Preface

I am most happy to welcome to the Faculty of Mathematics all those students who are enrolling in the Faculty for the first time, and to welcome back those people who are now in their second or later years of study. I hope that we in the Faculty of Mathematics will have the pleasure of extending this welcome, eventually, to at least some of the readers of this Handbook who may be undecided on their exact course of study, but who are interested in some field of Mathematics. If any information you seek is not found in this Handbook, or if you simply have general questions about your course of study or about aspects of Mathematics, please accept a standing invitation to discuss your questions with me. I am sure that all other members of the academic staff of the Faculty will also be keen to help you with such questions.

Your desire to study Mathematics is, I hope, based on the conviction that Mathematics will be the most enjoyable of all those disciplines open to you — there can be no better reason. If you enjoy Mathematics you will welcome the demands it makes upon you and your studies will be most rewarding. I would like to commend to you the essay on Mathematics by Professor E. C. Zeeman in the book University Choice (edited by Klaus Boehm) pp. 261-270, Penguin 1966.

Although Faculties of Mathematics are not uncommon overseas, particularly in universities which have been founded within the last twenty years, the Faculty of Mathematics at the University of Newcastle was the first in Australia. This lead has now been followed by several other Australian universities.

It is probably still true that the most common location for Departments concerned with Mathematics in universities world-wide is in a Faculty of Science. This is an historical reflection of the fact that Mathematics has been associated most closely with scientific subjects, particularly the physical sciences, and has played a crucial part in their development, in the last 150 years. Before this period, Faculties of Arts were the most common homes for Mathematics in universities, again for good historical reasons. The relatively recent arrival of Faculties of Mathematics on the scene is evidence of the increasing recognition of a more modern fact: that Mathematics and the use of mathematical language and ideas have a place in all university studies, and are not exclusive to any one area. The best way in which we can do justice to this universality is to exist in a distinct Faculty of Mathematics having intellectual links with all other disciplines.

In Newcastle we have given practical effect to these links by introducing programmes of study which lead to the award of the B. Math degree together with other first degrees of the University. The other fields with which combined degree programmes have been available since 1975 are Arts, Science, Metallurgy and Commerce. More recently, we have put into effect arrangements for combined degree programmes with Engineering and with Economics. The details of the joint degree courses which are available this year are given in the section of this Handbook which begins at page 17.

The distinctive position that the Faculty of Mathematics occupies has advantages for all students with an interest in Mathematics who wish to work towards a single degree. For those whose tastes are specifically mathematical, the advantages scarcely need any special comment. For other people, who may realise the need for mathematical study as an adjunct to their principal subjects, we provide a variety of courses, as set out in the following pages. We are always attentive to the advances in Mathematics and related subjects which may make new or revised courses necessary; evidence of this is easy to find from a comparison of the contents of the present Handbook with the contents of previous editions.

Not all the areas of mathematical work which are of importance to the Faculty have the word “Mathematics” in their titles. Operations Research (“the mathematical description of what actually happens, rather than of what ought to happen”, according to one of the originators of the subject) is one example. Two others, in which the Faculty’s activity has expanded recently, are Statistics and Computer Science. For several years the Faculty has offered a postgraduate Diploma in Computer Science, and in 1977 it introduced the
undergraduate subject Computer Science II. Our range of undergraduate studies in Computer Science was completed in 1978 by the presentation of the new subject Computer Science III. A similar extension of our undergraduate offerings in Statistics was provided in 1979 with the introduction of Statistics III. Both of these areas, of course, provide points of contact between Mathematics and many other subjects. For that reason, mathematicians with special knowledge of Computer Science or of Statistics can expect to be citizens whose special skills will always be in demand. Graduates with such special knowledge will, if they so wish, complete the degree of B.Math with Computer Science or Statistics and have their testamur appropriately endorsed.

The Council of the University has now approved a course leading to a postgraduate Diploma in Medical Statistics; this course is offered jointly by the Faculties of Mathematics and Medicine. The field of Medical Statistics is one for which a growing demand is evident in many countries overseas and there is an increasing demand in Australia for people trained in this profession. The Diploma was offered for the first time in 1982 to students who have a suitable first degree; it is not available at any other University in Australia.

University education is not merely a question of attending courses. The University provides an environment in which your self-education can take place. Naturally, courses are part of the environment, but not the whole of it. The lecturer and the laboratory are not the only sources of information; you can reasonably expect to gain as much from discussions, debates and arguments with your fellow-students, because this type of interaction allows you to try out on other people with similar concerns your ideas about what you are learning. By “learning” I mean your appreciation of how the material you meet in your formal courses fits into a wider understanding of the world and of its problems. If you see your University education in this light, you can deduce that you should take every opportunity to broaden your outlook while you are here. The various student clubs and associations in the University provide one type of opportunity. There is another opportunity in the wide range of interests of your fellow-students; it is a better policy to find your friends and acquaintances at the University in all your activities than to confine your activities to meeting only with people whose courses are the same as your own.

I repeat my earlier welcome to you all, and wish you an enjoyable and constructive stay at the University.

J. A. KEATS,
Dean, Faculty of Mathematics.
Concurrent B. Math. and Diploma in Computer Science

Year 1 Mathematics I and three other subjects.
Year 2 Mathematics IIIA, Mathematics IIIC and one other subject.
Year 3 Mathematics IIIA and 5 or 6 units of work towards the Diploma in Computer Science.
Year 4 One other Part III subject (Statistics III for example) and the remainder of the work towards the Diploma in Computer Science.

* The normal programme of study for those wishing to major in Computer Science is to enrol in the B. Math. degree with Computer Science. The concurrent course is designed to satisfy the requirements of other students. For example, those within the Faculty of Mathematics who only decide at the third year level that they desire a qualification in Computer Science.

A GUIDE TO STUDENTS ENROLLING IN THE COURSE LEADING TO THE DEGREE OF BACHELOR OF MATHEMATICS

1. It is usually assumed that students will have studied 2-unit Mathematics. Lectures in Mathematics I have been planned to accommodate students who have taken 2-unit Mathematics. Those students who have taken more units of Mathematics will find the extra knowledge and practice very helpful. Experience has shown that students heavily on Mathematics are much more successful if they have at least 3 unit Mathematics. A programme of this sort is Mathematics I, Physics IA, Engineering I and Chemistry I.

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.

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| Geography I | Japanese IIA
| Philosophy I | Latin I |
| Physics I | Legal Studies I |
| Psychology I | Linguistics I |
| Sanskrit I | Mathematics I |
| Sociology I | Modern Languages (French, German) |

3. Enrolment in the following subjects is restricted as indicated below.

Economics IIA — Students should also include the Part II Mathematics Topic H, Probability and Statistics, in their course.

Economics IIB — This subject would 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 1 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 may take action under the Regulations.

Unless there are mitigating circumstances, a student who fails any 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 subjects of the University of Newcastle. Applicants with qualifications from other universities, or in 1981 or 1982 from this University whose courses of study have included subjects which are deemed for this purpose to provide an equivalent foundation, may be admitted 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 a Part III subject in at least one teaching area, or a Part III subject in Psychology or Education together with a Part II subject in a teaching area.

Note

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

Mathematics Education Subjects

Candidates for the degree of Bachelor of Mathematics intending a career in teaching may wish to include professional studies related directly to teaching in addition to, and concurrently with, the normal course of study in the second and third years by enrolling in Mathematics Education II and Mathematics Education III, the contents of which are set out below.
160406 Mathematics Education II - (offered only if sufficient demand)

Prerequisite
Mathematics I

Pre- or Corequisite
A Part II Mathematics subject

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

Examination
One 2-hour paper

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

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

Prerequisite
Mathematics Education II

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

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

Examination
One 2-hour paper

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

REGULATIONS GOVERNING THE DEGREE OF
BACHELOR OF MATHEMATICS

Part I -- General

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

Definitions
2. In these Regulations, unless the context or subject matter otherwise indicates or requires:

"course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
"Dean" means the Dean of the Faculty;
"the degree" means the degree of Bachelor of Mathematics;
"Department" means the Department offering a particular subject and includes any other body so doing;
"Faculty" means the Faculty of Mathematics;
"Faculty Board" means the Faculty Board of the Faculty;
"subject" means any part of the course for which a result may be recorded, provided that for the purpose of these Regulations 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 enrols in or is already enrolled in any subjects prescribed as its corequisites.
(2) A candidate obtaining a Terminating Pass in a subject shall be deemed not to have passed that subject for prerequisite purposes.

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

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

Part II -- The Ordinary Degree

Enrolment
8. (1) A candidate’s enrolment in any year must be approved by the Dean or the Dean’s nominee.
(2) A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the timetable for that year.
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 provisions 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 by 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 IIB 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 I and Division 2.

Time Requirements

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

(2) A candidate who has been granted 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.

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 IIC and Mathematics III A;
   (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) 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 IIA or IIB;
      (e) a candidate counting Psychology IIC shall not be entitled to count either Psychology III A or III B;
      (f) a candidate counting Economics IIC shall not be entitled to count either Economics III A or Economics III B;
      (g) a candidate counting Geology IIC shall not be entitled to count either Geology III A or Geology III B.

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 IIC and Mathematics III A;
   (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) six subjects chosen from the other subjects listed in the Schedule of Subjects approved for the degree of Bachelor of Science; and
   (d) three subjects chosen with the approval of the Deans of the Faculties of Mathematics and Science, from the subjects approved for any of the degree courses offered by the University.

   (2) The following restrictions shall apply to a candidate’s choice of subjects, namely:
      (a) the number of Part I subjects shall not exceed six;
      (b) the minimum number of Part III subjects shall be three;
      (c) a candidate counting Psychology II C shall not be entitled to count either Psychology IIA or Psychology IIB;
      (d) a candidate counting Psychology IIC shall not be entitled to count either Psychology III A or Psychology III B;
      (e) a candidate counting Economics IIC shall not be entitled to count either Economics III A or Economics III B;
      (f) a candidate counting Geology IIC shall not be entitled to count 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 IIC and Mathematics III A;
   (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 degree of Bachelor of Metallurgy totalling a minimum of 48 units as calculated for that degree.

Mathematics/ Commerce

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

c) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Economics.

SCHEDULE A

Mathematics Subjects

Remarks including Prerequisites and Corequisites

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

Prerequisite Mathematics I
Prerequisite Mathematics II
The Dean may permit a candidate to take this subject in two parts, each of three terms duration
Prerequisite Mathematics II
Pre- or Corequisite Mathematics III A

Prerequisites Mathematics II A & Mathematics II C
Pre- or Corequisite Mathematics III A

Prerequisites Mathematics III A & one of Mathematics III B, Computer Science III or Statistics III

Computer Science Subjects

Remarks including Prerequisites and Corequisites

Prerequisite Mathematics I

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

Statistics Subject

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

SCHEDULE B

Subjects With a Substantial Mathematical Content

Part I
Engineering I

Part II
Accounting IIC
Civil Engineering IIIM
Psychology IIC

Part III
Accounting II C
Biology II B
Civil Engineering II IM
Communications & Automatic Control
Digital Computers & Automatic Control
Economics II C
Geology IIC

Industrial Engineering I
Mechanical Engineering II C

Prerequisites Physics III A

Psychology IIC

SCHEDULE C

Combined Honours Subjects

Part IV
Mathematics/Economics IV
Mathematics/Geology IV
Mathematics/Physics IV
Mathematics/ Psychology IV

NOTES ON COMBINED DEGREE COURSES

ARTS/MATHEMATICS

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

The course could be pursued in the following manner:

**Year I**
- Mathematics I and three other Part I subjects,
- Economics I
- Accounting I

**Year II**
- Mathematics IIA
- Mathematics IIC
- One B.Com. subject
- Introductory Quantitative Methods

**Year III**
- Mathematics IIIA
- Three B.Com. subjects
- Physics I
- Mathematics IIB
- Computer Science III
- Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics. This leaves twelve subjects which must clearly satisfy the Requirements for the Commerce degree. The course could be pursued in the following manner:

**Year I**
- Mathematics I
- Introductory Quantitative Methods
- Economics I
- Accounting I

**Year II**
- Mathematics IIA
- Mathematics IIC
- One B.Com. subject

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

**Year IV**
- Mathematics IIIIB, 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

**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 IIA, Mathematics IIC, Mathematics IIIA and either Mathematics IIIB, Computer Science III, Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics. This leaves nine subjects which must clearly satisfy the Requirements for the Arts degree.

The course could be pursued in the following manner:

**Year I**
- Mathematics I and three other Part I subjects,
- Economics I
- Accounting I

**Year II**
- Mathematics IIA
- Mathematics IIC
- One B.Com. subject
- Introductory Quantitative Methods

**Year III**
- Mathematics IIIA
- Three B.Com. subjects
- Physics I
- Mathematics IIB
- Computer Science III
- Statistics III or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics. This leaves nine subjects which must clearly satisfy the Requirements for the 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 IIIA
- Three B.Com. subjects

**Year IV**
- Mathematics IIIIB, 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 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 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 IIA
- Economics I
- Two B.Ec. subjects

**Year IV**
- Two B.Ec. subjects

**Year V**
- Three B.Ec. subjects

**ENGINEERING/MATHEMATICS**

The details of the combined course in Mathematics and Engineering follow simply from the Requirements for each degree. The combined degree course should contain Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA and one of Mathematics IIIB, Computer Science II, 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 Engineering.

The course could be pursued in the following manner:

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

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

**Year II**
- Mathematics IIA
- ChE261 Separation Processes I
- GE204 Engineering Computations I
- GE205 Engineering Computations II
- ChE241 Process Analysis I
- Chemistry II

**Year III**
- Mathematics IIIA
- ChE251 Structures & Pressure Vessel Design
- ChE271 Fuels & Combustion
- ChE272 Fluid Mechanics
- ChE291 Laboratory
- ChE361 Separation Processes II
- ChE371 Kinetics & Thermodynamics
- ChE391 Laboratory
- ChE362 Solids Handling & Minerals Processing
- ChE354 Electrochemistry & Corrosion
- ChE351 Equipment Design
- ChE342 Process Analysis II
- ChE381 Computations
- ChE382 Process Dynamics
- ChE352 Process Engineering
- ChE353 Process Economics
- Part III Subject from B.Math. Schedule of Subjects

**Year V**
- ChE462 Environmental Control
- ChE471 Industrial Safety
- ChE471 Transport Phenomena
- ChE482 Process Control
- ChE483 Reaction Engineering
- ChE497 Design Project
- ChE491 Seminar
- ChE496 Research Project
- Electives — 2 units
## (ii) B.E./B.Math in Civil Engineering

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

### Year II
- **Mathematics II**
- **Chemistry IS**
- **CE212** Mechanics of Solids I
- **CE213** Mechanics of Solids II
- **CE224** Civil Engineering Materials
- **CE231** Fluid Mechanics I
- **CE232** Fluid Mechanics II
- **CE223** Engineering Geology
- **GE204** Engineering Computations I
- **GE205** Engineering Computations II
- **ME223** Engineering Technology

### Year III
- **Mathematics III**
- **CE314** Structural Analysis I
- **CE315** Structural Design I
- **CE324** Soil Mechanics
- **CE333** Fluid Mechanics III
- **CE334** Fluid Mechanics IV
- **CE342** Water Resources Engineering II
- **GE350** Seminar
- **EE211** Energy Conversion

### Year IV
- **Mathematics III**
- **CE314** Civil Engineering Systems I
- **CE372** Transport Engineering
- **CE425** Earth & Rock Engineering
- **CE452** Engineering Construction
- **Structures Elective**

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

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

### Year I
- Year I is similar for all combined courses involving the Computer Engineering specialty and consists of the following subjects:
  - **CE111** Statics
  - **EE111** Circuit Fundamentals
  - **CE112** Introduction to Engineering Design
  - **ME111** Graphics and Engineering Drawing
  - **ME131** Dynamics
  - **Mathematics I**
  - **Physics IA**
  - **Chemistry IS**

### Year II
- **EE211** Energy Conversion
- **EE221** Semiconductor Devices
- **EE232** Electrical Circuits
- **EE262** Systematic Programming

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

### Year I
- **Mathematics I**
- **Physics IA**
- **Chemistry IS**
- **CE111** Statics
- **EE111** Circuit Fundamentals
- **GE111** Introduction to Engineering Design
- **ME111** Graphics & Engineering Drawing
- **ME131** Dynamics

### Year II
- **EE211** Energy Conversion
- **EE221** Semiconductor Devices
- **EE232** Electrical Circuits
- **EE262** Systematic Programming
- **EE264** Introduction to Computer Architecture & Assembly Language
- **EE221** Electromagnetics & Quantum Mechanics

### Year III
- **Mathematics III**
- **Mathematics III**
- **Part III subject from the Schedules of Subjects for B.Math.**

### Year IV
- **EE314** Electrical Machines
- **EE315** Power Electronics
- **EE323** Linear Electronics I
- **EE324** Linear Electronics II
- **EE325** Introduction to Digital Technology

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

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

### Year II
- **Mathematics II**
- **Chemistry IS**
- **CE212** Mechanics of Solids I
- **CE213** Mechanics of Solids II
- **CE224** Civil Engineering Materials
- **CE231** Fluid Mechanics I
- **CE232** Fluid Mechanics II
- **CE223** Engineering Geology
- **GE204** Engineering Computations I
- **GE205** Engineering Computations II
- **ME223** Engineering Technology

### Year III
- **Mathematics III**
- **CE314** Structural Analysis I
- **CE315** Structural Design I
- **CE324** Soil Mechanics
- **CE333** Fluid Mechanics III
- **CE334** Fluid Mechanics IV
- **CE342** Water Resources Engineering II
- **GE350** Seminar
- **EE211** Energy Conversion

### Year IV
- **Mathematics III**
- **CE314** Civil Engineering Systems I
- **CE372** Transport Engineering
- **CE425** Earth & Rock Engineering
- **CE452** Engineering Construction
- **Structures Elective**

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

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

### Year I
- **Mathematics I**
- **Physics IA**
- **Chemistry IS**
- **CE111** Statics
- **EE111** Circuit Fundamentals
- **GE111** Introduction to Engineering Design
- **ME111** Graphics & Engineering Drawing
- **ME131** Dynamics

### Year II
- **EE211** Energy Conversion
- **EE221** Semiconductor Devices
- **EE232** Electrical Circuits
- **EE262** Systematic Programming
- **EE264** Introduction to Computer Architecture & Assembly Language
- **EE221** Electromagnetics & Quantum Mechanics

### Year III
- **Mathematics III**
- **Mathematics III**
- **Part III subject from the Schedules of Subjects for B.Math.**

### Year IV
- **EE314** Electrical Machines
- **EE315** Power Electronics
- **EE323** Linear Electronics I
- **EE324** Linear Electronics II
- **EE325** Introduction to Digital Technology
- **EE333** Advanced Circuit Analysis
- **EE341** Automatic Control
EE344  Communications
EE362  Switching Theory & Logic Design
GE350  Seminar
4 units of electives

Year V
EE421  Electronics Design A
EE451  Electromagnetic Propagation & Antennas
EE480  Project
EE481  Project or 2 units from EE300, 400 subjects
EE491  Seminar
7 units from EE300, 400 subjects

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

Year I
Mathematics I
Physics I
Chemistry IS
GE111  Statics
GE131  Introduction to Materials Science
GE112  Introduction to Engineering Design
ME111  Graphics & Engineering Drawing
ME131  Dynamics
ME223  Engineering Technology

Year II
Mathematics IIA
Mathematics IIC
EE131  Circuit Fundamentals
EE201  Experimental Methods I
ME132  Mechanics of Solids I
ME202  Dynamic Systems II
ME203  Experimental Methods II
ME204  Engineering Computations 1
ME205  Engineering Computations II
ME217  Thermodinamics
ME221  Energy Conversion
ME222  Engineering Design I
ME224  Mechanics of Solids I
ME226  Fluid Mechanics I

Year III
Mathematics IIA
ME271  Thermodynamics I

Year IV
Mathematics IIB or Part III subject from Schedule of Subjects for B.Math.
ME302  Experimental Methods III
ME312  Engineering Design II
ME313  Engineering Design III
ME322  Dynamics of Machines II
ME342  Properties of Materials II
ME343  Mechanics of Solids II
ME361  Automatic Control

Year V
ME366  Numerical Control & Computer Aided Manufacturing
ME381  Engineering Administration
ME382  Engineering Economics I
GE301  Technology & Human Values I
GE302  Technology & Human Values II
3 units Departmental Technical Electives

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 subjects contain 14 subjects. The Bachelor of Mathematics requires Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIB, Computer Science III, Statistics III or a Part III subject from Schedule B of the Requirements. This leaves nine subjects which must clearly satisfy the requirements for the Science degree.
The course could be pursued in the following manner:

**Year I**
- Mathematics I 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 IIIA, 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 of Bachelor of Metallurgy and Bachelor of Mathematics as approved by the Faculty Boards of Mathematics and Engineering shall include Mathematics I, Mathematics II A, Mathematics IIC, Mathematics IIIA and one of Mathematics IIIA, 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 Mathematics and other subjects taken from the Schedule of Subjects approved for the degree of Bachelor of Metallurgy.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year I</th>
<th>Year II</th>
<th>Year III</th>
<th>Year IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td></td>
<td>Mathematics IIA</td>
<td>Mathematics IIIA</td>
<td>Part III Subject</td>
</tr>
<tr>
<td>Physics IA</td>
<td></td>
<td>Mathematics IIC</td>
<td>Met301 Communication Skills</td>
<td>2 units from Met300 subjects</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td>GE204 Engineering Computations I</td>
<td>Met392 Chemical Metallurgy Laboratory</td>
<td>OR</td>
</tr>
<tr>
<td>ChE141 Industrial Process Principles</td>
<td></td>
<td>GE205 Engineering Computations II</td>
<td>Met396 Physical Metallurgy Laboratory</td>
<td>2 units of Elective</td>
</tr>
<tr>
<td>GE151 Introduction to Materials Science</td>
<td></td>
<td>Met214 Theory of Metallurgy Processes I</td>
<td>Met901 Directed Reading</td>
<td>Met401 Laboratory Project</td>
</tr>
<tr>
<td>ChE151 Industrial Chemical Process &amp; Equipment</td>
<td></td>
<td>Met261 Extraction Metallurgy</td>
<td>Met402 Seminar</td>
<td>8 units from Met400 Subjects</td>
</tr>
<tr>
<td>ChE152 Industrial Process Design I</td>
<td></td>
<td>Met251 Metallography</td>
<td>Met391 Physical Metallurgy Laboratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Met241 Microplasticity</td>
<td>Met392 Chemical Metallurgy Laboratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Met271 Fabrication Metallurgy</td>
<td>Met393 Physical Metallurgy Laboratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Met281 Electronic &amp; Atomic Structure</td>
<td>Met394 Physical Metallurgy Laboratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REQUIREMENTS FOR THE DIPLOMA IN COMPUTER SCIENCE**

1. In these Requirements, unless the context or subject matter otherwise indicates or requires, "the Faculty Board" means the Faculty Board of the Faculty of Mathematics and "the Board" means the Board of Studies in Computer Science.

2. An application for admission to candidature for the Diploma shall be made on the prescribed form and lodged with the Secretary to the University by the prescribed date.

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

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 recommendations of the Board and the Faculty Board.

5. (1) Notwithstanding the provision of Section 4, a student who is required to complete not more than the equivalent of one year of full-time studies to qualify for a degree may be admitted as a part-time student to the course for the Diploma with such programme as the Dean recommends, provided that the student is not enrolled in any subject for which he has not satisfied the prerequisite. Before making such recommendation, the Dean will obtain the agreement of the Heads of Departments and Deans of other faculties concerned.
   (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 additional work and/or examinations if, in its opinion, he has not reached the assumed standard of attainment on which the content of any of the subjects is based.

7. Admission to candidature shall require the approval of the Board.

8. (1) In order to qualify for the Diploma, a candidate shall, in not less than two years of part-time or one year of full-time enrolment, complete to the satisfaction of the Board a programme of subjects approved by the Board totalling not less than 24 units.
   (2) The programme referred to in subsection (1) of this section shall consist of:
   (a) the core programme set out in the Schedule; and
   (b) units chosen from subjects approved by the Board designated either Group A subjects or Group B subjects.
   (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 2.
   (4) Notwithstanding the provision of subsection (2) of this section 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.
9. 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 course and shall not be given for work on the basis of which a degree or Diploma has already been conferred or awarded or approved for conferment or award.

10. (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 the subject and pass such examinations as the Board may require.
   (3) The result of a successful candidate in a subject shall be classified: Pass, Credit, Distinction or High Distinction.

11. (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 Dean of the Faculty of Mathematics 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.

12. 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 Requirements.

**SCHEDULE OF SUBJECTS**

<table>
<thead>
<tr>
<th>Core Subjects</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 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 Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS—Programming &amp; Algorithms</td>
<td>Mathematics</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
</tbody>
</table>

**CS—Data Structures & Programming**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>CS—Prog. &amp; Alg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**CS—Numerical Analysis**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>I or suitable alternative preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Systems Analysis**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>I or suitable alternative preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

1 The lecturer in the subject will assume that all students have a good understanding of the content of items in this column.

2 Subjects with a prefix CS are subjects offered in the Faculty of Mathematics specifically for the Diploma in Computer Science.

**REQUIREMENTS FOR THE DIPLOMA IN MATHEMATICAL STUDIES**

1. In these Requirements, unless the context or subject matter otherwise indicates or requires, "the Faculty Board" means the Faculty Board of the Faculty of Mathematics and "the Dean" means the Dean of the Faculty of Mathematics.

2. An applicant for registration as a candidate for the Diploma shall:
   (a) have satisfied all the Requirements for admission to a degree in the University of Newcastle or another institution approved for this purpose by the Faculty Board, OR
   (b) in exceptional circumstances produce evidence of possessing such other qualifications as may be approved by the Faculty Board.

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

4. In order to qualify for the Diploma, a candidate shall, in not less than three terms in the case of a full-time student or not less than six terms in the case of a part-time student, complete a course of studies comprising 12 units of advanced work offered by the Department of Mathematics, Statistics and Computer Science or another department offering courses with considerable mathematical content. Two units of this advanced work may be a project approved by the Faculty Board. Each unit will require attendance at lectures, seminars and tutorials, reading exercises, laboratory work and examinations as may be prescribed by the Faculty Board.

5. 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 course and shall not be given for work on the basis of which a degree or diploma has already been conferred or awarded or approved for conferment or award.

6. (a) To complete a unit qualifying towards the Diploma, a candidate shall attend such lectures, tutorials, seminars and laboratory classes, and submit such written work as the Faculty Board may require.
   (b) To pass a unit, a candidate shall complete the unit and pass such examinations as the Faculty Board may require.

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

* No more than 3 units at the Part II level may be counted.
(b) A candidate who after—
the last Monday in First Term, in the case of a unit lasting only the first half-year,
the last Monday in Second Term, in the case of a unit lasting the whole year,
the fourth Monday in Third Term, in the case of a unit lasting only the second half-year,
withdraws from a unit in which he has enrolled, shall be deemed to have failed in that unit, unless granted permission by the Dean to withdraw without penalty.

8. In exceptional circumstances the Senate may, on the recommendation of the Faculty Board, relax any of the above requirements.

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. 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.

4. 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.

5. (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) Seminar of Population Research Group which shall count as 1 unit;
(c) units chosen from the Schedule of Subjects or other units of advanced work approved by the Board.
(3) A candidate shall not enrol in a subject the content of which, in the opinion of the Board, is substantially equivalent to work already completed towards another degree or diploma. In such a case the Board shall prescribe an alternative subject to any listed in the Schedule.

6. 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.

7. (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, Credit, Distinction or High Distinction.

8. (1) A candidate may withdraw from a subject or the course only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date or receipt of such notification.
(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Chairman of the Board to withdraw without penalty. The relevant date shall be:
(a) in the case of any subject offered in the first half of the academic year - the last Monday in first term;
(b) in the case of any subject offered in the second half of the academic year - the fourth Monday in third term;
(c) in the case of any other subject - the last Monday in second term.

9. 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 – Seminar of Population Research Group</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS—Scientific Method and Critical Thinking</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS—Epidemiology and Study Design</td>
<td>Faculty of Medicine</td>
<td>1</td>
</tr>
<tr>
<td>MS – Theory of Statistics</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></td>
</tr>
<tr>
<td>MS – Regression, design, and analysis of experiments</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></td>
</tr>
<tr>
<td>MS—Demography and survival analysis</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></td>
</tr>
<tr>
<td>MS—Generalised linear statistical modelling</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td>CS—Programming and Algorithms</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></td>
</tr>
<tr>
<td>CS – Data Structures and Programming</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></td>
</tr>
<tr>
<td>MS – Survey Sampling Methods</td>
<td>Department of Mathematics,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistics &amp; Computer Science</td>
<td></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 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 other wise 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 page 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 fourth Monday in third term;

(c) in the case of any other subject 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 under Regulation 8(1) of these Regulations may request that the Faculty Board cause his case to be reviewed. Such request shall be made to the Dean of the Faculty within seven days from the date of posting to the candidate the advice of the Faculty Board’s decision or such further period as the Dean may accept.

(4) A candidate 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.

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

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

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

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

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

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

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

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

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

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

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

6. Any third examiner shall be an external examiner.

DESCRIPTION OF SUBJECTS

NOTE ON SUBJECT ENTRIES

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

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

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

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

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

1 At present there is no fee payable.
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, III, IIB, IIC there is some choice available to students; for Mathematics IIIA and IIB 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.

PART I SUBJECT

661100 Mathematics I

Prerequisites Nil

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 AL) — G. W. Southern

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content


Text

Elementary Linear Algebra 3rd edn (Wiley 1981)

References

Brusilov, W. A Basis for Linear Algebra (Wiley 1973)
Kolman, B. Elementary Linear Algebra (Macmillan 1977)
Lipschutz, S. Algebra for Scientists and Engineers (Wiley 1971)

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

Prerequisites Nil

Hours 1 lecture hour and ½ tutorial hour per week

Content


Text

References

Apostol, T. Calculus Vol. 1 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

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

When selecting topics for Part II subjects, students are advised to consider the prerequisites needed for the various Part III subjects offered in the Faculty of Mathematics (Mathematics IIA, Mathematics IIB, Statistics III and Computer Science III). All Mathematics IIA 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>Prerequisite Topic</th>
<th>Corequisite or Prerequisite Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mathematical Models</td>
<td>CO</td>
</tr>
<tr>
<td>B</td>
<td>Complex Analysis</td>
<td>CO</td>
</tr>
<tr>
<td>CO</td>
<td>Vector Calculus &amp; Differential Equations (Double topic)</td>
<td>M, N, P, PD, Q, QS, TC, Y, Z</td>
</tr>
<tr>
<td>D</td>
<td>Linear Algebra</td>
<td>CO</td>
</tr>
<tr>
<td>E</td>
<td>Topic in Applied Mathematics e.g. Mechanics and Potential Theory</td>
<td>P, T, X, Z, GT</td>
</tr>
<tr>
<td>F</td>
<td>Numerical Analysis &amp; Computing</td>
<td>TC</td>
</tr>
<tr>
<td>H</td>
<td>Probability &amp; Statistics</td>
<td>R, ST, U, Y</td>
</tr>
<tr>
<td>I</td>
<td>Applied Statistics</td>
<td>H</td>
</tr>
<tr>
<td>K</td>
<td>Topic in Pure Mathematics e.g. Group Theory</td>
<td>FM, O, T, X</td>
</tr>
<tr>
<td>L</td>
<td>Analysis of Metric Spaces</td>
<td>FM, O, P, V, W</td>
</tr>
</tbody>
</table>

The selection rules and definitions of the Part II subjects follow. Details of these topics are on page 42.

**662100 Mathematics IIA**

**Prerequisite**
Mathematics I

**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 IIB.

**662200 Mathematics IIB**

**Prerequisite**
Mathematics I

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

**Examination**
Each topic is examined separately

**Content**
Four topics chosen from A to H, 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, I, K or L may be included. Students in the Faculty of Mathematics may, with the consent of the Dean, take Mathematics IIB in two parts, each consisting of two topics.
**COMPUTER SCIENCE SUBJECT**

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

A statement concerning the relation between the Diploma in Computer Science and the undergraduate subjects can be found on page 8.

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**662300 Computer Science II**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Mathematics I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>168 hours of lectures, tutorials and practical work as listed below</td>
</tr>
<tr>
<td>Examination</td>
<td>See component descriptions below</td>
</tr>
<tr>
<td>Content Topics</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Introduction to Structuring of Information</td>
</tr>
<tr>
<td>SP</td>
<td>Systematic Programming</td>
</tr>
<tr>
<td>M1</td>
<td>Introduction to Computer Architecture and Assembly Language</td>
</tr>
<tr>
<td>F</td>
<td>Numerical Analysis and Computing</td>
</tr>
</tbody>
</table>

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

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**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.

Passes in both Mathematics II A and I C are prerequisite for entry to all Part III subjects and Mathematics IIIA is pre- or corequisite for Mathematics IIIB. It will be assumed that students taking third-year topics in 1984 have already studied topics CO, D, K and L (or C, D, E, K and L if passed prior to 1978) in their Part II subjects.

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

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

Summaries of these topics, together with texts and references, appear on page 51 et seq. of this handbook.

**List of Topics for Part III Mathematics Subjects**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>K, L</td>
</tr>
<tr>
<td>M</td>
<td>CO</td>
</tr>
<tr>
<td>N</td>
<td>CO</td>
</tr>
<tr>
<td>O</td>
<td>K, L</td>
</tr>
<tr>
<td>P</td>
<td>CO, D, L</td>
</tr>
<tr>
<td>PD</td>
<td>CO</td>
</tr>
<tr>
<td>PL</td>
<td>CO</td>
</tr>
<tr>
<td>Q</td>
<td>CO</td>
</tr>
<tr>
<td>QS</td>
<td>CO</td>
</tr>
<tr>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>S</td>
<td>H</td>
</tr>
<tr>
<td>SS</td>
<td>CO</td>
</tr>
<tr>
<td>T</td>
<td>D, K</td>
</tr>
<tr>
<td>TC</td>
<td>CO, F</td>
</tr>
<tr>
<td>U</td>
<td>H</td>
</tr>
<tr>
<td>V</td>
<td>B, CO, D, K, L</td>
</tr>
<tr>
<td>W</td>
<td>D, K</td>
</tr>
<tr>
<td>X</td>
<td>CO, H</td>
</tr>
<tr>
<td>Y</td>
<td>CO, D</td>
</tr>
<tr>
<td>Z</td>
<td>D</td>
</tr>
</tbody>
</table>

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

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

Prerequisites
Mathematics IIA & 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, Q, QS, SS, 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

Mathematics IIIIB

Prerequisite
Mathematics IIIA

or Corequisite

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 IIIIB, 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

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

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 (1C)
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”.

Part IV Subject

Mathematics IV

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

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

Students who have passed Computer Science III may, with the permission of the Head of this Department, select up to half of their topics of study from the Commonwealth Public Service, and given in other departments. This list is printed on page 81.

Hours
At least 8 lecture hours per week or 4 lecture hours per week over two part-time years.
Examination
At least eight 2-hour final papers
A thesis, i.e., a study under direction of a special topic using relevant published material and presented in written form. Work on this thesis normally starts early in February.

Content
A selection of at least eight Part IV topics. The topics offered may be from any branch of Mathematics including Pure Mathematics, Applied Mathematics, Statistics, Computer Science and Operations Research as exemplified in the publication Mathematical Reviews. Summaries of topics are on page 65, but the Department should be consulted for further details.

NOTE: A meeting will be held on the first Tuesday of first term in Room V107 at 1:00 p.m. to determine the timetable for Mathematics IV topics.

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

PART II TOPICS

662101 Topic A — Mathematical Models — A. J. Guttmann

Prerequisite or Corequisite
Topic CO

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

Examination
One 2-hour paper

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

Text
Nil

References
Bender, E. A. An Introduction to Mathematical Modelling (Wiley 1978)
Dym, C. L. & Ivey, E. S. Principles of Mathematical Modelling (Academic 1980)
Haberman, R. Mathematical Models (Prentice-Hall 1977)
Kemeny, J. G. & Snell, J. L. Mathematical Models in Social Sciences (Blaisdell 1963)
Noble, B. Applications of Undergraduate Mathematics in Engineering (M.A.A./Collier-Macmillan 1967)
Smith, J. M. Mathematical Ideas in Biology (Cambridge 1971)

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

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

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

References
Kreysig, E. Advanced Engineering Mathematics (Wiley 1979)
Levinson, N. & Redheffer, R. M. Complex Variables (Holden-Day 1970)
O'Neill, P. V. Advanced Engineering Mathematics (Wadsworth 1983)

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

Prerequisites
Nil

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

Examination
One 3-hour paper

Content
Differential and integral calculus of functions of several variables: partial derivatives, chain rule, Jacobians, multiple integrals, Green's, Gauss' and Stokes' theorems, gradient, divergence and curl.
Taylor's polynomial; Fourier series.
First and second order linear differential equations; general solution, initial and boundary value problems, solution by Laplace transform. A little on Sturm-Liouville systems if time permits.

Second order linear partial differential equations: Laplace, Wave and Diffusion equations.

Text

Either

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

or

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

References

Amaigo, J. C. & Rubenfeld, L. A. Advanced Calculus and its Applications to the Engineering and Physical Sciences
(Wiley 1980)

(Wiley 1969)

Churchill, R. V. & Brown, J. W. Fourier Series and Boundary Value Problems
(McGraw-Hill 1978)

Courant, R. Differential and Integral Calculus Vol. II (Wiley 1968)

(Prentice-Hall 1982)

Greenspan, H. D. & Benney, D. J. Calculus — an Introduction to Applied Mathematics
(McGraw-Hill 1973)

O’Neill, P. V. Advanced Engineering Mathematics
(Wadsworth 1983)


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

Spiegel, M. R. Theory and Problems of Advanced Calculus
(Schaum 1974)

Stein, S. K. Calculus and Analytic Geometry 3rd edn
(McGraw-Hill 1982)


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)

Brayley, 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)

Ronres, 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 Nil

References

Chorlton, F. Textbook of Dynamics (Van Nostrand 1963)

Goodman, L. E. Dynamics (Blackie 1963)

Marion, J. B. Classical Dynamics (Academic 1970)


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

662204 Topic H — Probability & Statistics — C. J. Ashman

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 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 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 distribution, 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 $\chi^2$, T, F and normal random variables to hypothesis testing.

Text

References
Principles of Mathematics Chapter 12

An Introduction to Probability Theory and its Applications Vol. 1

Fried, J. E. (Prentice-Hall 1971)
Mathematical Statistics 2nd edn

Gnedenko, B. V. (Chelsea 1962)
The Theory of Probability Chapters 1 & II

Hine, J. & Wetherill, G. B. (1955)
A Programmed Text in Statistics Vol. 1

Kolmogorov, A. N. (1950)
Foundations of the Theory of Probability

Lipschutz, S. (Schaum 1968)
Theory and Problems of Probability

Loeve, M. (Van Nostrand 1960)
Probability Theory pp 1-18

Mendenhall, W. & Scheaffer, R. L. (Duxbury 1973)
Mathematical Statistics with Applications

An Introduction to Probability Theory

662301 Topic I — Applied Statistics — W. P. Wood

Prerequisite or Corequisite
Topic H

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: Markov chains, regression, correlation, comparisons of two or more samples, I-tests, one-way analysis of variance. Wherever appropriate, both parametric and non-parametric tests will be considered.

Text

Mathematical Statistics 3rd edn

References
Applied Regression Analysis

Finite Markov Chains

Introduction to Statistics: A Nonparametric Approach

Noether, G. E. (Houghton/ Mifflin 1976)

662303 Topic K—Topic in Pure Mathematics
e.g. Group Theory — J. G. Couper

Prerequisites
Nil

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

Examination
One 2-hour paper

Content
Groups, subgroups, isomorphism. Permutation groups, groups of linear transformations and matrices, isometries, symmetry groups of regular polygons and polyhedra. Cosets, Lagrange’s theorem, normal subgroups, isomorphism theorems, correspondence theorem. Orbits, stabilisers, and their applications to the Burnside-Polya counting procedure and classification of finite groups of isometries in $\mathbb{R}^3$ or $\mathbb{R}^2$.

Text
Nil
References
Budden, F. J. The Fascination of Groups (Cambridge 1972)
Coxeter, H. S. M. Introduction to Geometry (Wiley 1961)
Herstein, I. N. Topics in Algebra 2nd edn (Wiley 1975)
Weyl, H. Symmetry (Princeton 1952)

662304 Topic LI -- Analysis of Metric Spaces -- M. J. Hayes

Prerequisites
Nil

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

Examination
One 2-hour paper

Content
Examples of metric spaces and normed vector spaces. Convergence of sequences, continuity of maps. Limit points, closed and open sets. Compactness and application to existence of maxima, uniform continuity and integrability of continuous functions, and continuity of inverse functions.
Completeness, contraction maps, Picard's theorem for differential equations.
Uniform convergence, differentiation and integration of sequences and series, power series, Abel's limit theorem, Taylor series, Weierstrass approximation theorem.
Fourier series, convergence theorems, Gibb's phenomenon.

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
1 lecture hour per week and 1 tutorial hour per fortnight

Examination
One 2-hour paper

Content
Influence of structuring of information on design of programming languages.

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

Bates, F. &
Douglas, M. L.
Balfour, A. &
Marwick, D. H.
Dahl, O. J. et al.
Elson, M.

Graham, N.
Grogono, P.
Guttmann, A. J.
Jensen, K. &
Wirth, N.
Moore, L.
Pyle, I. C.
Wegner, P.

Wirth, N.
Yourdon, E. J.

References

Birkhoff, G. &
MacLane, S.
Burkill, C. W.
Cohen, I. &
Ehrlich, G.
Courant, R. &
Robbins, H.
Halmos, P.
Landau, E.
MacLane, S. &
Birkoff, G.
Wilder, R.

Enderton, H. B.

Elements of Set Theory (Academic 1977)

PART III TOPICS

66310 Topic FM — Foundations of Mathematics — Not offered in 1984

Prerequisites

Topics K & L

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper plus several assignments and short tests

Content

First and second year topics have introduced the real numbers axiomatically. But what reasons do we have for assuming the existence of a unique real number system? Where do the axioms come from? Why stop with the real, or complex, numbers? This topic is aimed at answering such questions. The second half of the topic will deal with Euclidean geometry: first as done by the Greeks, to find its strengths and flaws; second as “tidied-up” by modern mathematicians.

Text

Enderton, H. B.

Elements of Set Theory (Academic 1977)

References

Birkhoff, G. &
MacLane, S.

Foundations of Real Numbers (McGraw-Hill 1967)
The Structure of the Real Number System (Van Nostrand 1963)
What is Mathematics? (Oxford 1961)

Naive Set Theory (Van Nostrand 1960)
Foundations of Analysis (Chelsea 1951)
Algebra 2nd edn (Macmillan 1979)

Introduction to the Foundation of Mathematics (Wiley 1965)

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

Prerequisite

Topic CO

Hours

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

Examination

One 2-hour paper

Content

Covariant and contravariant vectors, general systems of coordinates. Covariant differentiation, differential operators in general coordinates. Riemannian geometry, metric, curvature, geodesics. Applications of the tensor calculus to the theory of elasticity, dynamics, electromagnetic field theory, and Einstein’s theory of gravitation.

Text

Nil

References

Chu, Y. H.

Computer Organization and Micro Programming (Prentice-Hall 1972)

Donovan, J. J.

Friedman, A. D.

Stone, H. S.

Introduction to Computer Organization and Data Structures (McGraw-Hill 1972)
References
Abram, J.  
Landau, L. D. & Lifshitz, E. M.  
Lichnerowicz, A.  
Tyldesley, J. R.  
Willmore, T. J.

Tensor Calculus through Differential Geometry  
The Classical Theory of Fields  
Elements of Tensor Calculus  
An Introduction to Tensor Analysis  
An Introduction to Differential Geometry
(Butterworths 1965)  
(Pergamon 1962)  
(Methuen 1962)  
(Longman 1975)  
(Oxford 1972)

663103 Topic 0 -- Mathematical Logic and Set Theory -- W. Brisley

Prerequisites  
Topics K & L

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

Examination  
One 2-hour paper, and assignments

Content

Text  
Lecture notes 4: Set theory and logic

References
Coppel, W. A.  
Hale, J. K.  
Hirsch, M. W. & Smale, S.  
Jordan, D. W. & Smith, P.

Stability and Asymptotic Behaviour of Differential Equations  
Ordinary Differential Equations  
Differential Equations; Dynamical Systems and Linear Algebra  
Nonlinear Ordinary Differential Equations
(Heath 1965)  
(Wiley 1969)  
(Academic 1974)  
(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.
663211  Topic PL — Programming Languages & Systems — W. D. Wallis and D. W. E. Blatt

Prerequisite
Knowledge of FORTRAN and PASCAL.

Hours
1½ lecture and tutorial hours per week

Examination
One 2-hour paper

663215  Topic QS — Quantum and Statistical Mechanics — C. A. Croxton

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. Flow 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
Nil

References
Batchelor, G. K. An Introduction to Fluid Dynamics (Cambridge 1967)
Chirgwin, B. H. & Plumptre, C. Elementary Classical Hydrodynamics (Pergamon 1967)
Curle, N. & Davies, H. J. Modern Fluid Dynamics Vols 1 & II (Van Nostrand 1968, 1971)
Goldstein, S. (ed) Modern Developments in Fluid Dynamics Vols 1 & II (Dover 1965)
Milne-Thompson, L. M. Theoretical Hydrodynamics (Macmillan 1962)

663105  Topic Q — Fluid Mechanics — W. Summerfield

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; canonicl ensemble; energy fluctuations; grand canonical ensemble; density fluctuations; quantum statistical mechanics; density matrix, ideal Bose gas, ideal Fermi gas; white dwarf stars; Bose-Einstein condensation; superconductivity.
Quantum mechanics: the wave-particle duality, concept of probability; development, solution and interpretation of Schrodinger's equations in one, two and three dimensions; degeneracy; Heisenberg uncertainty; molecular structure.

Text
Nil

References
Croxton, C. A. Introductory Eigenphysics (Wiley 1975)
Fong, P. Elementary Quantum Mechanics (Addison-Wesley 1968)
Huang, K. Statistical Mechanics (Wiley 1963)
**663106 Topic R — Theory of Statistics — A. J. Dobson**

**Prerequisite**  
Topic H

**Hours**  
3 hours per week for 1st half year

**Examination**  
One 2-hour paper

**Content**  

**Text**  
Nil

**References**  
Cox, D. R. & Hinkle, D. V.  
Introduction to Mathematical Statistics 4th edn  
(Collier Macmillan 1978)

**Statistical Inference**  
Chapman & Hall 1975)

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**663107 Topic S — Geometry — T. K. Sheng**

**Prerequisites**  
Nil

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

**Examination**  
One 2-hour paper

**Content**  
Euclidean geometry: axiomatic and analytic approach, transformations, isometries, decomposition into plane reflections, inversions, quadratic geometry.

Geometry of incidence: the real projective plane, invariance, projective transformation, conics, finite projective spaces.

**Text**  
Nil

**References**  
Blumenthal, L. M.  
Eves, H.  
Garner, L. E.  
Greenberg, M. J.  
Studies in Geometry (Freeman 1970)  
A Survey of Geometry (Allyn & Bacon 1972)  
An Outline of Projective Geometry (North Holland 1981)  
Euclidean and non-Euclidean geometries 2nd edn (Freeman 1980)

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

**Prerequisite**  
Topic H

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

**Examination**  
One 2-hour paper, and assignments

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**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
Content
This course will attract science, mathematics and engineering students who are interested in the theoretical foundations of computer science. Topics studied include the following:

Mathematical Models of Computers: Finite Automata are introduced as a first approximation to a model of a computer and some of their properties are studied. Three equivalent models of computation are then introduced and compared. These models are Turing machines, counter machines, and recursive functions. Some of the limits of models of computation (unsolvability) are also discussed.

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

Program Correctness: Methods of program verification are introduced and discussed.

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

Text
Nil

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

663202 Topic V — Measure Theory & Integration — R. J. Vaughan

Prerequisite
Topic H

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

Examination
One 2-hour paper

Content
The purpose of the course is to familiarise the student with tools for the interpretation of data. Minitab — 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, J. & Wasserman, W. Applied Linear Statistical Models (Irwin 1974)

References
Cochran, W. G. & Cox, G. M. Experimental Designs (Wiley 1964)
Cox, G. M. The Design of Experiments Any edn (Oliver & Boyd)
References
Banach, S.  Théorie des Opérations Linéaires 2nd edn (Chelsea)
Giles, J. R.  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.  Introduction to Functional Analysis (Wiley 1958)
Wilansky, A.  Functional Analysis (Blaisdell 1964)

663206 Topic X — Rings and Fields — M. J. Hayes

Prerequisites  Topics D & K
Hours  1 lecture hour per week and 1 tutorial hour per fortnight
Examination  One 2-hour paper

Content

Text  Nil

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

663207 Topic Y — Theory of Probability — V. Ficker

Prerequisites  Topics CO & H
Hours  2 lecture hours and 1 tutorial hour per week for 2nd half year
Examination  One 2-hour paper

Content
Probability spaces, random variables, integration of random variables, various types of convergence of random variables, conditional expectations, independence of random variables and products of probability spaces. Introduction to stochastic processes.

Text  Nil

References
Burrill, C. W.  Measure, Integration and Probability (McGraw-Hill 1972)
Loève, 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 2nd half year
Examination  One 2-hour paper

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.

Text  Nil

References
Atkinson, K. E.  An Introduction to Numerical Analysis (Wiley 1978)

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 2nd half year
Examination  One 2-hour paper

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.

Text  Nil

References
Atkinson, K. E.  An Introduction to Numerical Analysis (Wiley 1978)

Analysis of Numerical Methods (Wiley 1966)
Computational Methods in Ordinary Differential Equations (Wiley 1973)
The Finite Element Method in Partial Differential Equations (Wiley 1977)
**663134 Topic GT — Applied Graph Theory — W. D. Wallis**

**Prerequisite**

Topic D

**Hours**

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

**Examination**

One 2-hour paper

**Content**


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 — R. J. Evans**

**Prerequisite**

EE264 Introduction to Computer Architecture & Assembly Language or Topic MI

**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**

Aho, A. V. & Ullman, J. D.

Donovan, J. J.

*The Theory of Parsing, Translation and Compiling* 2nd Vol. (Prentice-Hall)

*Systems Programming* (McGraw-Hill)

**410143 Commercial Programming**

**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

**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. Tria, M. J.


**References**

Chai, W. A. & H. W.

Clifton, H. D.

Davis, G. B. & Litecky, C. R.

DeRossi, C. J.

Kapur, G. K.

Laden, H. N. & Gildersleeve, T. R.

McCracken, D. D. et al.

Murach, M.

Sanders, D. H.

Sprows, R. C.

Stern, N. B. & R. A.

Watters, J. L.

*Programming Standard COBOL* (Academic)

*Systems Analysis for Business Data Processing* (Business Books)

*Elementary COBOL Programming* (McGraw-Hill)

*Learning COBOL Fast* (Reston)

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

*Systems Design for Computer Applications* (Wiley)

*Programming Business Computers* (Wiley)

*Standard COBOL* (S.R.A.)

*Computers in Business* (McGraw-Hill)

*Computing with COBOL* (Harper & Row)

*COBOL Programming* (Wiley)

*COBOL Programming* (Heinemann)

**410127 Systems Analysis**

**Prerequisite**

Mathematics I

**Hours**

2 lecture hours per week for the first half year

**Examination**

An examination at mid-year plus progressive assessment

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.

63
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
Nagle, Carroll & Irwin  
An Introduction to Computer Logic (Prentice-Hall)

663406 Mathematical Logic and Set Theory  
see Topic O page 52.

663402 Mathematical Principles of Numerical Analysis  
see Topic Z page 61.

663405 Programming Languages & Systems  
see Topic PL page 54.

663404 Theory of Computing  
see Topic TC page 57.

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)

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; multiprogramming.

Text  
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.

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

Prerequisite  
Topic FM

Hours  
About 27 lecture hours

Examination  
One 2-hour paper

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

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

Text
Nil

References
Lists will be presented during the course

664151 Radicals & Annihilators - R. F. Berghout

Prerequisites
Topics F, M, T or X

Hours
About 27 lecture hours

Examination
One 2-hour paper

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

Text
Nil

References
Cohn, P. Algebra Vol. 2 (Wiley 1977)
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
The University of Newcastle Calendar consists of the following volumes:

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

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

Volume 3 - Handbook, *Faculty of Architecture*

Volume 4 - Handbook, *Faculty of Arts*

Volume 5 - Handbook, *Faculty of Economics and Commerce*

Volume 6 - Handbook, *Faculty of Education*

Volume 7 - Handbook, *Faculty of Engineering*

Volume 8 - Handbook, *Faculty of Mathematics*

Volume 9 - Handbook, *Faculty of Medicine*

Volume 10 - Handbook, *Faculty of Science*

Volume 11 - *Annual Report*

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

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

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

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

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I PRINCIPAL DATES 1984

January
1 Sunday New Year's Day
2 Monday Public Holiday
6 Friday Last day for return of Re-Enrolment Forms — Continuing Students
16 Monday Deferred Examinations begin
27 Friday Deferred Examinations end
30 Monday Public Holiday
31 Tuesday Closing date for applications for residence in Edwards Hall

February
6 Monday New students attend in person to enrol and pay charges
15 Wednesday Late enrolment session for new students
22 Wednesday First Term begins

April
20 Friday Good Friday — Easter Recess commences
25 Wednesday Public Holiday — Anzac Day
26 Thursday Lectures resume
30 Monday Last day for withdrawal without academic penalty from first half year subjects (See page (vii) for Dean's discretion)

May
4 Friday First Term ends
21 Monday Examinations begin
25 Friday Examinations end
28 Monday Second Term begins

June
11 Monday Public Holiday — Queen's Birthday
15 Friday Last day for return of Confirmation of Enrolment forms
30 Saturday Closing date for Applications for Admission to the Bachelor of Medicine course in 1985

July
2 Monday Examinations begin
6 Friday Examinations end

August
6 Monday Last day for withdrawal without academic penalty from full year subjects (See page (vii) for Dean's discretion)
10 Friday Second Term ends
13 Monday Examinations begin
17 Friday Examinations end

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

October
1 Monday Public Holiday — Eight Hour Day

November
2 Friday Third Term ends
5 Monday Annual Examinations begin
23 Friday Annual Examinations end

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

1985

January
14 Monday Deferred Examinations begin
25 Friday Deferred Examinations end

February
25 Monday First Term begins
II. GENERAL INFORMATION

Enrollment of New Students

Persons offered admission 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 Admission.

Enrollment of Continuing Students

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

1. Lodging Enrolment Forms

Re-enrolment materials will be mailed to all undergraduate students in mid-December. Those who wish to enrol in 1984 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 1983 annual examination results, and forward it to The Secretary, University of Newcastle, N.S.W., 2308.

Enrolment forms from continuing students are due by 6 January 1984 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 10 am to 12 noon and 2 pm to 4 pm 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 who has been enrolled previously at the University of Newcastle, but not enrolled in 1983, is required to lodge an Application for Admission if further undergraduate enrolment is desired. Applications are available from the Student Administration Office and should preferably be lodged by 1 October 1983.

Attendance Status

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

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

Change of Address

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

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

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

Change of Name

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

Change of Programme

Approval must be sought for any changes to the programme for which a student has enrolled. This includes adding or withdrawing subjects, changing attendance status (for example from full-time to part-time) or transferring to a different degree or faculty.

All proposed changes should be entered on the Variation of Programme form available at the Student Administration Office. Reasons for changes and where appropriate documentary evidence in the form of medical or other appropriate certificates must be submitted.

Withdrawal

Application to withdraw from a subject should be made on a Variation of Programme form and lodged at the Student Administration Office or mailed to the Secretary.

Applications received by the appropriate date listed below will be approved for withdrawal without a failure being recorded against the subject or subjects in question.

<table>
<thead>
<tr>
<th>Full Year Subjects</th>
<th>First Half-Year Subjects</th>
<th>Second Half-Year Subjects</th>
</tr>
</thead>
</table>

Withdrawal after the above dates will normally lead to a failure being recorded against the subject or subjects unless the Dean of the Faculty grants permission for the student to withdraw without a failure being recorded.
If a student believes that a failure should not be recorded because of the circumstances leading to his withdrawal, it is important that full details of these circumstances be provided with the application to withdraw.

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

Indebtedness
The Council of the University has directed that students who are indebted to the University because of unpaid charges, library fines or parking fines may not:
- complete enrolment in a following year;
- receive a transcript of academic record; or
- graduate or be awarded a Diploma.

Students are requested to pay any debts incurred without delay.

Leave of Absence
A student who does not wish to re-enrol for any period up to three years should 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.

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 seamy fashion. Smoking is not permitted during lectures, in examination rooms or in the University Library. Gambling is forbidden.

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

Notices
Official University notices are displayed on the notice boards and students are expected to be acquainted with the contents of those announcements which concern them.

A notice board on the wall opposite the entrance to Lecture Theatre B01 is used for the specific purpose of displaying examination time-tables and other notices about examinations.

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

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

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

- End of First Term: 21 to 25 May, 1984
- Mid Year: 2 to 6 July, 1984
- End of Second Term: 13 to 17 August, 1984
- End of Year: 5 to 23 November, 1984

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

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 each examination will be on a noticeboard outside the 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 connection will be granted:

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

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

- (a) candidates shall comply with any instructions given by a supervisor relating to the conduct of the examination;

* A programmable calculator will be permitted provided program cards and devices are not taken into the examination room.
(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
Each student will be advised in December by mail of his annual examination results. 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 11 January 1985.

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

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

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

Deferred Examinations
The Boards of the Faculties of Architecture, Engineering, and Mathematics may grant deferred examinations. Such examinations, if granted, will be held in January-February and candidates will be advised by mail of the times and results of the examinations.
(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 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 for it any other decision which the Faculty Board is empowered to make pursuant to these Regulations.

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

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

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

(c) exclude the student from the University.

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

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

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

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

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

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

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

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

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

V CHARGES

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

<table>
<thead>
<tr>
<th>Full-time students</th>
<th>$135</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per annum</td>
</tr>
</tbody>
</table>

| Part-time students | $130 |
|                   | Per annum |

(b) Non-Degree Students

<table>
<thead>
<tr>
<th>Newcastle University Union charge</th>
<th>$61</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per annum</td>
</tr>
</tbody>
</table>

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

2. Late Charges

(a) Late Lodgement of Enrolment Form

<table>
<thead>
<tr>
<th>Where a continuing student does not lodge the Enrolment form by Friday, 6 January, 1984</th>
<th>$14</th>
</tr>
</thead>
<tbody>
<tr>
<td>where a candidate for a special or deferred examination in January does not lodge the Enrolment form by Monday, 13 February, 1984</td>
<td>$14</td>
</tr>
</tbody>
</table>

(b) Late Lodgement of Authority to Complete Enrolment Form with Cashier

Where the Authority to Complete Enrolment Form together with

(i) General Services Charge payable; or

(ii) evidence of sponsorship (e.g. scholarship voucher or letter from Sponsor); or
Students who notify the Student Administration Office of a complete withdrawal from their courses should also lodge a claim form for a refund of charges that they have paid. A refund cheque will be mailed to the student or, if applicable, to the sponsor. The refund will be based on the date of notification of withdrawal, as follows:

1. Notification on or before Monday, 27 February, 1984
   - 100%
2. Notification on or before Friday, 23 March, 1984
   - 90%
3. Notification on or before Friday, 29 June, 1984
   - 50%

No refund will be made before 31 March 1984.

Higher Degree Candidates

Higher degree candidates are required to pay the General Services charge and Union Entrance charge, if applicable. Where the enrolment is effective from First or Second Term, the General Services charge covers the period from the first day of the term to the Friday immediately preceding the First Term in the following academic year. Where enrolment is on or after the first day of Third Term, the General Services charge paid will cover liability to the end of the long vacation following the next academic year.
References
Barnes, J. G. P.  
Bowen, B. A. & Buhr, R. J. A.  
Brinch Hansen, P.  
Brinch Hansen, P. 
Coffman, E. G. & Denning, P. J. 
Habermann, A. N. 
Holt, R. C. et al. 
Kernighan, B. W. & Ritchie, D. M. 
Pyle, I. C. 
Satyanarayanan, M.  
Shaw, A. C. 
Weitzman, C. 

664144 High-Level Software Development — D. W. E. Blatt and J. A. Lambert

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.  

References Date, C. J.  
Kernighan, B. W. & Plauger, P. J.  
Kernighan, B. W. & Ritchie, D. M.  
Martin, J. 
Wasserman, A. I. & Freeman, P. (eds)

Software Tools in Pascal (Addison-Wesley 1981)

An Introduction to Data Base Systems 2nd edn (Addison-Wesley 1977))  
Software Tools (Addison-Wesley 1976)  
The C Programming Language (Prentice-Hall 1978)  
Computer Data Base Organisation 2nd edn (Prentice-Hall 1977)  
Software Engineering, Education, Needs and Objectives (Springer-Verlag 1976)

67
664166 Symmetry — W. Bristley

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 will 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; Mathieu groups.

Text
Nil

References
Biggs, N.
Carmichael, R. D.
Harary, F.
Lomont, J. S.
White, A. T.
Wielandt, H.
Wilson, R. J.

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-linear systems and their perturbations. The method of averaging. Frequency locking, jump phenomena, and subharmonics. Bifurcation of periodic solutions. Attention will be paid to applications throughout the course.

Text
Nil

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

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.

Text
Croxton, C. A.

References
Croxton, C. A.

664120 Quantum Mechanics — C. A. Croxton

Prerequisites
Nil

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
Operators; Schrodinger 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; Schrodinger equations of motion; Heisenberg equation of motion. Quantum molecular orbitals; hybridization; LCAO theory; MO theory.

Texts
Croxton, C. A.

References
Croxton, C. A.

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
To be advised

664153 Algebraic Graph Theory — R. B. Eggleton

Prerequisite
Topic D

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

Text
Biggs, N. (Cambridge 1974)

References
Harary, F. (Addison-Wesley 1969)
Lancaster, P. (Academic 1969)
Wilson, R. J. (Longman 1972)

664173 Mathematical Problem Solving — R. B. Eggleton

Prerequisite
Topic FM or 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

Content
This topic deals with drawings of graphs on various surfaces. It will begin with a brief introduction to the theory of graphs, to be followed by a fairly detailed introduction to the topology of surfaces, with particular attention to the classification of surfaces.

The main graph-theoretic areas to be treated are: Kuratowski's Theorem characterising graphs which can be embedded in the plane; genus, thickness, coarseness and crossing numbers of graphs; chromatic number of a surface and some details of the proof of the Four Colour Theorem by Appel and Haken; transposition-free chain decompositions of graphs embedded in surfaces.

Text
Nil

References
Harary, F. (Addison-Wesley 1969)
Ore, O. (Academic 1967)
Ringel, G. (Springer 1974)
Wilson, R. J. (Oliver & Boyd 1972)

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, urban modelling and the survival models used in demography and bio-statistics.

Text
Lawless, J. (Wiley 1982)

References
J. R. Giles

664103 Banach Algebra — J. R. Giles

Prerequisite 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, normality and finite dimensional cases. We examine continuity and separation for locally convex spaces, convexity. 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.

Text
Giles, J. R.
Convex Analysis with application in Differentiation of Convex Functions (Pitman 1982)

References
Barbu, V.
Convexity and Optimization in Banach Spaces
(Štyholt & Noordhoff 1978)

Day, M. M.
Normed Linear Spaces
(Springer 1973)

Diestel, J.
Geometry of Banach Spaces—Selected Topics
(Springer 1975)

Ekeland, I.
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)

Roberis, A. W.
Convex Functions (Academic 1970)

Varberg, D. E.
Convex Analysis (Princeton 1970)

Rockafeller, R. T.
Functional Analysis (McGraw-Hill 1973)

Rudin, W.
Convex Sets (McGraw-Hill 1964)

Valentine, F. A.
Functional Analysis (Blaisdell 1964)

Wilansky, A.
Functional Analysis (Blaisdell 1964)

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

Prerequisite
Nil

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

Text
Thompson, C. J. Mathematical Statistical Mechanics (Princeton 1979)

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)

664150 General & Algebraic Topology — M. J. Hayes

Prerequisite
Topic I.

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)
Leech, 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)

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. An Introduction to Fluid Dynamics (Cambridge 1967)
Lampl, W. E. Slow Viscous Flow (Macmillan 1964)
Schlichting, H. Boundary Layer Theory (McGraw-Hill 1968)

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.

Text
Rudin, W. Functional Analysis (paperback Academic 1966)

References
Dunford, N. & Schwartz, J. Linear Operators (Interscience 1958)
Lorch, E. Spectral Theory (Oxford 1962)
Schmeidler, W. Linear Operators on Hilbert Space (Academic 1954)
Taylor, A. Functional Analysis (Wiley 1958)

664118 Perturbation Theory — D. L. S. McElwain

Prerequisite
Topic CO

Hours
About 27 lecture hours

Examination
One 2-hour paper

References
Bender, C. M. & Orszag, S. A. Advanced Mathematical Methods for Scientists and Engineers (McGraw-Hill 1978)
Cole, J. D. Perturbation Methods in Applied Mathematics (Blaisdell 1968)
Nayfeh, A. H. Introduction to Perturbation Techniques (Wiley 1981)
Nayfeh, A. H. Perturbation Methods (Wiley 1973)
Van Dyke, M. Perturbation Methods in Fluid Mechanics (Parabolic 1975)

664106 Combinatorics — R. B. Eggleton and W. Brisley (To be offered if sufficient demand)
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. Also asymptotic analysis of many of the exact results.

References
Beckenbueck, E. F. (ed.) Applied Combinatorial Mathematics (Wiley 1964)
Hall, M. Combinatorial Theory (Blaisdell 1967)
Liu, C. L. Introduction to Combinatorial Mathematics (McGraw-Hill 1968)
Riordan, J. Combinatorial Analysis (Wiley 1958)

664164 Number Theory — T. K. Sheng
Prerequisites
Nil

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

References
Andrews, G. E. Number Theory (Saunders 1971)
Hardy, G. & Wright, E. M. An Introduction to Number Theory (Oxford 1960)
Niven, I. & Zuckerman, H. S.

664159 Foundations of Modern Differential Geometry — P. K. Smrz
Prerequisite
Topic CO

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content

References
Auslander, L. Differential Geometry (Harper & Row 1967)

664181 Numerical Methods and Analysis — W. Summerfield
Prerequisite
Topic Z

Hours
About 27 lecture hours

Examination
One 2-hour paper

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

Text
Nil
References
Forsythe, G. & Moler, C. B. Computer Solution of Linear Algebraic Systems (Prentice-Hall 1967)
Gear, C. W. The Numerical Solution of Initial Value Problems in Ordinary Differential Equations (Prentice-Hall 1971)
Lambert, J. D. Computational Methods in Ordinary Differential Equations (Wiley 1973)
Ortega, J. M. Numerical Analysis—A Second Course (Academic 1973)
Wilkinson, J. The Algebraic Eigenvalue Problem (Oxford 1965)

664165 Mathematical Physiology — W. Summerfield
Prerequisites Nil
Hours About 27 lecture hours
Examination One 2-hour paper

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

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

Text Nil

References
Christensen, H. N. Biological Transport (W.A. Benjamin, 1975)

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)

664139 Coding Theory — W. D. Wallis
Prerequisites Topics D and K
Hours About 27 lecture hours
Examination One 2-hour paper

Content
Introduction to codes; Hamming distance; linear codes; the Slepian-Moore-Prange algorithm, Hamming codes; perfect codes; polynomial codes; BCH codes, comma-free codes.
664176 Graph Theory and Applications — W. D. Wallis

Prerequisites
Topic D

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
The course contains the content of the third year topic GT (Applied Graph Theory) together with some additional work on pure graph theory.

Text
Nil

References
Street, A. P. & Wallis, W. D. Combinatorics: A First Course (CBRC 1983)

664168 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
Street, A. P. & Wallis, W. D. Combinatorial Theory: An Introduction (CBRC 1977)

References
Denes, J. & Keedwell, A. D. Latin Squares and their Applications (English and Akademiai Kiado 1974)
Hall, M. Jr.
Combinatorial Theory (Blaisdell 1967)
Mann, H. B.
Addition Theorems, The Addition Theorems of Group Theory and Number Theory (Interscience 1965)
Raghavachari, D.
Constructions and Combinatorial Problems in Design of Experiments (Wiley 1971)
Ryser, H. J.
Combinatorial Mathematics (Wiley 1963)
Wallis, W. D. et al.
Combinatorics: Room Squares, Sum-Free Sets, Hadamard Matrices (Springer 1972)
Wallis, W. D.
Combinatorial Designs (Univ. of Surrey 1977)

664185 Computer Operating Systems — see page 103

References
Sloan, N. J. A.
A Short Course on Error Correcting Codes (Springer 1975)
Sloane, N. J. A.
The Mathematical Theory of Coding (Academic 1975)
Blake, R.
The Application of Graph Theory (CBRC 1983)
Berlekamp, E. R.
Algebraic Coding Theory (McGraw-Hill 1968)
Berlekamp, E. R.
A Survey of Algebraic Coding Theory (Springer-Verlag 1970)
Blake, I. F. & Mullin, R. C.
Combinatorial Designs: the basic theory, some existence theorems, Wilson’s theorems, Latin squares and Kirkman’s schoolgirl problem. The course contains the content of the third year topic GT (Applied Graph Theory) together with some additional work on pure graph theory.

Text
Nil

References
See Topic GT on page 62

664168 Astrophysical Applications of Magnetohydrodynamics — W. P. Wood

Prerequisites
Topics CO and PD

Hours
About 27 lecture hours

Examination
One 2-hour paper

Content
The normal state of matter in the universe is that of a plasma, or ionized gas, permeated by magnetic fields. Moreover, these fields (unlike that of the earth) may be dominant, or at least significant, in controlling the structure of the region. The aim of this course is to investigate the effects of astrophysical magnetic fields, ranging from $10^{-7}$ gauss in the galaxy to $10^{4}$ gauss in a neutron star.

Text
Nil

References
Chandrasekhar, S.
Hydrodynamic and Hydromagnetic Stability (Oxford 1961)
Cowling, T. G.
Magnetohydrodynamics (Interscience 1957)
De Jong, T. & Maeder, A. (eds.)
Star Formation (D. Reidel 1977)
Mestel, L.
Effects of Magnetic Fields (Memoriei della Roy. Scienza di Liege (6) 8 79 1975)
Spiegel, E. A. & Zahn, J. P. (eds.)
Problems of Stellar Convection (Springer-Verlag 1976)

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 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 94

Department of Mechanical Engineering
ME487 Operations Research — Fundamental Techniques — see page 103
ME488 Operations Research — Planning, Inventory Control & Management — see page 104

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 B

**PART I**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>541100</td>
<td>Engineering I</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisites</strong> 3-unit Mathematics &amp; multistrand Science at the 4-unit level (advisory)</td>
</tr>
<tr>
<td></td>
<td><strong>Corequisite</strong> Mathematics I</td>
</tr>
<tr>
<td></td>
<td><strong>Hours</strong> 4 To be advised</td>
</tr>
<tr>
<td></td>
<td><strong>Examination</strong> To be advised</td>
</tr>
</tbody>
</table>

**Content**

Four of the following units to be chosen.

(i) CE111 Statics  
Content  
Two-dimensional force systems; equilibrium, funicular polygon, rigid bars, shear force, axial force, bending moment; pin-jointed frames, analytical and graphical treatment; equilibrium of three-dimensional force systems, cables.

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

(ii) ME131 Dynamics  
Content  
Basic concepts for the study of motion; length, time, force and mass; Newton's laws of motion; law of friction; systems of units. Motion of point masses, rigid bodies and connected bodies in straight or curved paths and in simple rotation. Relative motion using translating reference frames. General plane motion of rigid bodies. Momentum and impulse, both linear and angular, related to point masses and rigid bodies.

Energy and the conservation principle applied to mechanical work, strain energy, kinetic energy, friction losses, for particles and rigid bodies.

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

Text  

(iii) ME111 Graphics and Engineering Drawing  
Content  
A study in communication and analysis by pictorial means. Methods of projection covering orthogonal projection of points, lines, planes and solids; lengths of lines, angles and intersection between lines, planes and contoured surfaces; orthographic projection, dimensioning and sectioning; isometric projection; perspective projection.

Text  

References  
Levens, A. S.  
Luzadder, W. J. *Basic Graphics* (Prentice-Hall)

(iv) GE112 Introduction to Engineering Design  
Content  
Philosophy and fundamentals of engineering design.

Text  
— *Australian Standard Engineering Drawing Practice C1976* (Inst. of Engineers, Australia)

Krick, E. V. *An Introduction to Engineering and Engineering Design* (John Wiley & Sons)

(v) EE123 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 RL, RC 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)

(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 fundamentals of corrosion and practical considerations; the electrical, magnetic, optical and thermal properties of solid materials.

**Text**

412700 Accounting IIC

**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 IIA and Accounting IIIB

**Accounting IIA**
Theory and practice of company accounting; accounting for the formation, reconstruction, amalgamation, take-over, official management, receivership and liquidation of companies; the preparation of holding company and group financial statements; equity accounting; presentation, analysis and interpretation of financial statements; the valuation of shares and goodwill; funds statements; accounting for inflation; accounting for executorship, 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; overhead 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**


Taylor, R. B. & O'Shea, B. P. *Questions on the Law & Practice of Company Accounting* 2nd edn (Butterworths)

Craig, R. & Tippett, M. *Questions on Management Accounting* (Butterworths)

522700 Civil Engineering HM

**Prerequisites**
Mathematics I, CE111, ME111, GE112 and ME111

**Hours**
5 lecture hours & 2½ tutorial hours per week

**Examination**
Five 3-hour papers

**Content**
5 units from:
(i) CE212 Mechanics of Solids I
(ii) CE213 Mechanics of Solids II
(iii) CE231 Fluid Mechanics I
(iv) CE232 Fluid Mechanics II
(v) CE224 Civil Engineering Materials

(i) 522102 CE212 Mechanics of Solids I – 1 Unit

**Prerequisites**
CE111 & Mathematics I

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

**Examination**
One 3-hour paper

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

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

Prerequisite: CE212

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

Examination: One 3-hour paper

Content:
Buckling of columns, introduction to theory of elasticity; non uni-planar bending; shear centre; torsion of non-circular sections; lateral instability of beams; energy methods.

Text:
As for CE212

(iii) 522202 CE231 Fluid Mechanics I — 1 Unit

Prerequisites: Mathematics I, ME131 Dynamics

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

Examination: One 3-hour paper

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

Text:

(iv) 522204 CE232 Fluid Mechanics II — 1 Unit

Prerequisites: CE231

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

Examination: One 3-hour paper

Content:

Text:
As for CE231

(v) 522112 CE224 Civil Engineering Materials — 2 Units

Content:
Theoretical background and laboratory tests of elastic and inelastic properties of concrete, component materials, properties of plastic and hardened concrete, concrete mix design, manufacturing and field control. (1 1/4 units)

Properties and behaviour of brick masonry and timber (1 1/2 units)

Texts:
Jackson, N. Civil Engineering Materials (Macmillan 1980)
Nagarajan, N. & Antill, J. M. Australian Concrete Inspection Manual (Pitman - Australia)

752300 Psychology I IC

Prerequisites:
Psychology I & Mathematics I

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

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

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

Texts:
To be advised

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 IIIA or Accounting IIIB and two appropriately chosen Part III topics offered by the Department of Mathematics, Statistics and Computer Science and approved by the Head of the Department.

OR

(ii) Accounting IIIB and Financial Management.

413100 Accounting IIIA

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
An Introduction to Financial Accounting Theory
(Longman Cheshire)

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

American Institute of Certified Public Accountants

Baxter, W. T. & Davidson, S.

Bromwich, M. & Hopwood, A. (eds)

Chambers, R. J.

Financial Accounting Standards Board

Goldberg, L.

Hendriksen, E. S.

Jager, M. O. et al.

Keane, S. M.

Moonitz, M.

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

Sprouse, T. R. & Moonitz, M.

Vatter, W. J.

An Inquiry into the Nature of Accounting (American Accounting Assn 1965)

Company Financial Statements: Form and Content
(Butterworths)

The Efficient Market Hypothesis and Implications for Financial Reporting

The Basic Postulates of Accounting (A.I.C.P.A.)

Readings in the Concept of Measurement of Income
(Cambridge U.P.)

A Tentative Set of Broad Accounting Principles for Business Enterprises (A.I.C.P.A.)

The Fund Theory of Accounting
(Chicago Uni. Press)

An Introduction to Financial Accounting Theory

Objectives of Financial Statements

Studies in Accounting (I.C.A.E.W.)

Essays in British Accounting Research

Accounting Evaluation and Economic Behaviour
(Prentice-Hall 1966)

Statements of Financial Accounting Concepts

An Introduction to Financial Accounting Theory

Text
To be advised

References
Contemporary Problems in Cost Accounting
2nd edn (Houghton Mifflin)

Pricing Practices and Strategies
(Conference Board)

Contemporary Cost Accounting and Control
2nd edn (Dickenson)

Production and Operations Management (Irwin)

Costs (Wiley)

Normative Models in Managerial Decision-Making
(N.A.A.)

Impediments to the Use of Management Information
(N.A.A.)

Planning Under Uncertainty: Multiple Scenarios and Contingency Planning (Conference Board)

413602 Financial Management

Prerequisite
Accounting I

Hours
2 lecture hours and 1 tutorial hour per week

Examination
One 3-hour paper

Content
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 budgeting; capital structure; dividend policy; management of current assets; short and intermediate term financing; mergers and takeovers; liquidation and abandonment of assets.

Texts

Principles of Corporate Finance

References
D'Ambrosio, C. & Hodges, S.

Study Guide to Accompany Brealey & Myers
(McGraw-Hill 1981)

Australian Financial System Interim Report
of the Committee of Enquiry (AGPS May 1980)

713300 Biology HIB

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 IIB 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**

**References**
- Setchell, B. P. *The Mammalian Testis* (Paul Elek 1978)

### (ii) 713204 Ecology and Quantitative Genetics

**Content**

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

**Quantitative Genetics**

**Texts**
- Stewart, J. (ed.) *S299 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* (Methuen 1975)

### 523100 Civil Engineering IIIM

**Prerequisite**
Civil Engineering IIIM, Mathematics II A & IIC

### 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**

**Texts**
Nil
Prerequisite: CE232

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

Examination: One 3-hour paper

Content: Ideal-fluid flow, Flow nets, Seepage flow, Fluid measurement, Turbomachinery, Specific speed, pumps and turbines, cavitation, Steady-closed conduit flow, Pipe networks.

Text: As for CE231

Prerequisite: 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

Prerequisite: CE334

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

Examination: One 3-hour paper


Text: Forthmann, T. E. & Hitz, K. L. or Cannon, R. H. or Distefano, et al.

Prerequisites: Mathematics HA & IIC (including Topics CO, D)

Hours: 6 lecture, tutorial & laboratory hours per week

Examination: Progressive assessment & final examination


References: de Neufville, R. & Stafford, J. H.

Text: Systems Analysis for Engineers and Managers (McGraw-Hill)

Prerequisite: CE333

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

Examination: One 3-hour 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.

Text: de Neufville, R. & Stafford, J. H.

Prerequisite: CE334

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

Examination: One 3-hour 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.

Text: de Neufville, R. & Stafford, J. H.

Prerequisite: CE333

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

Examination: One 3-hour paper


Prerequisite: CE333

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

Examination: One 3-hour 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.

Text: de Neufville, R. & Stafford, J. H.
(iii) 533113 EE344 Communications  
G. C. Goodwin

Hours  
3 hours per week for second half year

Examination  
Progressive assessment & final examination

Content  

Text  
Taub & Schilling  
Principles of Communication Systems  
(McGraw-Hill)

(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

533901 Digital Computers and Automatic Control

Prerequisites  
Mathematics IIA & IIC (including Topics CO, D)

Hours  
6 lecture, tutorial & practical hours per week

Examination  
Progressive assessment & final examination

Content  

(i) 501108 GE360 Automatic Control  
see page 93

(ii) 533110 EE342 Linear System Theory  
see page 93

(iii) 532116 EE264 Introduction to Computer Architecture and Assembly Language  
see CS topic page 111

(iv) 533222 EE362 Switching Theory & Logic Design  
see CS topic, page 112

423800 Economics IIIC

Prerequisites  
Mathematics IIA & IIC & 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) 423203 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 Systems — 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.

Text  
Johnston, J.  
Econometric Methods (McGraw-Hill 1972)

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 1976)

Koutsoyiannis, A.  
A Theory of Econometrics (Macmillan 1975)

Kmenta, J.  
Elements of Econometrics (McGraw-Hill)

Pindyck, R. S. & Rubinfeld, D. L.  
Econometric Models and Economic Forecasts  
(McGraw-Hill)

(ii) 423204 Mathematical Economics

Prerequisites  
Economics II or IIA

Hours  
3 lecture hours per week

Examination  
One 3-hour paper

Content  
1. 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. After a review of some mathematical preliminaries, five topics are covered including an introduction to calculus, linear modelling and constrained optimization. The
material is so arranged that each topic consists of two lectures, the first covering the necessary mathematics and the second its application to economics.

2. The second section of the course deals with 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 concludes with a discussion of the theory and economic application of the calculus of variations.

Text

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)
Yamanc, T. Mathematics for Economists — An Elementary Survey (Prentice-Hall)

(iii) 423113 Development

Prerequisite Economics II

Hours 2 lecture hours per week

Examination One 3-hour paper

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

Text

(iv) 423102 International Economics

Hours 2 lecture hours per week for half the year

Examination One 3-hour paper and progressive assessment

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

Text
Kreinin, M. International Economics 3rd edn (Harcourt, Brace, N.Y. 1979)
Perkins, J. Australia in the World Economy 3rd edn Melbourne (Sun Books 1979)

References
Caves, R. E. Readings in International Economics (Allen & Unwin 1968)
Heller, H. R. International Monetary Economics (Prentice-Hall 1974)
Kindleberger, C. P. & Lindert, P. H. Oversea Trade and Investment (Pelican 1972)

(v) 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, aggregate models are used to analyse the relation of fiscal policy to other economic policies for stability and growth.

References
Brown, C. V. & Jackson, P. M. Public Sector Economics (Martin Robertson)
The equilibrium approach to protection, analysis of Australian protection policy, consists of:

- International factor mobility and host country costs and benefits.
- 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.

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

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

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

Text

Grubel, H. F.  
International Economics (Irwin 1981)

(vii) 423114 Growth and Fluctuations

Prerequisite  
Nil

Hours  
2 lecture hours per week for half the year

Examination  
Progressive assessment

Content

This course aims to impart a thorough comprehension of basic growth models (e.g. classical, Keynesian, neoclassical) and of the rationale of trade cycles. Theoretical constructs are examined in light of the empirical evidence on growth and instability in mature economies.

References

Kregel, J. A.  
The Theory of Economic Growth (Macmillan 1972, 1978)

Lundberg, E.  
Instability and Economic Growth (Yale University Press 1968)

Rau, N.  

(vii) 423115 Topics in International Economics

Prerequisite  
Economics II

Hours  
2 lecture hours per week for half the year

Examination  
One 3-hour paper and progressive assessment

Content

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

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

References

(i) Macroeconomics:

- Branson, W. H.  
  Macroeconomic Theory and Policy 2nd edn (Harper & Row 1979)
- Davidson, P.  
  Money and the Real World 2nd edn (McMillan 1978)
- Mayer, T.  
  The Structure of Monetarism (Norton 1978)
- Turnovsky, S. J.  
  Macroeconomic Analysis and Stabilisation Policy (Cambridge University Press 1977)

(ii) Microeconomics:

- Breit, W. & Hochman, H. M. (eds)  
  Readings in Microeconomics (Holt, Rinehart & Winston 1971)
- Douglas, E. J.  
  Intermediate Microeconomic Analysis (Prentice-Hall 1982)
- Hartley, K. & Tisdell, C. A.  
  Microeconomic Policy (Wiley 1981)
- Mansfield, E. (ed.)  
  Microeconomics: Selected Readings (Norton 1975)
733300 Geology IIA

**Prerequisites**
Physics IIA, 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).

**Texts**
Consult lecturers concerned

543500 Industrial Engineering I

**Prerequisites**
Mathematics IIA & IIC

**Hours**
Approximately 6 lecture hours per week

**Examination**
Progressive assessment & examination

**Content**
Four of the following:
(i) 543501 ME381 Methods Engineering
(ii) 543502 ME383 Quality Engineering
(iii) 543503 ME384 Design for Production
(iv) 544469 ME419 Bulk Solids Handling Systems I
(v) 544433 ME482 Engineering Economics I
(vi) 544470 ME483 Production Scheduling
(vii) 544464 ME434

(i) 543501 ME381 Methods Engineering

**Hours**
1½ hours per week

**Examination**
Progressive assessment

**Content**
The integration of man, machines and materials to achieve maximum efficiency of operation. The critical questioning attitude. Charting methods, Work study, Ergonomics, Activity sampling. Case studies.

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

(ii) 543502 ME383 Quality Engineering

**Hours**
1½ hours per week

**Examination**
Progressive assessment & examination

**Content**

**Text**
Nil

(iii) 543503 ME384 Design for Production

**Hours**
1½ hours per week

**Examination**
Progressive assessment & examination

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

**Text**
Nil

(iv) 544469 ME419 Bulk Solids Handling Systems I

— A. W. Roberts

**Hours**
42

**Examination**
Progressive assessment

**Content**

**Text**

(v) 544433 ME482 Engineering Economics I

**Hours**
42

**Examination**
To be advised
Content
Elementary accounting concepts. Time value of money, interest formulae. Comparison of
alternatives, annual and present equivalent rate of return. Depreciation and income tax
effects. Projects financed from public funds. Replacement and retirement economics.
Capital budgeting.

Text
Smith, G. W.  
*Engineering Economy: Analysis of Capital Expenditures*
3rd edn (Iowa State U.P. 1979)

(vi) 544470 ME483 Production Scheduling

Hours  
42

Examination  
Progressive assessment & examination

Content
Production systems; job shop, line production, group technology; Computer aided
manufacture, numerically controlled systems; Materials handling. Production scheduling
and sequencing. Computer algorithms for scheduling and sequencing problems.

Text
Nil

(vii) 544464 ME484 Engineering Economics II

Hours  
1½ hours per week

Examination  
Progressive assessment

Content
Accounting concepts, use of accounting data in decision making. Utility, risk and
uncertainty. Expansion and economic package concepts. Capital expenditure
programming. Effects of inflation. Application of mathematical programming to
economic problems.

Text
Smith, G. W.  
*Engineering Economy: Analysis of Capital Expenditures*
3rd edn (Iowa State U.P. 1979)

553900 Mechanical Engineering III C

Prerequisites
Mathematics IA & IC (including Topics F & H)

Hours  
6 hours per week

Examination  
Progressive assessment

Content
Four of the following:
(i) GE360 Automatic Control
(ii) ME505 Systems Analysis, Organisation & Control*
(iii) ME487 Operations Research -- Fundamental Techniques
(iv) ME488 Operations Research -- Planning, Inventory Control and Management
(v) ME434 Dynamics of Machines III

* Not offered in 1984.
Taha, H. A.  Operations Research (Macmillan)
Wagner, H. W.  Principles of Operations Research (Prentice-Hall)

(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


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

743100  Physics IIIA

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

Hours  Approximately 4 lecture hours & 8 laboratory hours per week
Examination  Assessment to the equivalent of 12½ hours of examination time

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

A. Classical Physics  Mathematical methods, advanced mechanics, special theory of relativity, electromagnetics including waveguide and antenna theory.

B. Quantum Physics  Quantum mechanics, atomic and molecular physics, statistical physics, solid state physics, nuclear physics, electronics.

C. Laboratory  Parallels the lecture course in overall content with at least one experiment available in each topic, although students are not expected to carry out all the experiments available.

Texts  Refer to the Physics Department notice board. Students should retain their Physics II texts.

753300  Psychology IIIC

Prerequisites  Mathematics II A, II C & Psychology II C

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  To be advised

Two additional topics to be selected from Psychology III A or III B. Students will also be required to complete an independent investigation in mathematical psychology under supervision.

Text  To be advised

References  To be advised

664210  Mathematics/Economics IV

Prerequisites  Mathematics III A and Economics III C and such additional work as is required for combined honours students by the Department of Mathematics, Statistics and Computer Science. A student desiring admission must apply in writing to the Dean of the Faculty of Mathematics before the Christmas 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 7th 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 7th 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 IIIIC. A student desiring admission to this subject must apply in writing to the Dean of the Faculty of Mathematics before 7th 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 65 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 H 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

1 The lecturer in the subject will assume that all students have a good understanding of the content of items in the column headed "Assumed Standard of Attainment".

2 Subjects with a prefix CS are subjects offered in the Faculty of Mathematics specifically for the Diploma in Computer Science.

Topics C and E existing before 1978 are no longer offered as separate topics, and have been replaced by the Topic CO, whose present content is a good guide to the assumed standard of attainment indicated below.
### Core Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS - Commercial Programming</td>
<td>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 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 Engineering</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS - Programming &amp; Algorithms</td>
<td>Mathematics</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>CS - Data Structures &amp; Programming</td>
<td>Mathematics</td>
<td>CS Programming &amp; Algorithms</td>
<td>1</td>
</tr>
<tr>
<td>CS - Numerical Analysis</td>
<td>Mathematics</td>
<td>Mathematics I or suitable alternative preparation</td>
<td>1</td>
</tr>
<tr>
<td>Systems Analysis</td>
<td>Mathematics</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### General Notes

A student is referred to page 8 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 not more than two units.

A student may suggest to the Dean for consideration by the Board the inclusion in his programme of a subject not listed below.

Students interested in positions as Computer Systems Officers in the Australian Public Service are strongly advised to include the subject Systems Design in their course.

The Australian Computer Society has granted full exemption from the educational requirements for admission to the Society as Associate to those who have completed the Diploma in Computer Science.

### Subjects Overlapping in Content

The Board of Studies in Computer Science has decided that a candidate is not permitted to include in his/her programme more than one of each pair of the mutually exclusive subjects listed in the Table below, nor may he/she include a subject if it has been previously included in work for a degree or Diploma which has already been conferred or awarded or approved for conferment or award.

| CS - Quantitative Business Analysis II | ME487 - Operations Research-Fundamental Techniques |

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### Subjects Approved for the Diploma

#### Group A

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Systems</td>
<td>Commerce</td>
<td>Commerce</td>
<td>1</td>
</tr>
<tr>
<td>CS - Quantitative Business Analysis II</td>
<td>Commerce</td>
<td>Commerce</td>
<td>1</td>
</tr>
<tr>
<td>Systems Design</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>GE360 - Automatic Control</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>EE345 - Digital Signal Processing</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>GE325 - Microprocessor Systems and Applications</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>EE447 - Digital Communications</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>EE463 - Computer Operating Systems</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
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<tr>
<td>EE464 - Compiler Construction</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>EE462 - Topics in Switching Theory</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CS - Theory of Computing</td>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1</td>
</tr>
<tr>
<td>CS - Mathematical Principles of Numerical Analysis</td>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1</td>
</tr>
<tr>
<td>CS - Programming Languages &amp; Systems</td>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1</td>
</tr>
<tr>
<td>CS - Concurrent Programming Techniques</td>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1</td>
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<tr>
<td>CS - High Level Software Development</td>
<td>Mathematics</td>
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</tr>
<tr>
<td>ME505 - Systems Analysis, Organisation &amp; Control</td>
<td>Engineering</td>
<td>Electrical Engineering</td>
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</tr>
</tbody>
</table>

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

#### Group A

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department Offering</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Systems</td>
<td>Commerce</td>
<td>Commerce</td>
<td>1</td>
</tr>
<tr>
<td>CS - Quantitative Business Analysis II</td>
<td>Commerce</td>
<td>Commerce</td>
<td>1</td>
</tr>
<tr>
<td>Systems Design</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>GE360 - Automatic Control</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
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<tr>
<td>EE345 - Digital Signal Processing</td>
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<tr>
<td>GE325 - Microprocessor Systems and Applications</td>
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<td>Electrical Engineering</td>
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<tr>
<td>EE447 - Digital Communications</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
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<tr>
<td>EE463 - Computer Operating Systems</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>1</td>
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<tr>
<td>EE464 - Compiler Construction</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
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<tr>
<td>EE462 - Topics in Switching Theory</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
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</tr>
<tr>
<td>CS - Theory of Computing</td>
<td>Mathematics</td>
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<tr>
<td>CS - Mathematical Principles of Numerical Analysis</td>
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<tr>
<td>CS - Programming Languages &amp; Systems</td>
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<td>CS - Concurrent Programming Techniques</td>
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<td>Mathematics</td>
<td>1</td>
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<tr>
<td>CS - High Level Software Development</td>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1</td>
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<tr>
<td>ME505 - Systems Analysis, Organisation &amp; Control</td>
<td>Engineering</td>
<td>Electrical Engineering</td>
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</tbody>
</table>
### Subjects which have some application to computer science

<table>
<thead>
<tr>
<th>Subject</th>
<th>Offering Subject</th>
<th>Assumed Standard of Attainment</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE510</td>
<td>Elastic Continua</td>
<td>CE212 Mechanics of Solids I</td>
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<tr>
<td></td>
<td>Civil Engineering</td>
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<td></td>
<td>Engineering</td>
<td>Organisational Behaviour</td>
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<td>Computer Science</td>
<td>Engineering Information</td>
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<td>Electrical</td>
<td>Engineering</td>
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<td>Electronics I</td>
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<td>Mathematically</td>
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<td>Part II Mathematics, Topics D, K</td>
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<td>Part II Mathematics, Topics D, K</td>
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<td>Part II Mathematics, Topics D, K</td>
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<td></td>
<td>CS 2nd Year</td>
<td>Part II Mathematics, Topics D, K</td>
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<td>Mechanical</td>
<td>Part II Mathematics, Topics D, K</td>
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### 41036 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

**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 programs accurately.

COBOL as a business data processing and file organisation language. Extensive practical work in COBOL, including case studies.

**Texts**

Triance, J. M. D.E.C.

COBOL Programming (N.C.C. Publications)


**References**

Chai, W. A. & H. W. Clifton, H. D.

Programming Standard COBOL (Academic)

Systems Analysis for Business Data Processing (Business Books)

Davis, G. B. & Lightey, C. R.

Elementary Cobol Programming (McGraw-Hill)

DeRossi, C. J.

Learning COBOL Fast (Reston)

Kapur, G. K.

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

Laden, H. N. & Gildersleeve, T. R.

System Design for Computer Applications (Wiley)

McCacken, D. D.

Programming Business Computers (Wiley)

et al.

Murach, M.

Standard COBOL (S.R.A.)

Sanders, D. H.

Computers in Business (McGraw-Hill)

Sprowls, R. C.

Computing with COBOL (Harper & Row)

Stern, N. B. & R. A.

Cobol Programming (Wiley)

Watters, J. L.

Cobol Programming (Heinemann)

**532117 CS — Introduction to Computer Architecture & Assembly Language**

**Assumed Standard of Attainment**

Mathematics I

**Hours**

2 hours of lectures & practical work per week for first two terms

**Examination**

Progressive assessment & final examination
**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**


**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**

Nagle, Carroll & Irwin *An Introduction to Computer Logic* (Prentice-Hall)

**660112 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/1 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 topological sorting, manipulation of algebraic formulae, symbolic differentiation and subroutine linkage and loading.

**Text**


**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)


Wirth, N. *Systematic Programming* (Prentice-Hall 1973)

Yourdon, E. J. *Techniques of Program Structure and Design* (Prentice-Hall 1975)

**660112 CS — Data Structures and Programming — P. Moylan**

**Corequisite**

CS — Programming & Algorithms

**Hours**

1 lecture hour & 1 tutorial hour per fortnight throughout the year

**Examination**

One 2-hour paper.

**Content**


The course will be run in parallel with Computer Science II, topic SI, with additional reading and assignment work required on selected topics from topological sorting, manipulation of algebraic formulae, symbolic differentiation and subroutine linkage and loading.
Text
Tenebaum, A. M. & Augenstein, M. J.

References
Berztiss, A. T.
Day, A. C.
Galler, B. A. & Perlis, A. J.
Gear, W.
Knuth, D. E.
McCameron, F. A.
Page, E. S. & Wilson, I. B.
Sammet, J. E.

Data Structures Using Pascal (Prentice-Hall 1981)

Data Structures: Theory and Practice 2nd edn (Academic 1975)

Fortran Techniques: with Special Reference to Non-numerical Applications (Cambridge U.P. 1972)

A View of Programming Languages (Addison-Wesley 1970)


COBOL Logic and Programming (Irwin-Dorsey 1974)

Information Representation and Manipulation in a Computer 2nd edn (Cambridge U.P. 1978)

Programming Languages: History and Fundamentals (Prentice-Hall 1969)

660113 CS — Numerical Analysis — V. Ficker

Assumed Standard of Attainment
Mathematics I

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

Examination
One 2-hour paper

Content
The course will be run in parallel with Mathematics II, Topic F, with additional reading and assignments.

Text and References
See topic F page 45.

410127 Systems Analysis

Assumed Standard of Attainment
Nil

Hours
2 lecture hours per week for the first half year

Examination
An examination at mid-year plus progressive assessment

Content
This course is concerned with the early activities carried out in the development of computer-based information systems.

Topics covered include, the role of systems in modern business; the profession of systems analysis and design; management of the life cycle of a business information system; the tools of the systems analyst; the study phase, its associated documentation and its relationship to design, development and implementation. Students are also introduced to the concepts of structured analysis.

Texts

References
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)
Gore, M. & Stubbe, J. — Elements of Systems Analysis (W. C. Brown)

GROUP A

Subjects in the mainstream of Computer Science

Offered by the Department of Commerce

413611 Information Systems

Assumed Standard of Attainment
Introductory Quantitative Methods

Hours
2 lecture hours per week, 1 tutorial/group meeting hour per week

Examination
Progressive assessment/group assignments
One 2-hour paper

Content
COBOL programming: a general consideration of information systems; a particular consideration of computer associated business systems. Subject matter is aimed towards students who will be undertaking business careers. Topics include: data v. information; people and systems; the industrial or computer revolution; data base concepts; problem solving. Students will correct, debug, rewrite and write several programs using COBOL.

Texts

Any COBOL language reference manual.

References
660139 CS — Quantitative Business Analysis II

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.

References

Loomba, N. P.
Starr, M. K. & Stein, I.

Management — A Quantitative Approach
The Practice of Management Science
(Prentice-Hall)

410128 Systems Design

Assumed Standard of Attainment

CS — Commercial Programming, Systems Analysis

Hours

2 lecture hours per week for the second half year

Examination

Progressive assessment only (assignments and case study)

Content

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

References

As for Systems Analysis

Offered by Department of Electrical and Computer Engineering

501108 GE360 Automatic Control — see page 93.

533116 EE345 Digital Signal Processing

Assumed Standard of Attainment

FE341 or ME361 Automatic Control

Hours

3 hours of lectures & tutorials per week for second half year

Examination

Progressive assessment & final examination

Content


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

Text

Stanley, W. D.

Digital Signal Processing (Reston 1975)

References

Gold, B. & Rader, C.


Kuo, B. C.

Discrete-Data Control Systems (Prentice-Hall 1970)

Oppenheim, A. V. & Schafer, R. W.

Digital Signal Processing (Prentice-Hall 1975)

501107 GE325 Microprocessor Systems and Applications

(Students who have completed EE325 Introduction to Digital Technology prior to 1983 will not be permitted to enrol in this subject)

Review of basic logic design and number systems.

Memory Technology: capacity, cost, speed and organisation.


Bus standards: Memory and I/O interfacing, bus handshaking procedures.

Interrupt structures and interrupt programming.

I/O Peripherals: direct memory access; parallel devices, serial devices; timers; disks; I/O programming.

Software and Hardware development aids for microprocessor systems.

Computer Interconnections: Taxonomy, characteristics and examples.

Examples of microprocessor applications: real time systems, dedicated systems and general purpose systems.

Fourteen hours of laboratory exercises dealing with hardware and microprocessor hardware and software.

Text

Cantoni, A.

An Introduction to Microprocessor Systems
Course Notes Department of Electrical and Computer Engineering
534134 EE347 Digital Communications

Assumed Standard of Attainment
EE344 Communications

Hours
3 hours of lectures & tutorials per week for first half year

Examination
Progressive assessment & final examination

Content
Pulse modulation schemes. Introduction to Information Theory, Framing, Timing Recovery, Equalization, Matched Filters, Error Control Coding, Digital Carrier Modulation, ASK, PSK, FSK, DPSK.

Text
Shanmugan, K. S. Digital and Analog Communications Systems (Wiley Paperback)

534124 EE463 Computer Operating Systems — A. Cantoni

Assumed Standard of Attainment
EE264 Introduction to Computer Architecture & Assembly Language

Hours
3 hours per week for the second half year

Examination
Progressive assessment & final examination

Content
Views of an operating system. Multiprogramming, interacting concurrent processes, process control primitives. Processor management, memory management, name management. Protection.

Text

References
Coffman, E. G. & Denning, P. J. Operating Systems Theory (Prentice-Hall)
Hansen, F. B. Operating Systems Principles (Prentice-Hall)

534143 EE464 Compiler Construction — R. J. Evans

Assumed Standard of Attainment
EE264 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.

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

References
Aho, A. V. & Ullman, J. D. The Theory of Parsing, Translation and Compiling Vol. 2 (Prentice-Hall)
Donovan, J. J. Systems Programming (McGraw-Hill)

534145 EE462 Topics in Switching Theory — (Not offered in 1984)

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

660127 CS—Theory of Computing
— Mathematics III Topic TC, see page 57

660128 CS—Mathematical Principles of Numerical Analysis
— Mathematics III Topic Z, see page 61

660135 CS—Programming Languages & Systems
— Mathematics III Topic PL, see page 54

664403 CS—Concurrent Programming Techniques
— Mathematics IV, see page 66

660133 CS—High Level Software Development
— Mathematics IV, see page 67

Offered by Department of Mechanical Engineering

540126 ME505 Systems Analysis, Organisation & Control — see page 103

GROUP B

Listed below are a number of subjects which the Board regards as suitable for Group B. This list is not, however, intended to be exhaustive and other subjects will be considered.

Offered by Department of Civil Engineering and Surveying

520137 CE510 Elastic Continua — For details consult the Engineering Faculty Handbook
Offered by Department of Commerce

413612 Theories of Organisation

Assumed Standard of Attainment
Organisational Behaviour

Hours
2 lecture hours per week

Examination
Two 3-hour papers

Content
The influence of 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. Organisations: An Australian Perspective (Cheshire)

References
Altman, D. Rehearsals for Change (Fontana)
Argyle, M. The Psychology of Interpersonal Behaviour (Penguin)
Albrow, M. Bureaucracy (Macmillan)
Anthony, P. D. The Ideology of Work (Tavistock)
Klein, L. New Forms of Work Organisations (Tavistock)
March, J. G. & Simon, H. A. Organisations (Wiley)
Mouzelis, N. P. Organisation and Bureaucracy Rev. edn. (R.K.P.)
Silverman, D. The Theory of Organisations (Heinemann)

Offered by Department of Mechanical Engineering

544467 ME487 Operations Research -- Fundamental Techniques -- see page 103
544468 ME488 Operations Research -- Planning, Inventory Control and Management -- see page 104
540137 ME503 Design of Experiments for Engineering Research
1 For details consult the Engineering Faculty Handbook.

Offered by Department of Metallurgy

113393 Met312 Modelling and Control of Metallurgical Processes
1 For details consult the Engineering Faculty Handbook.

Offered by Department of Physics

742201 CS—Instrumentation Techniques — not offered in 1984

Assumed Standard of Attainment
Physics IA or IB

Hours
1 hour per week & a 12-hour project

Examination
Project assessment & one 2-hour paper

Content
From the subject Electronics and Instrumentation II:
Specialist Instrumentation — 8 lectures
Instrumentation Systems — 8 lectures
Measurement Devices — 14 lectures

Text
Malmstadt, H. V. et al. Instrumentation for Scientists Series (Vols 1–4)
Text with Experiments or Text only or combined volume (Benjamin 1973)

DIPLoma IN MEdical StaTIsTics

The requirements are set out on page 28

Course Content
Subjects offered by the Faculty of Medicine
MS—Seminar of Population Research Group
MS—Scientific Method and Critical Thinking
MS—Epidemiology and Study Design
Subjects offered by the Department of Mathematics, Statistics and Computer Science

MS—Theory of Statistics — see page 56
MS—Regression, Design and Analysis of Experiments — see page 58
MS—Demography and Survival Analysis — see page 71
MS—Generalised Linear Statistical Modelling — see page 69
CS—Programming and Algorithms — see page 112
CS—Data Structures and Programming — see page 113
MS—Survey Sampling Methods — see Topic SS page 56

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. Brisley 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 magneto-acoustic waves in the atmosphere of Ap stars is also being studied.

Biostatistics

Associate Professors A. J. Dobson and R. W. Gibberd are interested in theoretical problems which arise from consulting in medical statistics. Current research includes: measures of agreement between observers; methods for analysing clustered prevalence data, prognostic indicators.

Biostatistics

Combinatorial Theory and Operations Research

Dr R. B. Eggleton is interested in all aspects of combinatorial mathematics, particularly graph theory.

Associate 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 realtime 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.

Associate 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

Associate 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 particular area of the geometry of Banach spaces, and interest there is focused on various smoothness and rotundity properties of the norm and their implications for the space. This work is being generalised to a study of differentiation of convex functions on Banach spaces. Particular
attention is being given to characterising Banach spaces where the continuous convex functions have various differentiability properties.

Dr V. Ficker and Mr 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 working on Greek algebra.

Integral Geometry
Dr T. K. Sheng studies the powers of distances between random points in convex and non-convex regions in IR^n.

Mathematical Biology
Dr D. L. S. McElwain is developing mathematical models of biological systems including solid tumours, transporting epithelia and leukocyte chemotaxis.

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; age and sex-specific death rates from ischaemic heart disease in Australia; collection and analysis of data from the Hunter Valley Heart Attack Study; validation of routinely collected data on ischaemic heart disease; design and analysis for surveys of smoking habits of schoolchildren; spatial behaviour of hospital patients in the Hunter Region; doctor patient interactions; use of antibiotics; evaluation of intervention programmes.

Number Theory
Dr R. B. Eggleton is interested in number theory, particularly in combinatorial aspects of the subject.

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.

Associate 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.

Associate Professor A. J. Guttmann and Dr J. S. Reeve are using renormalisation group 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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Diploma in Medical Statistics Course

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1 Not offered in 1984.