral Presentation of their project work (see 32908).

EXTENSION COURSES PRESENTLY RUN BY INSEARCH

COBOL Extension Course
Three semester hours

Students gain the computing knowledge necessary to deal with problems which confront them in a commercial environment. The Cobol language is an internationally standardised commercial language. In all practical work, the emphasis will be on good programming technique, adequate testing, appropriate documentation and correct syntax.

Pascal Extension Course

Three semester hours

An introduction to the analysis and design of computer algorithms and their implementation in Pascal. The practical work will cover numeric and non-numeric aspects of computing, with the emphasis on writing well-structured and documented programmes.

UNIX/C Extension Course

Three semester hours

An introduction to the C programming language and the Unix* operating system. Students enrolling in this course are expected to have programming experience.

[C] UNIX is a trademark of AT&T and Bell Laboratories.

THE STUDENTS' ASSOCIATION (SA)

All students of the University are members of the SA. In general the SA plays a representative and advocacy role on behalf of students. It also operates to organise and encourage students themselves to become active in campaigns. It liaises closely with the University Union and the Student Services Unit. Additionally, it negotiates with and/or lobbies government and non-government organisations on education and welfare issues in the interests of the students.

The Students' Association maintains close links with student bodies in other tertiary institutions and has a political role to play in maintaining educational standards and conditions for students both within the University and the tertiary sector as a whole.

The SA is governed by the Student Representative Council (SRC) which deals with University-wide issues and is responsible for controlling the SA's funds. At a campus level there are Campus Committees dealing with campus related issues. There are five Campus Committees:

- Balmain
- Broadway
- Kuring-gai
- Haymarket
- Northern (Gore Hill & St Leonards)

The SRC and the Campus Committees are elected by students and are accountable to the student body. Any student is welcome to attend the SRC and Campus Committee meetings.

The full-time paid President of the SA is directly elected by students. An Executive Committee assists the President in carrying out the directions of the SRC and the day-to-day management of the Association. The Education Vice-President is employed to represent student education interests. At a campus level the Campus Convenor carries out the directions of the Campus Committee and generally represents the Campus.

A Women's Officer and International Students' Officer are employed on a full-time basis. A Special Needs Officer is employed on a part-time basis to provide support and representation to students with disabilities.

The SA provides resource centres at Broadway, Haymarket, Gore Hill and Balmain, second-hand bookshops at Broadway, Haymarket and Kuring-gai, and photocopying is provided at Broadway, Haymarket, Gore Hill, St Leonards and Balmain. Three Education Officers are employed by the SA to provide assistance in educational matters and Austudy.

For further information contact the main office of the SA which is located at the Broadway campus on level 3A of the Tower Building (telephone 218 9064). Opening hours: 9.00am to 7.00pm. Or alternatively contact the Students' Centre at Balmain campus (Batty Street).

PRINCIPAL DATES FOR 1991

AUTUMN SEMESTER

January

14	Release of HSC results
21	Closing date for changes of preference of 1990 NSW HSC applicants (4.30 pm)
26	Australia Day
29	Public School Holidays end
29-31	Enrolment of continuing students at Broadway Campus

February

1-21	Enrolment of continuing and new students at Broadway Campus
25-28	Enrolment at Kuring-gai Campus
27-28	University Orientation Day at Broadway Campus

March

1	University Orientation Day at Kuring-gai Campus
15	Last day to enrol in a course or add subjects
28	Last day to apply for leave of absence
29	Public School Holidays commence
29	Good Friday
31	HECS Census Date

April

1	Easter Monday
1-5	Vice-Chancellors' Week (non-teaching)
7	Public School Holidays end
12	Last day to drop a subject without academic penalty
12	Last day to withdraw from course without academic penalty
25	Anzac Day
29	Graduation Ceremonies commence

May

10	Graduation Ceremonies finish
24-25	Information Evening
31	Closing date for applications for Spring Semester

June

7	Formal examinations commence
29	Public School Holidays commence

SPRING SEMESTER

July

5	End of formal examinations
3-12	Vice-Chancellors' week (non-teaching)
14	End of Public School Holidays
19-26	Enrolment of new students

August

9	Last day to enrol in a course or add subjects
23	Last day to apply for Leave of Absence
31	HECS Census Date

September

6	Last day to drop a subject
6	Last day to withdraw from a course
28	Public School Holidays commence
30	Undergraduate applications close for admission in 1992
30	Vice-Chancellors' Week (non-teaching)

October

6	End of Public School holidays

November

11	Formal examinations commence

December

6	End of formal examinations
14	Public School Holidays commence

UNIVERSITY OF TECHNOLOGY,
SYDNEY

ISSN 1036 0697