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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4
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 I  Geology I
Biology I    German I or II
Chemistry I  Greek I
Classical Civilisation I History I
Drama I      Japanese I
Economics I A  Latin I
English I    Legal Studies I
French I A or IS  Linguistics I
Geography I  Philosophy I

Part II
Biology IA, IIB & IIA
Chemistry I A
Classical Civilisation IIA
Economics IIA & IIB
Education I
Electronics & Instrumentation I
English I A
French IIA, IIS & IIB
Geography I A, IIB & IIB
Geology I A & IIB
German IIA, IIS & IIB
History IIA, IIB & IIC
Japanese I A
Legal Studies I A
Philosophy I A & IIB
Physics II
Psychology I A & IIB
```

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 Curriculum and Method Subjects Offered in the Diploma in Education

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.

The Diploma in Education course offers the following Curriculum and Method units:

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

Candidates are strongly urged to opt for two units.

(b) Primary

Prerequisites

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

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

Note

A Part II subject assumes 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 to teach 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.

160406 Mathematics Education II — (offered only if sufficient demand)

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Mathematics I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- or Corequisite</td>
<td>A Part II Mathematics subject</td>
</tr>
<tr>
<td>Hours</td>
<td>1 lecture hour per week and two 5-day schoolroom observation periods</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour paper</td>
</tr>
</tbody>
</table>

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.

160407 Mathematics Education III — (offered only if sufficient demand)

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Mathematics Education II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- or Corequisite</td>
<td>A Part III Mathematics subject or Statistics III</td>
</tr>
<tr>
<td>Hours</td>
<td>1 lecture hour per week and two 5-day schoolroom observation periods</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour paper</td>
</tr>
</tbody>
</table>

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 Mathematics II B Part I and Mathematics II B Part II shall together count as one subject.

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 enrolls 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:
   Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA, and either Mathematics IIIB or one Part III subject from Schedule B of the Schedule of Subjects.

(2) To qualify for the degree of Bachelor of Mathematics with Computer Science, a candidate shall pass nine subjects including:
   Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA, 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 IIIA 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 candidacy 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 1 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 shall 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 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) 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 II 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 I I A or II B;
(e) a candidate counting Psychology III C shall not be entitled to count either Psychology III A or Psychology III B;
(f) a candidate counting Economics III C shall not be entitled to count either Economics III A or Economics III B;
(g) a candidate counting Geology III C shall not be entitled to count either Geology III A or Geology III 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 III 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) 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 III C shall not be entitled to count either Psychology I I A or Psychology II B;
(d) a candidate counting Psychology III C shall not be entitled to count either Psychology III A or Psychology III B;
(e) a candidate counting Economics III C shall not be entitled to count either Economics III A or Economics III B;
(f) a candidate counting Geology III C shall not be entitled to count either Geology III A or Geology III 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 III 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 IIIA, Mathematics IIC and Mathematics IIIA;
   (b) one subject from the following, namely Mathematics IIB, 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 IIIA, Mathematics IIC and Mathematics IIIA;
   (b) one subject from the following, namely Mathematics IIB, 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 degrees of Bachelor of Engineering (Mechanical), Bachelor of Engineering (Industrial), 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 IIIA, Mathematics IIC and Mathematics IIIA;
   (b) one subject from the following, namely Mathematics IIB, 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**

**Part I**

Mathematics I

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

**Part II**

Mathematics IIA
Mathematics IIB
Mathematics IIC

**Part III**

Mathematics IIA
Mathematics IIB

**Part IV**

Mathematics IV

**Part II**

Computer Science II

**Part III**

Computer Science III

**Part III**

Statistics III

**SCHEDULE B**

**Subjects With a Substantial Mathematical Content**

**Part I**

Engineering I

**Part II**

Accounting IIC
Civil Engineering IIM
Psychology IIC

**Prerequisites**

- Mathematics I
- Engineering I
- Mathematics I
- Psychology I

A candidate counting Psychology IIC shall not be entitled to count Psychology IIA or Psychology IIB.
Part III
Accounting III C
Biology III B
Civil Engineering III M
Communications &
Automatic Control
Digital Computers & Automatic
Control
Economics III C
Geology III C
Industrial Engineering I
Mechanical Engineering II C
Physics III A
Psychology III C

**Prerequisites:**
- Mathematics IIA & Mathematics IIC & Accounting IIC
- Mathematics IIA & Mathematics IIC & either Biology IIA or Biology IIB
- Civil Engineering IIM, Mathematics IIA & Mathematics IIC
- Mathematics IIA & Mathematics IIC (including Topics CO, D)
- Economics IIA, Mathematics IIA & Mathematics IIC
- Physics IIA, Mathematics IIA, Mathematics IIA &
  Mathematics IIC
- Mathematics IIA & Mathematics IIC (including Topics F & H)
- Mathematics IIA, Mathematics IIC & Psychology II A
  and either Psychology II C or Psychology III A and
  Psychology III B.

**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 A, Mathematics II C, Mathematics III A and either Mathematics II B,
Computer Science III, Statistics II I 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 IIA
- Mathematics IIC
- One B.Com. subject

**Year III**
- Mathematics III A
- Three B.Com. subjects

**Year IV**
- Mathematics III B, Computer Science III, Statistics III or 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 A, Mathematics II C, Mathematics III A 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
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 IIA
- Mathematics IIC
- One B.Ec. subject

**Year III**
- Mathematics III A
- Economics II
- Two B.Ec. subjects

**Year IV**
- Mathematics III B, Computer Science III, Statistics III or a Part III Schedule
  B subject from the Requirements for B.Math.
- 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 III A 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Mathematics IIA</th>
<th>Mathematics IIC</th>
<th>Physics I</th>
<th>Chemistry I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td>ChE141 Industrial Process Principles</td>
<td>ChE151 Industrial Chemical Processes &amp; Equipment</td>
<td>ChE152 Industrial Process Design</td>
<td>GE151 Introduction to Materials Science</td>
</tr>
<tr>
<td>Year II</td>
<td>ChE151</td>
<td>ChE152</td>
<td>GE151 Introduction to Materials Science</td>
<td>ChE151 Process Analysis I</td>
</tr>
<tr>
<td>Year III</td>
<td>ChE261 Separation Processes I</td>
<td>ChE271 Fuels &amp; Combustion</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
</tr>
<tr>
<td>Year IV</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
</tr>
<tr>
<td>Year V</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
</tr>
</tbody>
</table>

Electives — 2 units

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Mathematics IIA</th>
<th>Mathematics IIC</th>
<th>EE131 Circuit Fundamentals</th>
<th>GE112 Introduction to Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td>ChE141</td>
<td>ChE151</td>
<td>ChE152</td>
<td>GE151 Introduction to Materials Science</td>
</tr>
<tr>
<td>Year II</td>
<td>ChE151</td>
<td>ChE152</td>
<td>GE151 Introduction to Materials Science</td>
<td>ChE151 Process Analysis I</td>
</tr>
<tr>
<td>Year III</td>
<td>ChE261 Separation Processes I</td>
<td>ChE271 Fuels &amp; Combustion</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
</tr>
<tr>
<td>Year IV</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
</tr>
<tr>
<td>Year V</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
<td>ChE271 Laboratory</td>
<td>ChE272 Fluid Mechanics</td>
</tr>
</tbody>
</table>

Electives — 2 units

Year I is similar for all combined courses involving the Computer Engineering specialty and consists of the following subjects:

Year II Mathematics IIA

Year III Mathematics IIC

Year IV Mathematics IIB or a Part III subject from the Schedules of Subjects for B.Math.

Departmental Elective

Part III Subject from B.Math. Schedule of Subjects
### Year IV
- EE263: Introduction to Structuring of Info.
- EE323: Linear Electronics I
- EE324: Linear Electronics II
- EE326: Digital Design and Technology
- EE333: Advanced Circuit Analysis
- EE344: Communications
- EE345: Digital Switching Proc.
- EE362: Switching Theory and Logic Design
- GE360: Automatic Control
- GE325: Microprocessor Systems and Applications

4 Units of electives

### Year V
- EF421: Electronics Design A
- EF422: Electronics Design B
- EF426: Advanced Digital Systems
- EF463: Computer Operating Systems
- EF464: Compiler Construction
- EF480: Project
- EF481: Project OR 2 EE300/400/500 Units
- EF491: Seminar

4 Units from List I

1 Unit or Elective

(iv) **B.E./B.Math. in Electrical Engineering**

#### Year I
- Mathematics I
  - Physics IA
  - Chemistry IS
  - CE111: Statics
  - GE131: Circuit Fundamentals
  - GE112: Introduction to Engineering Design
  - ME111: Graphics & Engineering Drawing
  - ME131: Dynamics

#### Year II
- EF211: Energy Conversion
- EF221: Semiconductor Devices
- EF232: Electrical Circuits
- EF262: Systematic Programming
- EF264: Introduction to Computer Architecture & Assembly Language
- EF221: Electromagnetics & Quantum Mechanics
- Mathematics II
  - Mathematics II A
  - Mathematics II C

#### Year III
- Mathematics II A
  - Mathematics II B or a Part III subject from the Schedule of Subjects for B.Math.

#### Year IV
- EE313: Power Systems
- EE314: Electrical Machines
- EE315: Power Electronics
- EE323: Linear Electronics I
- EE324: Linear Electronics II
- EE326: Digital Design and Technology
- EE333: Advanced Circuit Analysis
- GE360: Automatic Control
- EE344: Communications
- EE362: Switching Theory & Logic Design

1 unit of elective

4 units of electives

### Year V
- EF421: Electronics Design A
- EF451: Electromagnetic Propagation & Antennas
- EF480: Project
- EF481: Project or 2 units from EE300, 400 subjects
- EF491: Seminar

7 units from EE 300, 400 subjects

(v) **B.E./B.Math. in Industrial Engineering**

#### Year I
- Mathematics I
  - Physics IA
  - Chemistry IS
  - CE111: Statics
  - GE131: Circuit Fundamentals
  - ME201: Experimental Methods I
  - ME202: Dynamics of Engineering Systems
  - ME203: Experimental Methods II
  - ME214: Mechanics of Solids I
  - ME251: Properties of Materials I
  - ME251: Fluid Mechanics I
  - ME271: Thermodynamics I

#### Year II
- Mathematics III A
  - Mathematics III C
  - EF413: Energy Conversion
  - ME212: Engineering Design I
  - ME232: Dynamics of Machines I
  - GE204: Engineering Computation I
  - GE205: Engineering Computation II
  - ME343: Mechanics of Solids II
  - GE360: Automatic Control

#### Year III
- Mathematics III A
  - Mathematics III B or a 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

#### Year V
- ME413: Engineering Design III
- ME484: Engineering Economics II
- ME485: Numerical Control & Computer Aided Manufacturing
- ME487: O.R. - Fundamental Techniques
- ME488: O.R. - Planning, Inventory Control and Management
- ME496: Project/Seminar
- GE301: Technology & Human Values I

5 units Departmental Technical Electives
The course could be pursued in the following manner:

**Year I**
- Mathematics I
- Physics I A
- Chemistry I S
- CE111 Statics
- GE151 Introduction to Materials Science
- GE112 Introduction to Engineering Design
- ME223 Engineering Technology
- ME131 Dynamics
- ME111 Graphics & Engineering Drawing

**Year II**
- Mathematics IIA
- Mathematics IIC
- EE131 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 IIIA
- EE211 Energy Conversion
- GE204 Engineering Computations I
- GE205 Engineering Computations II
- ME212 Engineering Design I
- ME232 Dynamics of Machines I
- ME342 Properties of Materials II
- ME343 Mechanics of Solids II
- GE360 Automatic Control

**Year IV**
- Mathematics IIIB or Part III subject from Schedule of Subjects for B.Math.
- ME302 Experimental Methods III
- ME312 Engineering Design II
- ME333 Dynamics of Machines II
- ME352 Fluid Mechanics II
- ME372 Heat Transfer
- ME373 Thermodynamics II
- GE301 Technology & Human Values I
- GE350 Seminar

**Year V**
- ME413 Engineering Design III
- ME496 Project/Seminar
- 9 units Departmental Technical Electives
- ME485 Numerical Control & Computer Aided Manufacturing

**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. The Bachelor of Mathematics requires Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA and one of Mathematics IIIB, Computer Science III, Statistics III or a Part III subject from Schedule B of the Requirements for Bachelor of Mathematics. 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 and three other Part I subjects.

**Year II**
- three Part II subjects including Mathematics IIA and Mathematics IIC and another Part I subject.

**Year III**
- Mathematics IIIA plus two other subjects which must include at least one Part III subject.

**Year IV**
- one of 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 Science degree.

**MATHEMATICS/METALLURGY**

A combined course leading to admission to the degrees Bachelor of Metallurgy and Bachelor of Mathematics as approved by the Faculty Boards of Mathematics and Engineering shall include Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA and one of Mathematics IIIB, Computer Science III, Statistics III or a Part III subject chosen from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Metallurgy and other subjects taken from the Schedule of Subjects approved for the degree of Bachelor of Metallurgy.

**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 recommendation 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
additional 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.
(4) 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 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.

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 Subject</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS—Commercial Programming</td>
<td>Commerce</td>
<td>Mathematics I, Topic 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>
<tr>
<td>CS—Numerical Analysis</td>
<td>Mathematics, Statistics &amp; Computer Science</td>
<td>Mathematics I or suitable alternative preparation</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 lecturer 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 Pascal programming language is assumed in several 'core' subjects.
REGULATIONS GOVERNING THE DIPLOMA IN MATHEMATICAL STUDIES

1. These Regulations prescribe the Requirements for the Diploma in Mathematical Studies 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:
   “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.

REGULATIONS GOVERNING THE DIPLOMA IN MEDICAL STATISTICS

1. These Regulations prescribe the requirements for the Diploma in Medical Statistics 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:
   “the Board” means the Board of Studies in Medical Statistics;
   “the diploma” means the Diploma in Medical Statistics.

3. The Diploma shall be awarded in two grades, namely:
   Diploma in Medical Statistics with Merit
   Diploma in Medical Statistics.

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 Board, or
   (b) have other qualifications approved for this purpose by the Senate on the recommendation of the Board.

5. The Board may require a candidate to complete work and/or examinations additional to the programme referred to in Regulation 5 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.

6. (1) To qualify for the diploma a candidate shall, in not less than one year of full-time study or two 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) a thesis which shall count as 2, 3 or 4 units as determined by the Board;
      (b) MS Epidemiology and Study Design I
         MS Epidemiology and Study Design II
         MS Regression, Design and Analysis of Experiments
         MS Survey Sampling Methods
         CS Programming and Algorithms
         MS Population Research Seminar;
      (c) units chosen from the Schedule of Subjects or other units of advanced work approved by the Board.

(c) in the case of any other subject the last Monday of Second Term.
7. 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.

8. (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.

9. (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 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 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.

10. 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.

SCHEDULE OF SUBJECTS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Offered by</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS—Population Research Seminar</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS—Epidemiology and Study Design I</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS—Epidemiology and Study Design II</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS—Theory of Statistics</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>MS—Regression, design, and analysis of experiments</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>MS—Demography and survival analysis</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>MS—Generalised linear statistical modelling</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>CS—Programming and Algorithms</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>CS—Data Structures and Programming</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>MS—Survey Sampling Methods</td>
<td>Department of Mathematics, Statistics &amp; Computer Science</td>
<td>1</td>
</tr>
</tbody>
</table>

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 Schedule; 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.

* See paga 32.
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.

The relevant date shall be:
(a) in the case of a subject offered in the first half of the academic year — the last Monday in first term;
(b) in the case of a subject offered in the second half of the academic year — the last Monday in second term.

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.

(3) A candidate against whom a decision of the Faculty Board has been made may appeal to the Vice-Chancellor against any decision made following the review under Regulation 8(3) of these Regulations.

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.

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
   (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 thesis to be consulted or borrowed and, 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 3 — MASTER OF MATHEMATICS

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

1 At present there is no fee payable.
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 enrolls 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 enroll 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. Each subject is composed of topics, each single-unit topic consisting of about 27 lectures and 13 tutorials throughout the year. Each of the Part I, Part II and Part III Mathematics subjects consists of the equivalent of four single-unit topics. For Mathematics I, there is no choice of topics; for Mathematics II A, II B, III C there is some choice available to students; for Mathematics III A and III B there is a wider choice. No topic may be counted twice in making up distinct subjects. (Students who passed some mathematics subjects before this arrangement of subjects was introduced should consult the “transition arrangements” set out on p. 155 of the 1970 Faculty of Arts handbook, and p. 76 of the 1973 Faculty of Mathematics handbook. Note that the “code letters” for the topics may vary slightly from year to year.)

Statistics III is a specified course, requiring previous topic selection in Mathematics II.

The subjects Computer Science II and III are taught and examined jointly by the Department and the Departments of Electrical and Computer Engineering and Commerce. In Computer Science II, there is no choice of topics.

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 worse than that student’s performance in the final examination, then the year’s work will be ignored in determining the final result.

However, performance during the early part of the year is taken into account when considering exclusion for “unsatisfactory progress”.

PART I SUBJECT

661100 Mathematics 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.

Hours 4 lecture hours and 2 tutorial hours per week

Examination Two 3-hour papers

Content

Topics
Al — Algebra
AN — Real Analysis
CA — Calculus
SC — Statistics and Computing
PART I TOPICS

Algebra (Topic A1) — G. W. Southern

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content

Text

References
Brisley, W. A Basis for Linear Algebra (Wiley 1973)
Kolman, B. Elementary Linear Algebra (Macmillan 1977)
Lieberk, H. Algebra for Scientists and Engineers (Wiley 1971)
Lipschutz, S. Linear Algebra (Schaum 1974)

Real Analysis (Topic AN) — C. J. Ashman

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content
Real numbers, sequences and series. Functions of one real variable, continuity, differentiability, integrability. Power series, Taylor Series.

Text Nil

References
Apostol, T. Calculus Vol. I 2nd edn (Blaisdell 1967)
Giles, J. R. Real Analysis an Introductory Course (Wiley 1972)
Spivak, M. Calculus (Benjamin 1967)

Calculus (Topic CA) — R. F. Berghout and W. P. Wood

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content

Text

References
Ayres, E. Calculus (Schaum 1974)

Statistics & Computing (Topic SC) — W. Brisley and R. W. Gibberd

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content

Text
University of Newcastle Statistical Tables

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

References
Cooper, D. & Clancy, M. Oh! Pascal (W. W. Norton & Co. 1982)
Hoel, P. G. Introduction to Mathematical Statistics (Wiley 1971)
Huntsberger, O. V. & Bilingsley, P. Elements of Statistical Inference (Allyn & Bacon 1981)


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 is a pre- or corequisite for Mathematics IIC, and IIA and IIC together a prerequisite for any Part III subject, so students wishing to take two 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 three 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 41 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 37 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 IIIB, 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</th>
<th>Part III Topic</th>
<th>Part II Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Complex Analysis</td>
<td>CO</td>
<td>M, N, P, PD, Q, E, QS, TC, Y, Z</td>
</tr>
<tr>
<td>CO</td>
<td>Vector Calculus &amp; Differential Equations (Double topic)</td>
<td>CO</td>
<td>P, T, X, Z, GT, U</td>
</tr>
<tr>
<td>D</td>
<td>Linear Algebra</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Topic in Applied Mathematics</td>
<td>CO</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Numerical Analysis &amp; Computing</td>
<td>CO</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Topics in Pure Mathematics</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Analysis of Metric Spaces</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

The selection rules and definitions of the Part II subjects follow. Details of these topics are on page 41.

662100 Mathematics IIIA

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Mathematics I</th>
</tr>
</thead>
</table>

Hours 4 lecture hours and 2 tutorial hours per week

Examination Each topic is examined separately

Content

Topics B, CO and D. In exceptional circumstances and with the consent of the Head of the Department, one other topic may be substituted for B. Additional substitutions may be allowed in the case of candidates who have passed the subject Mathematics IIIB.

662200 Mathematics IIIB

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Mathematics I</th>
</tr>
</thead>
</table>

Hours 4 lecture hours and 2 tutorial hours per week

Examination Each topic is examined separately

Content

Four topics chosen from A to L, where CO counts as two topics, and approved by the Head of the Department. In exceptional circumstances and with the consent of the Head of the Department, one or more of the topics SP of Computer Science II, K, or I may be included. Students in the Faculty of Mathematics may, with the consent of the Dean, take Mathematics IIIB in two parts, each consisting of two topics.
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 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 for Mathematics IIIA.

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

663100 Mathematics IIIA

Prerequisites: Mathematics IA & IIC

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, O, Q, QS, S, U, R), and at least one from the set (S, X, T, V, W). The final choice of topics must be approved by the Head of the Department. The topic PL will not normally be included in this subject. In addition, students taking this subject will be required to complete an essay on a topic chosen from the history or philosophy of Mathematics. Students should consult members of academic staff regarding their choice of topics. General reference (especially in connection with the essay requirement):

Eves, H. Great Moments in Mathematics
Vol. 1 Before 1650
Vol. 2 After 1650

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 IIA 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 IIA and Mathematics IIC 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. Commercial Programming (CS-Diploma Course)
9. Systems Analysis (CS-Diploma Course)
10. Systems Design (CS-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”.

* These regulations are correct at the time of going to press (Aug. 1984), but changes are currently under discussion. Prospective candidates should check with the Dean’s office concerning any changes to regulations or subjects that may have been introduced.

664100 Mathematics IV

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

Content
A student desiring admission to this subject should apply in writing to the Head of the Department before 30th December of the preceding year.

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.

PART IV SUBJECT

663105 Mathematical Models

Prerequisite
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.
References
Andrews, J. G. & McClone, R. R.
Bender, E. A.
Boyce, W. E. (ed.)
Dym, C. L. & Ivey, E. S.
Haberman, R.
Kemeny, J. G. & Snell, J. L.
Noble, B.
Smith, J. M.
Smith, J. M.

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

Prerequisite or Corequisite
Topic CO

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

Examination
One 2-hour paper

Text
Churchill, R. V.
Brown, J. W. & Verhey, R. F.

Introduction to Complex Variables
Houghton Mifflin 1974
Advanced Engineering Mathematics (Wiley 1979)
Complex Variables (Holden-Day 1970)
Advanced Engineering Mathematics
(Wadsworth 1983)

Complex Variables and Applications
(McGraw-Hill 1984)

References
Grove, E. A. & Ladas, G.
Kreyszig, E.
Levinson, N. & Redheffer, R. M.
O'Neil, P. V.

Spiegel, M. R.
Theory and Problems of Complex Variables
(McGraw-Hill 1964)
Tall, D. O.
Functions of a Complex Variable I and II
(Wiley 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

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
Amazigo, J. C. & Rubenfeld, L. A.
Boyce, W. E. & Di Prima, R. C.
Churchill, R. V. & Brown, J. W.
Courant, R.
Finizio, N. & Ladas, G.
Greenspan, H. D. & Benney, D. J.
O'Neill, P. V.
Powers, D. I.
Spiegel, M. R.

Advanced Calculus and its Applications to the Engineering and Physical Sciences (Wiley 1980)
Elementary Differential Equations and Boundary Value Problems (Wiley 1969)
Fourier Series and Boundary Value Problems (McGraw-Hill 1978)
Differential and Integral Calculus Vol. II (Wiley 1968)
Calculus and Analytic Geometry (Prentice-Hall 1982)
Ordinary Differential Equations with Modern Applications 2nd edn (Wadsworth 1982)
Calculus — an Introduction to Applied Mathematics (McGraw-Hill 1973)
Advanced Engineering Mathematics (Wadsworth 1983)
Boundary Value Problems (Academic 1972)
Theory and Problems of Vector Analysis (Schaum 1959)
Theory and Problems of Advanced Calculus (Schaum 1974)
662104 Topic D — Linear Algebra — R. B. Eggleton

Prerequisites
Nil

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

Examination
One 2-hour paper

Content


Text
Lipschutz, S. Linear Algebra (Schaum 1974)

References
Anton, H. Elementary Linear Algebra 2nd edn (Wiley 1977)
Bloom, D. M. Linear Algebra and Geometry (Cambridge 1979)
Brisley, W. A Basis for Linear Algebra (Wiley 1973)
Nering, E. D. Linear Algebra and Matrix Theory (Wiley 1964)
Reza, F. Linear Spaces in Engineering (Ginn 1971)
Rorres, C. & Anton, H. Applications of Linear Algebra (Wiley 1979)

662201 Topic E — Topic in Applied Mathematics e.g. Mechanics and Potential Theory — C. A. Croxton

Prerequisite or Corequisite
Topic CO

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

Examination
One 2-hour paper

Content

Text
An Introduction to Partial Differential Equations for Science Students 2nd edn (Longman 1974)

References
Stein, S. K.
Stephenson, G.

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
Etter, D. M. Problem Solving with Structured Fortran 77 (Benjamin 1984)
Etter, D. M. Structured Fortran 77 for Engineers and Scientists (Benjamin 1983)
McCracken, D. D. Computing for Engineers and Scientists with Fortran 77 (Wiley 1984)

662204 Topic H — Applied Statistics — W. P. Wood

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 an introduction to some methods of statistics and its applications. The lectures will include the following topics — population models, expectation, sums of random variables, sampling distributions, point and interval estimation, hypothesis testing (theory and applications), contingency tables, analysis of variance, regression, correlation, non-parametric methods.

Text
Nil

References
Chorlton, F. Textbook of Dynamics (Van Nostrand 1963)
Goodman, L. E. Dynamics (Blackie 1963)
Marion, J. B. Classical Dynamics (Academic 1970)
662301 Topic I — Probability & Statistics — C. J. Ashman

Prerequisite

Topic CO

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper

Content

This topic is an introduction to the theory of probability and statistics. The lectures will include the following topics. Probability space, basic probability theorems, conditional probability, independence of events. Discrete and continuous random variables, probability density functions, distribution function, Expectation, mean, variance, moment generating function. Joint distribution, covariance, correlation, independence. Error propagation. Chebyshev inequality and the weak law of large numbers. Binomial and Poisson probability distributions. Normal and Poisson random variables. Classification of experimental data, histograms. Random samples, sampling distributions for mean and variance. Statistical inference, hypothesis testing types of error, power functions. Point and interval estimation. Application of the $x^2$, $T$, $F$ and normal random variables to hypothesis testing.

Text

Freund, J. E. & Walpole, R. E.

Mathematical Statistics 3rd edn
(Prentice-Hall 1980)

References

Hoel, P. G.

Introduction to Mathematical Statistics
5th edn (Wiley 1984)

Miller, I. & Freund, J. E.

Probability and Statistics for Engineers
2nd edn (Prentice-Hall 1977)

Noether, G. E.

Introduction to Statistics: A Non-parametric
Approach 2nd edn (Houghton/Mifflin 1976)

662304 Topic I — 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


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 SI --- 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, dequeues 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**

**References**
- Elson, M. *Data Structures* (Science Research Associates 1975)
- Grogono, P. *Programming in Pascal*, 2nd edn (Addison-Wesley 1980)

**662402 Topic SP --- Systematic Programming**

**Prerequisite**
Mathematics I

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

**Examination**
One 2-hour paper

**Content**
Number systems: representation and arithmetic.

Hardware components, processor structure, addressing modes, Assembly language. Instruction sets, operations, 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.

**References**
- Wirth, N. *Algorithms + Data Structures = Programs* (Prentice-Hall 1976)

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**Problem Solving and Structured Programming in Pascal** (Addison-Wesley 1981)

**References**
- Research Associates *Introduction to Pascal* (West 1980)
- Guttmann, A. J. & Wirth, N. *Programming and Algorithms* (Heinemann 1977)
- Wirth, N. & Yourdon, E. J. *Systematic Programming* (Prentice-Hall 1973)

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**662405 Topic ML --- 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**
An introduction to Pascal.

The case for high level programming languages. The formal definition of the syntax of high level languages. An overview and comparison of several high level languages, including FORTRAN 77, COBOL, PLI and Ada.

Modular design: top-down programming, good coding style. The role of 'goto' constructs, conditional statements, looping, 'case' statements.

Procedures, co-routines, re-entry. Recursive programming. Appropriate and inappropriate uses of recursion.

**Text**

**References**
- Elson, M. *Concepts of Programming Languages* (Science Research Associates 1973)
- Guttmann, A. J. & Wirth, N. *Programming and Algorithms* (Heinemann 1977)

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**662400 Introduction to Computer Architecture & Assembly Language**

**Prerequisite**
Mathematics I

**Hours**
3 lecture and practical 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.
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.

References
Arthur’s, 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 & L.

Hours
1 lecture hour per week and one tutorial per fortnight

Examination
One 2-hour paper, and assignments

Content
Formalisation of deductive processes as inference rules. Sentential calculus, predicate calculus, and predicate calculus with equality. First order theories, consistency, independence, and completeness. (Examples will be taken from the usual mathematical systems). Gödel’s Theorem. Set Theory; questions of cardinality and of ordering. The continuum hypothesis. Zorn’s Lemma and the Axiom of Choice. The place of the paradoxes, and their consequences. Applications in Computer Science.

Text
Nil

References
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)

663104 Topic P — Ordinary Differential Equations — D. L. S. McElwain

Prerequisites
Topics CO, D & I.

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

Examination
One 2-hour paper

Text
Nil

References
Arthur’s, 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)
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

References

Arrowsmith, D. K. & Place, C. M.
Hirsch, M. W. & Smale, S.
Jordan, D. W. & Smith, P.

Ordinary Differential Equations (Chapman & Hall 1982)
Differential Equations, Dynamical Systems and Linear Algebra (Academic 1974)
Nonlinear Ordinary Differential Equations (Oxford 1977)

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

References

Courant, R. & Hilbert, D.
Epstein, B.
Haack, W. & Wendland, W.
Smith, M. G.
Sneddon, I. N.

Methods of Mathematical Physics Vol. II Partial Differential Equations (Interscience 1966)
Lectures on Partial and Pfaffian Differential Equations (Pergamon 1972)
Introduction to the Theory of Partial Differential Equations (Van Nostrand 1967)
Elements of Partial Differential Equations (McGraw-Hill 1957)

663211 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 some of LISP, SNOBOL, APL, Ada and C. 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

References

Barnes, J. G. P.
Eshon, M.
Gimpel, J. F.
Griswold, R. E.
Pratt, I. W.
Pyle, I. C.
Sammet, J. E.
Tucker, A. B.

Programming in Ada (Addison-Wesley 1982)
Concepts of Programming Languages (Science Research Associates 1973)
Algorithms in SNOBOL3 (Wiley 1976)
The SNOBOL4 Programming Language 2nd edn (Prentice-Hall 1971)
Programming Languages: Design and Implementation (Prentice-Hall 1975)
The Ade Programming Language (Prentice-Hall 1981)
Programming Languages: History and Fundamentals (Prentice-Hall 1969)
Let's Talk LISP (Prentice-Hall 1975)
Programming Languages (McGraw-Hill 1977)

663105 Topic Q — Fluid Mechanics — W. Summerfield

Prerequisite

Topic CO

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper

Content

Basic concepts: continuum, pressure, viscosity. Derivation of the equations of motion for a real incompressible fluid; Poiseuille and Stokes' boundary layer flow. Dynamical similarity and the Reynolds number. Fluid at high Reynolds number: ideal (non-viscous) fluid; simplification of the equations of motion: Bernoulli equations; the case of irrotational flow; Kelvin's circulation theorem. Investigation of simple irrotational inviscid flows; two-dimensional flows; circulation: axisymmetric flow around sphere; virtual mass. Generation of vorticity at solid boundaries; boundary layers and their growth in flows which are initially irrotational.

Text

References

Batchelor, G. K.
Chirgwin, B. H. & Plumpton, C.
Curle, N. & Davies, H. J.
Goldstein, S. (ed)
Milne-Thomson, L. M.
Paterson, A. R.
Robertson, J. H.

An Introduction to Fluid Dynamics (Cambridge 1967)
Elementary Classical Hydrodynamics (Pergamon 1967)
Modern Fluid Dynamics Vols I & II (Van Nostrand 1968, 1971)
Modern Developments in Fluid Dynamics Vols I & II (Dover 1965)
Theoretical Hydrodynamics (Macmillan 1962)
A first course in Fluid Dynamics (Cambridge 1983)
Hydrodynamics in Theory and Application (Prentice-Hall 1965)
663215 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 Schrödinger's equations in one, two and three dimensions; degeneracy; Heisenberg uncertainty; molecular structure.

Text: Nil

References
Croxton, C. A. 
Fong, P.
Huang, K.
Landau, L. D.
& Lifshitz, E. M.

663106 Topic R — Theory of Statistics — A. J. Dobson

Prerequisite: Topics H, I, CO

Hours: 3 hours per week for 1st half year

Examination: One 2-hour paper

Content

Text: Nil

References
Cox, D. R. & Hinkley, D. V.
Hogg, R. V. & Craig, A. J.
Silvey, S. D.

663107 Topic S — Geometry — T. K. Sheng

Prerequisites: Nil

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

Prerequisites: Topics D and K

Hours: 2 lecture hours and 1 tutorial hour per week for 2nd 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 $p^1, pq$ or $p^1$, finite $p$-groups. Finitely generated abelian groups, Free groups, homomorphisms of free groups, free abelian groups.

Text
Ledermann, W.

References
Baumslag, B. & Chandler, B.
Carmichael, R. D.
Macdonald, I. D.
Rotman, J. J.

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
The purpose of the course is to familiarise the student with tools for the interpretation of data. Minitab — use of the PDP 11/70 and RSTS 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
Neter, L. & Wasserman, W.

References
Cochran, W. G. & Cox, G. M.
Fisher, R. A.
Graybill, F. A.
Hoel, P. G.
Kendall, M. G. & Stuart, A.

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.
de Barra, G.
Halmos, P. R.
Kolmogorov, A. N. & Fomin, S. V.
Munroe, M. E.

Introduction to Measure and Integration (Addison-Wesley 1953)
663204  Topic W — Functional Analysis  J. R. Giles

Prerequisites
Topics B, CO, D, K, I.

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

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. Elements of Functional Analysis (Van Nostrand 1970)
Brown, A. I. & Page, A. Analysis of Metric Spaces (University of Newcastle 1975)
Kreysig, E. Introductory Functional Analysis with Applications (Wiley 1978)
Simmons, G. F. Introduction to Topology and Modern Analysis (McGraw-Hill 1963)
Taylor, A. E. Functional Analysis (Blaisdell 1964)

663205  Topic X — Rings and Fields  — R. F. Berghout

Prerequisites
Topics D & K

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

Content

References
Birchhoff, G. D. & MacLane, S. A Survey of Modern Algebra (Macmillan 1953)
Birkhoff, G. D. & MacLane, S. Topics in Algebra (Wiley 1975)
Kapitansky, I. Fields and Rings (Chicago 1969)
Stewart, I. Galois Theory (Chapman & Hall 1973)

663216  Topic Y — Stochastic Processes  — V. Ficker

Prerequisites
Topics CO & I

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

Content

Text
Nil

References
Dudley, R. M. Stochastic Processes (Wiley 1953)
Laba, R. G. & Robatgi, V. K. Probability Theory (Wiley 1979)
Loeve, M. Probability Theory (Van Nostrand 1960)

663207  Topic Z — Mathematical Principles of Numerical Analysis  — A. J. Guttmann

Prerequisites
Topics CO and D; High-level language programming ability is assumed

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

Content
Solution of linear systems of algebraic equations by direct and linear iterative methods; particular attention will be given to the influence of various types of errors on the numerical result, to the general theory of convergence of the latter class of methods and to the concept of “condition” of a system. Solution by both one step and multistep methods of initial value 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.
References

Atkinson, K. E.
Ames, W. F.
Cohen, A. M. et al.
Conte, S. D. &
de Boor, C.
Forsythe, G. E.,
Malcolm, M. A. &
Musler, C. B.
Isaacsen, E. &
Keller, H. M.
Lambert, J. D. &
Wait, R.
Mitchell, A. R. &
Wait, R.
Pizer, S. M. &
Wallace, V. L.
Smith, G. D.

An Introduction to Numerical Analysis (Wiley 1978)
Numerical Methods for Partial Differential Equations
(Nelson 1969)
Numerical Analysis (McGraw-Hill 1973)
Elementary Numerical Analysis 3rd edn
(McGraw-Hill 1980)
Computer Methods for Mathematical Computations
(Prentice-Hall 1977)
Analysis of Numerical Methods (Wiley 1966)
Computational Methods in Ordinary Differential
Equations (Wiley 1973)
The Finite Element Method in Partial
Differential Equations (Wiley 1977)
To Compute Numerically: Concepts and
Strategies (Little, Brown & Co. 1983)
Numerical Solution of Partial Differential Equations:
Finite Difference Methods (Oxford 1978)

663134 Topic GT — Applied Graph Theory — W. D. Wallis (not offered in 1985)

Prerequisite

Topic D

Hours

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

Examination

One 2-hour paper

Content

Introductory concepts of graph theory: graphs, digraphs, walks, paths, cycles, matchings,
colourings, planarity. Euler and Hamilton walks and applications. Personnel assignments
and timetabling. Storage allocation.

Trees. The minimal spanning tree. Distance; communication networks and
organisational structure. Tree counting. The vector spaces associated with a graph.

Graphs and networks. Electrical application - Kirchhoff’s law, squaring the square.

Commodity networks, the max flow-min cut theorem, feasible flows, supply and demand
problems.

Critical path analysis. The shortest route problem and dynamic programming.

Various applications in the social sciences.

Text

Nil

References

Bondy, J. A. &
Murty, U. S. R.
Street, A. P. &
Wallis, W. D.
Wilson, R. J.
Wilson, R. J. &
Beineke, L. W.

Graph Theory with Applications (Macmillan 1977)
Combinatorics: A First Course (Charles
Babbage Research Centre 1983)
Introduction to Graph Theory (Longman 1972)
Applications of Graph Theory (Academic 1979)

COMPUTER SCIENCE III TOPICS

534137 Compiler Construction — P. J. Muylan

Prerequisite

EE264 Introduction to Computer Architecture & Assembly Language or Topic M1.

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

The Theory of Parsing, Translation and Compiling
2nd Vol. (Prentice-Hall)
Systems Programming (McGraw-Hill)

410143 Commercial Programming — I. R. Beaman

Prerequisite

Mathematics I 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

D.E.C.
Fengold, C.

Fundamentals of Structured COBOL
Programming (W. C. Brown)

References

Chai, W. A. &
H. W.
Clifton, H. D.
Davis, G. B. &
Litecky, C. R.

Programming Standard COBOL. (Academic)

Systems Analysis for Business Data Processing
(Business Books)
Elementary Cobol Programming (McGraw-Hill)
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)
- Davis, W. Information Processing Systems — Student Workbook (Addison-Wesley)
- Gildersleeve, T. Successful Data Processing Systems Analysis (Prentice-Hall)

**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. Operating Systems Theory (Prentice-Hall)
- Hansen, P. B. Operating Systems Principles (Prentice-Hall)

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

**Prerequisite**
Mathematics I and Topic ML

**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 59.**

**663405 Programming Languages & Systems — see Topic PL page 52.**

**663404 Theory of Computing — see Topic TC page 56.**

**410128 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)
Contents
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 Mathematics IV topics.

664185 Software Engineering Principles — J. L. Keedy
Details will be available at the beginning of 1985.

664186 Software-Oriented Computer Architecture — J. L. Keedy
Details will be available at the beginning of 1985.

664187 Advanced Operating System Principles — J. L. Keedy
Details will be available at the beginning of 1985.

664188 Computer Graphics — D. W. E. Blatt
Details will be available at the beginning of 1985.

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, infinitesimals, 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
graphy; 17th and 18th century calculus; rigorous analysis in the 19th century with
stress on the developments of number systems, continuity, function concept, differen-
tiability, 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

64

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)
Divinsky, N. Rings and Radicals (Allen-Unwin 1964)
Herstein, I. N. Non-commutative Rings (Wiley 1968)
Kaplansky, I. Fields and Rings (Chicago 1969)
McCoy, N. The Theory of Rings (McMillan 1965)

664157 Concurrent Programming Techniques — D. W. E. Blatt

Prerequisite
Topic TC or Computer Operating Systems

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
Methods of controlling concurrent activities in a computer or a multiprocessor system.
Time dependent errors, functional systems, the deadlock problem. Semaphores, simple
and conditional critical regions, message buffers, event queues, Hoare's monitor
construct, path expressions. Theory of communicating sequential processes. Languages
used for structured concurrent programming: Concurrent Pascal, C, Modula, Ada
Hardware architectures to support concurrent processing, e.g. matrix multiplication with
processor arrays. Practical work in C (modifying Unix internals) and Ada (writing a small
concurrent system).

Text
Nil

References
Barnes, J. G. P. Programming in Ada (Addison-Wesley 1982)
Bowen, B. A. & Buhr, R. J. A. The Logical Design of Multiple Microprocessor
Systems (Prentice-Hall 1980)
Brinch Hansen, P. The Architecture of Concurrent Programs (Prentice-
Hall 1977)
Brinch Hansen, P. Operating Systems Principles (Prentice-Hall 1973)
Habermann, A. N. The Ada Programming Language (Prentice-Hall 1976)
Pyle, I. C. Structured Concurrent Programming with
The C Programming Language (Prentice-Hall 1978)
Satyanarayanan, M. Multi-processors — A comparative Study
(Prentice-Hall 1980)
664144 High-Level Software Development

Prerequisite
Programming experience in a high-level language is assumed.

Hours
About 27 lecture hours concentrated into the first two terms.

Examination
One 2-hour paper and assignments throughout the course.

Content
This course covers the writing of medium to large scale software projects. The course covers software tools and packages, data base management systems and involves a series of review seminars on current software engineering literature. Parts of the course are run as a seminar series with all participants contributing. The writing of successful programs is integral to the course, and in the data base section a small online multiuser data base is developed as a class project.

Text
Kernighan, B. W. & Plauger, P. J.  
Software Tools in Pascal (Addison-Wesley 1981)

References
Date, C. J.  
An Introduction to Data Base Systems 2nd edn  
(Addison-Wesley 1977)
Kernighan, B. W. & Plauger, P. J.  
Software Tools (Addison-Wesley 1976)
Kernighan, B. W. & Ritchie, D. M.  
The C Programming Language (Prentice-Hall 1978)
Martin, J.  
Computer Data Base Organisation 2nd edn  
(Prentice-Hall 1977)
Wasserman, A. I. & Freeman, P. (eds)  
Software Engineering, Education, Needs and Objectives  
(Springer-Verlag 1976)

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
Nil
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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January
1 Tuesday  Public Holiday — New Year’s Day
11 Friday  Last day for return of Re-Enrolment Forms — Continuing Students
14 Monday  Deferred Examinations begin
25 Friday  Deferred Examinations end
28 Monday  Public Holiday — Australia Day
31 Thursday  Closing date for applications for residence in Edwards Hall

February
6 Wednesday  New students attend in person to enrol and pay charges
8 Friday  Late enrolment session for new students
19 Tuesday  First Term begins
25 Monday  First Term begins

March
5 Friday  Good Friday — Easter Recess commences
9 Tuesday  Lectures resume
25 Thursday  Public Holiday — Anzac Day
29 Monday  Last day for withdrawal without academic penalty from first half year subjects (See page (vii) for Dean’s discretion)

April
3 Friday  First Term ends
20 Monday  Examinations begin
24 Friday  Examinations end
27 Monday  Second Term begins

May
10 Monday  Public Holiday — Queen’s Birthday
14 Friday  Last day for return of Confirmation of Enrolment forms
29 Saturday  Examinations begin
30 Saturday  Closing date for Applications for Selection to the Bachelor of Medicine course in 1986

June
13 Saturday  Examinations end

August
12 Monday  Last day for withdrawal without academic penalty from full year subjects (See page (vii) for Dean’s discretion)
16 Friday  Second Term ends
19 Monday  Examinations begin
23 Friday  Examinations end

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

October
1 Tuesday  Closing date for Applications for Enrolment 1986 (Undergraduate courses other than Medicine)
7 Monday  Public Holiday — Labor Day

November
1 Friday  Third Term ends
11 Monday  Annual Examinations begin
27 Wednesday  Annual Examinations end

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

1986

January
13 Monday  Deferred Examinations begin
24 Friday  Deferred Examinations end

February
24 Monday  First Term begins
II. GENERAL INFORMATION

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.

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 at the Student Administration Office by 11 January 1985.

Enrolment of Continuing Students

The University makes arrangements for continuing students to enrol by mail. There are two steps involved:

1. Lodging Enrolment Forms

Enrolment forms will be mailed to all undergraduate students in mid-December. Those who wish to enrol in 1985 and who are eligible to do so (see Regulations Governing Unsatisfactory Progress) should complete the enrolment form as soon as possible after the release of the 1984 annual examination results, and forward it to The Secretary, University of Newcastle, N.S.W., 2308.

Enrolment forms continuing students are due by 11 January 1985 except in the case of a student who is required to take a special or deferred examination in which case the enrolment form must be submitted within seven days of the release of those examination results.

Submission of enrolment forms after the due date will render the student liable to a late lodgement charge of $14.00.

Students who, for good reason, are unable to submit their enrolment forms by the due date, may apply for an extension of time. The request, with details of the reason for the extension must reach the Secretary by the due date if the late lodgement charge is to be avoided. The By-laws provide that no enrolment will be accepted after 31 March without the approval of the Secretary.

2. Completing Enrolment

When the proposed programme has been approved, an Authority to Complete Enrolment form will be mailed to the student showing charges payable. Students are required to complete enrolment by lodging the form with the Cashier with the charges payable. This can be done by mail or in person. The Cashier's office is open 9am to 12 noon and 2pm to 4pm Monday to Friday. At least 14 days notice is allowed from the date of posting to the date by which charges must be paid if a late charge is to be avoided.

Student Cards

The Authority to Complete Enrolment form incorporates the student's identification card which is returned to him after payment of charges. It should be carried by students when at the University. It serves as evidence that the student is enrolled and must be presented when applying for travel concessions, a parking permit or to confirm membership of the University Union.

If a student loses his Student Card he should pay the replacement charge of 50 cents to the Cashier and present the receipt at the Student Administration Office when seeking a replacement card.

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

Library Cards

Students should present their Student Card to the Library desk to be issued with their Library Borrower Number. This card, with its machine readable lettering, must be presented when borrowing books from the Library.

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 1984, 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 closed with the UCAC on 1 October each year. There is a $30 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 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.

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 sight 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.
Students may be excused from attending lectures, excused for the purpose of studying, through the JCAC for academic reasons. This request must be made in writing and supported by the Dean of the Faculty. An application for withdrawal must be made to the University's Academic Registrar by the student for the purpose of enrolling in another University or for other reasons. 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 completed 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 apply 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 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.

Any student who does not enrol for a period of two years and does not obtain leave of absence, must apply for re-admission to the University when he wishes to resume his studies. 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 seedy 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 these announcements which concern them.

A notice board on the wall opposite the entrance to Lecture Theatre B10 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 test or other examinations 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:** 20 to 24 May, 1985
- **Mid Year:** 29 June to 13 July, 1985
- **End of Second Term:** 19 to 23 August, 1985
- **End of Year:** 11 to 27 November, 1985

Timetables showing the time and place at which individual examinations will be held will be posted on the examinations notice board near Lecture Theatre B10 (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.

A programmable calculator will be permitted provided provided program cards and devices are not taken into the examination room.
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;
(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 7 January 1986.

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 I).

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 I).

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 re-enrolment forms by Friday 11 January 1985.

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 under 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 that 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;
   or
   (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 notification 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 it for 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

Enrolment is completed by lodging with the Cashier the approved Authority to Complete Enrolment form with a remittance to cover all charges due or written evidence that a sponsor will meet all charges.

New students are required to pay all charges when they attend to enrol.

For re-enrolling students at least 14 days notice is allowed from the date of mailing the Authority to Complete Enrolment form to the date by which charges must be paid if late charges are to be avoided. The actual date, which will not be before mid February, will be printed on the form. A later date will be set if approval of the proposed programme has been delayed or if the student has taken Special or Deferred examinations.

Charges

1. General Services Charge
   (a) Students Proceeding to a Degree or Diploma
      Full-time students ........................................... $154
      Part-time students .......................................... $148
      Post Students joining Newcastle University Union for the first time ........................................... $10
   (b) Non-Degree Students
      Newcastle University Union charge ................................. $70

   The exact amount must be paid in full by the prescribed date.
References
Biggs, N.  
Carmichael, R. D.  
Harris, D. C. & Bertolucci, M. D.  
Rosen, J.  
Shubnikov, A. V. & Koptsk, V. A.  
Weyl, H.  
White, A. T.  

Finite Groups of Automorphisms (Cambridge 1971)  
Groups of Finite Order (Dover reprint)  
Symmetry and Spectroscopy (Oxford 1978)  
Symmetry Discovered (Cambridge 1975)  
Symmetry in Science and Art (Plenum Press 1974)  
Symmetry (Princeton 1973)  
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 Poincare-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 phenomenon, 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.  

Ordinary Differential Equations (Wiley 1969)  
Differential Equations, Dynamical Systems and Linear Algebra (Academic 1974)  
The Hopf Bifurcation and its Applications (Springer-Verlag 1976)  
Nonlinear Oscillations (Wiley 1979)  
Nonlinear Vibrations (Wiley 1950)

664170 Many-body Theory — 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.
664120 Quantum Mechanics — C. A. Croxton

Prerequisites: Nil

Hours: About 27 lecture hours

Examination: One 2-hour paper

Content: Operators; Schrödinger equation; one dimensional motion; parity; harmonic oscillator; angular momentum; central potential; eigenfunction; spin and statistics; Rutherford scattering; scattering theory; phase shift analysis; nucleon-nucleon interaction; spin-dependent interaction; operators and state vectors; Schrödinger equations of motion; Heisenberg equation of motion. Quantum molecular orbitals; hybridization; LCAO theory; MO theory.

Texts:
- Croxton, C. A. *Introduction to Liquid State Physics* (Wiley 1975)
- Bondy, J. A. & Murty, U. S. R. *Graph Theory with Applications* (Macmillan 1977)
- Harary, F. *Graph Theory* (Addison-Wesley 1969)
- Wilson, R. J. *Introduction to Graph Theory* (Longman 1972)

664172 Generalised Linear Statistical Modelling — A. J. Dobson

Prerequisites: Topics R and U

Hours: About 27 hours

Examination: One 2-hour paper

Content: The course covers the theory of generalised linear models and illustrates how many methods for analysing continuous, binary and multivariate categorical data fit into this framework. Topics include the exponential family of distributions; maximum likelihood estimation; sampling distributions for goodness-of-fit statistics; linear models for continuous data (regression and analysis of variance); logistic regression; contingency tables. Students will implement these methods using various computer packages which form an integral part of the course.

Text:
- Dobson, A. J. *An Introduction to Statistical Modelling* (Chapman & Hall 1983)
- Bondy, J. A. & Murty, U. S. R. *Graph Theory with Applications* (Macmillan 1977)
- Harary, F. *Graph Theory* (Addison-Wesley 1969)
- Wilson, R. J. *Introduction to Graph Theory* (Longman 1972)

664173 Mathematical Problem Solving — R. B. Eggleton

Prerequisites: Topic O

Hours: About 27 class hours

Examination: One 2-hour paper

Content: The class will be conducted by a team of several staff members with interests across a wide spectrum of mathematics. The course will contain a series of mathematical problems, presented for solution. Participants in the class will be expected to contribute to initial discussion of the problems, then to attempt individual solutions, and subsequently to present their full or partial solutions.

In the case of problems solved only partially by individuals, subsequent class discussion would be aimed at producing a full solution on a team basis. Finally participants in the class will be expected to write up a polished version of the statement and solution of each problem. The intention of the class is to build up participants' experience in skills appropriate for mathematical research. The final examination will be mainly concerned with problems actually solved during the year.

References: References will be suggested during the course.

664142 Topological Graph Theory — R. B. Eggleton

Prerequisite: Topic CO

Hours: About 27 lecture hours

Examination: One 2-hour paper
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 characterizing 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; transfinite chain decompositions of graphs embedded in surfaces.

References
Blackett, D. W.
Bondy, J. A. & Murty, U. S. R.
Harary, F.
Ore, O.
Ringel, G.
White, A. T.
Wilson, R. J.

664180 Demography and Survival Analysis — R. W. Gibberd

Prerequisite
Topic H

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.
Elandt-Johnson, R. C. & Johnson, N. L.
Kalbfleisch, J. D. & Prentice, R. L.
Keyfitz, N.
Pollard, J. H.

664103 Banach Algebra — J. R. Giles

Prerequisite
Topic W

or Corequisite

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.

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.

Text
Zelazko, W.

Banach Algebras (Elsevier 1973)

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.

664158 Convex Analysis — J. R. Giles

Prerequisite
Topic W

or Corequisite

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
Convexity has become an increasingly important concept in analysis; much of current research in functional analysis concerns generalising to convex functions, properties previously studied for the norm; much of interest in convexity has arisen from areas of applied mathematics related to fixed point theory and optimisation problems.
We begin with a study of convex sets and functions defined on linear spaces: gauges of convex sets, separation properties. We then study topology on linear spaces generated by convex sets: metrisability, normability and finite dimensional cases. We examine continuity and separation for locally convex spaces, continuity for convex functions. We study weak and weak * topologies on normed linear spaces: convexity properties and Banach-Alaoglu Theorem. We study extreme points of convex sets, the Krein-Milman theorem. We give particular attention to the study of differentiation of convex functions on normed linear spaces: Gateaux and Fréchet derivative, Mazur’s and Asplund’s theorems.

References
Barbu, V. & Precupanu, T. Convexity and Optimization in Banach Spaces (Sijthoff & Noordhoff 1978)
Clarke, F. H. Optimization and non-smooth analysis (Wiley 1983)
Day, M. M. Normed Linear Spaces (Springer 1973)
Diestel, J. Geometry of Banach Spaces—Selected Topics (Springer 1975)
Ekeland, I. & Teman, R. Convex Analysis and Variational Problems (North Holland 1976)
Giles, J. R. Analysis of Normed Linear Spaces (University of Newcastle 1978)
Holmes, R. B. Geometric Functional Analysis and its Applications (Springer 1975)
Valentine, F. A. Convex Sets (McGraw-Hill 1964)
Walsky, A. Functional Analysis (Blaisdell 1964)

664116 Mathematical Models of Phase Transitions — A. J. Guttmann

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

Content

Text Nil

References
Amit, D. J. Field Theory, the Renormalisation Group, and Critical Phenomena (McGraw-Hill 1978)
Huang, K. Statistical Mechanics (Wiley 1963)
Stanley, H. E. Introduction to Phase Transitions and Critical Phenomena (Oxford 1971)
Thompson, C. J. Mathematical Statistical Mechanics (Princeton 1979)

664150 General & Algebraic Topology — M. J. Hayes

Prerequisite Topic L
Hours About 27 lecture hours
Examination One 2-hour paper

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 Nil

References
Cairns, S. S. Introductory Topology (Ronald 1961)
Lefshetz, 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)
Wallace, A. H. An Introduction to Algebraic Topology (Pergamon 1961)

664114 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.
References
Bachman, G. & Narici, L.
Dunford, N. & Schwartz, J.
Lorch, E.
Rudin, W.
Schmeidler, W.
Taylor, A.

References
Batchelor, G. K.
Landau, L. D. & Lifshitz, E. M.
Langlois, W. E.
Pai, S. I.
Rosenhead, L. (ed.)
Schlichting, H.
Temam, R.

References
Batchelor, G. K.
Landau, L. D. & Lifshitz, E. M.
Langlois, W. E.
Pai, S. I.
Rosenhead, L. (ed.)
Schlichting, H.
Temam, R.

Text
Brown, A. & Page, A.

References
Batchelor, G. K.
Landau, L. D. & Lifshitz, E. M.
Langlois, W. E.
Pai, S. I.
Rosenhead, L. (ed.)
Schlichting, H.
Temam, R.

References
Batchelor, G. K.
Landau, L. D. & Lifshitz, E. M.
Langlois, W. E.
Pai, S. I.
Rosenhead, L. (ed.)
Schlichting, H.
Temam, R.

Text
Elements of Functional Analysis (Van Nostrand 1970)
Functional Analysis (paperback Academic 1966)
Linear Operators (Interscience 1958)
Spectral Theory (Oxford 1962)
Functional Analysis (McGraw-Hill 1973)
Linear Operators on Hilbert Space (Academic 1954)
Functional Analysis (Wiley 1958)

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
Nil

References
Batchelor, G. K.
Landau, L. D. & Lifshitz, E. M.
Langlois, W. E.
Pai, S. I.
Rosenhead, L. (ed.)
Schlichting, H.
Temam, R.

664118 Perturbation Theory — D. L. S. McElwain

Prerequisite
Topics CO, P

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

Text
Nil

References
Bender, C. M. & Orszag, S. A.
Cole, J. D.
Nayfeh, A. H.
Nayfeh, A. H.
Van Dyke, M.

664106 Combinatorics and Counting — W. Brisley

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
Liu, C. L.

References
Beckenbach, E. F.
Hall, M.
Harary, F. & Palmer, E. M.
Riordan, J.
Wallis, W. D. & Street, A. P.

664164 Number Theory — T. K. Sheng (not likely to be offered in 1985)

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
The three major problem areas of numerical analysis involve rounding error, the three types of error for the methods will be examined.
Lightfoot, E. N. *Transport Phenomena and Living Systems* (Wiley 1974)
Margaria, R. *Biomechanics and Energetics of Muscular Exercise* (Clarendon 1976)
Riggs, D. S. *The Mathematical Approach to Physiological Problems* (M.I.T. 1963)
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**

**Text**
Nil

**References**
Kendall, M. G. & Moran, P. A. P. *Geometrical Probability* (Griffin 1963)
Mardia, K. V. *Families of Bivariate Distributions* (Griffin 1970)

**664105 Combinatorial Designs** — W. D. Wallis

**Prerequisites**
Topics D and K

**Hours**
About 27 lecture hours

**Examination**
One 2-hour paper

**Content**
An introduction to various types of designs and their properties. Pairwise balanced designs: the basic theory, some existence theorems. Wilson's theorems. Latin squares and balanced incomplete block designs. The existence theory using pairwise balanced designs, and various constructions. Partial balance. Room squares. Hadamard matrices. Block designs on graphs, such as handcuffed designs.

**Text**
Nil

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

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

Hall, M. Jr. *Combinatorial Theory* (Blaisdell 1967)
Raghavarao, 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)
Lige (6) 8 79 1975)
Moffatt, H. K.  Magnetic Field Generation in Electrically
Conducting Fluids (C.U.P. 1978)

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 92

Department of Mechanical Engineering
ME487  Operations Research — Fundamental Techniques — see page 101
ME488  Operations Research — Planning, Inventory Control & Management — see page 102

Additionally, students permitted to select courses from this list may also select any of the following topics which they have not studied in Computer Science III:
Compiler Construction
Computer Operating Systems
Programming Languages and Systems

SCHEDULE 8

PART I

541100  Engineering I

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

Corequisite
Mathematics 1

Hours
To be advised

Examination

Content
Four of the following units to be chosen.
(i) 521101  CE111 Statics
(ii) 541103  ME131 Dynamics
(iii) 541104  ME111 Graphics and Engineering Drawing
(iv) 501101  GE112 Introduction to Engineering Design
(v) EE131  Circuit Fundamentals
(vi) CE141  Industrial Process Principles
(vii) GE151  Introduction to Materials Science
(viii) EE161  Introduction to Computer Technology

(i) 521101  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) 541103  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) 541104  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 C.Z1 1976 (Inst. of Engineering, Australia)

References
Levens, A. S.  Graphics (Wiley)
Luzadder, 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 C.Z1 1976 (Inst. of Engineers, Australia)
(v) 531203 EE134 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

Texts
Wall, T. F. An outline of Industrial Process Principles (Department of Chemical Engineering, University of Newcastle)
- Metric Conversion and the Use of S.I. Units 2nd edn (University of Newcastle)

(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

(viii) 531204 EE161 Introduction to Computer Technology

Content
Number systems and codes.
Boolean algebra, functions and logical circuits.
Combination logic, analysis, synthesis and MSI 1SI 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)

412700 Accounting HC

Prerequisites
Accounting I, Mathematics I

Hours
4 lecture hours and 4 tutorial hours per week

Examination
4 3-hour papers at end of year

Content
Accounting IA and Accounting IIIB

Accounting IA
Theory and practice of company accounting; accounting for the formation, reconstruction, amalgamation, 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, bankruptcy, hire purchase and instalment purchase, lease agreements and tax-effect accounting.

Accounting IIIB
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.

Texts
Henderson, S. & Peirson, G. The Law and Practice of Company Accounting in Australia 4th edn (Butterworths)
Taylor, R. B. & O'Shea, B. P. Questions on the Law & Practice of Company Accounting 3rd edn (Butterworths)
Craig, R. & Tippett, M. Companies Act, 1981 (N.S.W. Govt. Printer)
Louderback, J. & Hirsch, M. Questions on Management Accounting (Butterworths)

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Issues in Financial Accounting
3rd edn (Cheshire)

Cost Accounting (Kent)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
<th>Prerequisites</th>
<th>Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>522700</td>
<td>Civil Engineering I</td>
<td>5 lecture hours &amp; 2½ tutorial hours per week</td>
<td>Mathematics I, CE111, ME131, GE112 and ME111</td>
<td>Five 3-hour papers</td>
</tr>
<tr>
<td>522009</td>
<td>Civil Engineering II</td>
<td>2 lecture hours &amp; 1 tutorial hour per week for first half year</td>
<td>CE212, CE213, CE231, CE232, CE224</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>522102</td>
<td>Mechanics of Solids I</td>
<td>2 lecture hours &amp; 1 tutorial hour per week for second half year</td>
<td>CE212</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>(ii) 522111</td>
<td>Mechanics of Solids II</td>
<td>2 lecture hours &amp; 1 tutorial hour per week for second half year</td>
<td>CE213</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>(iii) 522202</td>
<td>Fluid Mechanics I</td>
<td>2 lecture hours &amp; 1 tutorial hour per week for second half year</td>
<td>CE231</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>(iv) 522204</td>
<td>Fluid Mechanics II</td>
<td>2 lecture hours &amp; 1 tutorial laboratory hour per week</td>
<td>CE232</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>(v) 522412</td>
<td>Civil Engineering Materials</td>
<td>2 lecture hours &amp; 1 tutorial hour per week</td>
<td>GE151</td>
<td>One 3-hour paper</td>
</tr>
<tr>
<td>752000</td>
<td>Psychology II</td>
<td>3 lecture hours, one 2-hour practical session &amp; 1 tutorial hour per week</td>
<td>Psychology I &amp; Mathematics I</td>
<td>Two 3-hour papers plus an assessment of practical work</td>
</tr>
</tbody>
</table>

**Content**

(i) 522102 CE212 Mechanics of Solids I

- Assumed Knowledge: Mathematics I, CE111, ME131, GE112 and ME111

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

- Examination: Five 3-hour papers


(ii) 522111 CE213 Mechanics of Solids II

- Assumed Knowledge: Mathematics I

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

- Examination: One 3-hour paper

- Text: As for CE212

(iii) 522202 CE231 Fluid Mechanics I

- Assumed Knowledge: Mathematics I, Physics IA or IB

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

- Examination: One 3-hour paper

- Text: As for CE212

(iv) 522204 CE232 Fluid Mechanics II

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

- Examination: One 3-hour paper


(v) 522412 CE224 Civil Engineering Materials

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

- Examination: One 3-hour paper

- Text: As for CE231

- Assumed Knowledge: GE151

- Content: Theoretical background and laboratory tests of elastic and inelastic properties of metals and timber.

Content
2. Two other topics chosen from those topics available in Psychology IIA and Psychology IIB.
3. Mathematical Psychology.

Texts

References

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 IIB or Accounting IIC 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.
(ii) Accounting IIC 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
Anthony, N. V. et al. (eds) Readings in Advanced Accounting Theory (Butterworths)

References
Journal articles and extracts from relevant accounting monographs including the following:
American Accounting Association A Statement of Basic Accounting Theory
American Institute of Certified Public Accounts Objectives of Financial Statements

413200 Accounting IIB

Hours
To be advised

Examination
To be advised

Content
Review and extension of C.V.P. (under certainty); C.V.P. analysis under certainty; methods of cost estimation; learning curves.

Text
Kaplan, R. S. Advanced Management Accounting (Prentice-Hall)

References
Bailey, E. Pricing Practices and Strategies (Conference Board)
Corcoran, A. Costs (Wiley)
Mintzberg, H. Impediments to the Use of Management Information (N.A.A.)
O'Connor, R. Planning Under Uncertainty: Multiple Scenarios and Contingency Planning (Conference Board)

413619 Foundations of Finance

Prerequisite
Accounting I, Economics I

Hours
2 lecture hours and 1 tutorial hour per week

Examination
One 3-hour paper
An examination of some of the decision-making aspects of finance, such as, its goals and functions; financial planning, evaluation of capital projects; methods of capital budgeting; cost of capital; risk analysis and capital bugeting; capital structure; dividend policy; management of current assets; short and intermediate term financing; mergers and takeovers; liquidation and abandonment of assets.

Texts
To be advised

References
To be advised

713200 Biology IIIB

Prerequisites
Mathematics IIA & IIC & either Biology IIA or IIB

Hours
4 lecture hours & 8 tutorial hours per week

Examination
Two 3-hour papers

Content
Biology IIIB consists of two units, Environmental Physiology, and Ecology and Quantitative Genetics.

(i) 713201 Environmental Physiology

Content
Plants
Interrelationships between the environment and the operation of key physiological processes including photosynthesis, mineral ion acquisition and assimilate transfer.

Animals
Biology of reproduction in vertebrates with particular emphasis on gamete physiology.

Texts
Baker, D. A. Transport Phenomena in Plants (Chapman & Hall 1978)
Johnson, M. H. & Everitt, B. J. Essential Reproduction (Blackwell 1980)

References
Austin, C. R. & Short, R. V. Reproduction in Mammals Vols 1-8 (Cambridge 1972)
Setchell, B. P. Plant Growth and Development (McGraw-Hill 1975)
Forrey, I. W. & Feduccia, A. The Mammalian Textis (Paul Elek 1978)

(ii) 713204 Ecology and Quantitative Genetics

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

Quantitative Genetics

Texts
Krebs, C. J. Ecology 2nd edn (Harper & Row)
Stewart, J. (ed.) S289 Genetics, Units 11, 12, 13 (Open University Press 1976)

References
Daubenmire, R. F. Plants and Environment 3rd edn (Wiley 1974)
Ford, E. B. Ecological Genetics (Metheun 1975)

523700 Civil Engineering III M

Prerequisite
Civil Engineering II M, Mathematics IIA & IIC

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

Examination
Four 3-hour papers, one 2-hour paper & two 1½-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
References
Lambe, I. W. Methods of Testing Soils for Engineering Purposes AS1289

(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.

(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

(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.
Text As for CE231

(v) 523107 CE351 Civil Engineering Systems I
Hours 1 lecture hour & ½ tutorial hour per week
Examination Two ½-hour term papers & one 3-hour final paper
Content General introduction to the systems approach. Techniques available as aids to the identification of optimal policies -- mathematical modelling, computer simulation, various mathematical programming techniques, heuristics. Choice of techniques, problem formulation. Example applications of the systems approach to civil engineering problems.

533100 Communications and Automatic Control
Prerequisites Mathematics IIA & IIC (including Topics CO, D)
Hours 6 lecture, tutorial & laboratory hours per week
Examination Progressive assessment & final examination
Content (i) 501108 GE360 Automatic Control
(ii) 533110 EE342 Linear System Theory
(iii) 533133 EE344 Communications
(iv) 534134 EE447 Digital Communications

(i) 501108 GE360 Automatic Control
Hours 3 lecture, tutorial & laboratory hours per week for first half year
Examination Progressive assessment & final examination
Text Fortmann, T. E. & Hitz, K. L. Introduction to Linear Control System Theory (Dekker 1977)
or Cannon, R. H. Dynamics of Physical Systems (McGraw-Hill 1967)
or Distefano, et al Feedback and Control Systems (Schaum's Outline Series 1976)

(ii) 533110 EE342 Linear System Theory
Prerequisite GE360
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 lecture, tutorial & laboratory hours per week for second half year

Examination: Progressive assessment & final examination


Lectures plus tutorials and laboratories.


(iv) 534134 EE447 Digital Communications

Prerequisite: EE344 Communications

Content: Pulse code 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

## 423800 Economics III C

**Prerequisites**: Mathematics II A & HC & Economics II A

**Hours**: As indicated in the description of the components

**Examination**: To be advised

**Content**: Two points of the following so as to include Econometrics I or Mathematical Economics or both:

(i) 423208 Econometrics I - 1.0 point
(ii) 423204 Mathematical Economics - 1.0 point
(iii) 423113 Development - 0.5 point
(iv) 423102 International Economics - 0.5 point
(v) 423103 Public Economics - 1.0 point
(vi) 423114 Growth and Fluctuations - 0.5 point
(vii) 423115 Topics in International Economics - 0.5 point
(viii) 423116 Advanced Economic Analysis - 1.0 point

(This topic is a prerequisite for Mathematics, Economics IV)

(i) 423208 Econometrics I - R. W. McShane

**Prerequisite**: Economic Statistics II or Statistical Analysis

**Hours**: 2 lecture hours per week

**Examination**: One 3-hour paper

**Content**: A knowledge of matrix algebra and of the mathematical statistics dealt with in Statistical Analysis is recommended for students attempting this course.

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.


**References**:
- Goldberger, A. Econometrics (John Wiley & Sons 1964)
- Hadley, G. Linear Algebra (Addison-Wesley 1961)
- Huang, D. S. Regression and Econometric Methods (John Wiley & Sons 1970)
- Koutsouianis, A. A Theory of Econometrics (Macmillan 1973)
- Kmenta, J. Elements of Econometrics (Macmillan)
- Pindyck, R. S. & Rubinfeld, D. L. Econometric Models and Economic Forecasts (McGraw-Hill)
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.

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)
Hadley, G. & Kemp, M. C. Finite Mathematics in Business and Economics (North-Holland 1972)
Intriligator, M. D. Mathematical Optimization and Economic Theory (Prentice-Hall)
Yamane, T. Mathematics for Economists — An Elementary Survey (Prentice-Hall)

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.

References
Caves, R. E. Readings in International Economics (Allen & Unwin 1968)
Heller, H. R. International Monetary Economics (Prentice-Hall 1974)
McCull, G. D. (ed.) Overseas Trade and Investment (Pelican 1972)
Snappe, R. H. International Trade and the Australian Economy 2nd edn (Longman 1973)

423113 Development

Prerequisites
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

423103 Public Economics

Hours
2 lecture hours per week

Examination
One 3-hour paper

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 relationships 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 relations of fiscal policy to other economic policies for stability and growth.
References
Brown, C. V. & Jackson, P. M.
Buchanan, J. M. & Flowers, M. R.
Cubertson, J. M.
Groenewegen, P. D. (ed.)
Groenewegen, P. D.
Houghton, R. W. (ed.)
Johansen, I.
Mishan, E. J.
Musgrave, R. A. & P. B.
Shoup, C. S.
Veale, I. et al.
Wilkes, J. (ed.)

(vi) 423114 Growth and Fluctuations

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
Duin, J. van
Harris, D. J.
Heertje, A.
Kalecki, M.
Kregel, J.
Lowe, A.
Steindl, J.

(vii) 423115 Topics in International Economics (not expected to be offered in 1985)

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 neoclassical 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. G.

(viii) 423116 Advanced Economic Analysis

Prerequisite
Economics IV

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 stabilization policy in the open-economy situation, the nature of “monetarist” and “rational expectations” based macroeconomics, dimensions of the capitalist “stagnation 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.

(ii) Microeconomics:
Kaldor, N.
Mayer, T.
Sawyer, M. C.

References
(i) Macroeconomics:
The Conditions for Economic Recovery
(Martin Robertson 1983)

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

Mayer, T.
The Structure of Monetarism (Norton 1978)

Sawyer, M. C.

Macroeconomics in Question: The Keynesian-Monetarist Orthodoxies and the Kaleckian Alternative (Wheatheal 1982)
Shone, R.  
(ii) Microeconomics:  
Douglas, E. J.  
Ferguson, C. E.  
Tisdell, C. A.  

digits 33300  Geology HIC  

**Prerequisites**  
Physics IA, 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  

**Content**  
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 and engineering 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**  

**Text**  
Niebel, B. W.  
or  
Stevenson, M. G.  

Motion and Time Study (Irwin)  

Methods Engineering (N.S.W. Univ. Press)  

543501 ME301 Methods Engineering  

543502 ME302 Quality Engineering  

543503 ME303 Design for Production  

544469 ME419 Bulk Solids Handling Systems I  

544470 ME483 Production Scheduling  

544464 ME484 Engineering Economics II  

543501 ME301 Methods Engineering  

**Hours**  
1½ hours per week  

**Examination**  
Progressive assessment  

**Text**  
Arnold, P. C., McLean, A. G. & Roberts, A. W.  

Bulk Solids: Storage, Flow and Handling (The Univ. of Newcastle Research Associates Ltd. (TUNRA 2nd edn 1982)
(v) 544433 ME482 Engineering Economics I

Hours 42
Examination To be advised

Content


(vi) 544470 ME483 Production Scheduling

Hours 42
Examination Progressive assessment & examination

Content

Text Nil

(vii) 544464 ME484 Engineering Economics II

Hours 1½ hours per week
Examination Progressive assessment

Content


553900 Mechanical Engineering III C

Prerequisites Mathematics IA & IC (including Topics F & H)
Hours 6 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.
(iv) 544468 ME488 Operations Research — Planning, Inventory Control and Management

**Hours** 1½ 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. Queueing theory: simple queue, multiserver queues, Queues in series. Transients in queues; simulation of systems. Applications.

Text As for ME487

(v) 544471 ME434 Dynamics of Machines III

**Hours** 1½ hours per week

**Examination** To be advised

**Content**

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

753300 Psychology IIIC

**Prerequisites** Mathematics II A, II C & Psychology IIIC

**Hours** 4 lecture hours & 3 laboratory hours per week

**Examination** To be advised

**Content**
Computer Assisted Data Analysis
Personality Assessment
Human Information Processing
Cognition
Perception
Two additional topics to be selected from Psychology II A or II B. Students will also be required to complete an independent investigation in mathematical psychology under supervision.

Text To be advised

References To be advised

SCHEDULE C

664210 Mathematics/Economics IV

**Prerequisites** Mathematics II A and Economics II 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 20 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 IIIA and Mathematics IIIA 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

664300 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 evaluated and normally an oral examination conducted.

Content
The student shall complete four topics from Mathematics IV, chosen for their application to Physics, and topics from Physics IV, as approved by Head of Department of Physics. Project work will normally begin in the first week of February.

664200 Mathematics/Psychology IV

Prerequisites
Mathematics IIIA. Psychology IIIC. 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
4 Mathematics topics chosen from the Part IV Mathematics topics (see page 64 et seq.) Psychological Measurement (see below). Mathematical Models in Perception and Learning (see below).

(i) Psychological Measurement – J. A. Keats

Prerequisites
Nil

Hours
1½ hours per week

Examination
To be advised

Content
The logic of measurement and its application to psychological phenomena and at least one paper on one of the more recently developed psychological scaling methods.

Text
Nil

References
To be advised


Prerequisites
Part II Mathematics Topic I recommended

Hours
1½ hours per week

Examination
To be advised

Content
An introduction to the application of stochastic process models to the analysis of psychological processes involved in human information processing. Use of a real-time computer.

Text
To be advised

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

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<th>No. of Units</th>
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<td>Commerce</td>
<td>Mathematics, I, Topic SC, or Commercial Electronic Data Processing</td>
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<tr>
<td>CS Introduction to Computer Architecture &amp; Assembly Language</td>
<td>Electrical Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
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<tr>
<td>CS Switching Theory &amp; Logical Design</td>
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<td>CS Data Structures &amp; Programming</td>
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<td>CS Numerical Analysis</td>
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</table>

1. Subjects with a prefix CS are subjects offered in the Faculty of Mathematics, specifically for the Diploma in Computer Science.
2. The lecturer 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 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 concurrent or award.

<table>
<thead>
<tr>
<th>CS – Quantitative Business Analysis II</th>
<th>ME487 – Operations Research - Fundamental Techniques</th>
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### Subjects Approved for the Diploma

#### Group A

### Subjects in the main-stream of computer science

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Group B

Subjects which have some application to computer science

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<td>Engineering</td>
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<td>EE321 Linear Electronics I</td>
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<td>EE203 Introduction to Electrical</td>
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<td>EE322 Linear Electronics II</td>
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<td>E1347 Linear System Theory</td>
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<td>E1401 Automatic Control</td>
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<td>E1331 Circuits</td>
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<td>EE323 Linear Electronics</td>
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<td>E1421 Electrics</td>
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<td>Mathemtical Logic and Set Theory</td>
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<td>Part II Mathematics, Topics K</td>
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<td>CS Theory of Statistics</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topics H</td>
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<tr>
<td>CS Random &amp; Restricted Walks</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topics K</td>
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<td>CS Combinatorial Designs</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topics D</td>
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<td>CS Graph Theory and Applications</td>
<td>Mathematics</td>
<td>Part II Mathematics, Topics D</td>
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<td>ME487 Operations Research</td>
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<td>Part II Mathematics, Topic CO</td>
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<td>ME488 Additions Research</td>
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<td>Part II Mathematics, Topic CO</td>
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<td>ME503 Design of Experiments</td>
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<td>Part II Mathematics, Topic CO</td>
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<td>Me312 Modelling and Control of Metallurgical Processes</td>
<td>Mechanical</td>
<td>Part II Mathematics, Topic CO</td>
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<td>CS Instrumentation Techniques</td>
<td>Physics</td>
<td>Physics IA or IB</td>
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</table>

DESCRIPTION OF SUBJECTS

**CORE SUBJECTS**

410136 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)


**References**

Chai, W. A. & H. W. Programming Standard COBOL (Academic)

Clifton, H. D. Systems Analysis for Business Data Processing (Business Books)


DeRossi, C. J. Learning COBOL Fast (Reston)

Kapur, G. K. Programming in Standard COBOL (S.R.A.)


McCracken, D. D. Programming Business Computers (Wiley)

Munach, M. Standard COBOL (S.R.A.)


Watters, J. L. Cobol Programming (Wiley)

532117 CS --- Introduction to Computer Architecture & Assembly Language K. K. Sahija

**Assumed Standard of Attainment**

Mathematics I

**Hours**

2 hours of lectures per week for first half year

**Examination**

Progressive assessment & final examination
Content

Number Systems: representation and arithmetic
Hardware components, processor structure, addressing modes, Assembly Language.
Instruction set, 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 the PDP-11 computer.

Texts
Eckhouse, R. H. & Morris, L. R. Minicomputer Systems Organization, Programming and Application (PDP-11) 2nd edn (Prentice-Hall 1979)

References
Chu, Y. Computer Organization and Micro Programming (McGraw-Hill)
Donovan, J. J. Systems Programming (McGraw-Hill)
Friedman, A. D. Logical Design of Digital Systems (Computer Science)
Stone, H. S. Introduction to Computer Organization and Data Structures (McGraw-Hill)

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, 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
Mano, M. M. Digital Design (Prentice-Hall)

660111 CS — Programming and Algorithms — D. W. E. Blatt

Assumed Standard of Attainment
Mathematics I

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

Examination
One 2-hour paper.

Content
Systematic programming and modular design. An introduction to Pascal. Overview and comparison of several high level languages, including BASIC, FORTRAN, ALGOL 60, PL I and COBOL.
The course will be run in parallel with Computer Science II, topic SI, with additional reading and assignment work required on selected topics from decision tables, random numbers, simulation and use of some of the other high level languages discussed in lectures.

Text
Koffman, E. B. Problem Solving and Structured Programming in Pascal (Addison-Wesley 1981)

References
Elson, M. Concepts of Programming Languages (Science Research Associates 1973)
Graham, N. Introduction to Pascal (West 1980)
Grogono, P. Programming in Pascal 2nd edn (Addison-Wesley 1979)

Content
Systematic programming and modular design. An introduction to Pascal. Overview and comparison of several high level languages, including BASIC, FORTRAN, ALGOL 60, PL I and COBOL.
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Elson, M. Concepts of Programming Languages (Science Research Associates 1973)
Graham, N. Introduction to Pascal (West 1980)
Grogono, P. Programming in Pascal 2nd edn (Addison-Wesley 1979)
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
Gane, C. & Sarson, T.  
Structured Systems Analysis: Tools and Techniques  
(Prentice-Hall)

Gore, M. & Stubble, 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)

Lee, B. (ed.)
Introducing Systems Analysis and Design  
Vols. 1 & 2 (N.C.C. Publications)

Semprevivo, P. C.
Systems Analysis: Definition, Process and Design  
(S.R.A.)

GROUP A

Subjects in the main-stream of Computer Science
Offered by the Department of Commerce

660139 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; queuing theory; dynamic programming; business forecasting; elements of simulation; quantitative analysis projects.

Texts Suggested
Loomba, N. P.
Management — A Quantitative Approach  
(Prentice-Hall)

Starr, M. K. & Stein, I.
The Practice of Management Science  
(Prentice-Hall)

410128 Systems Design

Assumed Standard of Attainment
CS — Commercial Programming, Systems Analysis

This course is concerned with the early activities carried out in the development of computer-based information systems.
This course consists mainly of lectures supplemented by tutorial sessions. For the first half of the year, there are 2 lecture hours per week for the second half year. The examination is 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

**References**


Offered by Department of Electrical and Computer Engineering

**501105 GE360 Automatic Control**

- Assumed Standard of Attainment: GE360 Automatic Control
- Hours: 3 hours of lectures & tutorials per week for second half year
- Examination: Progressive assessment & final examination

**References**


**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

**Contents**


The course consists mainly of lectures which will be supplemented by laboratory and tutorial sessions.

**Text**


**References**


Kuo, B. C. *Discrete-Data Control Systems* (Prentice-Hall 1977)


**501107 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

**References**

A. Cantoni & B. C. Kuo. *Digital and Analog Communications Systems* (Wiley Paperback)

**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

**Contents**

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**

Shannugan, 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

**Contents**

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.
534143 EE464 Compiler Construction  —  R. J. Evans

**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. (Addison-Wesley)

**References**


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 1985)

**Assumed Standard of Attainment**

EE362 Switching Theory & Logical Design

**Hours**

3 hours per week for the first half year

**Content**


**Offered by Department of Mathematics, Statistics and Computer Science**

660135 CS—which Programming Languages & Systems

660133 CS—which High Level Software Development

660139 CS—which Software Engineering Principles

660141 CS—which Software-Oriented Computer Architecture

660142 CS—which Advanced Operating Systems Principles

660143 CS—which Computer Graphics

Offered by Department of Mechanical Engineering

540143 ME505 Advanced Numerical Programming  see page 101

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 politics, power and conflict: 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; search for principles of management; worker participation models; organisational development; and propositions of organisational behaviour.

**Text**

Lansbury, R. D. & Gilmour, P.

**References**

Altman, D. Argyle, M.

Organisations: An Australian Perspective

(Cheshire)

Rehearsals for Change (Fontana)

The Psychology of Interpersonal Behaviour (Penguin)
Offered by Department of Electrical and Computer Engineering

533117 EE323 Linear Electronics I
533118 EE324 Linear Electronics II
533110 EE342 Linear System Theory
533113 EE344 Communications
534109 EE421 Electronic Design A
534110 EE422 Electronic Design B

Offered by Department of Mathematics, Statistics and Computer Science

660136 CS—Mathematical Logic and Set Theory
660129 CS—Theory of Statistics
660119 CS—Random and Restricted Walks
660122 CS—Combinatorial Designs
660123 CS—Combinatorics and Counting
660137 CS—Graph Theory and Applications

Offered by Department of Mechanical Engineering

544467 ME487 Operations Research
544466 ME488 Operations Research — Fundamental Techniques
540137 ME503 Design of Experiments for Engineering Research

Offered by Department of Metallurgy

113393 Met312 Modelling and Control of Metallurgical Processes

Offered by Department of Physics

742201 CS—Instrumentation Techniques

Assumed Standard of Attainment

Physics 1A or 1B

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

Malmstad, H. V. et al. Instrumentation for Scientists Series (Vols 1–4)

DIPLOMA IN MEDICAL STATISTICS

The requirements are set out on page 28

Course Content

Subjects offered by the Faculty of Medicine

MS — Population Research Seminar
MN — Epidemiology and Study Design I
MS — Epidemiology and Study Design II

Subjects offered by the Department of Mathematics, Statistics and Computer Science

MS — Theory of Statistics — see page 54
MS — Regression, Design and Analysis of Experiments — see page 56
MS — Demography and Survival Analysis — see page 70
MS — Generalised Linear Statistical Modelling — see page 68

CS — Programming and Algorithms — see page 110
CS — Data Structures and Programming — see page 111
MS — Survey Sampling Methods — see Topic SS page 55

RUSSIAN FOR THE SCIENTIST AND MATHEMATICIAN — C. A. Croxton

Formal enrolment in this course is not required.

Prerequisites

None, although familiarity with a modern language would be of advantage

Hours

Approximately 27 lecture hours

Examination

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.
RESEARCH IN THE DEPARTMENT OF MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

Algebra
Associate Professor W. Briskey is working on some problems in group theory which arise from graph theory, and also on some applications of algebra to data-processing problems.

Astrophysics
Dr Wood is investigating the structure and internal dynamics of the oblique rotator model of magnetic stars. The problem of magno-acoustic waves in the atmosphere of Ap stars is also being studied.

Biomathematics
Dr W. Summerfield is currently studying fluid mechanical features of the cardiovascular system. He is interested in the mathematical modelling of all functions of the human body.

Bioinformatics
Dr R. F. Bingham is working on models of programme referencing behaviour and studying performance of memory management systems. He is also working on real-time computer techniques for protection and monitoring of high voltage switchyards. In addition, he is developing concurrent programming systems and techniques for writing software for multiprocessor systems. He is also interested in the development of programming languages and systems.

Professor A. J. Guttmann is interested in methods of function approximation, particularly from the viewpoint of using a differential equation representation. He is also interested in the analysis of theoretical and experimental data.

Dr W. Summerfield is studying fluid mechanical problems which arise from consulting in medical statistics. Current research includes: analysis of data with correlated errors; systems modelling; proportional hazards models; prognostic indicators.

Combinatorial Theory and Operations Research
Dr R. B. Eggleton is interested in all aspects of combinatorial mathematics, particularly graph theory.

Professor A. J. Guttmann is studying the enumeration of self-avoiding random walks on lattices.

Dr R. J. Vaughan is interested in the application of optimisation methods to industrial production problems.

Associate Professor W. D. Wallis is carrying out research on block designs and arrays and graph theory.

Computer Science and Numerical Analysis
Dr D. W. E. Blatt is working on models of programme referencing behaviour and studying performance of memory management systems. He is also working on real-time computer techniques for protection and monitoring of high voltage switchyards. In addition, he is developing concurrent programming systems and techniques for writing software for multiprocessor systems. He is also interested in the development of programming languages and systems.

Professor A. J. Guttmann is interested in methods of function approximation, particularly from the viewpoint of using a differential equation representation. He is also interested in the analysis of theoretical and experimental data.

Dr W. Summerfield is interested in the solution by linear marching schema of ordinary differential equations, in particular “stiff” systems. He is also investigating the finite element method of solution for partial differential equations.

Differential Geometry and Relativity
Associate Professor P. Smrz 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.

Dr R. J. Vaughan is investigating mathematical models in urban geography.

Associate Professor W. D. Wallis is working on mathematical models in urban geography, urban sociology.

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. Fieker 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 T. K. Sheng studies functions of distances between random points in convex and non-convex regions in Euclidean 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.

Mathematical Models of Tumour Growth
Dr D. L. S. McElwain is investigating models for the growth of solid isolated tumours.

Epidemiology
Associate Professor 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 ischaemic 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 programs.
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.

Dr. T. K. Sheng studies the application of dispersive and explosive linear operators, distribution of algebraic numbers in the complex plane, and functions defined on rational numbers. Lines determined by lattice points and application of the results obtained to statistical mechanics are studied. Convexity indices and their applications to transport networks, etc.

Problems in Biostatistics
Mathematical problems arising from analysis of epidemiological data are investigated theoretically. For example Mrs. D. O'Connell and Associate Professor A. J. Dobson are studying measures of agreement between judges.

Statistical Mechanics
Associate Professor C. A. Croxton is working on the statistical mechanics of liquids, polymers and liquid interfaces. 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
Dr. R. J. Vaughan is continuing his work on the application of mathematics to traffic engineering, traffic accidents and transportation planning.

Computer Numbers of Bachelor of Mathematics Subjects

Computer Numbers must be shown on enrolment and course variation forms in the following manner:
Candidates wishing to enrol in any subjects not listed should consult the Faculty Secretary.

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<td>51100</td>
<td>ChE141 Industrial Process Principles</td>
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<td>711100</td>
<td>Biology I</td>
<td>521101</td>
<td>CE111 Statics</td>
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<td>721100</td>
<td>Chemistry I</td>
<td>531203</td>
<td>EE131 Circuit Fundamentals</td>
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<td>311400</td>
<td>Classical Civilisation I</td>
<td>541104</td>
<td>ME111 Graphics and Engineering</td>
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<td>261100</td>
<td>Drama I</td>
<td>501101</td>
<td>GE115 Introduction to Engineering</td>
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<td>423000</td>
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<td>541103</td>
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<td>Engineering I (4 components)</td>
<td>501102</td>
<td>GE151 Introduction to Materials Science</td>
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<td>381101</td>
<td>Introduction to Philosophical Problems</td>
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<td>341101</td>
<td>French IA</td>
<td>381106</td>
<td>Moral Problems</td>
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<td>Psychoanalysis &amp; Philosophy</td>
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Part II Subjects

412700 Accounting IIC
712100 Biology IIA
712101 Human Biology
712102 Biochemistry & Molecular Genetics
### Introduction to Structuring Topic in Applied Computer Chemistry IIA Biology Civil Engineering IIM Computer Science II

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¹ Not offered in 1985.
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<td>533222</td>
<td>EE362 Switching Theory &amp; Logic Design</td>
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423800 Economics IIC
(2 components including Econometrics I & or Mathematical Economics)

423208 Econometrics I
423204 Mathematical Economics
423113 Development
423102 International Economics
423103 Public Economics
423114 Growth & Fluctuations
423115 Topics in International Economics
423116 Advanced Economic Analysis

733300 Geology IIC

543500 Industrial Engineering I
(4 components)

543501 ME381 Methods Engineering
543502 ME383 Quality Engineering
543503 ME384 Design for Production
544469 ME419 Bulk Solids Handling Systems I
544433 ME482 Engineering Economics I
544470 ME483 Production Scheduling
544464 ME484 Engineering Economics II

663100 Mathematics IIIA
663200 Mathematics IIIB

663101 Topic M — General Tensors & Relativity
663102 Topic N — Variational Methods & Integral Equations
663103 Topic O — Mathematical Logic & Set Theory
663104 Topic P — Ordinary Differential Equations
663108 Topic PD — Partial Differential Equations
663211 Topic PL — Programming Languages & Systems
663105 Topic Q — Fluid Mechanics
663215 Topic QS — Quantum & Statistical Mechanics
663106 Topic R — Theory of Statistics
663107 Topic S — Geometry
663141 Topic SS — Survey Sampling Methods
663201 Topic T — Group Theory
663209 Topic TC — Theory of Computing
663202 Topic U — Regression, Design & Analysis of Experiments
663203 Topic V — Measure Theory & Integration
663204 Topic W — Functional Analysis
663205 Topic X — Rings and Fields
663216 Topic Y — Stochastic Processes
663207 Topic Z — Mathematical Principles of Numerical Analysis
663134 Topic GT — Applied Graph Theory

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743300 Physics IIA
753300 Psychology IIC
663300 Statistics III

Part IV Subjects

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<td>664500</td>
<td>Mathematics, Geology IV</td>
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<td>Mathematics, Psychology IV</td>
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<td>664185</td>
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<td>664186</td>
<td>Software-Oriented Computer Architecture</td>
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<td>664187</td>
<td>Advanced Operating System Principles</td>
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<td>Radicals &amp; Annihilators</td>
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<td>Concurrent Programming Techniques</td>
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Extraneous Subjects

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¹ Not offered in 1985.
Diploma in Computer Science Course

410136 CS Commercial Programming
532117 CS Introduction to Computer Architecture & Assembly Language
533221 CS Switching Theory & Logical Design
660111 CS Programming & Algorithms
660112 CS Data Structures & Programming
660113 CS Numerical Analysis
410201 CS Quantitative Business Analysis II
410128 Systems Design
501108 GE360 Automatic Control
533116 EE345 Digital Signal Processing
501107 GE323 Microprocessor Systems & Applications
534134 EE447 Digital Communications
534124 EE463 Computer Operating Systems
534143 EE464 Compiler Construction
534145 EE462 Topics in Switching Theory

Diploma in Medical Statistics Course

850004 MS Population Research Seminar
850005 MS Epidemiology & Study Design I
850006 MS Epidemiology & Study Design II
660136 CS Mathematical Logic and Set Theory
660129 CS Theory of Statistics
660119 CS Random & Restricted Walks
660122 CS Combinatorial Designs
660123 CS Combinatorics
660137 CS Graph Theory and Applications
540137 ME503 Design of Experiments for Engineering Research
113393 Met112 Modelling and Control of Metallurgical Processes
742201 CS Instrumentation Techniques
660130 Project - 2 units
660140 Project - 1 unit

1 Not offered in 1985.
AMENDMENTS:

Page 5: Delete: J.L. Keedy, BD (London) DPhil (Oxford) PhD (Monash)

Page 64: Delete the following topics:

- Software Engineering Principles
- Software-Oriented Computer Architecture
- Advanced Operating System Principles

Page 107: Delete the following subjects:

- CS-Software Engineering Principles
- CS-Software-Oriented Computer Architecture
- CS-Advanced Operating System Principles

Page 117: Delete the following subjects:

- CS-Software Engineering Principles
- CS-Software-Oriented Computer Architecture
- CS-Advanced Operating System Principles