Preface

To all new students and re-enrolling students I am pleased to extend a warm welcome. The study of Mathematics and the related disciplines of Statistics and Computer Science has always been held in high regard at the University of Newcastle, and indeed Australia's first Faculty of Mathematics (as distinct from a Department) was established here in 1970. The Faculty structure brings with it many advantages. Primarily, it emphasises the importance we place in Mathematics, and its central role in all scientific and engineering disciplines. Another aspect of a Faculty is the availability of combined degree courses, for students who wish to study both mathematics and some other discipline. At the graduate level, we have recently introduced the Diploma in Medical Statistics, jointly offered with the Faculty of Medicine. This course reflects our increasing commitment to the application of statistics in health related matters.

Our Faculty structure has resulted in links being forged with universities in Canada, U.S.A. and England, with exchange programs between Newcastle and those universities which benefit both staff and students.

At the time of writing, we are planning considerable expansion in the Computer Science area. Students taking final year, Honours or postgraduate courses should check with the Departmental Office prior to completing their enrolment, as there may be additional subjects available to them.

At this time, perhaps more than at any other time since the '30's, students are concerned about employment prospects. It is a fact that university graduates enjoy the lowest rates of unemployment of any large sector of the community. At present, and in the foreseeable future, there is a strong demand for technically trained graduates. Both Computer Science and Statistics graduates have been keenly sought for some years now, and the demand from industry for applied mathematicians is rapidly increasing. Both the teaching and public service sectors currently require graduates trained in the full spectrum of mathematical disciplines. The Mathematical Sciences are truly international disciplines, and allow great scope for graduates to travel and gain immediate recognition of their professional skills in other countries.

The best reasons to study any discipline are that one likes it and has a talent for it. Hence, if you study Mathematics for these reasons, it is reassuring to know that graduation will help you to embark on a career doing what you are good at, and enjoy.

We hope to expand further in the Statistics and Operations Research area in the future. But for the present I am confident you will find a sufficiently broad spectrum of stimulating and challenging subjects, which, when coupled with participation in the wide range of extra curricular activities available, will make your university studies an exciting, enjoyable and challenging experience.

A. J. GUTTMANN,
Dean, Faculty of Mathematics.
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FACULTY OF MATHEMATICS

Dean

Professor A. J. Guttmann, MSc(Melbourne), PhD(New South Wales), MACS

Sub-Dean

Assoc. Prof. J. R. Giles, BA(Sydney), PhD, DipEd(Sydney), Thl.

Faculty Secretary

Linda S. Harrigan, BA

MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

Professors

A. J. Guttmann, MSc(Melbourne), PhD(New South Wales), MACS

J. L. Keedy, BD(London), DPhil(Oxford), PhD(Monash), FACS, MBCS

Associate Professors

W. Breslau, BSc(Sydney), MSc(New South Wales), PhD; DipEd(New England), MACS

(Head of Department)

C. A. Croston, BSc(Leicester), MA, PhD(Cambridge), FAP, FInstP(Lond)

Annette J. Dobson, BSc(Adelaide), MSc, PhD(James Cook)

R. W. Gibbard, BSc, PhD(Adelaide)

J. R. Giles, BA(Sydney), PhD; DipEd(Sydney), Thl

P. K. Snize, PromPhys, Csc, RNDr(Charles)

R. J. Vaughan, BSc, MEngSc, ME(New South Wales), PhD(Adelaide), FSS, MIE Aust, MORS

Senior Lecturers

D. W. E. Blatt, BSc(Senior), BSc, PhD(Sydney), MACS, MACM

R. B. Eggleton, BSc, MA(Melbourne), PhD(Adelaide)

W. Fliker, PromMat, CSC, RNDr(Comenius)

W. T. F. Lau, MF(New South Wales), PhD(Sydney),

D. L. S. McElwain, BSc(Scotland), PhD(York (Canada)), MACS

T. K. Sheng, BA(Meric College), BSc(Malaya & London), PhD(Malaya)

Lecturers

C. J. Ashman, BA, LitB(New England), PhD

B. Bresford-Smith, BSc, PhD(ANU)

R. F. Berghout, MSc(Sydney)

J. G. Couper, BSc, PhD(New England)

M. J. Hayes, BA(Cambridge)

Simon, BSc, BA(James Cook), DipCompSc, MMath

G. W. Southern, BA(New South Wales), M.Math., DipCompSc

W. Summefield, BSc(Adelaide), PhD(Flinders)

W. P. Wood, BSc, PhD(New South Wales), FRAS

Professor Emeritus

R. G. Keats, BSc, PhD(Adelaide), DMath(Waterloo), FIMA, FASA, MACS

Honorary Associate

L. L. Rosc, BF(Sydney), PhD(New South Wales)

Computer Programmers

C. S. Hoskins, BMath, PhD

A. Nyqrner, BMath, DipCompSc

Departmental Office Staff

Cath Claydon

Jeanette Dennis

Jan Garnsey, BA(Sydney)

Vicky Piller

Ros Adams

Students are invited to discuss their interests in a particular branch of mathematics with members of the Department who are working in that branch. The appropriate staff members for each branch may be determined by reference to the section entitled "Research in the Department of Mathematics" p. 121.
A GUIDE TO STUDENTS ENROLLING IN THE COURSE LEADING TO THE
DEGREE OF BACHELOR OF MATHEMATICS

1. Students are advised that although the minimum assumed knowledge for
Mathematics I is 2 units of Mathematics at the Higher School Certificate,
nevertheless students who have less than 3 units of preparation will usually find
themselves seriously disadvantaged.

2. The requirements for the degree allow for up to four of the nine subjects to be
chosen from the subjects offered in other degree courses. Subjects which have been
approved in the past are listed below.

Part I

| Accounting | Geology 1 |
| Biology 1  | German I or I1 |
| Chemistry 1| Greek 1 |
| Classical Civilisation I | History 1 |
| Drama 1    | Japanese 1 |
| Economics I | Latin 1 |
| English 1  | Legal Studies I |
| French I or IS | Linguistics I |
| Geography I | Philosophy I |
| Physics IA or IB | Psychology I |
| Sanskrit I  | Sociology I |

Part II

| Biology IIA, IIB & I1IA |
| Chemistry IIA |
| Classical Civilisation IIA |
| Economics IIA & IIB |
| Education IIA |
| Electronics & Instrumentation IIA |
| English IIA |
| French IIA, IIB & I1IB |
| Geology IIA, IIB & I1IB |
| German IIA, IIB & I1IB |
| History IIA, IIB & I1IC |
| Japanese IIA |
| Legal Studies IIA |
| Philosophy IIA & I1B |
| Physics IIA |
| Psychology IIA & I1B |

3. Enrolment in the following subjects is restricted as indicated below.
Economics IIA — Students should also include the Part II Mathematics Topic I, Probability and Statistics, in their course.
Economics IIB — This subject would not normally be included in the Bachelor of
Mathematics course. However if permission is given to include this subject then
the content should be discussed with the Dean.
A student may not include both Physics IA and Physics IB in his course.

4. Permission will normally be given for the inclusion in a student's course of subjects
which are prerequisites or corequisites of subjects appearing in the schedules.

REVIEW OF ACADEMIC PROGRESS IN THE FACULTY OF MATHEMATICS

Acting under the Regulations Governing Unsatisfactory Progress, as set out in
Volume I of the Calendar, the Faculty Board will review:

(1) all full-time students who have failed to pass at least four subjects at the end of the
second year of attendance;
(2) all part-time students who have failed to pass at least four subjects at the end of the
fourth year of attendance;
(3) all students who have failed to pass at least four subjects after one full-time and two
part-time years;
(4) all students, whether part-time or full-time, who in their first year of attendance
have a record of complete failure; and
(5) all students who fail a compulsory subject twice,
and may take action under the Regulations.

Unless there are mitigating circumstances, a student who fails any elective subject twice
may not be permitted to enrol again in that subject.
Prerequisites for Diploma in Education Units

Students in the Faculty of Mathematics who are intending to study for the postgraduate Diploma in Education may be interested in the following prerequisite subjects for that Diploma.

These prerequisites are stated in terms of passes in subjects of the University of Newcastle. Applicants with qualifications from other universities, and those who finished a Newcastle course recently whose courses of study have included subjects which are deemed for this purpose to provide an equivalent foundation, may be admitted to candidature by the Dean of the Faculty of Education on the recommendation of the Head of the Department of Education.

In the Diploma course, the Problems in Teaching and Learning units are grouped as follows:

(a) Secondary
- English
- History
- Social Sciences (Geography, Commerce)
- Modern Languages (French, German)
- Mathematics
- Science

(b) Primary

Prerequisites

For secondary methods a Part II subject in the main teaching area and a Part I subject in another teaching area.

For primary method at least a Part II subject in one secondary teaching area and a Part I subject in another secondary teaching area.

Note

A Part II subject assumes as a prerequisite a pass in a Part I subject in the same discipline. A Part III subject assumes a pass in a Part I subject and a Part II subject in the same discipline.

Mathematics Education Subjects

Candidates for the degree of Bachelor of Mathematics intending a career in teaching may wish to include professional studies related directly to teaching in addition to, and concurrently with, the normal course of study in the second and third years by enrolling in Mathematics Education II and Mathematics Education III, the contents of which are set out below.

Mathematics Education II

Prerequisite: Mathematics I

Pre- or Corequisite: A Part II Mathematics subject

Hours: 1 lecture hour per week and two 5-day schoolroom observation periods

Examination: One 2-hour paper

Content

Learning mechanisms, stages of development as delineated by Piaget and others, discovery method and its limitations, Bruner model, and multiple embodiment principle; these topics are central to understanding the learning process and the conditions which make learning possible. Equivalence and equality, consistency and meaning in mathematical definitions, sets and intellectualism in mathematics, finite and categorical geometries; these topics are chosen to illuminate the rationale for teaching mathematics and the problem of developing strategies for teaching school mathematics, particularly in the light of the rapid development of mathematics since the seventeenth century. Psychopathological aspects of arithmetic, pedagogical problems associated with geometries, imagery and problem solving; these and other topics bear on how much in the way of new concepts pupils can be expected to absorb at various levels.

Mathematics Education III

Prerequisite: Mathematics Education II

Pre- or Corequisite: A Part III Mathematics subject or Statistics III

Hours: 1 lecture hour per week and two 5-day schoolroom observation periods

Examination: One 2-hour paper

Content

Building on the foundation laid in Mathematics Education II, a more thorough study is made of the psychology of learning, limits on the ability to learn and the development of teaching strategies in mathematics. Assignments will require students to articulate mathematical insights they are acquiring concurrently in the academic mathematics topics. The integration of mathematical ideas from different topics will be emphasized, as this is required for effective teaching. In the observation periods, lesson plans will be studied and compared with the results in the classroom.

REGULATIONS GOVERNING THE DEGREE OF BACHELOR OF MATHEMATICS

Part I — General

1. These Regulations prescribe the requirements for the degree of Bachelor of Mathematics of the University of Newcastle and are made in accordance with the powers vested in the Council under By-Law 5.2.1.

Definitions

2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
   - "course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
   - "Dean" means the Dean of the Faculty;
   - "the degree" means the degree of Bachelor of Mathematics;
   - "Department" means the Department offering a particular subject and includes any other body so doing;
   - "Faculty" means the Faculty of Mathematics;
   - "Faculty Board" means the Faculty Board of the Faculty;
   - "subject" means any part of the course for which a result may be recorded, provided that for the purpose of these Regulations, each of the following shall count as one subject notwithstanding that a result may be recorded for each part, namely: Mathematics IIB Part I together with Mathematics IIB Part II;
   - Computer Science I Part I together with Computer Science I Part II.

Grading of Degree

3. The degree may be conferred either as an ordinary degree or as an honours degree,
Withdrawal
4. (1) A candidate may withdraw from a subject or the course only by informing the Secretary to the University in writing and the withdrawal shall take effect from the date of such notification.

(2) A candidate who withdraws from a subject after the last Monday in second term shall be deemed to have failed in the subject save that, after consulting with the Head of Department, the Dean may grant permission for withdrawal without penalty.

Prerequisites and Corequisites
5. (1) Except with the permission of the Faculty Board granted after considering any recommendation made by the Head of the Department, no candidate may enrol in a subject unless that candidate has passed any subjects prescribed as its prerequisites at any grade which may be specified and has already passed or concurrently enrols in or is already enrolled in any subjects prescribed as its corequisites.

(2) A candidate obtaining a Terminating Pass in a subject shall be deemed not to have passed that subject for prerequisite purposes.

Subject
6. (1) To complete a subject a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written work or other work as the Department shall require.

(2) To pass a subject a candidate shall complete it and pass such examinations as the Faculty Board shall require.

Relaxing Provision
7. In order to provide for exceptional circumstances arising in a particular case the Senate on the recommendation of the Faculty Board may relax any provision of these Regulations.

Part II — The Ordinary Degree

Enrolment
8. (1) A candidate’s enrolment in any year must be approved by the Dean or the Dean’s nominee.

(2) A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the timetable for that year.

(3) Except with the permission of the Dean given only if satisfied that the academic merit of the candidate so warrants:

   (a) a candidate shall not enrol in more than four subjects in any one academic year;

   (b) a candidate enrolling in four subjects in any one academic year shall not enrol in a Part III subject and not more than one Part II subject in that year; and

   (c) a candidate enrolling in three subjects in any one academic year shall not enrol in more than two Part III subjects in that year.

Qualification for Admission to the Degree
9. To qualify for admission to the ordinary degree a candidate shall pass nine subjects presented in accordance with the provision of Regulation 12 of these Regulations.

Standing
10. The Faculty Board may grant standing under the following conditions:

(a) a candidate may be granted standing in recognition of work completed in another tertiary institution or Faculty, provided that:

   (i) the subjects for which credit is given shall have a reasonable correspondence with those offered in the Faculty;

   (ii) an undergraduate of another tertiary institution shall not receive credit for more than four subjects;

   (iii) a graduate or diplomate of another tertiary institution or Faculty shall not receive credit for more than four subjects and if granted credit may not include as a qualifying subject any subject equivalent to one counted towards his/her previous qualification.

(b) Notwithstanding the provision of sub-Regulation (a)(i) above, a graduate or undergraduate of another tertiary institution may be given credit for subjects not offered for the degree of Bachelor of Mathematics in the University of Newcastle provided that:

   (i) the candidate complies with all other conditions of the Regulations;

   (ii) the candidate has his/her proposed pattern of course approved at the time at which the concession is granted and does not depart from the proposed pattern without the approval of the Dean.

Choice of Subjects
11. (1) A candidate shall select at least five subjects from the Schedules of Subjects and shall comply with the rules relating to the selection of subjects as set out in the Schedules.

(2) Up to four subjects from those offered in other degree courses in the University may, with the permission of the Dean, be counted as qualifying subjects for the degree. When approving a subject, the Dean shall determine whether the subject concerned shall be classified as Part I, Part II or Part III.

Degree Pattern
12. (1) To qualify for the degree of Bachelor of Mathematics, a candidate shall pass nine subjects, including either:

   Mathematics I, Mathematics II, Mathematics III, Mathematics IIA, and either Mathematics IIB or one Part III subject from Schedule B of the Schedule of Subjects; or Mathematics I, Mathematics IIA, Mathematics IIC, Computer Science I, Computer Science II, Computer Science III and Statistics III.

(2) To qualify for the degree of Bachelor of Mathematics with Computer Science, a candidate shall pass nine subjects including:

   Mathematics I, Mathematics II, Mathematics IIC, Mathematics IIA, Computer Science I, Computer Science II and Computer Science III.

(3) To qualify for the degree of Bachelor of Mathematics with Statistics, a candidate shall pass nine subjects including:

   Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIA and Statistics III.

Results
13. The result obtained by a successful candidate in a subject shall be: Terminating Pass, Ungraded Pass, Pass, Credit, Distinction, or High Distinction.

Time Requirements
14. Except with the special permission of the Faculty Board, a candidate shall complete the requirements for the ordinary degree within nine calendar years of the commencement of the degree course. A candidate who has been granted standing in
recognition of work completed elsewhere shall be deemed to have commenced the degree course from a date to be determined by the Dean.

Part III -- The Honours Degree

Admission to Candidature
15. In order to be admitted to candidature for the honours degree an applicant shall:
(a) have completed the requirements for admission to the ordinary degree;
(b) have completed any additional work prescribed by the Head of each Department concerned;
(c) have satisfactorily completed the prerequisites prescribed in one of the Schedules of Subjects for a Part IV subject;
(d) have obtained the approval of the Head of each Department concerned.

Qualification for Admission to the Degree
16. To qualify for admission to the Honours degree a candidate shall in one year of full-time study or two years of part-time study pass one of the Part IV subjects listed in the Schedules of Subjects.

Classes of Honours
17. There shall be three classes of honours: Class I, Class II and Class III. Class II shall have two divisions, namely Division I and Division 2.

Time Requirements
18. (1) Except with the special permission of the Faculty Board a candidate for Honours shall complete the requirements within five years from the commencement of the degree course (not counting years for which leave of absence has been granted) provided that for a part-time student, the corresponding period shall be seven years.

(2) A candidate who has been given standing in recognition of work completed elsewhere shall be deemed to have commenced the degree course from a date determined by the Dean.

Part IV -- Combined Degree Courses

General
19. A candidate may complete the requirements for the degree in conjunction with another Bachelor's degree by completing a combined degree course approved by the Faculty Board and also the Faculty Board of the Faculty offering that other Bachelor's degree.

20. Admission to a combined degree course:
(a) shall be subject to the approval of the Deans of the two Faculties;
(b) shall, except in exceptional circumstances be at the end of the candidate's first year of enrolment for the ordinary degree; and
(c) shall be restricted to candidates with an average of at least credit level and who have passed Mathematics I at a level deemed satisfactory by the Dean.

21. The work undertaken by a candidate in a combined degree course shall be no less in quantity and quality than if the two courses were taken separately as shall be certified by the Deans of the two Faculties.

22. To qualify for admission to the two degrees a candidate shall satisfy the requirements for both degrees except as provided in Regulations 23 to 28 of these Regulations.

Arts/ Mathematics
23. (1) To qualify for admission to the ordinary degrees of Bachelor of Arts and Bachelor of Mathematics, a candidate shall pass fourteen subjects as follows:
(a) four subjects, being Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
(b) one subject from the following, namely Mathematics II B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
(c) nine other subjects chosen from the subjects listed in the Schedule of Subjects approved for the degree of Bachelor of Arts.

(2) The following restrictions shall apply to a candidate's choice of subjects, namely:
(a) not more than three subjects from Group I of the Schedule of Subjects approved for the degree of Bachelor of Arts may be counted;
(b) not more than five Part I subjects may be counted;
(c) at least three subjects shall be Part III subjects;
(d) a candidate counting Psychology II C shall not be entitled to count either Psychology II A or II B;
(e) a candidate counting Psychology II C shall not be entitled to count either Psychology II A or Psychology II B;
(f) a candidate counting Economics II C shall not be entitled to count either Economics II A or Economics II B;
(g) a candidate counting Geology II C shall not be entitled to count either Geology II A or Geology II B.

Mathematics/ Science
24. (1) To qualify for admission to the ordinary degrees of Bachelor of Mathematics and Bachelor of Science, a candidate shall pass fourteen subjects as follows:
(a) four subjects, being Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
(b) one subject from the following, namely Mathematics II B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
(c) six subjects chosen from the other subjects listed in the Schedule of Subjects approved for the degree of Bachelor of Science; and
(d) three subjects, chosen with the approval of the Deans of the Faculties of Mathematics and Science, from the subjects approved for any of the degree courses offered by the University.

(2) The following restrictions shall apply to a candidate's choice of subjects, namely:
(a) the number of Part I subjects shall not exceed six;
(b) the minimum number of Part III subjects shall be three;
(c) a candidate counting Psychology II C shall not be entitled to count either Psychology II A or Psychology II B;
(d) a candidate counting Psychology II C shall not be entitled to count either Psychology II A or Psychology II B;
(e) a candidate counting Economics II C shall not be entitled to count either Economics II A or Economics II B;
(f) a candidate counting Geology II C shall not be entitled to count Geology II A or Geology II B.
Mathematics/Metallurgy

25. To qualify for admission to the ordinary degrees of Bachelor of Mathematics and Bachelor of Metallurgy, a candidate shall pass:
   (a) Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
   (b) one subject from the following, namely Mathematics III B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
   (c) other subjects selected from the programme of subjects approved for the degree of Bachelor of Metallurgy totalling a minimum of 48 units as calculated for that degree.

Mathematics/Commerce

26. To qualify for admission to the ordinary degrees of Bachelor of Commerce and Bachelor of Mathematics, a candidate shall pass seventeen subjects as follows:
   (a) four subjects, being Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
   (b) one subject from the following, namely Mathematics III B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
   (c) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Commerce.

Mathematics/Engineering

27. To qualify for admission to the degree of Bachelor of Engineering and the ordinary degree of Bachelor of Mathematics, a candidate shall pass:
   (a) Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
   (b) one subject from the following, namely Mathematics III B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
   (c) other subjects selected from the programme of subjects approved for the degree of Bachelor of Engineering (Mechanical), Bachelor of Engineering (Electrical), Bachelor of Engineering (Chemical), Bachelor of Engineering (Civil) or Bachelor of Engineering (Computer), totalling a minimum of 48 units as calculated for those degrees.

Mathematics/Economics

28. To qualify for admission to the ordinary degree of Bachelor of Economics and Bachelor of Mathematics, a candidate shall pass seventeen subjects as follows:
   (a) four subjects, being Mathematics I, Mathematics II A, Mathematics II C and Mathematics III A;
   (b) one subject from the following, namely Mathematics III B, Computer Science III, Statistics III or a Part III subject chosen from the Schedules of Subjects approved for the degree of Bachelor of Mathematics; and
   (c) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Economics.

SCHEDULE A

Mathematics Subjects

Remarks including Prerequisites and Corequisites

It is assumed that students have studied Higher School Certificate Mathematics at the two-unit level or higher

Prerequisite Mathematics I

Pre-requisite Mathematics I

Prerequisite Mathematics II A

Pre-requisite Mathematics III A

Prerequisites Mathematics IIA & Mathematics III C

Pre-requisites Mathematics IIA & Mathematics III C

Computer Science Subjects

Remarks including Prerequisites and Corequisites

Corequisite Mathematics I

Prerequisite Mathematics I

The Dean may permit a candidate to take this subject in two parts. These parts would normally be

Part I — Topics SI and SP

Part II — Topics F and ML

Prerequisites Computer Science II, Mathematics II A & Mathematics II C

Prerequisites Computer Science II and one of Mathematics III A or Statistics III

Statistics Subject

Prerequisites Mathematics IIA & Mathematics II C

(including Topics CO, II & I)
NOTES ON COMBINED DEGREE COURSES

ARTS/MATHEMATICS
The details for the combined course follow simply from the Requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects less four subjects for which standing may be given, thus the combined degree should contain 14 subjects. The Bachelor of Mathematics requires Mathematics I, Mathematics II, Mathematics IIIA, Mathematics IIIB, and Computer Science III. Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics. This leaves nine subjects which must clearly satisfy the Requirements for the Arts degree.

The course could be pursued in the following manner:

Year I  Mathematics I and three other Part I subjects,
Year II  three Part II subjects including Mathematics II and Mathematics IIIC and another subject which should be a Part I or Part II subject approved for the degree of Bachelor of Arts,
Year III  Mathematics IIIA plus two other subjects which must include at least one Part III subject,
Year IV  either Mathematics IIIB, Computer Science III, Statistics III or a Schedule B subject from the Requirements for Bachelor of Mathematics plus two other subjects which will complete the Requirements for the Arts degree.

COMMERCE/MATHEMATICS
The details of the combined course in Commerce and Mathematics follow from the Requirements for each degree. The combined course should contain Mathematics I, Mathematics II, Mathematics IIIA, Mathematics IIIB, Computer Science III, Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics. This leaves twelve subjects which must clearly satisfy the Requirements for the Commerce degree. The course could be pursued in the following manner:

Year I  Mathematics I
Introductory Quantitative Methods
Economics I
Accounting I

Year II  Mathematics II
Mathematics IIC
One B.Com. subject

Year III  Mathematics IIIA
Three B.Com. subjects

Year IV  Mathematics IIIB, Computer Science III, Statistics III or a Part III Schedule B subject from the Requirements for Bachelor of Mathematics
Two B.Com. subjects

Year V  Three B.Com. subjects.

ECONOMICS/MATHEMATICS
The details of the combined course in Mathematics and Economics follow simply from the Requirements for each degree. The combined degree course should contain Mathematics I, Mathematics II, Mathematics IIIA, Mathematics IIIB, and Computer Science III, Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics, and all the subjects satisfying the Requirements for the degree of Bachelor of Economics. The course could be pursued in the following manner:

Year I  Mathematics I
Introductory Quantitative Methods
Economics I
One B.Ec. subject

Year II  Mathematics II
Mathematics IIC
One B.Ec. subject
Year III
Mathematics IIIA
Economics II
Two B.Ec. subjects

Year IV
Two B.Ec. subjects

Year V
Three B.Ec. subjects

ENGINEERING MATHEMATICS

The details of the combined course in Mathematics and Engineering follow simply from the Requirements for each degree. The combined degree course should contain Mathematics I, Mathematics II A, Mathematics II C, Mathematics IIIA and one of Mathematics III B, Computer Science III, Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics, and all subjects satisfying the Requirements for the degree of Bachelor of Engineering.

The course could be pursued in the following manner:

(i) B.E./B.Math in Chemical Engineering

Year I
ChE141 Industrial Process Principles
ChE151 Industrial Chemical Processes & Equipment
ChE152 Industrial Process Design I
GE151 Introduction to Materials Science
Chemistry I
Mathematics I
Physics IA

Year II
Mathematics II A
Mathematics II C
ChE261 Separation Processes I
GE206 Computational Methods I
GE207 Computational Methods II
ChE241 Process Analysis I
Chemistry II C

Year III
Mathematics IIIA
ChE251 Structures & Pressure Vessel Design
ChE271 Fuels & Combustion
ChE272 Fluid Mechanics
ChE391 Laboratory
ChE361 Separation Processes II

Year IV
Kinetics & Thermodynamics
ChE391 Laboratory
ChE362 Solids Handling & Minerals Processing
ChE354 Electrochemistry & Corrosion
ChE351 Equipment Design
ChE342 Process Analysis II
ChE381 Computations
ChE382 Process Dynamics
ChE352 Process Engineering
ChE353 Process Economics
Part III Subject from B.Math. Schedule of Subjects

Year V
ChE462 Environmental Control
ChE471 Industrial Safety
ChE472 Transport Phenomena
ChE482 Process Control
ChE483 Reaction Engineering
ChE497 Design Project
ChE491 Seminar
ChE496 Research Project
Electives — 2 units

(ii) B.E./B.Math. in Civil Engineering

Year I
CE111 Statics
ME111 Graphics & Engineering Drawing
GE112 Introduction to Engineering Design
ME131 Dynamics
GE151 Introduction to Materials Science
EE131 Circuit Fundamentals
Mathematics I
Physics IA
CE171 Engineering Surveying I

Year II
Mathematics II A
Chemistry IS
CE212 Mechanics of Solids I
CE213 Mechanics of Solids II
CE223J Engineering Geology
CE224 Civil Engineering Materials
CE231 Fluid Mechanics I
CE232 Fluid Mechanics II
GE204 Engineering Computations I
GE205 Engineering Computations II
ME223 Engineering Technology

Year III
Mathematics II C
CE314 Structural Analysis I
CE315 Structural Design I
CE324 Soil Mechanics
CE333 Fluid Mechanics III
CE334 Fluid Mechanics IV
CE341 Water Resources Engineering I
CE342 Water Resources Engineering II
GE350 Seminar
GE211 Theory & Applications of Electrical Energy Conversion

Year IV
Mathematics IIIA
CE351 Civil Engineering Systems I
CE372 Transportation Engineering
CF425 Earth & Rock Engineering
CE452 Engineering Construction
Structures Elective

Year V
Mathematics IIIB or a Part III subject from the Schedules of Subjects for B.Math.
CE453 Project
Departmental Elective

(iii) B.E./B.Math. in Computer Engineering

Year I
Year I is similar for all combined courses involving the Computer Engineering specialty and consists of the following subjects:
CE111 Statics
EE131 Circuit Fundamentals
EE161 Introduction to Computer Technology
ME111 Graphics and Engineering Drawing
ME131 Dynamics
Mathematics I
Physics IA
Chemistry IS
<table>
<thead>
<tr>
<th>Year II</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE211</td>
<td>Energy Conversion</td>
</tr>
<tr>
<td>EE221</td>
<td>Semiconductor Devices</td>
</tr>
<tr>
<td>EE232</td>
<td>Electrical Circuits</td>
</tr>
<tr>
<td>EE262</td>
<td>Systematic Programming</td>
</tr>
<tr>
<td>EE264</td>
<td>Introduction to Computer Architecture &amp; Assembly Language</td>
</tr>
<tr>
<td>PI221</td>
<td>Electromagnetics &amp; Quantum Mechanics</td>
</tr>
<tr>
<td>Mathematics IIA</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year III</th>
<th>Mathematics IIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part III Subject from B.Math. Schedule of Subjects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year IV</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE263</td>
<td>Introduction to Structuring of Info.</td>
</tr>
<tr>
<td>EE323</td>
<td>Linear Electronics I</td>
</tr>
<tr>
<td>EE324</td>
<td>Linear Electronics II</td>
</tr>
<tr>
<td>EE326</td>
<td>Digital Design and Technology</td>
</tr>
<tr>
<td>EE333</td>
<td>Advanced Circuit Analysis</td>
</tr>
<tr>
<td>EE344</td>
<td>Communications</td>
</tr>
<tr>
<td>EE345</td>
<td>Digital Signal Processing</td>
</tr>
<tr>
<td>EE362</td>
<td>Switching Theory and Logic Design</td>
</tr>
<tr>
<td>GE360</td>
<td>Automatic Control</td>
</tr>
<tr>
<td>GE325</td>
<td>Microprocessor Systems and Applications</td>
</tr>
<tr>
<td></td>
<td>4 Units of electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year V</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE421</td>
<td>Electronic Design A</td>
</tr>
<tr>
<td>EE422</td>
<td>Electronic Design B</td>
</tr>
<tr>
<td>EE426</td>
<td>Advanced Digital Systems</td>
</tr>
<tr>
<td>EE463</td>
<td>Computer Operating Systems</td>
</tr>
<tr>
<td>EE464</td>
<td>Compiler Construction</td>
</tr>
<tr>
<td>EE486</td>
<td>Project Seminar</td>
</tr>
<tr>
<td>EE481</td>
<td>Project OR 2 EE300/400/500 Units</td>
</tr>
<tr>
<td></td>
<td>4 Units from List I</td>
</tr>
<tr>
<td></td>
<td>1 Unit or Elective</td>
</tr>
</tbody>
</table>

| (iv) B.E./B.Math. in Electrical Engineering |
| Year I      | Mathematics I                               |
|             | Physics I                                   |
|             | Chemistry IS                                |
|             | CE111 Static                                |
|             | EE131 Circuit Fundamentals                  |
|             | EE161 Introduction to Computer Technology    |
|             | ME111 Graphics & Engineering Drawing        |
|             | ME131 Dynamics                              |
| Year II     | Mathematics IIA                              |
|             | EE211 Energy Conversion                      |
|             | EE221 Semiconductor Devices                  |
|             | EE232 Electrical Circuits                    |
|             | EE262 Systematic Programming                 |
|             | EE264 Introduction to Computer Architecture & Assembly Language |
|             | PI221 Electromagnetics & Quantum Mechanics   |
| Mathematics IIA |
| Mathematics IIC |

<table>
<thead>
<tr>
<th>Year III</th>
<th>Mathematics IIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIB or a Part III subject from the Schedule of Subjects for B.Math.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year IV</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE313</td>
<td>Power Systems</td>
</tr>
<tr>
<td>EE314</td>
<td>Electrical Machines</td>
</tr>
<tr>
<td>EE315</td>
<td>Power Electronics</td>
</tr>
<tr>
<td>EE332</td>
<td>Linear Electronics I</td>
</tr>
<tr>
<td>EE324</td>
<td>Linear Electronics II</td>
</tr>
<tr>
<td>EE326</td>
<td>Digital Design and Technology</td>
</tr>
<tr>
<td>EE333</td>
<td>Advanced Circuit Analysis</td>
</tr>
<tr>
<td>GE360</td>
<td>Automatic Control</td>
</tr>
<tr>
<td>EE362</td>
<td>Switching Theory &amp; Logic Design</td>
</tr>
<tr>
<td></td>
<td>1 unit of elective</td>
</tr>
<tr>
<td></td>
<td>4 units of electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year V</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE421</td>
<td>Electronics Design A</td>
</tr>
<tr>
<td>EE451</td>
<td>Electromagnetic Propagation &amp; Antennas</td>
</tr>
<tr>
<td>EE486</td>
<td>Project Seminar</td>
</tr>
<tr>
<td></td>
<td>7 units from EE300, 400 subjects</td>
</tr>
</tbody>
</table>

| (v) B.E./B.Math. in Industrial Engineering |
| Year I      | Mathematics I                               |
|             | Physics I                                   |
|             | Chemistry IS                                |
|             | CE111 Static                                |
|             | GE151 Introduction to Materials Science      |
|             | GE112 Introduction to Engineering Design     |
|             | ME111 Graphics & Engineering Drawing        |
|             | ME231 Dynamics                              |
|             | ME223 Engineering Technology                |
| Year II     | Mathematics IIA                              |
|             | EE311 Circuit Fundamentals                   |
|             | ME201 Experimental Methods I                 |
|             | ME202 Dynamics of Engineering Systems        |
|             | ME203 Experimental Methods II                |
|             | ME214 Mechanics of Solids I                 |
|             | ME241 Properties of Materials I              |
|             | ME251 Fluid Mechanics I                      |
|             | ME271 Thermodynamics I                       |
| Year III    | Mathematics IIA                              |
|             | EE211 Theory & Applications of Electrical Energy Conversion |
|             | ME212 Engineering Design I                   |
|             | ME232 Dynamics of Machines I                 |
|             | GE304 Engineering Computations I             |
|             | GE205 Engineering Computations II            |
|             | ME343 Mechanics of Solids II                |
|             | GE360 Automatic Control                      |
| Year IV     | Mathematics IIB or Part III subject from Schedule of Subjects for B.Math. |
|             | ME312 Engineering Design II                  |
|             | ME333 Dynamics of Machines II                |
|             | ME381 Methods Engineering                    |
|             | ME482 Engineering Economics I                |
|             | ME383 Quality Engineering                    |
|             | ME483 Production Engineering                 |
The combined degree requires 18 subjects less four subjects so the combined degree requires 14 subjects for which standing may be given, thus the combined degree should contain 14 subjects. The Bachelor of Mathematics requires Mathematics I, Mathematics II A, Mathematics III A and one of Mathematics III B, Computer Science III, Statistics III or a Part III subject from Schedule B of the Requirements. This leaves nine subjects which must clearly satisfy the Requirements for the Science degree. The course could be pursued in the following manner:

**Year I**
- Mathematics I
- Physics I A
- Chemistry I S
- GE111 Statics
- GE151 Introduction to Materials Science
- GE112 Introduction to Engineering Design
- ME221 Engineering Technology
- ME131 Dynamics
- ME111 Graphics & Engineering Drawing

**Mathematics / Science**

The details for the combined course follow simply from the Requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects less four subjects for which standing may be given, thus the combined degree should contain 14 subjects.
REGULATIONS GOVERNING THE DIPLOMA IN
COMPUTER SCIENCE

1. These Regulations prescribe the requirements for the Diploma in Computer Science of the University of Newcastle and are made in accordance with the powers vested in the Council under By-law 5.2.1.

2. In these Regulations unless the context or subject matter otherwise indicates or requires:
   “Board” means the Board of Studies in Computer Science;
   “Dean” means the Dean of the Faculty of Mathematics;
   “Diploma” means the Diploma in Computer Science;
   “Faculty Board” means the Faculty Board of the Faculty of Mathematics;
   “subject” means any part of a candidate’s programme of studies for which a result may be recorded.

3. The Diploma shall be awarded in two grades, namely: Diploma in Computer Science with merit and Diploma in Computer Science.

4. An applicant for admission to candidacy for the Diploma shall:
   (a) have satisfied all the requirements for admission to a degree of the University of Newcastle, or to a degree of any other tertiary institution approved for this purpose by the Board; or
   (b) have other qualifications approved for this purpose by the Senate on the recommendation of the Faculty Board.

5. (1) Notwithstanding the provisions of Regulation 4(a), a student with not more than the equivalent of one year of full-time studies remaining to qualify for a degree may be permitted to enrol as a part-time student for the Diploma with such programme as the Board may approve on the recommendation of the Dean. Before making any recommendations the Dean shall seek the agreement of the Heads of the Departments offering the subjects in which the student proposes to enrol and of the Dean of any other Faculty responsible for the degree course in which the student is enrolled.

   (2) In no case will a Diploma be awarded until the requirements for the degree have been satisfied.

6. The Board may require a candidate to complete work and/or examinations in addition to the programme referred to in Regulation 7 if, in its opinion, the candidate has not reached the assumed standard of attainment on which the content of any of the subjects for the Diploma is based.

7. (1) To qualify for the Diploma, a candidate shall, in not less than two years of part-time study or one year of full-time study, pass a programme of subjects approved by the Board totalling not less than eleven units.

   (2) The programme shall consist of:
      (a) the subjects listed in the Schedule; and
      (b) subjects chosen from those approved by the Board designated either Group A or Group B. A candidate’s programme may not include more than two subjects from Group B.

   (3) The Board may approve a Project for inclusion in the candidate’s programme. Such a Project shall count as a Group B subject with a unit value of not more than two.

8. A candidate may be granted standing by the Board for work completed in this University or in another tertiary institution approved for this purpose by the Board. Such standing shall not be given for more than half of the unit total of the programme nor for work on the basis of which a degree or diploma has already been conferred or awarded or for conferment or award.

9. (1) To complete a subject a candidate shall attend such lectures, tutorials, seminars and laboratory classes and submit such written work as the Board may require.

   (2) To pass a subject a candidate shall complete it and pass such examinations as the Board may require.

10. (1) A candidate may withdraw from enrolment in a subject or the Diploma only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification.

    (2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty. The relevant date shall be:
        (a) in the case of any subject offered in the first half of the academic year — the last Monday of First Term;
        (b) in the case of any subject offered in the second half of the academic year — the last Monday of Third Term;
        (c) in the case of any other subject — the last Monday of Second Term.

11. In order to provide for exceptional circumstances arising in particular cases, the Senate, on the recommendation of the Faculty Board, may relax any provision of these Regulations.

SCHEDULE OF SUBJECTS

Core Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS — Commercial Programming</td>
<td>Management</td>
<td>Mathematics I, Top Sc, or Commercial Electronic Data Processing</td>
<td>1</td>
</tr>
<tr>
<td>CS — Introduction to Computer Architecture &amp; Assembly Language</td>
<td>Electrical &amp; Computer Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS — Switching Theory &amp; Logical Design</td>
<td>Electrical &amp; Computer Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS — Programming &amp; Algorithms</td>
<td>Mathematics, Statistics &amp; Computer Science</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
</tbody>
</table>
2. In these Regulations unless the context or subject matter otherwise indicates or requires:

- "Dean" means the Dean of the Faculty of Mathematics;
- "Diploma" means the Diploma in Mathematical Studies;
- "Faculty Board" means the Faculty Board of the Faculty of Mathematics;
- "Subject" means any part of a candidate's programme of studies for which a result may be recorded.

3. The Diploma shall be awarded in two grades, Diploma in Mathematical Studies with Merit or Diploma in Mathematical Studies.

4. An applicant for admission to candidature for the Diploma shall:
   (a) have satisfied all the Requirements for admission to a degree of the University of Newcastle, or to a degree of any other tertiary institution approved for this purpose by the Faculty Board; or
   (b) in exceptional circumstances have other qualifications approved for this purpose by the Faculty Board.

5. The Faculty Board will appoint an adviser for each candidate.

6. (1) To qualify for the Diploma, a candidate shall, in not less than 2 years of part-time study or 1 year of full-time study, pass a programme of subjects comprising 12 units of advanced work.*
   (2) The programme shall consist of subjects offered by the Department of Mathematics, Statistics and Computer Science or another Department offering courses with considerable mathematical content.
   (3) The Faculty Board may approve a Project for inclusion in the candidate's programme, such a programme shall have a unit value of 2.

7. A candidate may be granted standing by the Faculty Board for work completed in this University or in another tertiary institution approved for this purpose by the Faculty Board. Such standing shall not be given for more than half of the unit total of the programme nor for work on the basis of which a degree or diploma has already been conferred or awarded or approved for conferment or award.

8. (1) To complete a subject a candidate shall attend such lectures, tutorials, seminars and laboratory classes and submit such written work as the Faculty Board may require.
   (2) To pass a subject a candidate shall complete it and pass such examinations as the Faculty Board may require.

9. (1) A candidate may withdraw from enrolment in a subject or the Diploma only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification.
   (2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty. The relevant date shall be:
      (a) in the case of any subject offered in the first half of the academic year — the last Monday of First Term;
      (b) in the case of any subject offered in the second half of the academic year — the fourth Monday in Third Term;
      (c) in the case of any other subject — the last Monday of Second Term.

10. In order to provide for exceptional circumstances arising in particular cases, the Senate, on the recommendation of the Faculty Board, may relax any provision of these Regulations.
6. The Board may require a candidate to complete work and or examinations additional to the programme referred to in Regulation 7 if, in its opinion, he has not reached the assumed standard of attainment on which the content of any of the subjects for the diploma is based.

7. (1) To qualify for the Diploma a candidate shall, in not less than one year and not more than two years of full-time study or in not less than two years and not more than five years of part-time study, complete to the satisfaction of the Board a programme approved by the Board totalling not less than ten units.

(2) The programme shall consist of:

(a) at least two units from Schedule A (Epidemiology)
(b) at least one unit from Schedule C (Computing)
(c) at least one unit from Schedule D (Project).

(3) A candidate shall not enrol in a subject the content of which, in the opinion of the Board, is substantially equivalent to work already completed towards another degree or diploma. In such a case the Board shall prescribe an alternative subject to any listed in the Schedule.

8. A candidate may be granted standing by the Board for work completed in this University, or in another tertiary institution approved for this purpose by the Board. Such standing shall not be given for more than half the unit total of the programme nor for work on the basis of which a degree or diploma has already been conferred or awarded or approved for conferment or award.

9. (1) To complete a subject a candidate shall attend such lectures, tutorials, seminars and laboratory classes, and submit such written and other work as the Board may require.

(2) To pass a subject, a candidate shall complete it and pass such examinations as the Board may require.

(3) The result of a successful candidate in a subject shall be: Ungraded Pass, Pass, Credit, Distinction or High Distinction.

10. (1) A candidate may withdraw from a subject or the course only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date or receipt of such notification.

(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Chairman of the Board to withdraw without penalty. The relevant date shall be:

(a) in the case of any subject offered in the first half of the academic year - the last Monday in first term;
(b) in the case of any subject offered in the second half of the academic year - the fourth Monday in third term;
(c) in the case of any other subject - the last Monday in second term.

11. In order to provide for exceptional circumstances arising in particular cases, the Senate, on the recommendation of the Board, may relax any provision of these Regulations.

---

**Schedules of Subjects**

**Schedule A (Epidemiology)**

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS—Epidemiologic Methods</td>
<td>1</td>
</tr>
<tr>
<td>MS—Study Design</td>
<td>1</td>
</tr>
<tr>
<td>MS—Health Care Evaluation</td>
<td>0.5</td>
</tr>
<tr>
<td>MS—Behavioural Change</td>
<td>0.5</td>
</tr>
<tr>
<td>MS—Assessing Health Problems</td>
<td>0.5</td>
</tr>
<tr>
<td>MS—Population Research Seminar</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Schedule B (Statistics)**

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS—Biostatistics I*</td>
<td>1</td>
</tr>
<tr>
<td>MS—Biostatistics II</td>
<td>1</td>
</tr>
<tr>
<td>MS—Applied Statistics (Topic H)*</td>
<td>1</td>
</tr>
<tr>
<td>MS—Probability and Statistics (Topic I)</td>
<td>1</td>
</tr>
<tr>
<td>MS—Survey Sampling Methods (Topic SS)</td>
<td>1</td>
</tr>
<tr>
<td>MS—Regression, Design and Analysis of Experiments (Topic U)</td>
<td>1</td>
</tr>
<tr>
<td>MS—Theory of Statistics (Topic R)</td>
<td>1</td>
</tr>
<tr>
<td>MS—Demography and Survival Analysis</td>
<td>1</td>
</tr>
<tr>
<td>MS—Generalised Linear Statistical Modelling</td>
<td>1</td>
</tr>
</tbody>
</table>

* At most one of Biostatistics I and Applied Statistics (Topic H) can be counted.

**Schedule C (Computing)**

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS—Programming and Algorithms</td>
<td>1</td>
</tr>
<tr>
<td>CS—Data Structures and Programming</td>
<td>1</td>
</tr>
<tr>
<td>Systems Analysis</td>
<td>1</td>
</tr>
<tr>
<td>Systems Design</td>
<td>1</td>
</tr>
</tbody>
</table>

**Schedule D** — Project worth at least one unit.

**Regulations Governing Masters Degrees**

**Part I — General**

1. (1) These Regulations prescribe the conditions and requirements relating to the degrees of Master of Architecture, Master of Arts, Master of Commerce, Master of Education, Master of Educational Studies, Master of Engineering, Master of Engineering Science, Master of Mathematics, Master of Psychology (Clinical), Master of Psychology (Educational), Master of Science, Master of Medical Science and Master of Scientific Studies.

(2) In these Regulations and the Schedules thereto, unless the context or subject matter otherwise indicates or requires: "Faculty Board" means the Faculty Board of the Faculty responsible for the course in which a person is enrolled or is proposing to enrol; "programme" means the programme of research and study prescribed in the Schedule; "Schedule" means the Schedule of these Regulations pertaining to the course in which a person is enrolled or is proposing to enrol; and "thesis" means any thesis or dissertation submitted by a candidate.

(3) These Regulations shall not apply to degrees conferred honoris causa.

(4) A degree of Master shall be conferred in one grade only.
2. An application for admission to candidature for a degree of Master shall be made on the prescribed form and lodged with the Secretary to the University by the prescribed date.

3. (1) To be eligible for admission to candidature an applicant shall:
(a) (i) have satisfied the requirements for admission to a degree of Bachelor in the University of Newcastle as specified in the Schedule6 or
(ii) have satisfied the requirements for admission to a degree or equivalent qualification, approved for the purpose by the Faculty Board, in another tertiary institution; or
(iii) have such other qualifications and experience as may be approved by the Senate on the recommendation of the Faculty Board or otherwise as may be specified in the Schedule; and
(b) have satisfied such other requirements as may be specified in the Schedule.
(2) Unless otherwise specified in the Schedule, applications for admission to candidature shall be considered by the Faculty Board which may approve or reject any application.
(3) An applicant shall not be admitted to candidature unless adequate supervision and facilities are available. Whether these are available shall be determined by the Faculty Board unless the Schedule otherwise provides.

4. To qualify for admission to a degree of Master a candidate shall enrol and satisfy the requirements of these Regulations including the Schedule.

5. The programme shall be carried out:—
(a) under the guidance of a supervisor or supervisors either appointed by the Faculty Board or as otherwise prescribed in the Schedule; or
(b) as the Faculty Board may otherwise determine.

6. Upon request by a candidate the Faculty Board may grant leave of absence from the course. Such leave shall not be taken into account in calculating the period for the programme prescribed in the Schedule.

7. (1) A candidate may withdraw from a subject or course only by informing the Secretary to the University in writing and such withdrawal shall take effect from the date of receipt of such notification.
(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty.

8. (1) If the Faculty Board is of the opinion that the candidate is not making satisfactory progress towards the degree then it may terminate the candidature or place such conditions on its continuation as it deems fit.
(2) For the purpose of assessing a candidate's progress, the Faculty Board may require any candidate to submit a report or reports on his progress.

9. In exceptional circumstances arising in a particular case, the Senate, on the recommendation of the Faculty Board, may relax any provision of these Regulations.

PART II — EXAMINATION AND RESULTS

10. The Examination Regulations approved from time to time by the Council shall apply to all examinations with respect to a degree of Master with the exception of the examination of a thesis which shall be conducted in accordance with the provisions of Regulations 12 to 16 inclusive of these Regulations.

11. The Faculty Board shall consider the results in subjects, the reports of examiners and any other recommendations prescribed in the Schedule and shall decide:
(a) to recommend to the Council that the candidate be admitted to the degree; or
(b) in a case where a thesis has been submitted, to permit the candidate to resubmit an amended thesis within twelve months of the date on which the candidate is advised of the result of the first examination or within such longer period of time as the Faculty Board may prescribe; or
(c) to require the candidate to undertake such further oral, written or practical examinations as the Faculty Board may prescribe; or
(d) not to recommend that the candidate be admitted to the degree, in which case the candidature shall be terminated.

PART III — PROVISIONS RELATING TO THESSES

12. (1) The subject of a thesis shall be approved by the Faculty Board on the recommendation of the Head of the Department in which the candidate is carrying out his research.
(2) The thesis shall not contain as its main content any work or material which has previously been submitted by the candidate for a degree in any tertiary institution unless the Faculty Board otherwise permits.

13. The candidate shall give to the Secretary to the University three months' written notice of the date he expects to submit a thesis and such notice shall be accompanied by any prescribed fee.1

14. (1) The candidate shall comply with the following provisions concerning the presentation of a thesis:
(a) the thesis shall contain an abstract of approximately 200 words describing its content;
(b) the thesis shall be typed and bound in a manner prescribed by the University;
(c) three copies of the thesis shall be submitted together with:
(i) a certificate signed by the candidate that the main content of the thesis has not been submitted by the candidate for a degree of any other tertiary institution; and

1 At present there is no fee payable.
(ii) a certificate signed by the supervisor indicating whether the candidate has completed the programme and whether the thesis is of sufficient academic merit to warrant examination; and

(iii) if the candidate so desires, any documents or published work of the candidate whether bearing on the subject of the thesis or not.

(2) The Faculty Board shall determine the course of action to be taken should the certificate of the supervisor indicate that in the opinion of the supervisor the thesis is not of sufficient academic merit to warrant examination.

15. The University shall be entitled to retain the submitted copies of the thesis, accompanying documents and published work. The University shall be free to allow the taking of photographic or xerographic copies or, subject to the provisions of the Copyright Act, 1968 (Com), may issue it in whole or any part in photocopy or microfilm or other copying medium.

16. (1) For each candidate two examiners, at least one of whom shall be an external examiner (being a person who is not a member of the staff of the University) shall be appointed either by the Faculty Board or otherwise as prescribed in the Schedule.

(2) If the examiners' reports are such that the Faculty Board is unable to make any decision pursuant to Regulation 11 of these Regulations, a third examiner shall be appointed either by the Faculty Board or otherwise as prescribed in the Schedule.

SCHEDULE 8 — MASTER OF MATHEMATICS

1. The Faculty of Mathematics shall be responsible for the course leading to the degree of Master of Mathematics.

2. To be eligible for admission to candidature an applicant shall:

(a) have satisfied all the requirements for admission to a degree of Bachelor of the University of Newcastle with honours in the area of study in which he proposes to carry out his research or to an honours degree, approved for this purpose by the Faculty Board, of another university; OR

(b) have satisfied all the requirements for admission to a degree of the University of Newcastle or to a degree, approved for this purpose by the Faculty Board, of another tertiary institution and have completed such work and sat for such examinations as the Faculty Board may have determined and have achieved a standard at least equivalent to that required for admission to a degree of bachelor with second class honours in an appropriate subject; OR

(c) in exceptional cases produce evidence of possessing such academic and professional qualifications as may be approved by the Faculty Board.

3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of:

(a) such examinations and such other work as may be prescribed by the Faculty Board; and

(b) a thesis embodying the results of an original investigation or design.

4. The programme shall be completed in not less than two years except that, in the case of a candidate who has completed the requirements for a degree of Bachelor with honours or for a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, the Faculty Board may reduce this period by up to one year.

5. A part-time candidate shall, except with the permission of the Faculty Board, which shall be given only in special circumstances:

(a) conduct the major proportion of the research or design work in the University; and

(b) take part in research seminars within the Department in which he is working.

6. Any third examiner shall be an external examiner.

DESCRIPTION OF SUBJECTS

NOTE ON SUBJECT ENTRIES

Subject outlines and reading lists are set out in a standard format to facilitate easy reference. An explanation is given below of some of the technical terms used in this Handbook.

(a) Prerequisites are subjects which must be passed before a candidate enrols in a particular subject. The only prerequisites noted for topics are any topics or subjects which must be taken before enrolling in the particular topic. To enrol in any subject which the topic may be part of, the prerequisites for that subject must still be satisfied.

Where a prerequisite is marked "(advisory)", lectures will be given on the assumption that the subject or topic has been completed as indicated.

(b) Corequisites for subjects are those which the candidate must pass before enrolment, or be taking concurrently.

Corequisites for topics are those which the candidate must take before enrolment or be taking concurrently.

(c) Examination Under examination Regulations "examination" includes mid-year examinations, assignments, tests or any other work by which the final grade of a candidate in a subject is assessed. Some attempt has been made to indicate for each subject how assessment is determined. See particularly the general statement below headed Progressive Assessment referring to Mathematics subjects.

(d) Texts are essential books recommended for purchase.

(e) References are books relevant to the subject or topic which, however, need not be purchased.

DEGREE OF BACHELOR OF MATHEMATICS

SCHEDULE A

Preliminary Notes — Department of Mathematics, Statistics and Computer Science

The Department offers and examines subjects, most being composed of topics, each single-unit topic consisting of about 27 lectures and 13 tutorials. Each of the Part I, Part II and Part III Mathematics subjects consists of the equivalent of four single-unit topics. For Mathematics I, Computer Science I, and Computer Science II, there is no choice of topics; for Mathematics II A, II B, II C, there is some choice available to students; for Mathematics III A and III B and Computer Science III there is a wider choice. Statistics III is a specified course, requiring previous topic selection in Mathematics II. No topic may be counted twice in making up distinct subjects.

In 1987 Computer Science II and in 1988 Computer Science III will be revised to take account of the introduction of Computer Science I in 1986.

Progressive Assessment

From time to time during the year students will be given assignments, tests, etc. Where a student's performance during the year has been better than that student's performance in the final examination, then the year's work will be taken into account in determining the final result. On the other hand, when a student's performance during the year has been
PART I SUBJECTS

661100 Mathematics 1

The Department offers two Part I subjects, Mathematics I and Computer Science I.

Advisory Prerequisite

Students intending to study Mathematics I are advised that although the minimum assumed knowledge for Mathematics I is 2 units of Mathematics at the Higher School Certificate, nevertheless students who have less than 3 units of preparation will usually find themselves seriously disadvantaged.

Content

The following four topics.

Text

University of Newcastle

Mathematics I Tutorial Notes

(1986)

Anton, H.

Elementary Linear Algebra 3rd edn (Wiley 1981)

Binmore, K. G.

Mathematical Analysis a straightforward approach 2nd edn (Cambridge University Press 1982)

References

See under individual topics.

Algebra


References

Bridy, W.

A Basis for Linear Algebra (Wiley 1973)

Kolman, B.

Elementary Linear Algebra (Macmillan 1977)

Lieberk"{u}hn, H.

Algebra for Scientists and Engineers (Wiley 1971)

Lipschutz, S.

Linear Algebra (Schaum 1974)

Real Analysis


References

Apostol, T.

Calculus Vol. 1 2nd edn (Blaisdell 1967)

Giles, J. R.

Real Analysis an Introductory Course (Wiley 1972)

Stein, S. K.


Calculus


References

Ayres, F.

Calculus (Schaum 1974)


Calculus and Analytical Geometry (Prentice-Hall 1982)

Stein, S. K.


Statistics & Computing

An introduction to elementary numerical analysis, computing, and statistics. Topics include finding roots, estimating integrals, handling and presenting data. Programming in Pascal starts early in the course, and students are required to compose and use effective programs and carry out laboratory work.

Note

Students intending to pursue computing studies should also obtain one of the following references for Pascal.

References for Pascal

Cooper, D. & Chancy, M.

Oh! Pascal 2nd edn (W. W. Norton & Co. 1982)

Savitch, Walter J.

Pascal, An Introduction to the Art and Science of Programming (The Benjamin/Cummings Publishing Co. Inc.)

Schneider, G. M. et al.

An Introduction to programming and Problem solving with Pascal 2nd edn (Wiley 1983)

Other References

Conte, S. D. & de Boor, C.


Hoel, P. G.

Introduction to Mathematical Statistics (Wiley 1971)

Huntsberger, O. V. & Billingsley, P.

Elements of Statistical Inference (Allyn & Bacon 1981)

661400 Computer Science I

Corequisite

Mathematics I

Hours

3 lecture hours and 3 laboratory hours per week.

Examination

Two 3-hour papers
PART II SUBJECTS

The Department offers three Part II Mathematics subjects. Students whose course restricts them to one subject must study Mathematics IIA or Mathematics IIB. The subject Mathematics IIA as a pre- or corequisite for Mathematics IIC, and IIA and IIC together a prerequisite for any Part II subjects would normally choose Mathematics IIA and IIC. (It should be noted that Computer Science III is regarded as a Part III subject in the Faculty of Mathematics.) Students taking all of the Part II subjects would study all of the topics listed below and perhaps an additional topic.

Summaries and booklists for these topics are given on page 42 et seq. of this handbook. The Department also offers (jointly with the Department of Electrical and Computer Engineering) the subject Computer Science II. No student taking this subject may choose the Mathematics Topic F as a component of another Part II subject. A description and course outline of Computer Science II will be found on page 38 et seq.

When selecting topics for Part II subjects, students are advised to consider the prerequisites needed for the various Part III subjects offered in the Faculty of Mathematics (Mathematics IIIA, Mathematics IIB, Statistics III and Computer Science III). All Mathematics III topics are offered with the assumption of Topics CO, D, K, L as background.

List of Topics for Part II Mathematics subjects

All Part II Topics have Mathematics I as prerequisite

<table>
<thead>
<tr>
<th>Topic</th>
<th>Corequisite or Prerequisite Topic</th>
<th>Part III Topic having this Part II Topic as prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mathematical Models</td>
<td>CO</td>
</tr>
<tr>
<td>B</td>
<td>Complex Analysis</td>
<td>CO</td>
</tr>
<tr>
<td>CO</td>
<td>Vector Calculus &amp; Differential</td>
<td>M, N, P, PD, Q, R, Q, Q, TC, Y, Z</td>
</tr>
<tr>
<td></td>
<td>Equations (Double topic)</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Linear Algebra</td>
<td>P, T, X, Z, U</td>
</tr>
<tr>
<td>E</td>
<td>Topic in Applied Mathematics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e.g. Mechanics and Potential</td>
<td></td>
</tr>
</tbody>
</table>

Notes

1. Students whose course includes a Schedule B subject may have their choice of topics specified further than is set out in the rules above.
2. Students whose course include Physics HIA are advised to include topics CO, H and one of D, F and H in their Mathematics Part II subjects: this may require the use of the substitution rules.

3. Students who take all three subjects Mathematics HA, HII, HIC will be required to take the ten topics above together with either Topic SP of Computer Science II or Topic S (Geometry) or some other suitable topic. Such students should consult the Head of the Department concerning the appropriate choice.

COMPUTER SCIENCE SUBJECT

Students who obtain an A.Maths Degree including Computer Science II and Computer Science III, thereby satisfy all educational requirements for membership of the Australian Computer Society. Students should also read the footnotes below the entry Computer Science III.

A statement concerning the relation between the Diploma in Computer Science and the undergraduate subjects can be found on page 6.

Following the introduction of Computer Science I, there will be changes to the content of Computer Science II in 1987 and following years.

662400 Computer Science II

Prerequisite
Mathematics I

Hours
168 hours of lectures, tutorials and practical work as listed below

Examination
See component descriptions below

Content
Topics
SI — Introduction to Structuring of Information
SP — Systematic Programming
ML — Introduction to Computer Architecture and Assembly Language
F — Numerical Analysis and Computing

Details of all the above Part II topics appear on page 42 et seq.

Students in the Faculty of Mathematics may, with the consent of the Dean, take Computer Science II in two parts, each consisting of two topics: part one could be topics F and SP.

PART III SUBJECTS

The Department offers two Part III Mathematics subjects, each comprising four topics chosen from the list below. It also offers Part III subjects in Statistics and Computer Science.

Students proceeding to the degree of Bachelor of Mathematics will be required to complete an essay on a topic chosen from the history or philosophy of Mathematics. Students wishing to proceed to Honours in Mathematics are required to take Mathematics IIIA and at least one of Mathematics IIIB, Computer Science III or Statistics III. Students wishing to proceed to Combined Honours are required to take Mathematics IIIA together with the appropriate subject from Schedule B. Students proceeding to Honours will also be required to study additional topics as prescribed by the Heads of the Departments concerned. Students proceeding to Honours are required to prepare under supervision, and deliver in a half-hour session, a seminar paper and may submit this paper as their essay requirement.

Passes in both Mathematics IIIA and IIIC are prerequisite for entry to all Part III subjects and Mathematics IIIA is pre- or corequisite for Mathematics IIIIB. It will be assumed that students taking third-year topics in 1986 have already studied topics CO, D, E, K, and L (or C, D, E, K, and L) passed prior to 1986 in their Part II subjects.

Students from other faculties who wish to enrol in particular Part III topics, according to the course schedules of those Faculties, should consult the particulars of the list below, and should consult the lecturer concerned. In particular, the prerequisites for subjects may not all apply to isolated topics.

Students wishing to enrol in Statistics III should avoid taking topics R, U and V as Mathematics IIIA topics, and students wishing to enrol in Computer Science III should note that topics O, TC and Z may be chosen as topics in either Mathematics IIIA or Computer Science III, but not both.

Summaries of these topics, together with texts and references, appear on page 50 et seq. of this handbook.

List of Topics for Part III Mathematics Subjects

Students who are relying on second-year subjects taken before 1985 should consult the lecturers concerned for transition arrangements for prerequisite topics.

Table

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>General Tensors and Relativity</td>
</tr>
<tr>
<td>N</td>
<td>Variational Methods and Integral Equations</td>
</tr>
<tr>
<td>O</td>
<td>Mathematical Logic and Set Theory</td>
</tr>
<tr>
<td>P</td>
<td>Ordinary Differential Equations</td>
</tr>
<tr>
<td>PD</td>
<td>Partial Differential Equations</td>
</tr>
<tr>
<td>PL</td>
<td>Programming Languages and Systems</td>
</tr>
<tr>
<td>Q</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>QS</td>
<td>Quantum and Statistical Mechanics</td>
</tr>
<tr>
<td>R</td>
<td>Theory of Statistics</td>
</tr>
<tr>
<td>S</td>
<td>Geometry</td>
</tr>
<tr>
<td>SS</td>
<td>Survey Sampling Methods</td>
</tr>
<tr>
<td>T</td>
<td>Group Theory</td>
</tr>
<tr>
<td>TC</td>
<td>Theory of Computing</td>
</tr>
<tr>
<td>U</td>
<td>Regression, Design &amp; Analysis of Experiments</td>
</tr>
<tr>
<td>V</td>
<td>Measure Theory &amp; Integration</td>
</tr>
<tr>
<td>W</td>
<td>Functional Analysis (not offered in 1986)</td>
</tr>
<tr>
<td>X</td>
<td>Fields &amp; Equations</td>
</tr>
<tr>
<td>Y</td>
<td>Stochastic Processes</td>
</tr>
<tr>
<td>Z</td>
<td>Mathematical Principles of Numerical Analysis</td>
</tr>
</tbody>
</table>

Some topics may be offered in alternate years, and, in particular, some may be available as Mathematics IV topics.

The selection rules and definitions of the Part III subjects follow:

663100 Mathematics IIIA

Prerequisites
Mathematics II & IIIC

Hours
4 lecture hours and 2 tutorial hours per week

Examination
Each topic is examined separately

Content
A subject comprising Topic O, together with three other topics, at least one of which should be from the set (M, N, Q, QS, SS, U, R), and at least one from the set (S, X, T, Y, P). The final choice of topics must be approved by the Head of the Department. The topics PL will not normally be included in this subject.
663200 Mathematics IIIB

**Prerequisite or Corequisite**
Mathematics IIIA

**Hours**
4 lecture hours and 2 tutorial hours per week

**Examination**
Each topic is examined separately

**Content**
A subject comprising four topics chosen from the topics listed above. Students should consult members of academic staff regarding their choice of topics. The final choice of topics must be approved by the Head of the Department.

**Notes**
1. In order to take both Mathematics IIIA and Mathematics IIIB, a student must study eight topics from the above with due regard to the composition of Mathematics IIIA mentioned above.
2. Students whose course includes a subject from Schedule B may have their choice of topics further restricted.
3. Students aiming to take Mathematics IV may be required to undertake study of more topics than the eight comprising the two Part III subjects.

**STATISTICS SUBJECT**

663300 Statistics III

**Prerequisites**
Mathematics II A and IIC (including topics CO, H & I)

**Hours**
4 lecture hours and 2 tutorial hours per week

**Examination**
Each topic is examined separately

**Content**
A subject comprising four topics: Topics R, U, SS, Y.

**COMPUTER SCIENCE SUBJECT**

663400 Computer Science III

**Prerequisites**
Computer Science II, Mathematics II A and Mathematics II C and any further prerequisites dictated by particular topic choice

**Hours**
See individual topics

**Examination**
See information given in description of individual topics

**Content**
At least five topics from the list of topics given below, provided that both of the topics 1 and 2 are included, and no more than two of topics 8, 9, 10 are counted in the minimal five. The final choice of topics must be approved by the Course Controller.

**Topics**
1. Computer Operating Systems (EE463)
2. Programming Languages and Systems (PL)
3. Compiler Construction (EE464)
4. Mathematical Logic and Set Theory (O)
5. Theory of Computing (TC)
6. Switching Theory and Logical Design (EE362)
7. Mathematical Principles of Numerical Analysis (Z)
8. CS—Commercial Programming (Diploma Course)
9. Systems Analysis (Diploma Course)
10. Systems Design (Diploma Course)

(i) The bracketed notation indicates corresponding courses and topics, to avoid double-counting.
(ii) Students who are considering eventual careers as Computer Systems Officers in the Commonwealth Public Service are strongly advised to compose a selection which includes the topic “Systems Design”.

**PART IV SUBJECTS**

664410 Computer Science IV

**Prerequisites**
Mathematics IIIA and at least one of Mathematics IIIB, Computer Science III or Statistics III and additional work as prescribed by the Head of the Department of Mathematics, Statistics and Computer Science.

A student desiring admission to this subject should apply in writing to the Head of the Department before 20th December of the year preceding the year of entry.

Students who have passed Computer Science III may, with the permission of the Head of this Department, select some of their topics of study from a supplementary list of courses related to computer science and given in other departments. This list is printed on page 81.

**Hours**
At least 8 lecture hours per week over one full-time year or 4 lecture hours per week over two part-time years.

**Examination**
At least eight 2-hour final papers

A thesis, i.e., a study under direction of a special topic using relevant published material and presented in written form. Work on this thesis normally starts early in February.

**Content**
A selection of at least eight Part IV topics. The topics offered may be from any branch of Mathematics including Pure Mathematics, Applied Mathematics, Statistics, Computer Science and Operations Research as exemplified in the publication Mathematical Reviews. Summaries of topics are on page 64, but the Department should be consulted for further details.

**NOTE:** A meeting will be held on the first Tuesday of first term in Room V 107 at 1:00 p.m. to determine the timetable for Mathematics IV and Computer Science IV topics.

664410 Computer Science IV

**Prerequisites**
Computer Science III and a third year mathematics subject, together with any additional work as prescribed by the Head of the Department of Mathematics, Statistics and Computer Science.
A student desiring admission to this subject should apply in writing to the Head of the Department before 20th December of the preceding year.

Hours
At least 6 lecture hours per week over one full-time year (or 3 lecture hours per week over two part-time years), plus a 400 hour project.

Examination
At least six 2-hour final papers or equivalent assessment. A thesis relating to the project undertaken. Work on the project normally starts early in February.

Content
A selection of at least six Part IV topics. Normally the topics will be chosen from the list of computer science topics approved by the Department but with the permission of the Head of Department a maximum of two other topics, normally from the other Mathematics topics offered by the Department, may be substituted.

NOTE: A meeting will be held on the first Tuesday of first term in Room V107 to determine the timetable for Computer Science IV and Mathematics IV topics.

THE FOLLOWING PAGES GIVE DETAILS OF THE TOPICS FOR THE PART II, III AND IV SUBJECTS OFFERED BY THE DEPARTMENT

PART II TOPICS


Prerequisite or Corequisite
Topic CO

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper

Content
This topic is designed to introduce students to the idea of a mathematical model. Several realistic situations will be treated beginning with an analysis of the non-mathematical origin of the problem, the formulation of the mathematical model, solution of the mathematical problem and interpretation of the theoretical results.

Text
Nil

References
Bender, E. A. An Introduction to Mathematical Modelling (Wiley 1978)
Dym, C. L. & Ivey, E. S. Principles of Mathematical Modelling (Academic 1980)
Haberman, R. Mathematical Models (Prentice-Hall 1977)
Kemeny, J. G. & Snell, J. L. Mathematical Models in Social Sciences (Blaisdell 1963)

Noble, B. Applications of Undergraduate Mathematics in Engineering (M.A.A./Collier-Macmillan 1967)
Smith, J. M. Mathematical Ideas in Biology (McGraw-Hill 1971)

662102 Topic B — Complex Analysis — R. J. Vaughan

Prerequisite or Corequisite
Topic CO

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper

Content
Complex numbers, Cartesian and polar forms, geometry of the complex plane, solutions of polynomial equations.
Complex functions, mapping theory, limits and continuity.
Differentiation, the Cauchy-Riemann Theorem. Elementary functions, exponential, logarithmic, trigonometric and hyperbolic functions.
Integration, the Cauchy-Goursat Theorem, Cauchy’s integral formulae.
Liouville’s Theorem and the Fundamental Theorem of Algebra.
Taylor and Laurent series, analytic continuation.
Residue theory, evaluation of some real integrals and series, the Argument Principle and Rouche’s Theorem.
Conformal mapping and applications.

Text
Brown, J. W. & Verhey, R. F. or
Kreyszig, E. Advanced Engineering Mathematics

References
Kreyszig, E. Advanced Engineering Mathematics (Wiley 1979)
Levinson, N. & Redheffer, R. M. Complex Variables (Holden-Day 1970)

662109 Topic CO — Vector Calculus & Differential Equations — W. Summerfield

Prerequisites
Nil

Hours
2 lecture hours per week and 1 tutorial hour per week

Examination
One 3-hour paper
Content
Taylor's polynomial, stationary points, Fourier series: generalisation.
Second order linear partial differential equations: Laplace, Wave and Diffusion equations.

Text
Either
Kreyszig, E. Advanced Engineering Mathematics 5th edn (Paperback) (Wiley 1979) (5th edn is preferable but 4th edn will suffice)

or
Greenberg, M. D. Foundations of Applied Mathematics (Prentice-Hall 1978)

References
Abramovitz, N. & Stegun, I. A. Handbook of Mathematical Functions (Dover 1965)


Coxeter, H. S. M. Introduction to Geometry (Wiley 1961)

Dix, N. & Fedor, G. Advanced Calculus (PWS 1988)

Dryden, B. L. & Hall, C. Methods of Geometry (Chapman & Hall 1984)


Finn, J. & Behrens, J. Elementary Differential Equations (McGraw-Hill 1973)


Greenlaw, D. & Hoover, H. Introduction to Theoretical Computer Science (McGraw-Hill 1987)

Haberman, R. Advanced Calculus (Prentice-Hall 1983)

O'Neil, P. V. Advanced Engineering Mathematics (Wadsworth 1983)

Piskunov, N. Calculus — An Introduction to Differential Equations (Schaum 1974)


Spiegel, M. R. Theory and Problems of Vector Analysis (Schaum 1959)


662202  Topic F --- Numerical Analysis & Computing --- V. Ficker

Prerequisites
Nil

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper

Content

Text
Nil

References
Burden, R. L. & Faires, J. D.

Numerical Analysis 3rd edn (Prindle, Weber & Schmidt 1985)

Cheney, W. & Kincaid, D.


Cooper, D. & Clancy, M.

Oh! Pascal! (Wiley 1985)

Crawley, J. W. & Miller, C. E.

A Structured Approach to Fortran (Prentice-Hall 1983)

Eeter, D. M.

Structured Fortran 77 for Engineers and Scientists (Benjamin 1983)

Eeter, D. M.

Problem Solving with Structured Fortran 77 (Benjamin 1984)

Marateck, S. L.

Fortran 77 (Academic 1983)

McCracken, D. D.

Computing for Engineers and Scientists with Fortran 77 (Wiley 1984)

McKown, P. G.

Structured Programming Using Fortran 77 (Harcourt 1985)


VAX-11 Fortran (Uni. Nele Computing Centre 1983)

662204  Topic II --- Applied Statistics --- A. J. Dobson

Prerequisite
Nil

Hours
One lecture hour per week and practical work in tutorials and assignments

Examination
One 2-hour paper

Content
Emphasis is placed on data analysis using the statistical computer program MINITAB. Contents of the course include: descriptive statistics, elementary probability theory, sampling, confidence intervals and hypothesis testing for means and proportions from single, paired and unpaired samples, simple linear regression and correlation and contingency tables.

Text
Ledermann, W.

Introduction to Group Theory (Longman 1976)
References
Baumslag, B. & Chandler, B. Group Theory (Schaum 1968)
Coxeter, H. S. M. Introduction to Geometry (Wiley 1961)
Herstein, I. N. Topics in Algebra 2nd edn (Wiley 1975)
Weyl, H. Symmetry (Princeton 1952)

662304 Topic II -- Analysis of Metric Spaces -- M. J. Hayes
Prerequisites Nil
Hours 1 lecture hour per week and 1 tutorial hour per fortnight
Examination One 2-hour paper

Content
Examples of metric spaces and normed vector spaces. Convergence of sequences, continuity of maps. Limit points, closed and open sets. Compactness and application to existence of maxima, uniform continuity and integrability of continuous functions, and continuity of inverse functions.

Text
Nil

References
Bartle, R. G. The Elements of Real Analysis (Wiley 1976)
Giles, J. R. Analysis of Metric Spaces (University of Newcastle 1975)
Goldberg, R. R. Methods of Real Analysis (Ginn Blaisdell 1964)
Simmons, G. F. Introduction to Topology and Modern Analysis (McGraw-Hill 1963)
White, A. J. Real Analysis (Addison-Wesley 1968)

COMPUTER SCIENCE II TOPICS

662401 Topic II -- Introduction to Structuring of Information -- P. J. Moylan
Prerequisite Mathematics I
Corequisite Topic SP
Hours 3 lecture and tutorial hours per week for the second half-year
Examination One 2-hour paper

Content
Influence of structuring of information on design of programming languages. Data structures: lists, trees, queues, deques and stacks. Examples of and methods for implementing these structures. Storage allocation for complex data items. Scatter storage and hash addressing. Elementary string processing, and list processing.

Searching and sorting. A description of several sorting algorithms and comparison of their efficiencies.
The course consists of mainly lectures supplemented by tutorials.

Text
Koffman, E. B. Problem Solving and Structured Programming in Pascal 2nd edn (Addison-Wesley 1985)
References
Cooper, D. & Cheney, M. Othi Pascal 2nd edn (Norton 1985)
Structured Programming (Academic 1972)
Concepts of Programming Languages (Science Research Associates 1973)
Findlay, W. & Watt, D. A. Programming 3rd edn (Pitman 1985)
Graham, N. Introduction to Pascal (West 1980)
Grogono, P. Programming in Pascal 2nd edn (Addison-Wesley 1980)
Guttman, A. J. Programming and Algorithms (Heinemann 1977)
Moore, L. Foundations of Programming (Ellis Horwood 1980)
Savitch, Walter J. Pascal — An Introduction to the Art and Science of Programming (Benjamin/Cummings) (Addison-Wesley) 1984
Wirth, N. Systematic Programming (Prentice-Hall 1973)
Yourdon, E. J. Techniques of Program Structure and Design (Prentice-Hall 1973)

663405 Topic MI — Introduction to Computer Architecture & Assembly Language — K. K. Saluja

Prerequisite Mathematics I

Hours 3 lecture and practical work hours per week for first half-year

Examination Progressive assessment and final examination

Content
Number systems: representation and arithmetic.
Hardware components, processor structure, addressing modes. Assembly language. Instruction sets, pseudo ops, machine language programming, subroutines, co-routines, use of stacks, interrupts, macros, recursion, re-entry, linkers and loaders.

Lectures will be supplemented with practical assignments using PDP-11 computer.

Texts

References
Friedman, A. D. Logical Design of Digital Systems (Computer Science)
Stone, H. S. Introduction to Computer Organization and Data Structures (McGraw-Hill 1972)

662202 Topic F — Numerical Analysis and Computing — see page 46

PART III TOPICS
663101 Topic M — General Tensors and Relativity — P. K. Smrz

Prerequisite Topic CO

Hours 1 lecture hour per week and 1 tutorial hour per fortnight

663102 Topic N — Variational Methods and Integral Equations — W. T. F. Lau

Prerequisite Topic CO

Hours 2 lecture hours and 1 tutorial hour per week for 1st half year

Examination One 2-hour paper

Content
Problems with fixed boundaries: Euler's equation, other governing equations and their solutions; parametric representation. Problems with movable boundaries: transversality condition; natural boundary conditions; discontinuous solutions; corner conditions. Problems with constraints. Isothermal problems. Direct methods.

Fredholm's equation; Volterra's equation; existence and uniqueness theorems; method of successive approximations; other methods of solution. Fredholm's equation with degenerate kernels and its solutions.

Text Nil

References
Arthurs, A. M. Complementary Variational Principles (Pergamon 1964)
Chambers, L. G. Integral Equations: A Short Course (International 1976)
Elsgolc, L. E. Calculus of Variations (Pergamon 1963)
Kanwal, R. P. Linear Integral Equations (Academic 1971)
Weinstock, R. Calculus of Variations (McGraw-Hill 1952)

663103 Topic O — Mathematical Logic and Set Theory — M. J. Hayes

Prerequisites Topics K & I.

Hours 1 lecture hour per week and one tutorial per fortnight

Examination One 2-hour paper, and assignments
Content

Text
Nil

References
Boole, G. S. & Jeffrey, R. C. Computability and Logic 2nd edn (Cambridge 1980)
Crossley, J. et al. What is Mathematical Logic? (Oxford 1972)
Halmos, P. R. Naive Set Theory (Springer 1974 and Van Nostrand 1960)
Hayden, G. E. & Kennison, J. F. Zermelo-Fraenkel Set Theory (Merrill 1968)
Kleene, S. C. Mathematical Logic (Wiley 1967)
Lipschutz, S. Set Theory and Related Topics (Schaum 1964)
Margaris, A. First Order Mathematical Logic (Blaisdell 1967)
Mendelson, E. Introduction to Mathematical Logic 2nd edn (Van Nostrand 1979, paperback)


Prerequisites
Topics CO, D & L

Hours
2 lecture hours and 1 tutorial hour per week for 1st half year

Examination
One 2-hour paper

Content
First order systems in two variables and linearization. The phase plane. Linear systems. Perturbation Methods. Stability of equilibria. Examples from mechanics and biology. The course will involve some computing.

Text
Nil

References
Arrowsmith, D. K. & Place, C. M. Ordinary Differential Equations (Chapman & Hall 1982)

663108 Topic PD — Partial Differential Equations — W. T. F. Lau

Prerequisite
Topic CO

Hours
2 lecture hours and 1 tutorial hour per week for 2nd half year

Examination
One 2-hour paper

Content
First order equations: linear equations; Cauchy problems; general solutions; nonlinear equations; Cauchy's method characteristics; compatible systems of equations; complete integrals; the methods of Charpit and Jacobi. Higher order equations: linear equations with constant coefficients; reducible and irreducible equations; second order equations with variable coefficients; characteristics; hyperbolic, parabolic and elliptic equations. Special methods: separation of variables; integral transforms; Green's function. Applications in mathematical physics where appropriate.

Text
Nil

References
Smith, M. G. Introduction to the Theory of Partial Differential Equations (Van Nostrand 1967)

663111 Topic PL — Programming Languages & Systems

Prerequisite
Knowledge of FORTRAN and Pascal

Hours
1½ lecture and tutorial hours per week

Examination
One 2-hour paper

Content
Survey and detailed comparisons of the properties of representative languages of various types with special consideration of LISP, SNOBOL, and Prolog. Review of the mutual influences between the design of languages and the nature of the applications for which the languages have originally been intended.

Text
Nil

References
Griswold, R. E. The SNOBOL4 Programming Language 2nd edn (Prentice-Hall 1971)
Simmet, J. E. Programming Languages: History and Fundamentals (Prentice-Hall 1969)
Siklossy, L. Let's Talk LISP (Prentice-Hall 1975)
Winston, P. H. & Horn, B. K. P. LISP 2nd edn (Addison-Wesley 1984)

663105 Topic Q — Fluid Mechanics — W. Summerfield

Prerequisite
Topic CO
66315 Topic QS — Quantum and Statistical Mechanics — C. A. Croxton

Prerequisite  Topic CO

Hours  2 lecture hours and 1 tutorial hour for 1st half year

Examination  One 2-hour paper

Content
Classical Lagrangian and Hamiltonian mechanics, Liouville theorem.
Statistical Mechanics: basic postulate; microcanonical ensemble; equipartition; classical ideal gas; canonical ensemble; energy fluctuations; grand canonical ensemble; density fluctuations; quantum statistical mechanics; density matrix, ideal Bose gas; ideal Fermi gas; white dwarf stars; Bose-Einstein condensation; superconductivity. Quantum mechanics: the wave-particle duality, concept of probability; development, solution and interpretation of Schrodinger's equations in one, two and three dimensions; degeneracy; Heisenberg uncertainty; molecular structure.

Text  Nil

References
Croxton, C. A.  Introductory Eigrophysics (Wiley 1975)
Fong, P.  Elementary Quantum Mechanics (Addison-Wesley 1968)

Huang, K.  Statistical Mechanics (Wiley 1963)


Prerequisite  Topics H, I

Hours  Approximately 40 class contact hours

Examination  One 2-hour paper

Content

Text  Nil

References
Cox, D. R. & Hinkley, D. V.  Theory of Statistics (Chapman & Hall)
Silvey, S. D.  Statistical Inference (Chapman & Hall 1975)

663107 Topic S — Geometry — T. K. Sheng

Prerequisites  Nil

Hours  2 lecture hours and 1 tutorial hour per week for 2nd half year

Examination  One 2-hour paper

Content
Euclidean geometry; axiomatic and analytic approach, transformations, isometries, decomposition into plane reflections, inversions, quadratic geometry. Geometry of incidence: the real projective plane, invariance, projective transformation, conics, finite projective spaces.

Text  Nil

References
Blumenthal, L. M.  Studies in Geometry (Freeman 1970)
Greenberg, M. J.  Euclidean and non-Euclidean geometries 2nd edn (Freeman 1980)

663141 Topic SS — Survey Sampling Methods — R. W. Gibberd

Prerequisite  Topics H, I
G. W. Southern

Examination

Content
This course covers the statistical principles that are used to construct and assess methods for collecting and analysing data from finite populations. Topics covered include: simple random sampling, ratio and regression estimators, stratified sampling and cluster sampling, and other relevant sections from the text. Some consideration of the practical problems will be obtained through the class projects.

Text
Barnett, V.  Elements of Sampling Theory (E. U. P. 1974)

References
Cochran, W. G.  Sampling Techniques 3rd edn (Wiley 1977)
Kish, L.  Survey Sampling (Wiley 1965)

663201  Topic T — Group Theory — R. B. Eggleton

Prerequisites
Topics D and K

Hours
2 lecture hours and 1 tutorial hour per week for 1st half year

Examination
One 2-hour paper

Content
Permutation groups, regular permutations, alternating groups, graphs and permutation groups, transitive and multiply transitive groups. External and internal direct products of groups; quotient groups. Normalizers, conjugate subgroups, centre, derived or commutator subgroup; lattice of subgroups; Sylow theorems; groups of order $p^2$, $pq$ or $p^3$; finite $p$-groups. Finitely generated abelian groups. Free groups, homomorphisms of free groups, free abelian groups.

Text
Ledermann, W.  Introduction to Group Theory (Longman 1976)

References
Baumslag, B. & Chandler, B.  Group Theory (Schaum 1968)
Carmichael, R. D.  Introduction to the Theory of Groups of Finite Order (Dover 1956)
Macdonald, I. D.  The Theory of Groups (Oxford 1975)
Rotman, J. J.  The Theory of Groups: An Introduction (Allyn and Bacon 1965)

663209  Topic TC — Theory of Computing — G. W. Southern

Prerequisites
Topics CO & F

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper, and assignments

Content
This course will attract science, mathematics and engineering students who are interested in the theoretical foundations of computer science. Topics studied include the following: Mathematical Models of Computers: Finite Automata are introduced as a first approximation to a model of a computer and some of their properties are studied. Three equivalent models of computation are then introduced and compared. These models are Turing machines, counter machines, and recursive functions. Some of the limits of models of computation (unsolvability) are also discussed.

Algorithmic Aspects of Computation: How "good" an algorithm do we have for performing some computation? Is there any way in which we can say that some algorithm is the "best" for accomplishing some task?

Program Correctness: Methods of program verification are introduced and discussed. Formal Languages and Parsing: Methods of systematically and formally specifying the syntax of programming languages are discussed. Some parsing methods are introduced.

Text
Nil

References
Dennning, P. J., Dennis, J. B. & Qualitz, J. E.  Machines, Languages and Computation (Prentice-Hall 1978)
Garay, M. R. & Johnson, D. S.  Computers and Intractability (Freeman 1979)
Hopcroft, J. E. & Ullman, J. D.  Introduction to Automata Theory, Languages and Computation (Addison-Wesley 1979)

663202  Topic U — Regression, Design and Analysis of Experiments — R. J. Vaughan

Prerequisite
Topics D, H

Hours
2 lecture hours and 1 tutorial hour per week for 2nd half year

Examination
One 2-hour paper

Content
The purpose of the course is to familiarise the student with tools for the interpretation of data. Minitab BMDP — use of the VAX and VMS operating system. General concept of regression. General linear model: point estimation, sample distribution of estimators, tests of hypothesis including analysis of variance, tests of subhypotheses. Simple and multiple linear regression. Polynomial regression. Design of Experiments: philosophy, randomisation, randomised blocks including interactions, Latin squares, factorial experiments.

Text

References
Cochran, W. G. & Cox, G. M.  Experimental Designs (Wiley 1964)


663203 **Topic V — Measure Theory & Integration** — J. G. Couper

**Prerequisite**
Topic I

**Hours**
2 lecture hours and 1 tutorial hour per week for
2nd half year

**Examination**
One 2-hour paper

**Content**

**Text**
Nil

**References**
Bartle, R. G. *The Elements of Integration* (Wiley 1966)
de Barra, G. *Introduction to Measure Theory* (Van Nostrand 1974)
Halmos, P. R. *Measure Theory* (Van Nostrand 1950)
Munroe, M. E. *Introduction to Measure and Integration* (Addison Wesley 1953)

663204 **Topic W — Functional Analysis** — (not offered in 1986)

**Prerequisites**
Topics B, CO, D, K, L

**Hours**
2 lecture hours and 1 tutorial hour per week for
1st half year

**Examination**
One 2-hour paper

**Content**
Hilbert space, the geometry of the space and the representation of continuous linear functionals. Operators on Hilbert space, adjoint, self-adjoint and projection operators. Complete orthonormal sets and Fourier analysis on Hilbert space. Banach spaces, topological and isometric isomorphisms, finite dimensional spaces and their properties. Dual spaces, the Hahn-Banach Theorem and reflexivity. Spaces of operators, conjugate operators.

**Text**
Giles, J. R. *Analysis of Normed Linear Spaces* (University of Newcastle 1978)

**References**
Banach, S. *Théorie des Opérations Linéaires* 2nd edn (Chelsea)

Brown, A. L. & Page, A.
Giles, J. R.
Kolmogorov, A. N. & Fomin, S. V.
Kreyszig, E.
Lusin, L. A. & Sobolev, U. J.
Simmons, G. F.
Taylor, A. E.
Wilansky, A.

Elements of Functional Analysis (Van Nostrand 1970)
Analysis of Metric Spaces (University of Newcastle 1975)
Elements of the Theory of Functions and Functional Analysis Vol. I (Grayloch 1957)
Introductory Functional Analysis with Applications (Wiley 1978)
Elements of Functional Analysis (Frederick Unger 1961)
Introduction to Topology and Modern Analysis (McGraw-Hill 1963)
Introductory to Functional Analysis (Wiley 1958)
Functional Analysis (Blaisdell 1964)

663217 **Topic X — Fields and Equations** — R. F. Berghout

**Prerequisites**
Topics D & K

**Hours**
1 lecture hour per week and 1 tutorial hour per
fortnight

**Examination**
One 2-hour paper

**Content**
In this topic we will study the origin and solution of polynomial equations and their relationships with classical geometrical problems such as duplication of the cube and trisection of angles. It will further examine the relations between the roots and coefficients of equations, relations which gave rise to Galois theory and the theory of extension fields. We will learn why equations of degree 5 and higher cannot be solved by radicals, and what the implications of this fact are for algebra and numerical analysis.

**Text**
Nil

**References**
Birkhoff, G. D. & MacLane, S. *A Survey of Modern Algebra* (Macmillan 1953)
Edwards, H. M. *Galois Theory* (Springer 1984)
Herstein, I. N. *Topics in Algebra* (Wiley 1975)
Kaplansky, I. *Fields and Rings* (Chicago 1969)
Stewart, I. *Galois Theory* (Chapman & Hall 1973)

663216 **Topic Y — Stochastic Processes** — V. Ficker

**Prerequisites**
Topics CO & L

**Hours**
Approx. 40 class contact hours

**Examination**
One 2-hour paper

**Content**

**Text**
Nil
Stability of linear marching numerical analysis problems involving ordinary differential equations. Investigation of stability of linear marching schemes. Boundary value problems. Finite-difference and finite-element methods of solution of partial differential equations. If time permits, other numerical analysis problems such as integration, solution of non-linear equations etc. will be treated.

Text

References
Atkinson, K. E. An Introduction to Numerical Analysis (Wiley 1978)
Lambert, J. D. & Wait, R. Computational Methods in Ordinary Differential Equations (Wiley 1973)


COMPUTER SCIENCE III TOPICS

534137 Compiler Construction — P. J. Moylan
Prerequisite EE264 Introduction to Computer Architecture & Assembly Language or Topic ML
Hours 3 hours per week for the first half year
Examination Progressive assessment and final examination
Content
The design of assemblers. Introduction to the theory of grammars, parsing techniques, construction of compilers, object code generation. Construction of interpreters. The course consists mainly of lectures and assignments on computers.

Text
Aho, A. V. & Ullman, J. D. Principles of Compiler Construction (Addison-Wesley 1977)

References
Donovan, J. J. Systems Programming (McGraw-Hill)

490126 CS—Commercial Programming
Prerequisite Mathematics 1 Topic SC or Commercial E.D.P.
Hours 2 lecture hours per week for the first half year
Examination One 3-hour paper plus progressive assessment

Content
Basic concepts of file handling and file maintenance, including file creation and processing.
Flow charting; file merging and updating of transactions; tape blocking and buffering. General run types including editing, searching and sorting. Direct access versus serial; random or sequential organisation; re-run techniques; verifying programme accuracy; table lookup; programme documentation and use of test data.
COBOL as a business data processing and file organisation language. Extensive practical work in COBOL, including case studies.

Texts
Feingold, C. Fundamentals of Structured COBOL Programming (W. C. Brown)
This course is concerned with the early activities carried out in the development of computer-based information systems. Topics covered include: the role of systems in modern business; the profession of systems analysts; management of the life cycle of a business information system; the tools of the systems analyst; the study phase, its associated documentation and its relationship to design, development and implementation. Students are also introduced to the concepts of structured analysis.

References

Chai, W. A. & H. W. Clifton, H. D.
Davis, G. B. & Liticky, C. R.
DeRossi, C. J.
Kapur, G. R.
Laden, H. N. & Gildersleeve, T. R.
McCracken, D. D.
Murray, M.
Saunders, D. H.
Sprowls, R. C.
Sten, N. B. & R. A.
Waters, J. L.

440123 Systems Analysis

Prerequisite

Mathematics I

Hours

2 lecture hours per week for the first half year

Examination

A 2-hour examination at mid-year plus progressive assessment

References

Gane, C. & Sarson, T.
Gore, M. & Stubbe, J.

Structured Systems Analysis: Tools and Techniques
(Prentice-Hall)

Elements of Systems Analysis (W. C. Brown)

Brookes, C. H. P.

Information Systems Design
(Prentice-Hall)

Information Processing Systems (Addison-Wesley)

Information Processing Systems — Student Workbook
(Addison-Wesley)

Successful Data Processing Systems Analysis
(Prentice-Hall)

Introducing Systems Analysis and Design
Vols. 1 & 2 (N.C.C. Publications)

Systems Analysis: Definitive Process and Design
(S.R.A.)

Programming Standard COBOL (Academic)

Systems Analysis for Business Data Processing
(Business Books)

Elementary Cobol Programming (McGraw-Hill)

Learning COBOL Fast (Reston)

Programming in Standard COBOL (S.R.A.)

Systems Design for Computer Applications (Wiley)

Programming Business Computers (Wiley)

Standard COBOL (S.R.A.)

Computers in Business (McGraw-Hill)

Computing with COBOL (Harper & Row)

Cobol Programming (Wiley)

Cobol Programming (Heinemann)

534138 Computer Operating Systems — P. J. Moynan

Prerequisite

EE264 Introduction to Computer Architecture & Assembly Language or Topic MI.

Hours

Three hours per week for the second half of the year

Examination

Progressive assessment and final examination

Content

Views of an operating system. Multiprogramming, interacting concurrent processes, process control primitives. Processor management, memory management, name management, protection. The course consists mainly of lectures supplemented by tutorial sessions.

Text


References

Coffman, E. G. & Denning, P. J.
Hansen, P. B.
Madnick, S. E. & Donovan, J. J.

533902 Switching Theory & Logical Design — K. K. Saluja

Prerequisite

Mathematics I and Topic MI.

Hours

3 hours of lectures, tutorials and practical work per week for first half year

Examination

Progressive assessment and final examination

Content

Boolean algebra, combinational logic, logical circuits, minimization techniques, threshold logic. Data representation, binary arithmetic, codes, error checking and correcting. Sequential logic, flip-flops, state diagrams, state reduction, races and hazards. Logic subsystems: registers, adders, counters, converters, coders, etc. Basic architecture of digital computers.

Lectures will be supplemented by practical assignments on logic trainers and some tutorial sessions.

Text


663406 Mathematical Logic and Set Theory — see Topic O page 51.

663402 Mathematical Principles of Numerical Analysis — see Topic Z page 60.

663405 Programming Languages & Systems — see Topic PI page 53.

663404 Theory of Computing — see Topic TC page 56.
440124 Systems Design

Prerequisite Systems Analysis
Corequisite Commercial Programming
Hours 2 lecture hours per week for the second half year
Examination Progressive assessment only (assignments and case study)

Content
This subject is a development of Systems Analysis and includes: data transmission; real time systems; information retrieval; file processing; form design; management and the computer; file design; systems design and determination; operating systems; multi-programming.

Texts As for Systems Analysis

PART IV TOPICS

NOTE: A meeting will be held on the first Tuesday of first term in Room V107 at 1 p.m. to determine the timetable for Part IV topics.

664185 Software Engineering Principles — J. L. Keedy

Prerequisites Computer Science III
Hours About 27 lecture hours
Examination One 2-hour paper

Content
After a brief explanation of the nature and life-cycle of large software systems, the software crisis which they have created, and the desirable properties of well-designed systems, the lectures explore the nature of stable systems in the natural world and in engineering and consider how humans think about, remember and create complex systems. This leads to a re-evaluation of the principles and techniques used in the construction of major software systems, offering new insights into the concepts of modularity and hierarchical structure.

664186 Software-Oriented Computer Architecture — J. L. Keedy

Prerequisites Computer Science III
Hours About 27 lecture hours
Examination One 2-hour paper

Content
Conventional computer architectures have usually been designed with little understanding of the needs of the software intended to be executed on them. This topic examines mechanisms which can fairly easily be incorporated into computers and which can have a dramatic effect on the design of software (operating systems, compilers and application programs). The main issues discussed include stack organisation, the structure of virtual memory, addressing mechanisms and protection, as well as support for modularity.

664187 Advanced Operating System Principles — J. L. Keedy

Prerequisites Computer Science III
Hours About 27 lecture hours
Examination One 2-hour paper

Content
A critical study of operating system techniques, with emphasis on the nature of processes and the methods used to synchronise them, including a study of various advanced mechanisms. Other aspects studied include modularity, naming, file system structures and command language design. Various new ideas for structuring operating systems are presented.

664191 Concurrency, Complexity and VLSI — B. Beresford-Smith

Prerequisites Topic TC
Hours About 27 lecture hours
Examination One 2-hour paper

Content
This course provides an introduction to aspects of VLSI systems which are relevant to those with a software bent. The fundamentals of VLSI will be introduced together with a description of the types of software design tools used. The opportunities which VLSI offers for the development of non-conventional computational structures and the theoretical computer models and algorithms appropriate to such structures will be investigated. Complexity and other issues arising from the prospect of building machines with very many parallel processing elements and a high level of concurrency will be discussed.

Text Nil

References
Hopcroft, J. E. & Ullman, J. D. Introduction to Automata Theory, Languages and Computation (Addison-Wesley 1979)
Ullman, J. D. Computational Aspects of VLSI (Computer Science Press 1984)

664179 History of Analysis to Around 1900 — R. F. Berghout

Prerequisite Nil
Hours About 27 lecture hours
Examination

One 2-hour paper

Content

A course of 26 lectures on the history of mathematics with emphasis on analysis. Other branches of mathematics will be referred to putting the analysis into context. Where feasible, use will be made of original material, in translation. The course will be assessed by essays and a final 2-hour examination.

Topics to be covered include: pre-Greek concepts of exactness and approximation; Greek concepts of continuity, irrationality, infinity, infinitesimal, magnitude, ratio, proportion and their treatment in Elements V, XII and the works of Archimedes; developments of number systems and their equivalents; scholastic mathematics; virtual motion; Renaissance quadrature/cubature by infinitesimals and by “geometry”; Cartesian geometry; 17th and 18th century calculus; rigorization of analysis in the 19th century with stress on the developments of number systems, continuity, function concept, differentiability, integrability.

Text

Nil

References

Lists will be presented during the course

664151 Radicals & Annihilators — R. F. Berghout

Prerequisites

Topics T or X

Hours

About 27 lecture hours

Examination

One 2-hour paper

Content

This topic will briefly outline the classical theory of finite dimensional algebras and the emergence of the concepts of radical, idempotence, ring, chain conditions, etc. Hopefully thus set in perspective, the next part will deal with the Artin-Hopkins-Jacobson ring theory and the significance of other radicals when finiteness conditions are dropped. The relations between various radicals, noetherian rings, left and right annihilators and the Goldie-Small theorems will end the topic.

Text

Nil

References

Cohn, P. *Algebra Vol. 2* (Wiley 1977)
Di Vinsky, N. *Rings and Radicals* (Allen-Unwin 1964)
Herstein, I. N. *Non-communitive Rings* (Wiley 1968)
Kaplansky, I. *Fields and Rings* (Chicago 1969)
McCoy, N. *The Theory of Rings* (McMillan 1965)

664188 Computer Graphics — D. W. E. Blatt

Prerequisites

Mathematics I
Numerical Analysis
Computer Science III or equivalent

Hours

2 hours per week for second half of the year and one 2-hour exam.

Content

This course will cover advanced computer graphics topics with relevant mathematical and programming techniques and an overview of graphics hardware design.
The University of Newcastle Calendar consists of the following volumes:

Volume 1 -- Legislation:
   Part 1 -- The University of Newcastle Act,
   Part 2 -- By-laws and Regulations,
   Part 3 -- Bodies Established by Resolution of Council,
   Part 4 -- Scholarships, Prizes and Financial Assistance.

Volume 2 -- University Bodies and Staff:
   Part 1 -- Principal Officers, Council, Senate, Boards and Committees,
   Part 2 -- The Professors and Staff.

Volume 3 -- Handbook, Faculty of Architecture
Volume 4 -- Handbook, Faculty of Arts
Volume 5 -- Handbook, Faculty of Economics and Commerce
Volume 6 -- Handbook, Faculty of Education
Volume 7 -- Handbook, Faculty of Engineering
Volume 8 -- Handbook, Faculty of Mathematics
Volume 9 -- Handbook, Faculty of Medicine
Volume 10 -- Handbook, Faculty of Science
Volume 11 -- Annual Report

All volumes, except Volume 1 -- Legislation, are published annually.

Volume 1 -- Legislation is published irregularly the last issue being 1982.

All volumes except Volumes 2, Staff and 11 Annual Report are available on microfiche.

Other Publications
Undergraduate Prospectus
Postgraduate Prospectus
An ABC for New Students
University News
Gazette

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I PRINCIPAL DATES 1986

January
1 Wednesday Public Holiday — New Year’s Day
10 Friday Last day for return of Application for Re-Enrolment Forms — Continuing Students
13 Monday Deferred Examinations begin
24 Friday Deferred Examinations end
27 Monday Public Holiday — Australia Day
31 Friday Closing date for applications for residence in Edwards Hall

February
5 Wednesday New students attend in person to enrol and pay charges
7 Friday Re-enrolment Approval Sessions for Re-Enrolling Students
10 Monday to
17 Monday
18 Tuesday Late enrolment session for new students
24 Monday First Term begins

March
28 Friday Good Friday — Easter Recess commences

April
2 Wednesday Lectures resume
25 Friday Public Holiday — Anzac Day
28 Monday Last day for withdrawal without academic penalty from first half year subjects
(See page (vii) for Dean’s discretion)

May
2 Friday First Term ends
19 Monday Examinations begin
23 Friday Examinations end
26 Monday Second Term begins

June
9 Monday Public Holiday — Queen’s Birthday
13 Friday Last day for return of Confirmation of Enrolment forms
28 Saturday Examinations begin
30 Monday Closing date for Applications for Selection to the Bachelor of Medicine course in 1987

July
12 Saturday Examinations end

August
11 Monday Last day for withdrawal without academic penalty from full year subjects
(See page (vii) for Dean’s discretion)
15 Friday Second Term ends
18 Monday Examinations begin
22 Friday Examinations end

September
8 Monday Third Term begins
29 Monday Last day for withdrawal without academic penalty from second half year subjects
(See page (vii) for Dean’s discretion)

October
1 Wednesday Closing date for Applications for Enrolment 1987
(33ndergraduate courses other than Medicine)
6 Monday Public Holiday — Labor Day
31 Friday Third Term ends

November
10 Monday Annual Examinations begin
26 Wednesday Annual Examinations end

Note: Term dates for students in the Bachelor of Medicine course are printed in Calendar Volume 9 — Medicine Handbook, 1987

January
12 Monday Deferred Examinations begin
23 Friday Deferred Examinations end

March
2 Monday First Term begins
II GENERAL INFORMATION

1. Enrolment of New Students
Persons offered enrolment are required to attend in person at the Great Hall early in February to enrol and pay charges. Detailed instructions are given in the Offer of Enrolment.

2. Transfer of Course
Students currently enrolled in an undergraduate Bachelor degree course who wish to transfer to a different undergraduate Bachelor degree course must complete an Application for Course Transfer form and lodge it with their Application for Re-enrolment at the Student Administration Office by 10 January 1986.

3. Re-enrolment by Continuing Students
There are four steps involved for re-enrolment by continuing students:
- collection of the re-enrolment kit
- lodging the Application for Re-enrolment form with details of your proposed programme
- attendance at the Great Hall for enrolment approval, and
- payment of the General Service Charge.
(Students who are in research higher degree programmes re-enrol and pay charges by mail).

Re-enrolment Kits
Re-enrolment kits will be available for collection from 21 to 25 October 1985 from the Tanner Room, Level Three University Union and thereafter from the Student Administration Office in the McMullin Building. The re-enrolment kit contains the student’s Application for Re-enrolment form, the 1986 Class Timetable, the Statement of Charges Payable for 1986 and re-enrolment instructions.

Lodging Application for Re-enrolment forms
The Application for Re-enrolment form must be completed carefully and lodged at the Student Administration Office by 10 January 1986. It can be lodged in November or December, but in general students should know their examination results before completing the form. There is no late charge payable if the form is late, but it is very important that the Application for Re-enrolment form is lodged by 10 January 1986 as late lodgement will mean that enrolment approval will not be possible before the late re-enrolment session to the disadvantage of the student.

Enrolment Approval
All re-enrolling students are required to attend at the Great Hall on a specific date and time during the period 10–17 February 1986. Enrolment Approval dates are on posters on University Noticeboards and are included in the enrolment kits issued to students in October. When attending for Enrolment Approval students will collect their approved 1986 programme and student card. Any variations to the proposed programme must be clarified and submitted for approval. Enrolments in tutorial or laboratory sessions will be arranged. Staff from academic Departments will be available to answer enquiries. Fare concessions forms will also be issued, providing the General Services Charge has been paid.

A service charge of $10 will be imposed on students who re-enrol after the specified date.

Payment of Charges
The re-enrolment kit issued to re-enrolling students includes a Statement of Charges Payable form which must accompany the payment of charges for 1986. These charges may be paid at any time after receiving the re-enrolment kit.

All charges, including debts outstanding to the University, must be paid before or upon re-enrolment - part payment of total amount due will not be accepted by the cashier. Payment by mail is encouraged; alternatively by cheque or money order lodged in the internal mail deposit box in the foyer of the McMullin Building. The receipt will be mailed to the student.

Payment by cash at the Cashier’s Office may lead to queues at enrolment time. The Cashier’s Office will be open for extended hours during the enrolment approval sessions in the period 10–17 February 1986. Afterwards any further payment should be by mail only.

Late Payment
Payment of the General Services Charge is due before or upon re-enrolment. The final date for payment is the date of the Re-enrolment Approval session for the course concerned in the period 10–17 February 1986, after which a late charge applies at the rate of:
- $10 if payment is received up to and including 7 days late;
- $20 if payment is received between 8 and 14 days late; or
- $30 if payment is received 15 or more days late.

Thereafter enrolment will be cancelled if charges remain unpaid.

Student Cards
When attending for Enrolment Approval, students will be given their Approved Programme form which incorporates the Student Card. The Student Card should be carried by students when at the University as evidence of enrolment. The Student Card has machine readable lettering for use when borrowing books from the University Library, and contains the student’s interim password for access to facilities of the Computing Centre.

Students are urged to take good care of their Student Card. If the card is lost or destroyed, there is a service charge of $5 payable before the card will be replaced.

A student who withdraws completely from studies should return the Student Card to the Student Administration Office.

Re-admission after Absence
A person wishing to resume an undergraduate degree course who has been enrolled previously at the University of Newcastle, but not enrolled in 1985, is required to apply for admission again through the Universities and Colleges Admissions Centre, Box 7049 G.P.O. Sydney. Application forms may be obtained from the UCAC or from the Student Administration Office and close with the UCAC on 1 October each year. There is a $40 fee for late applications.

Attendance Status
A candidate for any qualification other than a postgraduate qualification who is enrolled in three quarters or more of a normal full-time programme shall be deemed to be a full-time student whereas a candidate enrolled in either a part-time course or less than three-quarters of a full-time programme shall be deemed to be a part-time student.

A candidate for a postgraduate qualification shall enrol as either a full-time or a part-time student as determined by the Faculty Board.

Change of Address
Students are responsible for notifying the Student Administration Office in writing of any change in their address. A Change of Address form should be used and is available from the Student Administration Office.

(vi)
Failure to notify changes could lead to important correspondence or course information not reaching the student. The University cannot accept responsibility if official communications fail to reach a student who has not notified the Student Administration Office of a change of address.

It should be noted that examination results, re-enrolment and other correspondence will be mailed to students in December and January. Students who will be away during the long vacation from the address given to the University for correspondence should make arrangements to have mail forwarded to them.

Change of Name
Students who change their name should advise the Student Administration Office. Marriage, deed poll or naturalisation etc., certificates should be presented for sighting in order that the change can be noted on University records.

Change of Programme
Approval must be sought for any changes to the programme for which a student has enrolled. This includes adding or withdrawing subjects, changing attendance status (for example from full-time to part-time) or transferring to a different degree or faculty. All proposed changes should be entered on the Variation of Programme form available at the Student Administration Office. Reasons for changes and where appropriate documentary evidence in the form of medical or other appropriate certificates must be submitted.

Withdrawal
Application to withdraw from a subject should be made on a Variation of Programme form and lodged at the Student Administration Office or mailed to the Secretary. Applications received by the appropriate date listed below will be approved for withdrawal without a failure being recorded against the subject or subjects in question.

Withdrawal Dates

<table>
<thead>
<tr>
<th>Full Year Subjects</th>
<th>First Half-Year Subjects</th>
<th>Second Half-Year Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11 August 1986</td>
<td>Monday 28 April 1986</td>
<td>Monday 29 September 1986</td>
</tr>
</tbody>
</table>

Withdrawal after the above dates will normally lead to a failure being recorded against the subject or subjects unless the Dean of the Faculty grants permission for the student to withdraw without a failure being recorded.

If a student believes that a failure should not be recorded because of the circumstances leading to his withdrawal, it is important that full details of these circumstances be provided with the application to withdraw.

Confirmation of Enrolment
In May each year the University mails to all students a Confirmation of Enrolment form which also serves as the application to sit for examinations. This form must be checked carefully, signed and returned by all students (including non-degree students and postgraduate students not taking formal subjects) to confirm that they are actively pursuing subjects for which they are enrolled and that the information on University records is correct and complete.

Indebtedness
The Council of the University has directed that students who are indebted to the University because of unpaid charges, library fines or parking fines may not complete enrolment in a following year; receive a transcript of academic record; or graduate or be awarded a Diploma. Students are requested to pay any debts incurred without delay.

Leave of Absence
A student who does not wish to re-enrol for any period up to three years should write to the Secretary and ask for leave of absence. Leave of absence is normally granted only to those students who are in good standing. Applications should be submitted before the end of the first term in the first year for which leave of absence is sought. Leave of absence will not be granted for more than three years and will not be granted retrospectively.

Application for re-admission to undergraduate degree courses must be made through the UCAC (see p. vii).

Attendance at Classes
Where a student's attendance or progress has not been satisfactory, action may be taken under the Regulations Governing Unsatisfactory Progress.

In the case of illness or absence for some other unavoidable cause, a student may be excused for non-attendance at classes.

All applications for exemption from attendance at classes must be made in writing to the Head of the Department offering the subject. Where tests or term examinations have been missed, this fact should be noted in the application.

The granting of an exemption from attendance at classes does not carry with it any waiver of the General Services Charge.

General Conduct
In accepting membership of the University, students undertake to observe the by-laws and other requirements of the University.

Students are expected to conduct themselves at all times in a seemly fashion. Smoking is not permitted during lectures, in examination rooms or in the University Library. Gambling is forbidden.

Members of the academic staff of the University, senior administrative officers, and other persons authorised for the purpose have authority to report on disorderly or improper conduct occurring in the University.

Notices
Official University notices are displayed on the notice boards and students are expected to be acquainted with the contents of those announcements which concern them. A notice board on the wall opposite the entrance to Lecture Theatre B01 is used for the specific purpose of displaying examination time-tables and other notices about examinations.

Student Matters Generally
The main notice board is the display point for notices concerning enrolment matters, scholarships, University rules and travel concessions, etc. This notice board is located on the path between the Union and the Library.

III EXAMINATIONS
Tests and assessments may be held in any subject from time to time. In the assessment of a student's progress in a university course, consideration will be given to laboratory work, tutorials and assignments and to any term or other tests conducted throughout the year. The results of such assessments and class work may be incorporated with those of formal written examinations.
Examination Periods

Formal written examinations take place on prescribed dates within the following periods:

- **End of First Term:** 19 to 23 May, 1986
- **Mid Year:** 30 June to 11 July, 1986
- **End of Second Term:** 18 to 22 August, 1986
- **End of Year:** 10 to 28 November, 1986

Timetables showing the time and place at which individual examinations will be held will be posted on the examinations notice board near Lecture Theatre B01 (opposite the Great Hall).

Misreading of the timetable will not under any circumstances be accepted as an excuse for failure to attend an examination.

Sitting for Examinations

Formal examinations, where prescribed, are compulsory. Students should consult the final timetable in advance to find out the date, time and place of their examinations and should allow themselves plenty of time to get to the examination room so that they can take advantage of the 10 minutes reading time that is allowed before the examination commences. Formal examinations are usually held in the Great Hall area and in (November) the Auchmuty Sports Centre. The seat allocation list for examinations will be placed on the Noticeboard of the Department running the subject, and on a noticeboard outside the examination room.

Students can take into any examination any writing instrument, drawing instrument or calculating instrument. Logarithmic tables may not be taken in; they will be available from the supervisor if needed.

Calculators may be used, if permitted by the examiner in any examination. They must be hand held, battery operated and non-programmable* and students should note that no concession will be granted:

- (a) to a student who is prevented from bringing into a room a programmable calculator;
- (b) to a student who uses a calculator incorrectly; or
- (c) because of battery failure.

Rules for Formal Examinations

Regulation 15 of the Examination Regulations sets down the rules for formal examinations, as follows:

- (a) candidates shall comply with any instructions given by a supervisor relating to the conduct of the examination;
- (b) before the examination begins candidates shall not read the examination paper until granted permission by the supervisor which shall be given ten minutes before the start of the examination;
- (c) no candidate shall enter the examination room after thirty minutes from the time the examination has begun;
- (d) no candidate shall leave the examination room during the first thirty minutes or the last ten minutes of the examination;
- (e) no candidate shall re-enter the examination room after he has left it unless during the full period of his absence he has been under approved supervision;
- (f) a candidate shall not bring into the examination room any bag, paper, book, written material, device or aid whatsoever, other than such as may be specified for the particular examination;
- (g) a candidate shall not by any means obtain or endeavour to obtain improper assistance in his work, give or endeavour to give assistance to any other candidate, or commit any breach of good order;

* A programmable calculator will be permitted provided program cards and devices are not taken into the examination room.

(h) a candidate shall not take from the examination room any examination answer book, graph paper, drawing paper or other material issued to him for use during the examination;

(i) no candidate may smoke in the examination room.

Any infringement of these rules constitutes an offence against discipline.

Examination Results

Examination results and re-enrolment papers will be available for collection from the Drama Studio in December. The dates for collection will be put on noticeboards outside the main examination rooms in November.

Results not collected will be mailed.

No results will be given by telephone.

After the release of the annual examination results a student may apply to have a result reviewed. There is a charge of $8.00 per subject, which is refundable in the event of an error being discovered. Applications for review must be submitted on the appropriate form together with the prescribed review charge by 6 January 1987.

However, it should be noted that examination results are released only after careful assessment of students' performances and that, amongst other things, marginal failures are reviewed before results are released.

Special Examinations

When considering the examination results Faculty Boards take into consideration any circumstances such as illness or personal problems which may have seriously affected a student's work during the year or during the examinations. Any student who considers that his work has been affected in this way or who is unable to attend for any examination and who wishes to apply for special consideration should write to the Secretary explaining the circumstances and, in the case of illness, enclosing a medical certificate (see Regulation 12 (2) of the Examination Regulations, Calendar Volume 1).

If a student is affected by illness during an examination, and wishes to ask for a Special Examination he must report to the supervisor in charge of the examination and then make written application to the Secretary as soon as possible after the examination (see Regulation 12 (3) of the Examination Regulations, Calendar Volume 1).

Deferred Examinations

The Boards of the Faculties of Architecture, Engineering, and Mathematics may grant deferred examinations. Such examinations, if granted, will be held in January-February and candidates will be advised by mail of the times and results of the examinations.

IV UNSATISFACTORY PROGRESS

The University has adopted Regulations Governing Unsatisfactory Progress which are set out below.

Students who become liable for action under the Regulations will be informed accordingly by mail after the release of the End of Year examination results and will be informed of the procedure to be followed if they wish to 'show cause'. Appeals against exclusion must be lodged together with Application for Re-enrolment forms by Friday 10 January 1986.

The Faculty's progress requirements are set out elsewhere in this volume.

Regulations Governing Unsatisfactory Progress

1. (1) These Regulations are made in accordance with the powers vested in the Council under By-law 5.1.2.

(2) These Regulations shall apply to all students of the University except those who are candidates for a degree of Master or Doctor.
(3) In these Regulations, unless the context or subject matter otherwise indicates or requires:

"Admissions Committee" means the Admissions Committee of the Senate constituted pursuant to By-law 2.3.5;

"Dean" means the Dean of a Faculty in which a student is enrolled.

"Faculty Board" means the Faculty Board of a Faculty in which a student is enrolled.

2. (1) A student's enrolment in a subject may be terminated by the Head of the Department offering that subject if the student does not maintain a rate of progress considered satisfactory by the Head of the Department. In determining whether a student is failing to maintain satisfactory progress the Head of Department may take into consideration such factors as:

(a) unsatisfactory attendance at lectures, tutorials, seminars, laboratory classes or field work;

(b) failure to complete laboratory work;

(c) failure to complete written work or other assignments; and

(d) failure to complete field work.

(2) The enrolment of a student in a subject shall not be terminated pursuant to regulation 2 (1) of these Regulations unless he has been given prior written notice of the intention to consider the matter with brief particulars of the grounds for doing so and has also been given a reasonable opportunity to make representations either in person or in writing or both.

(3) A student whose enrolment in a subject is terminated under regulation 2 (1) of these regulations may appeal to the Faculty Board which shall determine the matter.

(4) A student whose enrolment in a subject is terminated under this Regulation shall be deemed to have failed the subject.

3. (1) A Faculty Board may review the academic performance of a student who does not maintain a rate of progress considered satisfactory by the Faculty Board and may determine:

(a) that the student be permitted to continue the course;

(b) that the student be permitted to continue the course subject to such conditions as the Faculty Board may decide;

(c) that the student be excluded from further enrolment;

(i) in the course; or

(ii) in the course and any other course offered in the Faculty;

(iii) in the Faculty; or

(d) if the Faculty Board considers its powers to deal with the case are inadequate, that the case be referred to the Admissions Committee together with a recommendation for such action as the Faculty Board considers appropriate.

(2) Before a decision is made under regulation 3 (1) (b) (c) or (d) of these Regulations the student shall be given an opportunity to make representations with respect to the matter, either in person or in writing or both.

(3) A student may appeal against any decision made under regulation 3 (1) (b) or (c) of these Regulations to the Admissions Committee which shall determine the matter.

4. Where the progress of a student who is enrolled in a combined course or who has previously been excluded from enrolment in another course or Faculty is considered by the Faculty Board to be unsatisfactory, the Faculty Board shall refer the matter to the Admissions Committee together with a recommendation for such action as the Faculty Board considers appropriate.

5. (1) An appeal made by a student to the Admissions Committee pursuant to Regulation 3 (3) of these Regulations shall be in such form as may be prescribed by the Admissions Committee and shall be made within fourteen (14) days from the date of posting to the student of the notice of the decision or such further period as the Admissions Committee may accept.

(2) In hearing an appeal the Admissions Committee may take into consideration any circumstances whatsoever including matters not previously raised and may seek such information as it thinks fit concerning the academic record of the appellant and the making of the determination by the Faculty Board. Neither the Dean nor the sub-Dean shall act as a member of the Admissions Committee on the hearing of any such appeal.

(3) The appellant and the Dean or his nominee shall have the right to be heard in person by the Admissions Committee.

(4) The Admissions Committee may confirm the decision made by a Faculty Board or may substitute for it any other decision which the Faculty Board is empowered to make pursuant to these Regulations.

6. (1) The Admissions Committee shall consider any case referred to it by a Faculty Board and may:

(a) make any decision which the Faculty Board itself could have made pursuant to regulation 3 (1) (a) (b) or (c) of these Regulations; or

(b) exclude the student from enrolment in such other subjects, courses, or Faculties as it thinks fit; or

(c) exclude the student from the University.

(2) The Committee shall not make any decision pursuant to regulation 6 (1) (b) or (c) of these Regulations unless it has first given to the student the opportunity to be heard in person by the Committee.

(3) A student may appeal to the Vice-Chancellor against any decision made by the Admissions Committee under this Regulation.

7. Where there is an appeal against any decision of the Admissions Committee made under Regulation 6 of these Regulations, the Vice-Chancellor may refer the matter back to the Admissions Committee with a recommendation or shall arrange for the appeal to be heard by the Council. The Council may confirm the decision of the Admissions Committee or may substitute for it any other decision which the Admissions Committee is empowered to make pursuant to these Regulations.

8. (1) A student who has been excluded from further enrolment in a Faculty may enrol in a course in another Faculty only with the permission of the Faculty Board of that Faculty and on such conditions as it may determine after considering any advice from the Dean of the Faculty from which the student was excluded.

(2) A student who has been excluded from further enrolment in any course, Faculty or from the University under these regulations may apply for permission to enrol therein again provided that in no case shall such re-enrolment commence before the expiration of two academic years from the date of the exclusion. A decision on such application shall be made:

(a) by the Faculty Board, where the student has been excluded from a single course or a single Faculty; or

(b) by the Admissions Committee, in any other case.

9. (1) A student whose application to enrol pursuant to Regulation 8 (1) or 8 (2) (a) of these Regulations is rejected by a Faculty Board may appeal to the Admissions Committee.

(2) A student whose application to enrol pursuant to Regulation 8 (2) (b) of these Regulations is rejected by the Admissions Committee may appeal to the Vice-Chancellor.
V CHARGES

The General Services Charge (details below) is payable by all students. New undergraduate students are required to pay all charges when they attend to enrol. Re-enrolling students receive in October each year, as part of their re-enrolment kit, a statement of charges payable. Students are expected to pay charges in advance of re-enrolment and payment by mail is requested. The last date for payment of charges without incurring a late charge is the date of the Re-enrolment Approval session for the particular course (in the period 10-17 February 1986).

Charges

1. General Services Charge

   (a) Students Proceeding to a Degree or Diploma ...................... $166 Per annum

   (b) Non-Degree Students
       Newcastle University Union charge .......................... $75

   The exact amount must be paid in full by the prescribed date.

2. Late Charges

   Where the Statement of Charges payable form is lodged with all
   charges payable after the due date

   - if received up to and including 7 days late .................... $10
   - if received between 8 and 14 days late ....................... $20
   - if received 15 or more days late ............................. $30

3. Other Charges

   (a) Examination under special supervision ......................... $15 per paper
   (b) Review of examination results .................................. $8 per subject
   (c) Statement of matriculation status for non-members of the
       University .......................................................... $8
   (d) Replacement of Re-enrolment kit ................................ $10
   (e) Re-enrolment after the prescribed
       re-enrolment approval session ................................ $10
   (f) Replacement of Student Card ...................................... $5

4. Indebted Students

   All charges, including debts outstanding to the University, must be paid before or
   upon re-enrolment — part payment of total amount due will not be accepted by the
   cashier.

Method of Payment

Students are requested to pay charges due by mailing their cheque and the Statement of
Charges Payable form to the University Cashier. The Cashier's internal mail deposit box
in the foyer of the McMullen Building may also be used. Payment should be addressed to
the Cashier, University of Newcastle, NSW 2308. Cheques and money orders should be
payable to the University of Newcastle. Cash payment must be made at the Cashier's
Office 1st Floor McMullen Building between the hours of 10 am to 12 noon or 2 pm to 4
pm.

Scholarship Holders and Sponsored Students

Students holding scholarships or receiving other forms of financial assistance must lodge
with the Cashier their Statement of Charges payable form together with a warrant or
other written evidence that charges will be paid by the sponsor. Sponsors must provide
a separate voucher warrant or letter for each student sponsored.

Loans

Students who do not have sufficient funds to pay charges should seek a loan from their
bank, building society, credit union or other financial institution. Applications for a loan
from the Student Loan Fund should be made to Mr J. Birch, Student Administration
Office. Arrangements should be made well in advance to avoid the risk of a late charge.

Refund of Charges

A refund of the General Services charge paid on enrolment will be made when the student
notifies the Student Administration Office of a complete withdrawal from studies. (Any
change of address must also be advised.) A refund cheque will be mailed to the student or,
if applicable, to the sponsor.

The refund will be based on the date of notification of withdrawal, as follows:

   Notification on or before Monday, 24 February, 1986 .................. 100%
   Notification on or before Friday, 21 March, 1986 ..................... 90%
   Notification on or before Friday, 27 June, 1986 ....................... 50%

No refund will be made before 31 March 1986.

Higher Degree Candidates

Higher degree candidates are required to pay the General Services charge and Union
Entrance charge, if applicable. Where the enrolment is effective from First or Second
Term, the General Services charge covers the period from the first day of the term to the
Friday immediately preceding the first day of First Term in the following academic year.
Where enrolment is on or after the first day of Third Term, the General Services charge
paid will cover liability to the end of the long vacation following the next academic year.

VI CAMPUS TRAFFIC AND PARKING

Persons wishing to bring motor vehicles (including motor cycles) on to the campus are
required to complete a parking registration form for each vehicle. Completed forms must
be lodged with the Attendant (Patrol) Office located off the foyer of the Great Hall. All
persons must comply with the University’s Traffic and Parking Regulations including
parking in approved parking areas, complying with road signs and not exceeding 35 k.p.h.
on the campus.

If the Manager, Buildings and Grounds, after affording the person a period of seven days
in which to submit a written statement is satisfied that any person is in breach of
Regulations, he may:

(a) warn the person against committing any further breach; or
(b) impose a fine; or
(c) refer the matter to the Vice-Chancellor.

The range of fines which may be imposed in respect of various categories of breach include:

- Parking in areas not set aside for parking ........................... up to $10
- Parking in special service areas, e.g. loading bays, by fire hydrants,
  etc. ................................................................. up to $15
- Driving offences — including speeding and dangerous driving .... up to $30
- Failing to stop when signalled to do so by an Attendant (Patrol) .... up to $30
- Refusing to give information to an Attendant (Patrol) .............. up to $30
- Failing to obey the directions of an Attendant (Patrol) ............. up to $30

The Traffic and Parking Regulations are stated in full in the Calendar, Volume I.
Topics include:

Hardware devices for graphics output and input; geometrical transformations; homogeneous coordinates; planar projections; clipping in 2D and 3D; modelling and object hierarchy; standards - GKS, CORE; raster algorithms; anti-aliasing; region filling; 3D shape representation: polygon meshes, parametric cubics, Hermite, Bezier and B-splines; transforming curves and patches; hidden line removal, hidden surface removal algorithms; shading and texture mapping; diffuse and specular reflection; colour modelling; growth models; fractals and particle systems; animation techniques; advanced graphics hardware architectures; future trends in computer graphics.

Text

References

Angell, I. O.  

Enderle, G. Kansa, K. & Pfaff, G.  

Foley, J. D. & Van Dam, A.  

Freeman, H.  

Gili, W. K.  

Gouraud, H.  
*Computer Display of Curved Surfaces* (Garland 1979)

Harrington, S.  

Hopgood, F. R. A. et al.  

Newman, W. M. & Sproull, R. F.  

Pavlidis, T.  
*Algorithms for Graphics and Image Processing* (Springer 1982)

Rogers, D. F. & Adams, J. A.  

664166 Symmetry and Groups — W. Brisley

Prerequisites  
Topics D and K

Hours  
About 27 lecture hours

Examination  
One 2-hour paper

Content

This course studies various aspects of symmetry. Matters discussed may include: invariance of lattices, crystals and associated functions and equations; permutation groups; finite geometries; regular and strongly-regular graphs; designs; tactical configurations; "classical" simple groups, Matrix groups, representations, characters.

Text

References

Biggs, N.  
*Finite Groups of Automorphisms* (Cambridge 1971)

Carmichael, R. D.  
*Groups of Finite Order* (Dover reprint)

Harris, D. C. & Bertolucci, M. D.  
*Symmetry and Spectroscopy* (Oxford 1978)

Rosen, J.  
*Symmetry Discovered* (Cambridge 1975)

Shubnikov, A. V. & Koptsik, V. A.  

Weyl, H.  
*Symmetry* (Princeton 1973)

White, A. T.  
*Graphs, Groups and Surfaces* (North-Holland 1973)
664169 Nonlinear Oscillations — J. G. Couper

**Prerequisite**
Topic P

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
Physical problems often give rise to ordinary differential equations which have oscillatory solutions. This course will be concerned with the existence and stability of periodic solutions of such differential equations, and will cover the following subjects: Two-dimensional autonomous systems, limit sets, and the Poincaré-Bendixson theorem. Brouwer’s fixed point theorem and its use in finding periodic solutions. Non-critical linear systems and their perturbations. The method of averaging. Frequency locking, jump phenomena, and subharmonics. Bifurcation of periodic solutions. Attention will be paid to applications throughout the course.

**Text**
Nil

**References**
Hale, J. K.
Hirsch, M. W. & Smale, S.
Marsden, J. E. & McCracken, M.
Nayfeh, A. H. & Mook, D. T.
Stoker, J. J.

664172 Fluid Statistical Mechanics — C. A. Croxton

**Prerequisites**
Nil

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
Cluster-diagrammatic expansions — low density solutions; integrodifferential equations (BGY, HNC, PY) — high density solutions; quantum liquids — Wu-Feenburg fermion extension; numerical solution of integral equations; phase transitions — diagrammatic approach; critical phenomena; the liquid surface; liquid metals; liquid crystals; molecular dynamics and Monte Carlo computer simulation; irreversibility; transport phenomena. Polymeric systems.

**Text**
Croxton, C. A.
Introduction to Liquid State Physics (Wiley 1975)

**Reference**
Croxton, C. A.
Liquid State Physics — A Statistical Mechanical Introduction (Cambridge 1974)

664120 Quantum Mechanics — C. A. Croxton

**Prerequisites**
Nil

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
664173 Mathematical Problem Solving — R. B. Eggleton

Prerequisites
Topic O

Hours
About 27 class hours

Examination
One 2-hour paper

Content
The course will cover the following subject matter. Normed algebras; regular topological divisors of zero; the spectral radius and spectral mapping theorem for polynomials; ideals and maximal ideals; commutative Banach algebras; the Gelfand theory and the Gelfand representation theorem.

References
Cox, D. R. & Oakes, D.
Analysis of Survival Data (Chapman & Hall 1984)
Elandt-Johnson, R. C. & Johnson, N. L.
Survival Models and Data Analysis (Wiley 1980)
Giles (not offered in 1986)

664180 Demography and Survival Analysis — R. W. Gibberd

Prerequisite
Topic II

Hours
About 27 lecture hours for 1st half year

Examination
One 2-hour paper

Content
This course presents a mathematical treatment of the techniques used in population projections, manpower studies, and the survival models used in demography and biostatistics.

Text
Lawless, J.
Statistical Models & Methods for Lifetime Data (Wiley 1982)

References
Cox, D. R. & Oakes, D.
Analysis of Survival Data (Chapman & Hall 1984)
Elandt-Johnson, R. C. & Johnson, N. L.
Survival Models and Data Analysis (Wiley 1980)
Giles (not offered in 1986)

664142 Topological Graph Theory — R. B. Eggleton

Prerequisite
Topic CO

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
This topic deals with drawings of graphs on various surfaces. It will begin with a brief introduction to the theory of graphs, to be followed by a fairly detailed introduction to the topology of surfaces, with particular attention to the classification of surfaces. The main graph-theoretic areas to be treated are: Kuratowski's Theorem characterising graphs which can be embedded in the plane; genus, thickness, coarseness and crossing numbers of graphs; chromatic number of a surface and some details of the proof of the Four Colour Theorem by Appel and Haken; transfection-free chain decompositions of graphs embedded in surfaces.

Text
Nil

References
Blackett, D. W.
Elementary Topology: Combinational and Algebraic Approach (Academic 1967)

Bondy, J. A. & Murty, U. S. R.
Graph Theory with Applications corrected edn (Macmillan 1977)
Harary, F.
Graph Theory (Addison-Wesley 1969)
Ore, O.
The Four Colour Problem (Academic 1967)
Ringel, G.
Map Colour Theorem (Springer 1974)
White, A. T.
Graphs, Groups and Surfaces (North-Holland American Elsevier 1973)
Wilson, R. J.
Introduction to Graph Theory (Olive & Boyd 1972)

664103 Banach Algebra — J. R. Giles (not offered in 1986)

Prerequisite or Corequisite
Topic W

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
A Banach Algebra is a mathematical structure where the two main strands of pure mathematical study—the topological and the algebraic—are united in fruitful contact. The course will cover the following subject matter. Normed algebras; regular and singular elements; the spectrum of an element and its properties; the Gelfand-Mazur theorem; topological divisors of zero; the spectral radius and spectral mapping theorem for polynomials; ideals and maximal ideals; commutative Banach algebras; the Gelfand theory and the Gelfand representation theorem.

Text
Nil

References
Bondy, J. A. & Murty, U. S. R.
Graph Theory with Applications corrected edn (Macmillan 1977)
Harary, F.
Graph Theory (Addison-Wesley 1969)
Ore, O.
The Four Colour Problem (Academic 1967)
Ringel, G.
Map Colour Theorem (Springer 1974)
White, A. T.
Graphs, Groups and Surfaces (North-Holland American Elsevier 1973)
Wilson, R. J.
Introduction to Graph Theory (Olive & Boyd 1972)
Weak topologies, the Banach-Alaoglu theorem, the Gelfand topology. Involutions in Banach algebras; hermitian involutions; the Gelfand-Naimark representation theorem for commutative $B^*$ algebras. Numerical range of an element in a normed algebra; relation of the numerical range to the spectrum; $B^*$ algebras are symmetric, discussion of the Gelfand-Naimark representation theorem for $B^*$ algebras.

Applications of Banach algebra theory.

References

Bachman, G. & Narici, L.
Bonsall, F. F. & Duncan, J.
Bonsall, F. F. & Duncan, J.
Naimark, M. A.
Rickart, C. E.
Rudin, W.
Simmons, G. F.
Wilansky, A.

66416 Mathematical Models of Phase Transitions -- A. J. Guttmann

Prerequisites: Nil

Hours: About 27 lecture hours during Ist Term

Examination: One 2-hour paper

Content


Text

References

Amit, D. J.
Domb, C. & Green, M. S. (eds)
Fishier, M. E.
Huang, K.
Stanley, H. E.
Thompson, C. J.

664150 General & Algebraic Topology -- M. J. Hayes

Prerequisite: Topic L

Hours: About 27 lecture hours

Examination: One 2-hour paper

References

Barbu, V. & Precupanu, T.
## Content

Topological spaces are sets with enough properties on which to study continuity. These lectures will concentrate on the geometric aspects of these spaces, and will include the following topics: separation, relative and product topologies, compactness, connectedness, homeomorphisms, quotient spaces, homotopy and the fundamental group, deformation retracts. Seifert-Van Kampen Theorem. Covering spaces.

### Text

**References**

- Cairns, S. S. *Introduction to Topology* (Ronald 1961)
- Leshchetz, S. *Introduction to Topology* (Princeton 1949)
- Massey, W. S. *Algebraic Topology* (Harcourt, Brace & World 1967)
- Simmons, G. F. *Introduction to Topology and Modern Analysis* (McGraw-Hill 1963)

### 664144 Linear Operators — M. J. Hayes

**Prerequisites**

Topics V & W

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Content**

The theory of linear operators on Hilbert and Banach spaces is a very important theory and is valuable for applications. We consider the algebra of continuous linear operators on a normed linear space, the spectrum and numerical range of a continuous linear operator, and conjugate operators. We discuss the theory of compact linear operators and the Riesz-Schauder Theory for such operators. The course concentrates on spectral theory for different types of operator on Hilbert space: compact normal, self-adjoint and normal operators.

**Text**


**References**

- Dunford, N. & Schwartz, J. *Linear Operators* (Interscience 1958)
- Schneider, W. *Linear Operators on Hilbert Space* (Academic 1954)

### 664145 Viscous Flow Theory — W. T. F. Lau

**Prerequisite**

Topic Q

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Content**

Basic equations. Some exact solutions of the Navier-Stokes equations. Approximate solutions: theory of very slow motion, boundary layer theory, etc.

**Text**

**References**

- Batchelor, G. K. *An Introduction to Fluid Dynamics* (Cambridge 1967)
- Langlois, W. E. *Slow Viscous Flow* (Macmillan 1964)
- Pai, S. I. *Viscous Flow Theory* (Van Nostrand 1956)
- Rosenhead, L. *Laminar Boundary Layers* (Oxford 1963)
- Schlichting, H. *Boundary Layer Theory* (McGraw-Hill 1968)

### 664118 Perturbation Theory — D. L. S. McElwain

**Prerequisite**

Topics CO, P

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Content**


**Text**

**References**

- Cole, J. D. *Perturbation Methods in Applied Mathematics* (Blaisdell 1968)
- Van Dyke, M. *Perturbation Methods in Fluid Mechanics* (Parabolic 1975)

### 664106 Combinatorics and Counting — B. Richmond

**Prerequisite**

Topic K

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper
Content
Permutations and combinations, inclusion-exclusion and generating functions. Polya's theorem and its application to counting various kinds of structures and graphs will be discussed.

Text
Goulden, I. P. & Jackson, D. M.

References
Beckenbach, E. F. (ed.)
Hall, M.
Harary, F. & Palmer, E. M.
Liu, C. L.

664164 Number Theory — T. K. Sheng

Prerequisites
Nil

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
Divisibility. Congruences. Quadratic residues, the Legendre symbol, quadratic reciprocity, the Gaussian reciprocity law, the Jacobi symbol. Multiplicative functions, Mobius inversion formula, recurrence functions, Simple continued fractions, Pell's equation. Distribution of primes. Partitions. Asymptotic density. Dispersive and explosive mappings.

Text
Nil

References
Andrews, G. E.
Hardy, G. & Wright, E. M.
Niven, I. & Auckerman, H. S.

664189 Formal Semantics of Programming Languages — Simon

Prerequisites
None

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
The syntax of programming languages is generally described quite concisely and unambiguously in syntax diagrams, BNF, or the like; but the semantics, the meaning or outcome of constructs in the language, is generally described quite sloppily in English. Several highly formal abstract systems have been developed for the semantic description of programming languages. This course will look at such systems in general, and at one of them (denotational semantics) in detail.

Text
Gordon

References
Milne & Strachey

664193 Artificial Intelligence — Simon

Prerequisites
None (Topic PL would be an advantage)

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
This course will provide an overview of Artificial Intelligence, covering some or all of the following topics: introduction and history; game-playing; representation of knowledge; natural-language processing; expert systems; automatic deduction; predicate calculus; theorem-proving; computer vision; computer learning; philosophical, psychological, and social issues.

Text
Nil

References
Barr & Feigenbaum
Boden
Winston
Nilsson

664159 Foundations of Modern Differential Geometry — P. K. Smrz

Prerequisite
Topic CO

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

Text
Nil
664181 Numerical Methods and Analysis — W. Summerfield

**Prerequisite**
Topic Z

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
The three major problem areas of numerical analysis involve rounding error, discretisation error and convergence error. The effect of each of these types of error is often masked by "ill-conditioning" (instability) either in the numerical method or in the mathematical problem itself. This course investigates methods of solution of one or more of linear systems of equations, eigenvalue problems, ordinary differential equations or partial differential equations. At the same time, the basic theoretical results pertaining to the three types of error for the methods will be examined.

**References**

Forsythe, G. & Moler, C. B. *Computer Solution of Linear Algebraic Systems* (Prentice-Hall 1967)


Lambert, J. D. *Computational Methods in Ordinary Differential Equations* (Wiley 1973)


664165 Mathematical Physiology — W. Summerfield

**Prerequisites**
Nil

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
Physiology — the study of how the body works based on the knowledge of how it is constructed — essentially dates from early in the seventeenth century when the English physician Harvey showed that blood circulates constantly through the body. The intrusion of engineering into this field is well known through the wide publicity given to (for example) heart by-pass and kidney dialysis machines, cardiac assist pace-makers, and prosthetic devices such as hip and knee joints; the obviously beneficial union has led to the establishment of Bioengineering Departments within Universities and Hospitals. Perhaps the earliest demonstration of mathematics' useful application in (some areas of) physiology is the mid-nineteenth century derivation by Hagen, from the basic equations of continuum motion, of Poiseuille's empirical formula for flow through narrow straight tubes: detailed models of the cardiovascular circulatory system have recently been developed. Mathematical models have also been formulated for actions such as coughing, micturition and walking, as well as for the more vital processes involved in gas exchange in the lungs, mass transport between lungs and blood and blood and tissue, metabolic exchanges within tissues, enzyme kinetics, signal conduction along nerve fibres, sperm transport in the cervix, . . . . Indeed, mathematical engineering might now be said to be part of the conspiracy to produce super humans (see "Fast Running Tracks" in Dec. 1978 issue of Scientific American).

This course will examine in some detail a few of the previously mentioned mathematical models; relevant physiological material will be introduced as required.

**References**


Christensen, H. N., Fung, Y. C., Biological Transport (W. A. Benjamin, 1975)


Lightfoot, E. N. *Textbook of Medical Physiology* (W. A. Saunders 1971)


Murray, J. D. *Biomechanics and Energetics of Muscular Exercise* (Clarendon 1976)


West, J. B. (ed.) *Bioengineering Aspects of the Lung* (Marcel Dekker 1977)

664148 Urban Spatial Traffic Patterns — R. J. Vaughan

**Prerequisites**
Topics CO and H

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
Discussion of transportation problems in cities. The advantages and disadvantages of the use of continuous and discrete models to describe traffic characteristics of urban areas.

**References**

Kendall, M. G. & Moran, P. A. P. *Geometrical Probability* (Griffin 1963)

Mardia, K. V. *Families of Bivariate Distributions* (Griffin 1970)

664168 Astrophysical Applications and various constructions.

**Prerequisites**

Topics CO and PD

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Text**

Street, A. P. & Wallis, W. D. *Combinatorial Theory: An Introduction* (CBRC 1977)

**References**


Hall, M. Jr. *Combinatorial Theory* (Blaisdell 1967)


Raghavaran, D. *Constructions and Combinatorial Problems in Design of Experiments* (Wiley 1971)

Ryser, H. J. *Combinatorial Mathematics* (Wiley 1963)


Wallis, W. D. *Combinatorial Designs* (Univ. of Surrey 1977)

664168 Astrophysical Applications of Magnetohydrodynamics — W. P. Wood

**Prerequisites**

Topics CO and PD

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Text**

The normal state of matter in the universe is that of a plasma, or ionized gas, permeated by magnetic fields. Moreover, these fields (unlike that of the earth) may be dominant, or at least significant, in controlling the structure of the region. The aim of this course is to investigate the effects of astrophysical magnetic fields, ranging from $10^{17}$ gauss in the galaxy to $10^{11}$ gauss in a neutron star.

**References**


Cowling, T. G. *Magnetohydrodynamics* (Interscience 1957)


Other topics may be offered from time to time by visitors to the Department: intending students should consult the Department early in the year regarding them.

**SUPPLEMENTARY LIST**

(Courses from other Departments available for choice as Part IV topics by students who have passed Mathematics IIIA, Computer Science III or Statistics III. Not all of these courses are necessarily offered in any one year.)

**Department of Electrical Engineering**

EE447 Digital Communications — see page 93

**Department of Mechanical Engineering**

ME487 Operations Research — Fundamental Techniques — see page 103

ME488 Operations Research — Planning, Inventory Control & Management — see page 103

Additionally, students permitted to select courses from this list may also select some of the following topics which they have not studied in Computer Science III:

Compiler Construction

Computer Operating Systems

Programming Languages and Systems

**SCHEDULE B**

**PART I**

541100 Engineering I

**Prerequisites**

3-unit Mathematics & multistrand Science at the 4-unit level (advisory)

**Corequisite**

Mathematics I

80
Four of the following units to be chosen.

(i) CE111 Statics

Content
Two-dimensional force systems; equilibrium, funicular polygon, rigid bars, shear force, axial force, bending moment; pin-jointed frames, analytical and graphical treatment; equilibrium of three-dimensional force systems, cables.

Text
Hall, A. S. & Archer, F. Principles of Statics (Uni. of N.S.W. Students Union 1966)

(ii) ME131 Dynamics

Content
Basic concepts for the study of motion: length, time, force and mass; Newton's laws of motion; law of friction; systems of units. Motion of point masses, rigid bodies and connected bodies in straight or curved paths and in simple rotation. Relative motion using translating reference frames. General plane motion of rigid bodies. Momentum and impulse, both linear and angular, related to point masses and rigid bodies. Energy and the conservation principle applied to mechanical work, strain energy, kinetic energy, friction losses, for particles and rigid bodies.

In addition to lectures, the course includes weekly tutorials devoted to the solution of problems in Dynamics.

Text

(iii) ME111 Graphics and Engineering Drawing

Content
A study in communication and analysis by pictorial means. Methods of projection covering orthogonal projection of points, lines, planes and solids; lengths of lines, angles and intersection between lines, planes and contoured surfaces; orthographic projection, dimensioning and sectioning; isometric projection; prospective projection.

Texts
Levens, A. S. Graphics, Analysis and Conceptual Design (John Wiley & Sons)
Australian Standard Engineering Drawing Practice CZI 1976 (Inst. of Engineering, Australia)

References
Levens, A. S. Graphics (Wiley)
Launder, W. J. Basic Graphics (Prentice-Hall)

(iv) 501101 GE112 Introduction to Engineering Design

Content
Philosophy and fundamentals of engineering design.

Texts
— Australian Standard Engineering Drawing Practice CZI 1976 (Inst. of Engineers, Australia)

(v) 531203 EE131 Circuit Fundamentals

Content
Part 1 (Introduction)
Introduction to Electrical Engineering, Model Theory, Units.
Part 2 (Resistive Circuits)
Part 3 (Transient Circuits)
Inductance and Capacitance, Natural and Forced Response, Transients in R-L, R-C Circuits.
Part 4 (Sinusoidal Analysis)
The Phasor Concept, Complex Impedance and Admittance, Phasor diagrams.
Part 5 (Power in AC Circuits)
Power, Volt-Amps, Reactive Power, Power Factor.

The course will be evenly divided between lectures and laboratory work and will also be supplemented by tutorial sessions.

Text

(vi) 511108 ChE141 Industrial Process Principles

Content

(vii) 501102 GE151 Introduction to Materials Science

Content
The course provides a general introduction to materials of engineering significance and to the relationships which exist between structures, properties and applications. The detailed treatment of various aspects is left to the later stages of the degree programme. The following sections are given approximately equal amounts of time and emphasis: Atomic bonding; atomic arrangements in metals, glasses and polymers; the effects of stress and temperature on simple metals; the control of metallic structures by composition and thermal treatments; common metals of engineering importance; the structure and properties of ceramics and cement products.
Polymers, rubbers and woods; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical, magnetic, optical and thermal properties of solid materials.

Text

521200 EE161 Introduction to Computer Technology

Content
Number systems and codes.
Boolean algebra, functions and logical circuits.
Combinational logic, analysis, synthesis and MSI /LSI circuits.
Elementary sequential logic, flip-flops, registers, counters and memory elements.
Introduction to microprocessor systems.
Lectures will be supplemented by laboratory work on logic trainers and tutorial sessions.

Text
Mano, N. M. Digital Logic and Computer Design (Prentice-Hall 1979)

PART II

412700 Accounting IHC

Prerequisites
Accounting I, Mathematics I

Hours
4 lecture hours and 4 tutorial hours per week

Examination
4 papers throughout the year including one 3-hour paper at end of year for Accounting IIB and one for Accounting IIA

Content
Accounting IIA and Accounting IIB

Accounting IIA
Theory and practice of company accounting; accounting for the formation, reconstruction, amalgamation, take-over, official management, receivership and liquidation of companies; the preparation of holding company and group financial statements; equity accounting; presentation, analysis and interpretation of financial statements; the valuation of shares and goodwill; funds statements; accounting for inflation; accounting for executorship, hire purchase and instalment-purchase, lease agreements and tax-effect accounting.

Accounting IIB
The theory and practice of management accounting: the management planning and control process; the concept and classification of cost; cost estimation and forecasting; cost-volume-profit analysis; incremental decision analysis; budgeting; job costing; process costing; joint and by-product costing; accounting for materials labour and overhead; standard costing and variance analysis; responsibility accounting and performance evaluation; transfer pricing; capital investment analysis; inventory costing and control learning curves; behavioural aspects of accounting information.

Text

(iii) 522102 CE212 Mechanics of Solids I — 1 Unit

Prerequisites
CE111

Assumed Knowledge
Mathematics I

Hours
2 lecture hours & 1 tutorial hour per week for first half year

Examination
One 3-hour paper

Content
Stress, strain, axial load problems; states of stress and strain; stress-strain relationships; internal actions, internal stresses in beams; deflexion of beams; torsion in circular sections; combined stresses.

Text

(ii) 522111 CE213 Mechanics of Solids II — 1 Unit

Prerequisite
CE212

Hours
2 lecture hours & 1 tutorial hour per week for second half year

Examination
One 3-hour paper

Issues in Financial Accounting
3rd edn (Cheshire)
The Law and Practice of Company Accounting in Australia 4th edn (Butterworths)
Questions on the Law & Practice of Company Accounting 3rd edn (Butterworths)
Companies Act, 1981 (N.S.W. Govt. Printer)
Questions on Management Accounting (Butterworths)
Cost Accounting 5th edn (Prentice-Hall)

522700 Civil Engineering IIM

Prerequisites
Mathematics I, CE111, ME131, GE112 and ME111

Hours
5 lecture hours & 2½ tutorial hours per week

Examination
Five 3-hour papers

Text
Johnson, R. & Tippett, M. Hornigren, C. T.
Buckling of columns, introduction to theory of elasticity; non-uniform bending; shear centre; torsion of non-circular sections; lateral instability of beams; energy methods.

Text
As for CE212

(iii) 522202 CE231 Fluid Mechanics I — 1 Unit

Assumed Knowledge
Mathematics I, Physics IA or IB

Hours
2 lecture hours & 1 tutorial/laboratory hour per week for first half of year

Examination
One 3-hour paper

Content
Fluid properties. Fluid statics, stability of submerged and floating bodies, relative equilibrium. Fluid-flow concepts and basic equations of continuity, energy, linear and angular momentum.

Text

(iv) 522204 CE232 Fluid Mechanics II — 1 Unit

Prerequisites
CE231

Hours
2 lecture hours & 1 tutorial/laboratory hour per week for second half year

Examination
One 3-hour paper

Content

Text
As for CE231

(v) 522412 CE224 Civil Engineering Materials — 2 Units

Assumed Knowledge
GE151

Content
Theoretical background and laboratory tests of elastic and inelastic properties of materials, hardness and fracture of metals and timber, (½ unit) Properties and behaviour of brick, masonry and timber, (¼ unit) Properties and behaviour of bituminous materials, (½ unit) Concrete: component materials, properties of plastic and hardened concrete, concrete mix design, manufacturing and field control, (1¼ unit)

Texts

752300 Psychology IIC

Prerequisites
Psychology I & Mathematics I

Hours
3 lecture hours, one 2-hour practical session & 1 tutorial hour per week

Examination
Two 3-hour papers plus an assessment of practical work

Content
1. Experimental Methodology, Quantitative Psychology, Learning, Perception, Computer Applications.
2. Two other topics chosen from those topics available in Psychology IIA and Psychology IIB.
3. Mathematical Psychology.

Texts

References
To be advised

PART III

413900 Accounting IIC

Prerequisites
Mathematics IIA & IIC & Accounting IIC

Hours
4 lecture hours per week

Examination
Three 3-hour papers & progressive assessment

Content
(i) Either Accounting IIA or Accounting IIB and two appropriately chosen Part III topics offered by the Department of Mathematics, Statistics and Computer Science and approved by the Head of the Department.
OR
(ii) Accounting IIB and Foundations of Finance.

413100 Accounting IIA

Hours
2 lecture hours per week

Examination
Two 3-hour papers

Content
Selected contemporary problems in the theory and practice of financial accounting, company financial reporting and public practice including a study of current approaches to the formulation of accounting theory; implications of the efficient market hypothesis in accounting.

Preliminary Reading

Text
To be advised

87
References
Journal articles and extracts from relevant accounting monographs including the following:

American Accounting Association
American Institute of Certified Public Accountants
Beaver, W. H.

Bromwich, M. & Hopwood, A. (eds)
Chambers, R. J.

Financial Accounting Standards Board
Goldberg, L.

Hendriksen, E. S.
Jager, M. O. et al.

Keane, S. M.

Moonitz, M.
Parker, R. H. & Harcourt, G. C.

Sprouse, T. R. & Moonitz, M.
Vatter, W. J.

A Statement of Basic Accounting Theory
Objectives of Financial Statements
Essays in British Accounting Research
Accounting Evaluation and Economic Behaviour (Prentice-Hall 1966)

Statements of Financial Accounting Concepts
An Inquiry into the Nature of Accounting (American Accounting Assn 1965)
Accounting Theory (Irwin 1970)

The Efficient Market Hypothesis and Implications for Financial Reporting
The Basic Postulates of Accounting (A.I.C.P.A.)
Readings in the Concept of Measurement of Income (Cambridge U.P.)

A Tentative Set of Broad Accounting Principles for Business Enterprises (A.I.C.P.A.)
The Fund Theory of Accounting (Chicago Uni. Press)

413200 Accounting IIB

Prerequisites
Accounting IIB

Hours
2 lecture hours per week or 4 lecture hours per fortnight

Examination
One 3-hour paper and one 2-hour paper

Content
The application of analytical reasoning and the use of formal models in organizational decision making: financial modelling, decision analysis, cost estimation, product mix decisions, project scheduling.

Texts
Fatsfas, V. A. & Vagg, T. R.
Kaplan, R. S.

Quantitative Techniques for Managerial Decision Making (Prentice-Hall of Australia)
Advanced Management Accounting (Prentice-Hall)

413619 Foundations of Finance

Prerequisite
Accounting 1, Economics 1 and Introductory Quantitative Methods

Hours
2 lecture hours and 1 tutorial hour per week

Examination
One 3-hour paper

Content
Deriving basic financial relations (e.g. annuities); mean variance port folio theory, capital asset pricing model; applications of such models to evaluation of capital projects, financing and dividend policies.

Texts

van Horne, J. et al.

Financial Management & Policy in Australia 2nd edn (Prentice-Hall)

or

Prierson, G. & Bird, R.

Business Finance 4th edn (McGraw-Hill)

References
Ball, R. et al.

Share Markets and Portfolio Theory (Queensland Univ. Press)

Hart, W. L.
Bishop, S. et al.

Mathematics of Investment (D. C. Heath)
Corporate Finance (Holt, Rinehart & Winston)

713200 Biology IIB

Prerequisites
Mathematics IIA & IIC & either Biology IIA or IIB

Hours
4 lecture hours & 8 tutorial hours per week. Two 3-day excursions.

Examination
Two 3-hour papers

Content
Biology IIB consists of two units, Physiology and Ecology and Environmental Physiology.

(i) 713205 Physiology

Content
Plants
The operation of key physiological processes including photosynthesis, mineral ion acquisition and assimilate transfer.

Animals
Biology of reproduction with particular emphasis on gamete physiology.
Texts
Baker, D. A. 
Johnson, M. H. & Everitt, B. J.
Milthorpe, F. L. & Moorby, J.
Transport Phenomena in Plants (Chapman & Hall 1978)
Essential Reproduction (Blackwell 1980)

References
Asztin, C. R. & Shor, R. V.
Bloom, W. & Fawcett
Evans, L. T.
Leopold, A. C. & Kriedemann, P. E.
Setchell, B. P.
Torrey, T. W. & Feduccia, A.

(ii) 713206 Ecology and Environmental Physiology

Content
Ecology
Structure and dynamics of biological communities, evolutionary ecology.

Environmental Physiology
Adaptation of organisms in relation to their environment.

Text
Krebs, C. J. 
Ecology 2nd edn (Harper & Row)

References
C.S.I.R.O. 
The Australian Environment (Melbourne University Press 1970)
Daubenmire, R. F.
Kershaw, K. A.
Plants and Environment 3rd edn (Wiley 1974)
Quantitative and Dynamic Plant Ecology 2nd edn (Arnold 1973)

523700 Civil Engineering IIM

Prerequisite
Civil Engineering IIM, Mathematics IIA & IIC

Hours
6 lecture hours & 4½ tutorial/laboratory hours per week

Examination
Four 3-hour papers, one 2-hour paper & two ½-hour term papers

Content
(i) CE324 Soil Mechanics
(ii) CE314 Structural Analysis I
(iii) CE333 Fluid Mechanics III
(iv) CE334 Fluid Mechanics IV
(v) CE351 Civil Engineering Systems I

(i) 523102 CE324 Soil Mechanics

Assumed Knowledge
CE212

Hours
1 lecture hour & 2 tutorial & laboratory hours per week

Examination
One 2-hour paper

Content
Index properties, classification of soils; permeability, capillarity, seepage and flow nets; stresses in soils; settlement and consolidation; compaction, shear strength and failure criteria; stability of retaining walls.

Text
Scott, C. R. 

References
Capper, P. L. & Cassie, W. F.
Lambe, T. W.
SAA
Wu, T. H.
The Mechanics of Engineering Soils 6th edn (Spon 1976)
Methods of Testing Soils for Engineering Purposes AS1289
Soil Mechanics 2nd edn (Allyn & Bacon 1966)

(ii) 523109 CE314 Structural Analysis I

Prerequisites
CE212, CE213 & Mathematics I

Hours
2 lecture hours & 1 tutorial hour per week

Examination
One 3-hour paper

Content
Analysis of statically indeterminate, elastic plane structures by force and displacement methods. Elements of flexibility and stiffness matrix methods. Limit analysis.
Familiarisation with computer packages.

Texts
Nil

(iii) 523306 CE333 Fluid Mechanics III

Prerequisite
CE231

Assumed Knowledge
CE232

Hours
2 lecture hours & 1 tutorial & laboratory hour per week for the first half year

Examination
One 3-hour paper

Content
As for CE231

(iv) 523307 CE334 Fluid Mechanics IV

Assumed Knowledge
CE333

Hours
2 lecture hours & 1 tutorial laboratory hour per week for the second half year

Examination
One 3-hour paper

Content
Open channel flow, basic concepts, energy and momentum principles, flow resistance, non-uniform flow, channel controls, channel transitions. Unsteady flow; surges in closed conduits, water hammer, elements of unsteady flow in open channels.

As for CE231

(v) 523407 CE351 Civil Engineering Systems I

Hours
1 lecture hour & 1/2 tutorial hour per week

Examination
Two 1½-hour term papers & one 3-hour final paper

Content

533900 Communications and Automatic Control

Prerequisites
Mathematics II A & II C (including Topics CO, D)

Hours
6 lecture, tutorial & laboratory hours per week

Examination
Progressive assessment & final examination

Content

Text
Fortmann, T. E. & Hitz, K. L. Introduction to Linear Control System Theory (Dekker 1977)

or


or


(ii) 533110 EE342 Linear System Theory

Prerequisite
GE360

Hours
3 lecture, tutorial & laboratory hours per week for second half year

Examination
Progressive assessment & final examination

Content

The course consists mainly of lectures which are supplemented by laboratory work and tutorial sessions.

Text
As for GE360 Automatic Control

(iii) 533113 EE344 Communications — G. C. Goodwin

Hours
3 hours per week for second half year

Examination
Progressive assessment & final examination

Content

Text
Stremler, F. G. Introduction to Communication Systems 2nd edn (Addison-Wesley 1982)

(iv) 534134 EE447 Digital Communications

Prerequisite
EE344 Communications
The course is concerned with examining the usefulness of single equation regression analysis in applied economic research and also with providing an introduction to simultaneous estimation procedures.

Text
Johnston, J. Econometric Methods (McGraw-Hill)

References
Goldberger, A. Econometrics (Wiley & Sons)
Huang, D. S. Linear Algebra (Addison-Wesley)
Koutsoyiannis, A. Regression and Econometric Methods (Wiley & Sons)
Krenta, J. A Theory of Econometrics (Macmillan)
Pindyck, R. S. & Rubinfeld, D. L. Elements of Econometrics (McGraw-Hill)
Econometric Models and Economic Forecasts (McGraw-Hill)

(ii) 423204 Mathematical Economics

Prerequisites
Economics II or IIA

Hours
3 lecture hours per week

Examination
One 3-hour paper

Content
The first part of the course is designed to provide an introduction to Mathematical Economics for students who have some mathematical ability but whose university level work in this area has been confined to one or more statistics-oriented subject. Topics include linear modelling and constrained optimization, the theory and economic application of difference and differential equations, the mathematical reformulation and interpretation of traditional macro-theory (including matrix algebra), the techniques of input-output analysis, linear (and to a limited extent non-linear) programming, game theory and a discussion of the theory and economic application of the calculus of variations.

Text
Tu, P. N. V. Introductory Optimization Dynamics (Springer-Verlag 1984)

References
Benavie, A. Mathematical Techniques for Economic Analysis (Prentice-Hall 1972)
Chiang, A. C. Fundamental Methods of Mathematical Economics 2nd edn (McGraw-Hill)
Dernburg, T. F. Macroeconomic Analysis: An Introduction to Comparative Statics and Dynamics (Addison-Wesley 1969)
IntroducTory Mathematical Analysis 2nd edn (Reston Publishing Co. 1976)
Henderson, J. & Quandt, R. 
Intriligator, M. D. 
Yamanc, T. 

Microeconomic Theory — A Mathematical Approach
2nd edn (Prentice-Hall) 
Mathematical Optimization and Economic Theory (Prentice-Hall) 
Mathematics for Economists — An Elementary Survey (Prentice-Hall) 

(iii) 423113 Development

Prerequisite Economics II

Hours 2 lecture hours per week

Examination One 3-hour paper

Content
The course commences with a discussion of the concepts of development and poverty. Major topics to follow are: underdevelopment of the Australian aboriginals; growth, poverty and income distribution; population growth and development; rural-urban migration; industrial and agricultural development policies and trade, aid and foreign investment. Throughout the course case study materials from various Third World countries will be used, with particular emphasis on Indonesia.

Text
Todaro, M. P. 
Economic Development in the Third World
2nd edn (Longmans 1981)

References
Booth, A. & Sundrum, R. M. 
Booth, A. & McCawley, P. 
Gillis, M. et al. 
Meier, G. M. (ed.) 
Sundrum, R. M. 
Labour Absorption in Agriculture (Oxford U.P. 1984) 
The Indonesian Economy During the Soeharto Era (Oxford U.P. 1982) 
Economics of Development (Norton 1983) 
Development Economics (Wiley 1983)

(iv) 423102 International Economics

Hours 2 lecture hours per week for half the year

Examination One 3-hour paper and progressive assessment

Content
1. The theory and analysis of trade policy. This covers the role and scope for international specialization, the gains from trade, optimal trade intervention, the effects of trade at the national and international levels and the theory of preferential trading. Australian illustrations are used wherever possible.
2. The theory of balance of payments policy. This covers balance of payments problems, alternative adjustment processes including a synthesis of the elasticities, absorption and monetary approaches, international monetary systems and balance of payments policy. Australian illustrations are used wherever possible.

Texts
Haner, J. & Wood, J. 
International Economics Sydney 
(Phillip 1983)

Meier, G. M. 
International Economics, The Theory of Policy 
New York (Oxford 1980)

Perkins, J. 
Australia in the World Economy 3rd edn 
Melbourne (Sun Books 1979)

References
Caves, R. E. 
Readings in International Economics (Allen & Unwin 1968)
Heller, H. R. 
Heller, H. R. 
International Monetary Economics (Prentice-Hall 1971)
Kindleberger, C. P. & Lindert, P. H. 
Overseas Trade and Investment (Pelican 1972)
McColl, G. D. (ed.) 
International Trade and the Australian Economy 2nd edn (Longman 1973)

(v) 423103 Public Economics

Hours 2 lecture hours per week

Examination Two 2-hour papers and progressive assessment

Content
The effects of government intervention in the economy through the budget and through the operation of publicly-owned business undertakings and inter-governmental fiscal relationship are examined.
At the microeconomic level, there is an analysis of the effects of tax and expenditure policies on, in particular, community welfare and incentives.
At the macroeconomic level, aggregative models are used to analyse the relation of fiscal policy to other economic policies for stability and growth.

References
Brown, C. V. & Jackson, P. M. 
Buchanan, J. M. & Flowers, M. R. 
Culbertson, J. M. 
Groenewegen, P. D. (ed.) 
Groenewegen, P. D. 
Houghton, R. W. (ed.) 
Johansen, L. 
Mishan, E. J. 
Musgrave, R. A. & P. B. 
Rees, R. 
Shoup, C. S. 
Veale, J. et al. 
Wilkens, J. (ed.) 
Public Sector Economics (Martin Robertson) 
The Public Finances (Irwin) 
Macroeconomic Theory and Stabilisation Policy (McGraw-Hill) 
Australian Taxation Policy (Longman-Cheshire) 
Public Finance in Australia: Theory and Practice (Prentice-Hall) 
Public Finance (Penguin) 
Public Economics (North-Holland) 
Cost-Benefit Analysis (Allen & Unwin) 
Public Finance in Theory and Practice (McGraw-Hill) 
Public Enterprise Economics 2nd edn (Weidenfeld & Nicolson 1984) 
Public Finance (Weidenfeld & Nicolson) 
The Politics of Taxation (Hodder & Stoughton)
(vi) **423114 Growth and Fluctuations** (may not be offered in 1986)

**Prerequisite**  
Economics II

**Hours**  
2 lecture hours for half the year

**Examination**  
One three hour paper and progressive assessment

**Content**  
The course is devoted to a study of the various dimensions of the evolution and "motion" of the capitalist economic system through time. It considers explanations of capital accumulation and structural change, real economic growth and fluctuations in growth rates. Specific topics will include expanding reproduction and balanced growth, capital accumulation and income distribution, short-term fluctuations, long-wave fluctuations and the role of innovations and technological change in growth and fluctuations.

**References**  
Dunin, J. van  
*The Long Wave in Economic Life* (Allen & Unwin 1983)

Harris, D. J.  
*Capital Accumulation and Income Distribution* (Routledge & Kegan Paul 1979)

Heerje, A.  
*Economics and Technical Change* (Weidenfeld & Nicolson 1977)

Kalecki, M.  
*Selected Essays on the Dynamics of the Capitalist Economy* (Cambridge U.P. 1971)

Kregel, J.  
*Rate of Profit, Distribution and Growth: Two Views* (Macmillan 1971)

Lowe, A.  
*The Path of Economic Growth* (Cambridge U.P. 1976)

Steindl, J.  

(vii) **423115 Topics in International Economics**

**Prerequisite**  
Economics II

**Hours**  
2 lecture hours per week for half the year

**Examination**  
One 3-hour paper and progressive assessment

**Content**  
This course provides a more advanced theoretical treatment of selected topics introduced in the International Economics course. It also uses empirical studies and policy materials to provide a more detailed exposition and analysis of trade policy problems. The content consists of:

1. The neo-classical theory of international trade and equilibrium, the modern theory of trade, its clarification, extension and qualification, the sources of economic growth and international trade, equivalence among trade intervention measures, a general equilibrium approach to protection, analysis of Australian protection policy, international factor mobility and host country costs and benefits.

2. International monetary economics, the foreign exchange market and the role of arbitrage, extension of the analysis of the flexible exchange rate systems, extension of the analysis of fixed exchange rate systems, monetary and fiscal policies for internal and external balance, a single open economy and two country model, international monetary reform.

Text  
Grubel, H. F.  

(viii) **423116 Advanced Economic Analysis**  
This course is a prerequisite for Mathematics/Economics IV

**Prerequisite**  
Economics II

**Hours**  
2 lecture hours per week

**Examination**  
Two 2-hour papers and progressive assessment

**Content**  
(i) Macroeconomics:  
The course covers a series of macroeconomic issues in both theory and policy. These will include the management of fiscal policy, discretionary stabilisation policy in the open-economy situation, the nature of "monetarist" and "rational expectations" based macroeconomics, dimensions of the capitalist "stagflation crisis", and the role of price formation and income distribution in the determination of economic activity.

(ii) Microeconomics:  
The aims of this section of the course are to consolidate the students' knowledge of microeconomics acquired in Economics I and II, to improve the students' depth of understanding of microeconomics and to extend their knowledge of the subject through the introduction of several new topics in the areas of consumer behaviour theory, market failure and the role of government in the market.

**References**  
(i) Macroeconomics:  
Cornwall, J.  

Frisch, H.  
*Theories of Inflation* (Cambridge U.P. 1983)

Kaldor, N.  
The Source of Monetarism* (Oxford U.P. 1982)

Mayer, T.  
The Structure of Monetarism* (Norton 1976)

Sawyer, M. C.  
*Macroeconomics in Question: The Keynesian-Monetarist Orthodoxy and the Kaleckian Alternative* (Wheatheaf 1982)

Shone, R.  
*Issues in Macroeconomics* (Martin Robertson 1984)

(ii) Microeconomics:  
Douglas, E. J.  
*Intermediate Microeconomic Analysis* (Prentice-Hall 1982)

Ferguson, C. F.  
*Microeconomic Theory* (Irwin 1972)

Tisdell, C. A.  
*Microeconomics of Markets* (Wiley, Brisbane 1982)

**733300 Geology IIC**

**Prerequisites**  
Physics I A, Mathematics IIA, IIC & Geology IIA

**Hours**  
3 lecture hours, 6 laboratory hours per week & 12 days field work

**Examination**  
Two 2-hour papers in Geology plus assessment. Appropriate paper(s) in the selected Mathematics topic
Contents

Sedimentology - the petrogenesis of sedimentary rocks. Economic geology - principles of formation of economic mineral deposits; major Australian ore deposits. Ore Mineralogy. Structural geology - structural aspects of geosynclinal concept; orogenies; continental drift; global tectonics. Photogrammetry and Photogeology - basic principles of interpretation; aerial photographs and their use in stratigraphic and structural studies. Exploration Geophysics; geophysical techniques - their interpretation and the application in petroleum and mining exploration, and hydrogeological investigations. Appropriate Computer Science or Mathematics topic not previously taken in the course (to be decided in consultation with the Head of Department).

Text
Consult lecturers concerned

543500 Industrial Engineering I

Prerequisites
Mathematics IIA & IIC

Hours
Approximately 6 lecture hours per week

Examination
Progressive assessment & examination

Content
Four of the following:

(i) 543501 ME381 Methods Engineering
(ii) 543502 ME383 Quality Engineering
(iii) 543503 ME384 Design for Production
(iv) 544469 ME419 Bulk Solids Handling Systems I
(v) 544433 ME482 Engineering Economics I
(vi) 544470 ME483 Production Scheduling
(vii) 544464 ME484 Engineering Economics II

(i) 543501 ME381 Methods Engineering

Hours
1½ hours per week

Examination
Progressive assessment

Content

Text
Niebel, B. W. Motion and Time Study (Irwin)
or Stevenson, M. G. Methods Engineering (N.S.W. Univ. Press)

(ii) 543502 ME383 Quality Engineering

Hours
1½ hours per week

Examination
Progressive assessment & examination

Content

(iii) 543503 ME384 Design for Production

Hours
1½ hours per week

Examination
Progressive assessment & examination

Content
The application of economics, methods engineering, ergonomics and mechanical engineering to the development and design of a product. Production, distribution and marketing of engineering products. Production, assembly and inspection methods in relation to scale of output. Principles of metrology and tool, jig and fixture design.

Text
Nil

(iv) 544469 ME419 Bulk Solids Handling Systems I

A.W. Roberts

Hours
42

Examination
Progressive assessment

Content

Text

(v) 544433 ME482 Engineering Economics I

Hours
42

Examination
To be advised

Content

Text

(vi) 544470 ME483 Production Scheduling

Hours
42

Examination
Progressive assessment & examination
Content

Text
Nil

(vii) 544464 ME484 Engineering Economics II

Hours
1 1/2 hours per week

Examination
Progressive assessment

Content

Text

553900 Mechanical Engineering IHC

Prerequisites
Mathematics IIA & IIC (including Topics F & H)

Hours
6 hours per week

Examination
Progressive assessment

Content
Four of the following:
(i) GE360 Automatic Control
(ii) ME505 Advanced Numerical Programming
(iii) ME487 Operations Research — Fundamental Techniques
(iv) GE488 Operations Research — Planning, Inventory Control and Management
(v) ME434 Dynamics of Machines III

(i) 503004 GE360 Automatic Control

Hours
1 1/2 hours per week

Examination
Progressive assessment & examination

Content

Text
Fortmann, T. E. & Hitz, K. L. (1977) "Introduction to Linear Control Systems Theory" (Dekker 1977)

or

or
Distefano et al (1976) "Feedback and Control Systems" (Schaum's Outline Series 1976)

(ii) 540443 ME505 Advanced Numerical Programming

Hours
1 1/2 hours per week

Examination
Progressive assessment & examination

Content

Text
Nil

(iii) 544467 ME487 Operations Research — Fundamental Techniques

Hours
1 1/2 hours per week

Examination
Progressive assessment

Content
Concept of optimisation; optimisation approaches; formulation of models; linear programming; allocation and assignment; simplex method; duality; theory of games; parametric programming; integer programming; zero-one programming; quadratic programming; decomposition principle. Network theory; dynamic programming. Geometric programming. Applications.

Texts

or

or

(iv) 544468 ME488 Operations Research — Planning, Inventory Control and Management

Hours
1 1/2 hours per week

Examination
Progressive assessment

Content
Statistical decision theory; forecasting, methods moving average, exponentially smoothed average. Inventory control theory. Fixed order quantity; fixed order cycle systems; production — inventory systems. Queuing theory; simple queue, multiserver queues. Queues in series. Transients in queues; simulation of systems. Applications.

Text
As for ME487
54471 ME434 *Dynamics of Machines III*

Hours: 1½ hours per week

**Content**

Dynamic Motion Analysis; energy distribution method, equivalent mass-and-force method, the rate-of-change-of-energy method.

Advanced Kinematics of the Plane Motion; the inflection circle, Euler-Savary equation, Bobillier's construction, Hartmann's construction. Introduction to synthesis; graphical and analytical methods.

**Text**

Hirschorn, J. *Kinematics and Dynamics of Plane Motion* (McGraw-Hill)

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743100 *Physics III A*

**Prerequisites**

Physics II, at least one Mathematics II subject which should include, in addition to topic CO (which counts as two topics), topic B and one of the topics D, F and H

**Hours**

Approximately 4 lecture hours & 8 laboratory hours per week

**Examination**

Assessment to the equivalent of 12½ hours of examination time

**Content**

The areas of classical and quantum physics essential to the understanding of both advanced pure physics and also the many applications of physics. Some electronics is also included.

A. Classical Physics

Mathematical methods, advanced mechanics, special theory of relativity, electromagnetics including waveguide and antenna theory.

B. Quantum Physics

Quantum mechanics, atomic and molecular physics, statistical physics, solid state physics, nuclear physics, electronics.

C. Laboratory

Parallels the lecture course in overall content with at least one experiment available in each topic, although students are not expected to carry out all the experiments available.

**Texts**

Refer to the Physics Department notice board. Students should retain their Physics II texts.

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753300 *Psychology III C*

**Prerequisites**

Mathematics II A, II C & Psychology II C

**Hours**

4 lecture hours & 3 laboratory hours per week

**Examination**

To be advised

**Content**

Advanced Experimental Methodology

Quantitative Psychology

Computer Applications

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664210 *Mathematics/Economics IV*

**Prerequisites**

Mathematics III A and Economics III C and such additional work as is required for combined honours students by the Department of Mathematics, Statistics and Computer Science.

A student desiring admission must apply in writing to the Dean of the Faculty of Mathematics before 30 December of the preceding year.

**Hours**

To be advised. A project of mathematical and economic significance jointly supervised.

**Examination**

Assessment will be in the appropriate Mathematics and Economics topics. In addition, the project will be evaluated by independent examiners.

**Content**

The student shall complete not less than 4 topics from the Mathematics IV list and topics equivalent to 4 points from the Economics IV list chosen appropriately and approved jointly by the Heads of the Department of Economics and the Department of Mathematics, Statistics and Computer Science.

664500 *Mathematics/Geology IV*

**Prerequisites**

Geology III C and Mathematics III A and such additional work as is required for combined honours students by the Department of Mathematics, Statistics and Computer Science. A student desiring admission to this subject must apply in writing to the Dean of the Faculty of Mathematics before 20 December of the preceding year.

**Hours**

To be advised

**Examination**

To be advised

**Content**

At least four topics chosen from those available to honours students in Mathematics for the current year together with work offered by the Department of Geology for that year. The subject will also include a major thesis which embodies the results of a field research project involving the application of mathematical studies to a particular geological problem. Other work e.g. seminars and assignments may be required by either Department.

**Texts**

To be advised

**References**

To be advised
Mathematics/Physics IV

**Prerequisites**
Mathematics IIIA & Physics IIIA & such additional work as is required for combined honours students by the Dept of Mathematics, Statistics and Computer Science. A student desiring admission to this subject must apply in writing to the Dean of the Faculty of Mathematics before 20 December of the preceding year.

**Hours**
To be advised. A project of mathematical and physical significance, jointly supervised.

**Examination**
Assessment will be in the appropriate Mathematics & Physics topics selected. In addition the research project will be assessed on the basis of a written report and a seminar on the project.

**Content**
The student shall complete four topics from Mathematics IV, chosen for their application to Physics. A thesis involving the application of Mathematics in Psychology.

Mathematical Models in Human Information Processing (see below).

Psychological Measurement (see below).

**References**
To be advised

Diploma in Computer Science

**SCHEDULE OF SUBJECTS**

This schedule is correct at the time of going to press, but changes are currently under discussion. Prospective candidates should check with the Dean's office concerning any changes to subjects that may have been introduced.

**Core Subjects**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>Management</td>
<td>Mathematics I, Topic SC, or Commercial Electronic Data Processing</td>
<td>1</td>
</tr>
<tr>
<td>CS</td>
<td>Electrical Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS</td>
<td>Switching Theory &amp; Logical Design</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS</td>
<td>Computer Programming &amp; Algorithms</td>
<td>Mathematics CS Programming &amp; Algorithms</td>
<td>1</td>
</tr>
<tr>
<td>CS</td>
<td>Numerical Analysis</td>
<td>Mathematics</td>
<td>1</td>
</tr>
</tbody>
</table>

1 Subjects with a prefix CS are subjects offered in the Faculty of Mathematics, specifically for the Diploma in Computer Science.

2 The lecture in the subject will assume that all students have a good understanding of the content of items in this column. In particular, a rudimentary knowledge of the Pascal programming language is assumed in several "core" subjects.

**General Notes**

A student is referred to page 6 for information on the concurrent degree/Diploma programme. The subjects listed below are approved pursuant to Section 8 of the Requirements for the Diploma in Computer Science. The Board may approve from time to time additions to the lists of subjects shown below. A candidate may count not more than two Group B subjects towards the Diploma.
The Board may approve the inclusion in a student's programme of a project. This project would be in lieu of Group B subjects and may not count more than two units.

A student may suggest to the Dean for consideration by the Board the inclusion in his programme of a subject not listed below.

Students interested in positions as Computer Systems Officers in the Australian Public Service are strongly advised to include the subject Systems Design in their course.

The Australian Computer Society has granted full exemption from the educational requirements for admission to the Society as Associate to those who have completed the Diploma in Computer Science.

**Subjects Overlapping in Content**

The Board of Studies in Computer Science has decided that a candidate is not permitted to include in his/her programme more than one of each pair of the mutually exclusive subjects listed in the Table below, nor may he/she include a subject if it has been previously included in work for a degree or Diploma which has already been conferred or awarded or approved for conferment or award.

| CS Qualitative Business Analysis | ME487 - Operations Research-Fundamental Techniques |

### Subjects Approved for the Diploma

#### Group A

**Subjects in the main-stream of computer science**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering Subject</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS Quantitative Business Analysis B Systems Design</td>
<td>Management Management</td>
<td>Introductory Quantitative Methods</td>
<td>1</td>
</tr>
<tr>
<td>GE380 Automatic Control</td>
<td>Electrical Electrical</td>
<td>Part II Mathematics, Topix CO, D, H</td>
<td>1</td>
</tr>
<tr>
<td>EE435 Digital Signal Processing</td>
<td>Electrical Electrical</td>
<td>GE360 Automatic Control</td>
<td>1</td>
</tr>
<tr>
<td>GE325 Microprocessor Systems and Applications</td>
<td>Electrical Engineering</td>
<td>EE204 or CS Integration to Computer Architecture &amp; Assembly Language</td>
<td>2</td>
</tr>
<tr>
<td>EE447 Digital Communications</td>
<td>Electrical Engineering</td>
<td>EE204 or CS Introduction to Computer Architecture &amp; Assembly</td>
<td>1</td>
</tr>
<tr>
<td>EE463 Computer Operating Systems</td>
<td>Electrical Engineering</td>
<td>EE264 or CS Introduction to Computer Architecture &amp; Assembly</td>
<td>1</td>
</tr>
<tr>
<td>EE464 Computer Construction</td>
<td>Electrical Engineering</td>
<td>EE264 or CS Introduction to Computer Architecture &amp; Assembly</td>
<td>1</td>
</tr>
<tr>
<td>EE462 - Topics in Switching Theory</td>
<td>Electrical Engineering</td>
<td>EE360 or CS Switching Theory &amp; Logical Design</td>
<td>1</td>
</tr>
<tr>
<td>CS - Theory of Computing</td>
<td>Mathematics Mathematics</td>
<td>Part II Mathematics, Topix CO, P or equivalent</td>
<td>1</td>
</tr>
<tr>
<td>CS Mathematical Principles of Numerical Analysis</td>
<td>Mathematics Mathematics</td>
<td>Part II Mathematics, Topix CO, D</td>
<td>1</td>
</tr>
<tr>
<td>CS Programming Languages &amp; Systems</td>
<td>Mathematics Mathematics</td>
<td>Part II Mathematics, Topix F</td>
<td>1</td>
</tr>
<tr>
<td>CS Software Engineering Principles</td>
<td>Mathematics Mathematics</td>
<td>To be advised</td>
<td>1</td>
</tr>
<tr>
<td>CS Software-Oriented Computer Architecture</td>
<td>Mathematics Mathematics</td>
<td>To be advised</td>
<td>1</td>
</tr>
<tr>
<td>CS Advanced Operating System Principles</td>
<td>Mathematics Mathematics</td>
<td>To be advised</td>
<td>1</td>
</tr>
<tr>
<td>CS Computer Graphics</td>
<td>Mathematics Mathematics</td>
<td>Numerical Analysis</td>
<td>1</td>
</tr>
<tr>
<td>CS Formal Semantics of Programming Languages</td>
<td>Mathematics Mathematics</td>
<td>Nil</td>
<td>1</td>
</tr>
<tr>
<td>ME505 - Advanced Numerical Programming</td>
<td>Mechanical Engineering</td>
<td>Part II Mathematics, Topix CO, D, H GE360 - Automatic Control</td>
<td>1</td>
</tr>
</tbody>
</table>

### Group B

**Subjects which have some application to computer science**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering Subject</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT510 Elastic Continua</td>
<td>Civil Engineering</td>
<td>CE212 Mechanics of Solids I</td>
<td>1</td>
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<tr>
<td>Theories of Organisation</td>
<td>Commerce Engineering</td>
<td>Organizational Behaviour</td>
<td>1</td>
</tr>
<tr>
<td>EE233 Linear Electronics I</td>
<td>Electrical Engineering</td>
<td>EE203 Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td>EE324 Linear Electronics II</td>
<td>Electrical Engineering</td>
<td>EE201 Electromagnetics &amp; Quantum Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>EL342 Linear System Theory</td>
<td>Electrical Engineering</td>
<td>EL331 Controls</td>
<td>1</td>
</tr>
<tr>
<td>EE344 Communications</td>
<td>Electrical Engineering</td>
<td>EL323 Linear Electronics</td>
<td>1</td>
</tr>
<tr>
<td>EE421 Electronic Design A</td>
<td>Electrical Engineering</td>
<td>EL324 Linear Electronics</td>
<td>1</td>
</tr>
<tr>
<td>EE422 Electronic Design B</td>
<td>Electrical Engineering</td>
<td>ME421 Electronics</td>
<td>1</td>
</tr>
<tr>
<td>CS Mathematical Logic and Set Theory</td>
<td>Mathematics Engineering</td>
<td>Part II Mathematics, Topix K &amp; L</td>
<td>1</td>
</tr>
<tr>
<td>CS Theory of Statistics</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topix H</td>
<td>1</td>
</tr>
<tr>
<td>CS Random &amp; Restricted Walks</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topix CO, H</td>
<td>1</td>
</tr>
<tr>
<td>CS - Combinatorial Design</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topix D, K</td>
<td>1</td>
</tr>
<tr>
<td>CS - Combinatorics</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topix K</td>
<td>1</td>
</tr>
<tr>
<td>MI467 Operations Research</td>
<td>Mechanical Engineering</td>
<td>Part II Mathematics, Topix CO, D, H</td>
<td>1</td>
</tr>
<tr>
<td>MI480 Operations Research Fundamentals Techniques</td>
<td>Mechanical Engineering</td>
<td>Part II Mathematics, Topix CO, D</td>
<td>1</td>
</tr>
<tr>
<td>ME503 - Design of Experiments for Engineering Research</td>
<td>Mechanical Engineering</td>
<td>Part II Mathematics, Topix CO, D</td>
<td>1</td>
</tr>
<tr>
<td>Me5312 - Modelling and Control of Metallurgical Processes</td>
<td>Mechanical Engineering</td>
<td>Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>MS Survey Sampling Methods</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topix H</td>
<td>1</td>
</tr>
<tr>
<td>CS Instrumentation Techniques</td>
<td>Physics</td>
<td>Physics IA or IB</td>
<td>1</td>
</tr>
</tbody>
</table>
DESCRIPTION OF SUBJECTS

CORE SUBJECTS

440126 CS -- Commercial Programming

Assumed Standard of Attainment
Mathematics I Topic SC or Commercial E.D.P.

Hours
2 lecture hours per week for first half year

Examination
One 3-hour paper plus progressive assessment

Content
Basic concepts of file handling and file maintenance, including file creation and processing.
Flow charting; file merging and updating of transactions; tape blocking and buffering.
General run types including editing, searching and sorting. Direct access versus serial; random or sequential organisation; re-run techniques; verifying programme accuracy; table lookup; programme documentation and use of test data.
COBOL as a business data processing and file organisation language. Extensive practical work in COBOL, including case studies.

Texts
Feingold, C.
Fundamentals of Structured COBOL Programming (W. C. Brown)
D.E.C.
VAX-II COBOL Language Reference Manual

References
Chai, W. A. & H. W.
Clifton, H. D.
Davis, G. B. & Litecky, C. R.
DeRossi, C. J.
Kapur, G. K.
Laden, H. N. & Gildersleeve, T. R.
McCracken, D. D.
Muraeh, M.
Sanders, D. H.
Sprawls, R. C.
Stern, N. B. & R. A.
Watters, J. L.

533221 CS -- Switching Theory & Logical Design — K. K. Saluja

Assumed Standard of Attainment
Mathematics I

Hours
3 hours of lectures, tutorials & practical work per week for the first half year

Examination
Progressive assessment & final examination

Content
Boolean algebra, combinational logic, logical circuits, minimisation techniques, threshold logic: Data representation, binary arithmetic, codes, error checking and correcting. Sequential logic, flip-flops, state diagrams, state reduction, races and hazards. Logic subsystems: registers, adders, counters, converters, coders, etc. Basic architecture of digital computers.
Lectures will be supplemented by practical assignments on logic trainers and some tutorial sessions.

Text
Mano, M. M.
Digital Design (Prentice-Hall)

660111 CS -- Programming and Algorithms

Assumed Standard of Attainment
Mathematics I

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper.
Programming in a high level language — an introduction to Pascal. Top-down programming, stepwise refinement and the writing of understandable and maintainable programs. The instruction of algorithms — sequence, selection, iteration, recursion and modular design. Representative examples of algorithmic methods and an introduction to the analysis of algorithms including compatibility, complexity and correctness. Brief discussion of extensions of Pascal and a comparison with some other languages.

Text
Koffman, E. G.  Problem Solving and Structured Programming in Pascal 2nd edn (Addison-Wesley 1985)

References
—  Handbook for VAX/VMS University of Newcastle Computing Centre (October 1983)
Cooper, D. & Otten, M.  Oh! Pascal 2nd edn (Norton 1985)
Elson, M.  Concepts of Programming Languages (Science Research Associates 1973)
Guttmann, A. J.  Programming and Algorithms (Heinemann 1977)
Moore, L.  Foundations of Programming (Ellis Horwood 1980)
Wirth, N.  Systematic Programming (Prentice-Hall 1973)
Yourdon, E. J.  Techniques of Program Structures and Design (Prentice-Hall 1975)

660113 CS — Numerical Analysis — V. Ficker

Assumed Standard of Attainment
Mathematics 1

Hours
1 lecture hour per week & 1 tutorial hour per fortnight

Examination
One 2-hour paper

Content
The course will be run in parallel with Mathematics II, Topic F, with additional reading and assignments.

Text and References
See topic F page 45.

440123 Systems Analysis

Assumed Standard of Attainment
Nil

Hours
2 lecture hours per week for the first half year

Examination
A 2-hour examination at mid-year plus progressive assessment

Content
This course is concerned with the early activities carried out in the development of computer-based information systems.

Topics covered include, the role of systems in modern business; the profession of systems analysis and design; management of the life cycle of a business information system; the tools of the systems analyst; the study phase, its associated documentation and its relationship to design, development and implementation. Students are also introduced to the concepts of structured analysis.
Texts
Gore, M. & Stubbe, J. Elements of Systems Analysis (W. C. Brown)

References
Brookes, C. H. P. Information Systems Design (Prentice-Hall)
Davis, W. Information Processing Systems (Addison-Wesley)
Gildersleeve, T. Successful Data Processing Systems Analysis (Prentice-Hall)

GROUP A

Subjects in the main-stream of Computer Science

Offered by the Department of Commerce

440125 CS — Quantitative Business Analysis II — J. Cooper

Assumed Standard of Attainment
Introductory Quantitative Methods

Hours
2 lecture hours per week

Examination
Two 2-hour papers; progressive assessment & project

Content
Quantitative methodology; mathematics review; problem-solving in business and industry; decision theory; applications of statistics; CPM/PERT; inventory modelling; linear programming in practice; game theory; Markov analysis; queueing theory; dynamic programming; business forecasting; elements of simulation; quantitative analysis projects.

Texts Suggested

440124 Systems Design

Assumed Standard of Attainment
CS — Commercial Programming, Systems Analysis

Hours
2 lecture hours per week for the second half year

Examination
Progressive assessment only (assignments and case study)

Content
This subject is a development of Systems Analysis and includes: data transmission; real time systems; information retrieval; file processing form design; management and the computer; file design; systems design and determination; operating systems; multi-programming.

Texts
As for Systems Analysis

Offered by Department of Electrical and Computer Engineering

503004 GE360 Automatic Control — see page 92.

533116 EE345 Digital Signal Processing

Assumed Standard of Attainment
GE360 Automatic Control

Hours
3 hours of lectures & tutorials per week for second half year

Examination
Progressive assessment & final examination

Content

Text

References
Kuo, B. C. Discrete Data Control Systems (Prentice-Hall 1970)

503003 GE325 Microprocessor Systems and Applications

Assumed Standard of Attainment
CS — Introduction to Computer Architecture & Assembly Language

Hours
3 hours per week for second half year

(Students who have completed EE325 Introduction to Digital Technology prior to 1983 will not be permitted to enrol in this subject)

Review of basic logic design and number systems.
Memory Technology: capacity, cost, speed and organisation.
Microprocessors and Microcomputers; Architecture and performance.
Bus standards: Memory and I/O interfacing, bus handshakeing procedures.
Interrupt structures and interrupt programming.
I/O Peripherals: direct memory access; parallel devices, serial devices; timers; disks; I/O programming.
Software and Hardware development aids for microprocessor systems.
Computer Interconnections: Taxonomy, characteristics and examples.
Examples of microprocessor applications: real time systems, dedicated systems and
general purpose systems.
Fourteen hours of laboratory exercises dealing with hardware and microprocessor
hardware and software.

Text
Coffman, E. G. &
Denning, P. J.
Hansen, P. B.
Madnick, S. E. &
Donovan, J. J.

An Introduction to Microprocessor Systems
Course Notes Department of Electrical and
Computer Engineering

534134 EE447 Digital Communications

Assumed Standard of
Attainment
EE344 Communications

Hours
3 hours of lectures & tutorials per week for first half
year

Examination
Progressive assessment & final examination

Content
Pulse modulation schemes, Introduction to Information Theory, Framing, Timing
Recovery, Equalization, Matched Filters, Error Control Coding, Digital Carrier
Modulation, ASK, PSK, FSK, DPSK.

Lectures plus tutorial plus laboratory.

Text
Shanmugan, K. S.
Digital and Analog Communications Systems
(Wiley Paperback)

534124 EE463 Computer Operating Systems

Assumed Standard of
Attainment
CS Introduction to Computer Architecture &
Assembly Language

Hours
3 hours per week for the second half
year

Examination
Progressive assessment & final examination

Content
Views of an operating system. Multiprogramming, interacting concurrent processes,
process control primitives. Processor management, memory management, name
management. Protection.

The course consists mainly of lectures supplemented by tutorial sessions.

Text
Lister, A. M.
Fundamentals of Operating Systems 2nd edn
(Macmillan 1979)

References
Coffman, E. G. &
Denning, P. J.
Hansen, P. B.
Madnick, S. E. &
Donovan, J. J.

Operating Systems Theory (Prentice-Hall)
Operating Systems Principles (Prentice-Hall)
Operating Systems (McGraw-Hill)

534143 EE464 Compiler Construction

Assumed Standard of
Attainment
CS Introduction to Computer Architecture &
Assembly Language

Hours
3 hours per week for the first half year

Examination
Progressive assessment & final examination

Content
The design of assemblers. Introduction to the theory of grammars, parsing techniques,
construction of compilers, object code generation. Construction of interpreters.
The course consists mainly of lectures and assignments on computer.

Text
Aho, A. V. &
Ullman, J. D.
Principles of Compiler Design
(Addison-Wesley)

References
Aho, A. V. &
Ullman, J. D.
The Theory of Parsing, Translation and Compiling
Vol. 2 (Prentice-Hall)

Donovan, J. J.
Systems Programming (McGraw-Hill)

Further references will be given in class.

534145 EE462 Topics in Switching Theory — (may not be offered in 1986)

Assumed Standard of
Attainment
EE362 Switching Theory & Logical Design

Hours
3 hours per week for the first half year

Content
Complete set of logic primitives, strong and weak complete sets. Post's theorem,
Equivalence classes of functions. Decomposition Cellular realization of combinational
and sequential logic functions. universal Logic Modules. Finite and infinite cellular
arrays and their testing. Programmable cellular logic.

Offered by Department of Mathematics, Statistics and Computer Science

660127 CS—Theory of Computing
— Mathematics III Topic TC,
see page 56

660128 CS—Mathematical Principles of
Numerical Analysis
— Mathematics III Topic Z,
see page 60

660135 CS—Programming Languages &
Systems
— Mathematics III Topic PL,
see page 53

660139 CS—Software Engineering Principles
— Mathematics IV,
see page 64

660141 CS—Software-Oriented Computer
Architecture
— Mathematics IV,
see page 65

660142 CS—Advanced Operating Systems
Principles
— Mathematics IV,
see page 65

660143 CS—Computer Graphics
— Mathematics IV,
see page 66

660144 CS—Formal Semantics of
Programming Languages
— Mathematics IV,
see page 76
Offered by Department of Mechanical Engineering

540143 ME505 Advanced Numerical Programming — see page 103

GROUP B

Listed below are a number of subjects which the Board regards as suitable for Group B. This list is not, however, intended to be exhaustive and other subjects will be considered.

Offered by Department of Civil Engineering and Surveying

520137 CE510 Elastic Continua
For details consult the Engineering Faculty Handbook

Offered by Department of Commerce

413612 Theories of Organisation

Assumed Standard of Attainment
Organisational Behaviour

Hours
2 lecture hours per week

Examination
Two 3-hour papers

Content
The influence of the social environment, politics and power on the development of organisations. Topics include organisations and the rationalisation of work; organisational structures; bureaucracies as working communities; the scientific management movement; Mayo and the Hawthorne experiments; Kurt Lewin and field theory; group membership and intergroup conflict; total quality control and the search for principles of management; worker participation models; organisational development.

Text
Lansbury, R. D. & Gilmour, P. Organisations: An Australian Perspective (Cheshire)

References
Altman, D. Rehearsals for Change (Fontana)
Albrow, M. Bureaucracy (Macmillan)
Anthony, P. D. The Ideology of Work (Tavistock)
Feigenbaum, A. V. Total Quality Control 3rd edn (McGraw-Hill)
Hulse, E. F. Organisation, Development and Change 2nd edn (West)
Klein, I. New Forms of Work Organisation (Tavistock)
March, J. G. & Simon, H. A. Organisations (Wiley)
Mouzelis, N. P. Organisation and Bureaucracy Rev. edn. (R.K.P.)
Silverman, D. The Theory of Organisations (Heinemann)

Offered by Department of Electrical and Computer Engineering

534110 EE422 Electronic Design B

Offered by Department of Mathematics, Statistics and Computer Science

660113 CS—Mathematical Logic and Set Theory
— see Mathematics III, Topic O page 51
660129 CS—Theory of Statistics
— see Mathematics III, Topic R page 55
660119 CS—Random and Restricted Walks
— not offered in 1986
660122 CS—Combinatorial Designs
— not offered in 1986
660123 CS—Combinatorics and Counting
— see Mathematics IV, page 75
660005 MS—Survey Sampling Methods
— see Mathematics III, Topic SS, page 55

Offered by Department of Mechanical Engineering

544467 ME487 Operations Research — Fundamental Techniques — see page 103
544468 ME488 Operations Research — Planning, Inventory Control and Management — see page 103
540137 ME503 Design of Experiments for Engineering Research
For details consult the Engineering Faculty Handbook.

Offered by Department of Metallurgy

113393 Met312 Modelling and Control of Metallurgical Processes
For details consult the Engineering Faculty Handbook.

Offered by Department of Physics

742201 CS—Instrumentation Techniques — not offered in 1986

Assumed Standard of Attainment

Physics IA or IB

Hours
1 hour per week & a 12-hour project

Examination
Project assessment & one 2-hour paper

Content
From the subject Electronics and Instrumentation II:
Specialist Instrumentation — 8 lectures
Instrumentation Systems — 8 lectures
Measurement Devices — 14 lectures

Text
Malmstadt, H. V. et al. Instrumentation for Scientists Series (Vols 1-4) Text with Experiments or Text only or combined volume (Benjamin 1973)
Schedule A
- Epidemiologic Methods
- Study Design
- Health Care Evaluation
- Behavioural Change
- Assessing Health Problems
- Population Research Seminar

Schedule B
- Biostatistics 1
- Biostatistics II
- Applied Statistics
- Probability and Statistics
- Survey Sampling Methods
- Regression, Design and Analysis of Experiments
- Theory of Statistics
- Demography and Survival Analysis
- Generalised Linear Statistical Modelling
- At most one may be counted.

Schedule C
- Programming and Algorithms
- Data Structures and Programming
- Systems Analysis
- Systems Design

Schedule D
- Project

RUSSIAN FOR THE SCIENTIST AND MATHEMATICIAN — C. A. Croxton

The requirements are set out on page 27

Course Content

Prerequisites

Hours

Examination

None, although familiarity with a modern language would be of advantage

Approximately 27 lecture hours

None

Relevanten

Schedule

Course Content

Prerequisites

Hours

Examination

None, although familiarity with a modern language would be of advantage

Approximately 27 lecture hours

None

Content

This is a voluntary course designed to give students and members of staff a working reading knowledge of scientific and technical Russian. Translation from Russian into English is costly, and only a very small proportion of the Soviet Union’s technical literature is routinely translated into English; often translation of the abstract alone is sufficient to determine whether a complete translation is warranted. Emphasis throughout the course will be on translation from Russian into English, although both written and spoken Russian will necessarily be involved. The course should provide a good introduction for those seeking a somewhat more literary understanding of the language.
Differential Geometry and Relativity
Associate Professor P. R. Smeay is working on generalizations of Einstein's theory of relativity using modern differential geometry - in particular, the theory of Lie groups and fibre bundles.

Dynamical Systems
Dr. J. G. Couper is working on stable and generic properties of flows and diffeomorphisms.

Environmental and Urban Studies
Associate Professor R. W. Gibberd is studying the art of population projections and various models of urban structure and urban development.
Associate Professor R. J. Vaughan is investigating mathematical models in urban geography.

Epidemiology
Associate Professors A. J. Dobson and R. W. Gibberd collaborate with the Faculty of Medicine to investigate various problems in epidemiology. Current research includes: regional variations in mortality and morbidity; trends in ischemic heart disease incidence, case-fatality and mortality rates; risk factors and medical treatment; use of hospital separation data for epidemiological research; spatial behaviour of hospital patients in the Hunter Region; doctor patient interactions; use of antibiotics; evaluation of intervention programmes.

Fluid Mechanics
Professor A. J. Guttmann is studying the problem of extrapolating regular perturbation series in fluid mechanics.
Dr. W. T. F. Lau is concerned with viscous flow problems, particularly those involving free boundaries.
Dr. W. Summerfield is interested in all phenomena in which fluid dynamics plays a significant role; for example, ocean waves, turbulence, estuarine-dynamics, weather prediction, sailing vessels, surfing, animal propulsion.

Functional Analysis
Associate Professor J. R. Giles is carrying out research in the geometry of Banach spaces. In particular, he is interested in the differentiability theory for the norm and convex functions. He is working on the developing theory of differentiation of locally Lipschitz functions with a view to applying it to several geometrical problems in Banach spaces.
Dr. V. Ficker and Dr. C. J. Ashman are working in measure theory, particularly in some problems of families of sets.

History of Mathematics
Mr. R. F. Berghout is pursuing research into the development of algebra, notably modern algebra, as well as the relations between this and classical occidental and oriental algebra. Mr Berghout is also working on Greek mathematics and architecture.

Integral Geometry
Dr. R. B. Eggleton studies decomposition of squares into triangles with integer side lengths, and the finite structure of lattice point distributions inside circles.
Dr. T. K. Sheng studies functions of distances between random points in convex and non-convex regions in Euclidean n-space.

Mathematical Biology
Dr. D. L. S. McElwain is developing mathematical models of biological systems including solid tumours, transporting epithelia and facilitated transport of oxygen in tissue.

Number Theory
Dr. R. B. Eggleton is interested in number theory, particularly in combinatorial aspects of the subject, such as distribution of prime factors in runs of consecutive integers, and partitions of a number into summands which are divisors of that number.

Professor A. J. Guttmann is working on the theory of equilibrium critical phenomena. He is particularly interested in the analysis of power series expansions which are frequently used to study systems exhibiting phase transitions.

Professor A. J. Guttmann is using renormalisation group and series analysis methods to study the critical behaviour of systems with free surfaces.

Transportation Problems
Associate Professor R. J. Vaughan is continuing his work on the application of mathematics to traffic engineering, traffic accidents and transportation planning.
**Mathematical Models**

Candidate wishing to enrol in any subjects not listed should consult the Faculty Secretary.

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<th>Names of Components</th>
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**Computer Numbers of Bachelor of Mathematics Subjects**

Computer Numbers must be shown on enrolment and course variation forms in the following manner:

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**Part II Subjects**

<table>
<thead>
<tr>
<th>Computer Number</th>
<th>Subject Name</th>
<th>Computer Number</th>
<th>Names of Components</th>
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<tbody>
<tr>
<td>662100</td>
<td>Mathematics IIA</td>
<td>662100</td>
<td>Topic A – Mathematical Models</td>
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<td>662200</td>
<td>Mathematics IIB</td>
<td>662100</td>
<td>Topic B – Complex Analysis</td>
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<td>662210</td>
<td>Mathematics IIB Part 1</td>
<td>662100</td>
<td>Topic CO – Vector Calculus &amp; Differential Equations</td>
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<td>662220</td>
<td>Mathematics IIB Part 2</td>
<td>662100</td>
<td>Topic D – Linear Algebra</td>
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<td>662300</td>
<td>Mathematics IIC</td>
<td>662100</td>
<td>Topic E – Topic in Applied Mathematics, e.g. Mechanics &amp; Potential Theory</td>
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<tr>
<td>662200</td>
<td>Mathematics IIB</td>
<td>662200</td>
<td>Topic F – Numerical Analysis &amp; Computing</td>
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### Computer Science III

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<th>Computer</th>
<th>Subject Name</th>
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<tr>
<td>663400</td>
<td>Compiler Construction</td>
<td>534137</td>
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<td>Computer Operating Systems</td>
<td>534138</td>
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<tr>
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<td>Switching Theory &amp; Logical Design</td>
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<td>Mathematical Logic &amp; Set Theory</td>
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<td>Mathematical Principles of Numerical Analysis</td>
<td>663402</td>
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<td>Programming Languages &amp; Systems</td>
<td>663405</td>
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<td>Theory of Computing</td>
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<td>CS-Commercial Programming</td>
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<td>Systems Analysis</td>
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<td>Systems Design</td>
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### Digital Computers & Automatic Control

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<th>Subject Name</th>
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<td>GE360 Automatic Control</td>
<td>503004</td>
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<td>EE342 Linear System Theory</td>
<td>533110</td>
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<td>EE344 Communications</td>
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<td>EE447 Digital Communications</td>
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### Economics IIIC

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<td>EE342 Linear System Theory</td>
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<td>EE344 Introduction to Computer Architecture &amp; Assembly Language</td>
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<td>EE362 Switching Theory &amp; Logic Design</td>
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* May not be offered in 1986.
### Part IV Subjects

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<tr>
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<th>Subject Name</th>
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<tbody>
<tr>
<td>664110</td>
<td>Computer Science IV</td>
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<td>664100</td>
<td>Mathematics IV</td>
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<tr>
<td>664210</td>
<td>Mathematics Economics IV</td>
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<td>664500</td>
<td>Mathematics Geology IV</td>
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### Extraneous Subjects

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<tbody>
<tr>
<td>160406</td>
<td>Mathematics Education II *</td>
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<tr>
<td>160407</td>
<td>Mathematics Education III *</td>
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* Not offered in 1986.
Diploma in Medical Statistics Course

850004 MS - Population Research Seminar
850007 MS - Epidemiologic Methods
850008 MS - Study Design
850009 MS - Health Care Evaluation
850010 MS - Behavioural Change
850011 MS - Assessing Health Problems
666006 MS - Biostatistics I
666007 MS - Biostatistics II
666008 MS - Applied Statistics
666031 MS - Probability and Statistics
666001 MS - Theory of Statistics
666002 MS - Regression, Design, and Analysis of Experiments
666003 MS - Demography and Survival Analysis
666004 MS - Generalised Linear Statistical Modelling
660111 CS - Programming and Algorithms
660112 CS - Data Structures and Programming
666005 MS - Survey Sampling Methods
666009 MS - Project - 1 unit
666010 MS - Project - 2 units
666020 MS - Project - 3 units
666030 MS - Project - 4 units

1 Not offered in 1986.