The University of Newcastle

FACULTY OF MATHEMATICS HANDBOOK

CALENDAR 1988

VOLUME 8
The University of Newcastle Calendar consists of the following volumes:

Volume 1 — Legislation:
Volume 2 — University Bodies and Staff:
Volume 3 — Faculty of Architecture Handbook
Volume 4 — Faculty of Arts Handbook
Volume 5 — Faculty of Economics and Commerce Handbook
Volume 6 — Faculty of Education Handbook
Volume 7 — Faculty of Engineering Handbook
Volume 8 — Faculty of Mathematics Handbook
Volume 9 — Faculty of Medicine Handbook
Volume 10 — Faculty of Science Handbook

Also available are the Undergraduate Guide and Postgraduate Prospectus

This Volume is intended as a reference handbook for students enrolling in courses conducted by the Faculty of Mathematics.

The colour band, Amethyst BCC 28, on the cover is the lining colour of the hood of Bachelors of Mathematics of this University.

The information in this Handbook is correct as at 1 November, 1987.

ISSN 0159 — 3463

Recommended Price: Three dollars and fifty cents plus postage.
I should first like to welcome all new and re-enrolling students to the Faculty of Mathematics.

Whether 1988 marks the beginning or the continuation of your studies it represents a year of promise and interest for all of us throughout the Nation, and more specifically within this University and Faculty. We have always sought to provide flexible degree programs designed to encompass changes in demand whether from industry, commerce, the public service or research. Significant changes in tertiary education will undoubtedly occur over the next few years. However, the three Departments of Computer Science, Statistics and Mathematics will continue to provide degree programs ensuring the keen demand for graduates from the Faculty of Mathematics. The range of applications of computer science, mathematics and statistics, both in the public and the private sector, now extends into areas which a few years ago would have been considered inconceivable. It is clear that your studies within the Faculty of Mathematics will equip you for a worthwhile and rewarding career at the forefront of the social and economic development of this country.

Beyond this, a number of higher degrees is available within the Faculty, for research and scholarship have always been regarded as one of the fundamental activities of a university, and the Faculty of Mathematics has an established reputation both within Australia and internationally as an active research centre.

Perhaps in these days of economic uncertainty the greatest reassurance I can offer you is the knowledge that if you apply yourself diligently and successfully to the courses offered within the Faculty, then upon graduation a rewarding and challenging career is virtually assured.

I wish you every success in your studies in 1988.

C.A. CROXTON, Dean.
DEPARTMENT OF COMPUTER SCIENCE
Professor J.L. Keedy, BSc(London), DPhil(Oxford), PhD(Imperial), FACS, FBCS, AICE (Head of Department)
Senior Lecturers
D.W.E. Blatt, BSc, PhD(Sydney), MACS, MACM
J. Rosenberg, BSc, PhD(Monash)
Lecturers
B. Henderson-Smith, BSc, PhD(ANU)
J. Simon, BSc, BA(Lincoln), DipCompSc, MMath
Senior Tutor K. Wallac, BMath
Professional Officer D.M. Cochran, BEng(Comp)
Departmental Secretary D.C. Edwards

DEPARTMENT OF MATHEMATICS
Professor vacant
Associate Professors
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C.A. Croxton, BSc(Lincoln), MA, PhD(Cambridge), FAIl', FInstP(London)
R.B. Eggleton, BSc, MA(Melbourne), PhD(Calgary)
J.R. Giles, BSc(Sydney), PhD, DipEd(Sydney), PhD
F.K. Strew, ProfPhys, CSc, RNDr(Charles) (Head of Department)
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W.T.F. Lam, BSc(New South Wales), PhD(Sydney)
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T.K. Sheng, BSc(Macquarie College), BSc(Malaysia & London), PhD(Malaysia)
W.P. Wood, BSc, PhD(New South Wales), FEAS
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C.A. Ashman, BA, LittB(New England), PhD
K.F. Bragg, MSc(Sydney)
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M. Ellery, BSc(Adelaide)
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Professor Emeritus R.G. Kents, BSc, PhD(Adelaide), DMeth(Warsaw), FIMA, FASA, MACS
Computer Programmers C.S. Hopkins, BMath, PhD
Departmental Secretary A. Clark, BMath
Office Staff
J. Dennis
D. James, BMath(Wollongong), DipEd
I. Garnsey, BA(Sydney)
The Faculty of Mathematics comprises the Departments of Computer Science, Mathematics and Statistics. In the degrees of Bachelor of Computer Science and Bachelor of Mathematics and in the Diploma and Masters degree courses in Computer Science and Medical Statistics there are also many opportunities to take subjects offered by other departments of the University.

NOTES ON DEGREES AND DIPLOMAS

Review of Academic Progress

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

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

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

Time Limits

The various degree and diploma regulations require that students complete the relevant course within specified time limits. Only in the most extenuating circumstances will the Faculty Board give permission for these to be exceeded. Students should consult the appropriate regulations for details of the limits applying to the course in which they are enrolled.

COMPUTER SCIENCE COURSES

Computer Science courses are currently in a state of transition. Before 1986 the Faculty offered a Computer Science II subject and a Computer Science III subject. In 1986 a new subject Computer Science I was introduced. This led to a revised Computer Science II subject in 1987 (which, unlike the old Computer Science II, cannot be taken in two parts). In 1988 two new subjects, Computer Science IIIA and Computer Science IIIB, replaced the former Computer Science III subject. The computer science subjects and topics being offered in 1988 are described in the Department of Computer Science entry in this handbook.

Transition Arrangements

Students intending to study computer science as part of any degree must enrol in Computer Science I, which is the prerequisite for all other computer science subjects; they must also enrol in, or have already passed, Mathematics I. The only exception to this rule is for students who have been enrolled in their present degree since 1985 or earlier and who had a reasonable expectation at the time of their enrolment of later enrolling in the subject Computer Science II as an introductory computer science subject. Such students are permitted to enrol in the transitional subjects Computer Science IIIF and IIHF.

Degrees Which Include Computer Science Subjects

Computer Science subjects can be taken in a wide variety of degree courses, as follows:

Bachelor of Degrees of Mathematics, Science, Arts, Commerce, Economics

In these degrees students may take a major sequence in computer science, consisting of the subjects: Computer Science I (with Mathematics I), Computer Science II and Computer Science IIIA. In the BMaths degree students may also take the honours subject Computer Science IV.

Students in any of these degrees who have passed Computer Science IIIA with at least credit level may apply for enrolment in the Bachelor of Computer Science (Honours) degree (see below).

Bachelor of Engineering (Computer Engineering)

The subjects Computer Science I and II are an integral part of this degree (taken as second and third year subjects). It is also possible for students to take topics from Computer Science IIIA and IIIB as electives.

Students who pass sufficient such elective subjects with at least credit level may apply for enrolment in the Bachelor of Computer Science (Honours) degree (see below).

Bachelor of Engineering

The topic Introduction to Programming, an introductory course based on Pascal, is part of the electrical engineering degree. Other engineering students may take this and other topics as electives. For any student who has not completed Computer Science I the Introduction to Programming topic, or an approved equivalent, is a prerequisite for most other computer science units.

Bachelor of Computer Science

This new degree consists, which was introduced in 1987, has been designed to provide students with the opportunity to study a wide range of subjects in computer science and related areas, and thus equip them with an excellent background for a professional career in the computer industry or as a programmer or systems analyst in industry or commerce.

In order to qualify for a BCompSc degree, students must pass nine subjects. At least seven of these subjects must be from the Schedule, including three Pari I subjects, the Pari III subject Computer Science IIIB and one other Pari III subject. In practice this means that a full-time student will typically take the following subjects:

First year: Computer Science I, Mathematics I, Computer Engineering I, X

Second year: Computer Science II, Mathematics ICS, X

Third year: Computer Science IIIA, Computer Science IIIB
X will normally be a Part I subject and Y a Part II subject. Students may take any Part I subject from the list at the end of this section in the slot X. Slot Y will usually be a Part II subject and can include other Part II subjects from the Schedule. At present the only such subjects are Computer Engineering II and Data Processing II. Alternatively a student can choose a Part II subject from the list below.

Students who wish to transfer from one degree and who have already taken Computer Science I and Mathematics I, together with two other Part I subjects, may in suitable cases be granted standing in these subjects as the X and Y subjects, but then they must enrol in Computer Engineering I. For such students it would then be impossible to take Computer Engineering II. For this reason there is an option for them to study Computer Engineering III rather than Computer Science III. The prerequisite for Computer Engineering III is Computer Engineering I (not II). Students should note that they cannot take both Computer Engineering II and Computer Engineering III.

Up to two subjects which are not on the Schedule may be taken as part of the course. Subjects approved for this purpose include:

**Mathematics Courses**

Mathematics courses are currently offered under the degree regulations as in previous handbooks for those students who had enrolled in previous years, and the new regulations as set out in this handbook. Students should note that it is now possible, in the Bachelor of Mathematics degree course, to do complete major sequences in Mathematics and Computer Science, or in Mathematics and Statistics, as well as combining Mathematics with another discipline outside the Faculty.

**Transition Arrangements**

The subject and topic prerequisites which apply to various subjects in Mathematics are set out in this handbook in detail. However, students who had enrolled in previous years should, before completing their enrolment, consult with the Dean and/or the Head of the Department of Mathematics if they are in doubt.

**Degrees Which Include Mathematics Subjects**

Mathematics majors exist in the Faculties of Science, and Arts, as well as this Faculty, and substantial quantities of Mathematics are required in the Faculty of Engineering and may also be taken in the Faculties of Economics and Commerce.

There are two major sequences in Mathematics. These are:

1. Mathematics I, II, IIIB plus Mathematics IIIA, followed by Mathematics IIB.
2. Mathematics IIIA, Mathematics IIA, Mathematics IIB.

A student wishing to specialize in Mathematics as a double major would take the sequence Mathematics I, Mathematics IIA plus Mathematics IIIA, Mathematics IIB plus Mathematics IIIB as five of the nine subjects for the degree.

The subject Mathematics II CS, introduced in 1987, is composed of topics considered appropriate for student of the B.Comp.Sc. course.

**Combined Degrees**

At set out in the regulations, students of sufficient ability may take a Bachelor of Mathematics degree combined with another degree from this or another Faculty together, at a considerable saving in time compared with taking them separately. Details are set out later in these notes.

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**Choosing Subjects in the Bachelor of Mathematics Degree**

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

**Part I**

Accounting I

Biology I

Chemistry I

Classical Civilization I

Drama I

Economics I

English I

French I or IS

Geography I

History I

Japanese I

Latin I

Philosophy I

Physics IA or IB

Psychology I

Sanskrit I

Sociology I

German I or IS

Greek I

**Part II**

Biology IIA

Biology IIB & IIB

Chemistry IIA

Classical Civilization IIA

Economics IIA

Education II

Electronics and Instrumentation II

English IIA

French IIA

Geography IIA

History IIA, IIB & IIB

Philosophy IIA

Physics II

Psychology IIA & IIB

Geology IIA & IIB

German IIA & IIB

History IIA, IIB & IIC

Japanese IIA

Latin I

Philosophy IIA

Physics IIA & IIB

Psychology IIA & IIB

Mathematics IIA & IIB

Physics II

Psychology IIA & IIB

Statistics IIA

**Mathematics IIA, Mathematics IIB and Mathematics IIC**

**Mathematics IIA and Mathematics IIB, Mathematics IIA and Mathematics IIC, Mathematics IIB and Mathematics IIC.**

**Mathematics IIA and Mathematics IIC.**

**Mathematics IIB and Mathematics IIC.**

**Mathematics IIB and Computer Science III.**

**Mathematics IIA, Mathematics IIC and Statistics II.**

**Mathematics IIA and Statistics III.**

**Mathematics IIA, Mathematics IIB, Mathematics IIC and Accounting IIC.**

**Mathematics IIB, Accounting IIC.**

**Mathematics IIA, IIB and Foundations of Finance option.**

**Mathematics, including a discipline from the Faculty of Science, eg Psychology.**

**Mathematics IIA, Mathematics IIC, and Psychology I.**

**Mathematics IIB, Psychology I and two other subjects.**

**Mathematics IIC, Psychology II.**

**Mathematics IIA, Psychology IIA, and two other subjects.**

**Mathematics IIB, Psychology IIA, Psychology II.**

**Mathematics IIB, an Engineering discipline, eg Civil Engineering.**

**Mathematics I, Engineering I, and two other subjects.**

**Mathematics IIA, Mathematics IIC and Civil Engineering IIB.**

**Mathematics IIB and Civil Engineering IIB.**

**Statistics Courses**

From 1987 it will be possible for students to take a major sequence in statistics consisting of the following subjects:

1. **Note:** In order to complete the educational requirements for the professional bodies, it is necessary to pass additional subjects.
SECTION TWO
Mathematics I, Statistics II, Statistics III. This sequence can be taken as part of the Bachelor degrees in Mathematics, Science, Arts, Commerce and Economics. Statistics II is a new Part II subject which will be offered for the first time in 1987. Students enrolling in Statistics II must have already passed Mathematics I. As a transitional arrangement for 1987, students enrolling in the Part III subject Statistics III must have already passed the Mathematics II topic, II (Applied Statistics), I (Probability and Statistics) and CO (Vector Calculus and Differential Equations).

From 1988 the prerequisite for Statistics III will be Statistics II.

Statistics topics, in parts of Statistics II and Statistics III, are also available as part of other subjects. For example, Topic PS (Probability and Statistics) may be included in Mathematics IIC, Topic AS (Applied Statistics) is part of several Engineering programmes, and Topic RP (Random Processes and Simulation) is part of Mathematics IICS.

COMBINED DEGREE COURSES

The decision to take a combined degree course is usually taken at the end of a student’s first year in his original degree course, in consultation with the Deans of the Faculties responsible for the two degrees. Permission to embark on a combined degree course will normally require an average of credit levels in first year subjects.

Bachelor of Computer Science and Another Degree

Combined degree regulations for BComm students have been approved for combined degrees with Computer Science and Arts, Computer Engineering and Mathematics. Students interested in a combined degree course should discuss their plans with the appropriate Dean(s).

Bachelor Mathematics and Another Degree

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Mathematics requires Mathematics IIA, Mathematics IIC, Mathematics IIB and another three subjects. The Bachelor of Arts requires nine subjects in the same discipline. A Bachelor of Arts requires nine subjects in another discipline.

Bachelor of Mathematics and Bachelor of Education

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Mathematics requires Mathematics IIA, Mathematics IIC, Mathematics IIB and another three subjects and the Bachelor of Education requires nine subjects in the same discipline. A Bachelor of Education requires nine subjects in another discipline.

Bachelor of Science and Bachelor of Education

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Science requires nine subjects in the same discipline. A Bachelor of Education requires nine subjects in another discipline.

Bachelor of Mathematics and Bachelor of Philosophy

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Mathematics requires Mathematics IIA, Mathematics IIC, Mathematics IIB and another three subjects and the Bachelor of Philosophy requires nine subjects in the same discipline. A Bachelor of Philosophy requires nine subjects in another discipline.

Bachelor of Science and Bachelor of Philosophy

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Science requires nine subjects in the same discipline. A Bachelor of Philosophy requires nine subjects in another discipline.

Bachelor of Education and Bachelor of Arts

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Education requires nine subjects in the same discipline. A Bachelor of Arts requires nine subjects in another discipline.

Bachelor of Education and Bachelor of Science

Arts/Mathematics

The details of the combined course follow simply from the requirements for each degree. Each degree requires nine subjects so the combined degree requires 18 subjects. The Bachelor of Education requires nine subjects in the same discipline. A Bachelor of Science requires nine subjects in another discipline.
SECTION THREE

BACHELOR DEGREES OFFERED IN THE FACULTY OF MATHEMATICS
Bachelor of Computer Science (BComSc)
Bachelor of Computer Science (Honours) [BComSc(Hons)]
Bachelor of Mathematics (BMath)
Bachelor of Mathematics (Honours) [BMath(Hons)]

REGULATIONS GOVERNING THE ORDINARY DEGREE OF BACHELOR OF COMPUTER SCIENCE

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

2. Definitions

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;

"department" means the degree of Bachelor of Computer Science;

"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;

"Schedule" means the Schedule of Subjects to these Regulations;

"subject" means any part of the course for which a result may be awarded.

3. Requirements

(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 Normal Curriculum for that year.

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

(a) no candidate shall enrol in more than four subjects in any one academic year;

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

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

4. Qualification for Admission to the Degree

(1) To qualify for admission to the degree a candidate shall (a) pass nine subjects, and

(b) complete to the satisfaction of the Head of the Department of Computer Science an essay on any aspect of the history or philosophy of computer science or the social issues raised by computer technology.

(2) The nine subjects presented for the degree shall include:

(a) not fewer than seven subjects selected from the Schedule, provided that a candidate may not select both Computer Engineering I and Computer Engineering III;

(b) at least one Part I subject from the Schedule;

(c) Computer Science IIA and at least one other Part III subject from the Schedule.

(3) A candidate may select up to two subjects from subjects offered in other degree courses in the University with the permission of the Dean, who shall determine the classification of each subject as a Part I, Part II or Part III subject.

(4) A candidate may not present for the degree subjects which have previously been counted towards another degree or diploma obtained by that candidate, except to such extent as the Faculty Board may permit.

(5) Irrespective of the order in which they are passed, the subjects presented shall, except with the permission of the Dean, conform with one of the following patterns:

<table>
<thead>
<tr>
<th>Part I subjects</th>
<th>Part II subjects</th>
<th>Part III subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>(b) 4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>(c) 5</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

5. Subject

(1) To qualify for admission a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written or oral work as the Department may require.

(2) To pass a subject a candidate shall complete the requirements for the degree in accordance with Regulation 6 of these Regulations.

6. Standing

(1) The Faculty Board may grant standing in specified and unspecified subjects to a candidate, on such conditions as it may determine, in recognition of work completed in this University or another institution.

(2) A candidate may not be granted standing in more than four subjects which have already counted towards a degree to which that candidate has been admitted or is eligible for admission.

(3) The Dean shall determine the classification of each subject in which standing is granted as a Part I, Part II or Part III subject.

7. Prerequisites and Corequisites

(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 Part II subject unless that candidate has passed all 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 "Pass" in a subject shall be deemed not to have passed that subject for prerequisite purposes.

8. Withdrawal

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

9. Results

The result obtained by a successful candidate in a subject shall be:

- Terminating Pass, Ungraded Pass, Pass, Credit, Distinction, or High Distinction.

10. Time Requirements

Except with the special permission of the Faculty Board, a candidate shall complete the requirements for the degree within seven calendar years of the commencement of the degree course. A candidate who has been granted standing in accordance with Regulation 6 of these Regulations shall be deemed to have commenced the degree course from a date to be determined by the Dean.

11. Relating Provision

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.

Combined Degree Courses

12. General

A candidate may complete the requirements for the degree in conjunction with another Bachelor degree by completing a combined degree course approved by the Faculty Board and also where that other degree is offered by another Faculty, the Faculty Board of that Faculty.

Admission to a Combined Degree Course

(13) (a) shall be subject to the approval of the Dean or Deans of the two Faculties in the case may be;

(b) shall, except in exceptional circumstances, be at the end of the candidate's first year of enrolment in a degree; and

(c) shall be restricted to candidates with an average of at least credit level who have passed Computer Science I at a level deemed satisfactory to the Dean, or who have achieved a standard of performance deemed satisfactory for the purposes of admission to a combined degree course by the Faculty Board.

14. 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 or the Deans of the two Faculties in the case may be.

15. To qualify for admission to the two degrees a candidate shall satisfy the requirements for both degrees except as provided in the following Regulations.

16. Bachelor of Science/Bachelor of Arts

(1) To qualify for admission to the ordinary degree of Bachelor of Computer Science and Bachelor of Arts, a candidate shall:

(a) pass fourteen subjects, and

(b) complete to the satisfaction of the Head of the Department of Computer Science an essay on any aspect of the history or philosophy of Computer Science or the social issues raised by computer technology.

(2) The following restrictions shall apply to a candidate's choice of subjects, namely:

(a) no fewer than seven subjects shall be selected from the Schedule of Subjects to three regulations in accordance with paragraphs (a), (b) and (c) of Regulation 4(2) of these regulations.

(b) nine of the subjects shall be selected in accordance with Regulations 9 of the Regulations governing the ordinary degree of Bachelor of Arts.

(c) at least one Part III subject being a subject not included in the Schedule of Subjects for the ordinary degree of Bachelor of Computer Science shall be selected from the Schedule of Subjects to the Regulations governing the Ordinary degree of Bachelor of Arts.

17. Bachelor of Science/Engineering (Computer Engineering)

To qualify for admission to the degree of Bachelor of Engineering (Computer Engineering) and the ordinary degree of Bachelor of Computer Science, a candidate shall:

(a) pass Computer Science I, Computer Engineering I, Mathematics I, Computer Science II, Mathematics IICS, Computer Science IIA and Computer Science III,

(b) complete to the satisfaction of the Head of the Department of Computer Science an essay on some aspect of the history or philosophy of Computer Science or the social issues raised by computer technology,

(c) pass subjects selected from the programme of subjects approved for the degree of Bachelor of Engineering (Computer Engineering), totalling a minimum of 40 units, as calculated for those degrees.
SECTION THREE

UNIVERSITY OF CAMBRIDGE REGULATIONS

18. Computer Science/Mathematics

(1) To qualify for admission in the ordinary degree of Bachelor of Computer Science and Bachelor of Mathematics, a candidate shall:

(a) pass fourteen subjects, and
(b) complete in the satisfaction of the Head of the Department of Computer Science an essay on some aspect of the history or philosophy of Computer Science or the social issues raised by computer technology.

(2) The fourteen subjects prescribed for the degree shall conform to the following requirements:

(a) No fewer than seven subjects shall be selected from the Schedule of Subjects to these regulations in accordance with paragraphs (a), (b), and (c) of Regulation 4(2) of these Regulations;
(b) Nine of the subjects shall be selected in accordance with Regulations 4(1)(a) and (b) and Regulation 4(2) of the Regulations governing the Ordinary degree of Bachelor of Mathematics;
(c) At least two Part III subjects shall be selected from the Schedule of Subjects to these regulations;
(d) At least two Part III subjects, being subjects not included in the Schedule of Subjects shall be selected from the Schedule of Subjects to the Regulations governing the Ordinary degree of Bachelor of Mathematics.

SCHEDULE OF SUBJECTS

Bachelor of Computer Science

Subject

Part I

Computer Science I

Mathematics I

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

Computer Engineering I

Part II

Computer Science II

Data Processing II

Mathematics ICS

Computer Engineering II

Part III

Computer Science IIIA

Computer Science IIIB

Computer Engineering III

Computer Science IIIC

Computer Engineering IIID

Prerequisite Computer Science II, Mathematics ICS and Statistics III.

Prerequisite Computer Science II, Mathematics IIIA

Prerequisite Computer Science II, Mathematics ICS

Prerequisite Computer Science IIID

Prerequisite Computer Science II, Mathematics IIIB

Prerequisite Computer Science IIID

Computer Science IIIB

(2) A candidate may select Computer Engineering II or Computer Engineering IIID, but not both.

Computer Engineering II

Prerequisite Computer Engineering I

REGULATIONS GOVERNING THE ORDINARY DEGREE OF BACHELOR OF MATHEMATICS

1. These Regulations prescribe the requirements for the ordinary degree of Bachelor of Mathematics of the University of Cambridge and in accordance with the powers vested in the Council under By-Law 5.4.1.

2. Definitions

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;
"Departmental" means the Department offering a particular subject and includes any other body so doing;
"Faculty" means the Faculty of Mathematics;
"Part I" means the Faculty Board of the Faculty;
"Schedule" means a Subject of Subjects to these Regulations;
"subject" means any part of the course for which a result may be recorded, provided that for the purpose of these Regulations, Mathematics IIB Part I and Mathematics IIB Part II shall together count as one subject.

3. Enrolment

(a) A candidate's enrolment in any year must be approved by the Dean or the Dean's nominee.

(b) 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.

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

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

4. Qualification for Admission to the Degree

(a) At least two Part III subjects from Schedules A or B,

(b) At least one of Mathematics IIIA, Mathematics IIIIB and Statistics III,

(c) At least five subjects from Schedule A, including at least two Part II subjects from this Schedule.

5. Subject

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

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

6. Standing

(a) The Faculty Board may grant standing in specified and unspecified subjects to a candidate, on such conditions as it may determine, in recognition of work completed in this University or another institution.

(b) Subject to sub-regulation (3) a candidate may not be granted standing in more than four subjects.

(c) A candidate who is an undergraduate candidate enrolled for a different degree of the University may transfer enrolment to the degree of Bachelor of Mathematics with such standing as the Faculty Board deems appropriate.

7. Prerequisites and Corequisites

(a) 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.

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

8. Withdrawal

(a) 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 receipt of such notification.

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

9. Results

(a) The result obtained by a successful candidate in a subject shall be:

(a) First Class

(b) Second Class, upper division

(c) Second Class, lower division

(d) Third Class

(e) Failure

10. Time Requirements

Except with the special permission of the Faculty Board, a candidate shall complete the requirements for the 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.

11. Expulsion

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

Combined Degree Courses

13. General

A candidate may complete the requirements for the degree in conjunction with another Bachelor degree by completing a combined degree course approved by the Faculty Board and also, where that other degree is offered by another Faculty, the Faculty Board of that Faculty.

Admission to a Combined Degree Course

13. (a) shall be subject to the approval of the Dean or the Deans of the two Faculties as the case may be;

(b) shall, except in exceptional circumstances, be at the end of the candidate's first year of enrolment in a degree; and

(c) shall be restricted to candidates with an average of at least credit level who have passed Mathematics I and a level deemed satisfactory by the Dean, or who have achieved a standard of performance deemed satisfactory for the purposes of admission to a combined degree course by the Faculty Board.

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

15. To qualify for admission to the two degrees a candidate shall satisfy the requirements for both degrees except as provided in the following Regulations.

16. Mathematical/Arts

(a) To qualify for admission to the ordinary degrees of Bachelor of Arts and Bachelor of Mathematics, a candidate shall pass fourteen subjects which shall include:

(a) five subjects selected from Schedule A for the ordinary degree of Bachelor of Mathematics, of
which at least two are Part III subjects from that schedule, and
(b) nine other subjects, chosen from the subjects listed in the Schedule of Subjects approved for the ordinary degree of Bachelor of Arts.

17. Mathematics/Science

(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 IIA, Mathematics IIC and Mathematics IIIA;
(b) one subject from the following, namely Mathematics IIIB, 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;
(d) three subjects, chosen with the approval of the Dean of the Colleges 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 IIIC shall not be admitted to count either Psychology IIA or Psychology IIIB;
(d) a candidate counting Psychology IIBC shall not be admitted to count either Psychology IIIA or Psychology IIIB;
(e) a candidate counting Economics IIIC shall not be admitted to count either Economics IIA or Economics IIIB;
(f) a candidate counting Geology IIIC shall not be admitted to count Geology IIA or Geology IIIB.

18. Mathematics/Commerce

To qualify for admission to the ordinary degree of Bachelor of Commerce and Bachelor of Mathematics, a candidate shall pass seventeen subjects as follows:
(a) five subjects selected from Schedule A for the ordinary degree of Bachelor of Mathematics, of which at least two are Part II subjects from that schedule, and
(b) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Commerce.

19. Mathematics/Engineering

To qualify for admission to the Ordinary degree of Bachelor of Mathematics and the degree of Bachelor of Engineering, a candidate shall pass:
(a) five subjects selected from Schedule A for the ordinary degree of Bachelor of Mathematics, of which at least two are Part III subjects from that schedule, and
(b) other subjects selected from the programme of subjects approved for the degree 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.

20. Mathematics/Economics

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) five subjects selected from Schedule A of the Regulations Governing the ordinary degree of Bachelor of Mathematics, of which at least two are Part III subjects from that schedule, and
(b) other subjects totalling a minimum of twelve points which shall by themselves satisfy the requirements for the degree of Bachelor of Economics.

21. Mathematics/Computer Science

(1) To qualify for admission to the ordinary degrees of Bachelor of Mathematics and Bachelor of Computer Science, a candidate shall:
(a) pass fourteen subjects, and
(b) complete to the satisfaction of the Head of the Department of Computer Science an essay on some aspect of the history or philosophy of Computer Science or the social issues raised by computer science;
(c) pass four subjects, and
(d) complete to the satisfaction of the Head of the Department of Computer Science an essay on some aspect of the history or philosophy of Computer Science or the social issues raised by computer science;
(e) a candidate counting Psychology IIB shall not be admitted to count either Psychology IIA or Psychology IIIB;
(f) a candidate counting Economics IIIB shall not be admitted to count either Economics IIA or Economics IIIB;
(g) a candidate counting Geology IIB shall not be admitted to count Geology IIA or Geology IIIB.

22. Mathematics/Surveying

To qualify for admission to the Ordinary degree of Bachelor of Mathematics and the degree of Bachelor of Surveying, a candidate shall pass:
(a) five subjects selected from Schedule A to the Regulations Governing the Ordinary Degree of Bachelor of Mathematics, of which at least two are Part III subjects from that schedule, and
(b) other subjects selected from the programme of subjects approved for the degree of Bachelor of Surveying, totalling a minimum of 48 units as calculated for that degree.

SCHEDULES OF SUBJECTS
Bachelor of Mathematics

SCHEDULE A

<table>
<thead>
<tr>
<th>Subject</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td>It is assumed that students have studied Higher School Certificate Mathematics at the 2-unit level or higher. Nevertheless students who studied only two unit Mathematics or who achieved less than 110 out of 150 in three unit Mathematics will find themselves seriously disadvantaged in this subject and should instead study the subject Mathematics IIC followed by Mathematics II in the subsequent year.</td>
</tr>
<tr>
<td>Corequisite Mathematics I</td>
<td></td>
</tr>
<tr>
<td>Mathematics II IC</td>
<td></td>
</tr>
<tr>
<td>Mathematics II</td>
<td></td>
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<tr>
<td>Mathematics III</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIA</td>
<td></td>
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<tr>
<td>Mathematics IIB</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIIA</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIIC</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIIB</td>
<td></td>
</tr>
</tbody>
</table>

SCHEDULE B

<table>
<thead>
<tr>
<th>Subject</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIA</td>
<td>This is a half subject which together with Mathematics IIB provides a sufficient prerequisite for second year Mathematics subjects.</td>
</tr>
<tr>
<td>Prerequisite Mathematics IIA</td>
<td></td>
</tr>
<tr>
<td>Engineering I</td>
<td>It is assumed that students have studied Higher School Certificate Mathematics at the two-unit level or higher together with either Multistruct Science at the four-unit level or Physics at the two-unit level and Chemistry at the two-unit level.</td>
</tr>
<tr>
<td>Part II</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td></td>
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<tr>
<td>Part III</td>
<td></td>
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<tr>
<td>Mathematics IIIA</td>
<td></td>
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<tr>
<td>Mathematics IIB</td>
<td></td>
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<tr>
<td>Mathematics IIIIC</td>
<td></td>
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<tr>
<td>Mathematics IIC</td>
<td></td>
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<tr>
<td>Mathematics III</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIA</td>
<td></td>
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<tr>
<td>Mathematics IIB</td>
<td></td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td></td>
</tr>
<tr>
<td>Chemistry IIB</td>
<td></td>
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<tr>
<td>Communications &amp; Technology</td>
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<tr>
<td>Civil Engineering IIM</td>
<td></td>
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<tr>
<td>Prerequisites Civil Engineering IIM</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Chemistry IIA</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Mathematics IIA</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites either Biology IIA or Biology IIB</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Mathematics IIA, Chemistry IIA and Chemistry IIB</td>
<td></td>
</tr>
<tr>
<td>Prerequisites: Physics IIA, Mathematics IIA, Chemistry IIA</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Chemistry IIA</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Civil Engineering IIM,</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites Mathematics IIA</td>
<td></td>
</tr>
</tbody>
</table>

3 Students who have passed both Mathematics I I and Mathematics IIC 102 will be considered as having satisfied pre requisite requirements of Mathematics I. Successful completion of Mathematics I and Mathematics IIC 102 will count as one Part I Schedule A subject in lieu of Mathematics I.
4 Transition arrangements for candidates enrolled in the course prior to 1986 will be determined in particular cases by the Faculty Board.
NOTE ON SUBJECT AND TOPIC DESCRIPTIONS

The subject and topic outlines and reading lists which follow 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.

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 as advisory, lectures will be given on the assumption that the subject or topic has been completed as indicated.

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.

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 in the Department of Mathematics section headed "Progressive Assessment" referring to Mathematics subjects.

Texts are essential books recommended for purchase. References are books relevant to the subject or topic which, however, need not be purchased.

The following academic staff have been appointed course coordinators and should be consulted in cases of difficulty:

Computer Science I
Siomoe

Computer Science II
Dr. J. Rosenbaum

Computer Science III
Dr. D.W.B. Braith

Further information about computer science courses appears in the section "Notes on Degrees and Diplomas.

Students enrolling in Computer Science subjects do not formally enrol in their constituent topics. However, Computer Science IV and ITM students, and students who as part of any other Computer Science subject wish to take topics other than exactly as described in the relevant subject description, must first obtain permission from the Head of the Department of Computer Science.

PART I COMPUTER SCIENCE SUBJECT

681100 COMPUTER SCIENCE I

Corequisite: Mathematics IIA

Hours 4 lecture hours and approx. 4 hours of tutorials and practical work per week.

Content

Introduction to the following aspects of computer science: The design of algorithms. The theory of algorithms. How algorithms are executed as programs by a computer. The functions of system software (computers and operating systems). Applications of computers. Social issues raised by computers. An extensive introduction to programming in Pascal and a shorter introduction to programming in FORTRAN 77.

Texts

Goldschlag, L. & Lister, A.,
"Computer Science, A Modern Introduction" (2nd ed. Prentice-Hall 1987)
and either
Cooper, D.,
"Condensed Pascal" (Norton 1987)
or
Savitch, W.J.,
"Pascal. An Introduction to the Art and Science of Programming" (2nd ed. Benjamin/Cummings 1987)

PART II COMPUTER SCIENCE SUBJECTS

Computer Science II is the normal Part II computer science subject for students enrolled in all degrees. As a transitional arrangement, certain students who enrolled before 1986 and who have not taken Computer Science I may enrol in Computer Science ITM. Data Processing ITM is an optional subject in the B.ComputerSc. degree.

682100 COMPUTER SCIENCE II

Prerequisite: Computer Science I

Hours 4 lecture hours and approx. 4 hours of tutorials and practical work per week.

Examinations By topic:

5 The Dean, Faculty of Mathematics, should be consulted to ensure that the appropriate Statistics background materials for Economics I is covered.
**SECTION FOUR: UNDERGRADUATE COMPUTER SCIENCE SUBJECT DESCRIPTIONS**

**Content**
This subject comprises the four topics:

1. Assembly Language
2. Commercial Programming
3. Comparative Programming Languages
4. Data Structures & Algorithms

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

682900 COMPUTER SCIENCE III

**Prerequisite** Mathematics I

**Hours** 6 lecture hours and 4 practical hours per week.

**Examinations** By topic

**Content**
This subject comprises the four topics:

1. Introduction to Programming
2. Assembly Language
3. Comparative Programming Languages
4. Data Structures & Algorithms

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

683110 DATA PROCESSING II

**Prerequisite** Computer Science I

**Hours** 4 lecture hours and 4 practical hours per week.

**Examinations** By topic

**Content**
This subject comprises the four topics:

1. Introduction to Programming
2. Assembly Language
3. Comparative Programming Languages
4. Data Structures & Algorithms

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

683900 COMPUTER SCIENCE III

**Prerequisite** Computer Science III, or Computer Science II passed before 1987.

**Hours** 4 lecture hours and 4 practical hours per week.

**Examinations** By topic

**Content**
This subject comprises five topics, including topics 1 to 4 of the list of topics given below. The fifth topic must be topic 5 of the list if this has not already been studied in Computer Science II or III. If topic 5 has already been studied, the fifth topic will be chosen from topics 6 to 9 of the list.

1. Software Engineering Principles
2. Compiler Design
3. Operating Systems
4. Database Design
5. Artificial Intelligence Programming Techniques
6. Computer Networks
7. Computer Graphics
8. Theory of Computation

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

**Examination** By topic, plus a report on the project undertaken

**Content**
This subject comprises a project, and the four topics:

1. Artificial Intelligence Programming Techniques
2. Compiler Design
3. Operating Systems
4. Database Design

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

683300 COMPUTER SCIENCE III B

**Prerequisite** Computer Science II passed in or since 1987 and Mathematics II CS

**Hours** 4 lecture hours per week, with tutorial as required, plus a 100-hour project

**Examination** By topic, plus a report on the project undertaken

**Content**
This subject comprises a project, and the four topics:

1. Artificial Intelligence Programming Techniques
2. Compiler Design
3. Operating Systems
4. Database Design

Descriptions of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.

**Preceding Notes**
Before 1986 and who have not taken examination only, students who enrolled since 1987 and Mathematics II CS in Section Six.

**Description of these topics appear as the subject descriptions for the Diploma in Computer Science subjects of the same names in Section Six.**

**TOPIC DESCRIPTIONS**

**Mathematics I**

- **Preliminary Notes**
  - The Department of Mathematics offers and examines subjects, most of which appear as topics, consisting of about 27 lectures and 13 tutorials. Each of the Part I, Part II and Part III subjects consists of the equivalent of four single-topic units. For Mathematics I, Mathematics II, Mathematics III, and Mathematics IV, there is no choice of topics; for Mathematics II, III, and IV there is some choice available to students; for Mathematics II, III, and IV there is a wider choice. No topic may be counted twice in making up distinct subjects.

- **Progressive Assessment**
  - From time to time during the year students will be given assignments, tests, etc. Where a student’s performance in the performance of 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 has been worse than that student’s performance in the final examination, then the year’s work will be taken into account in determining the final result. However, performance during the early part of the year is taken into account when considering exclusion for unsatisfactory progress.

Further information about mathematics courses appears in the section Notes on Degrees and Diplomas.

**PART I MATHMATICS SUBJECTS**

661100 MATHEMATICS I

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

**References**
- **Vector geometry in two and three dimensions.** Matrices, Solutions of systems of linear equations, Determinants, Linear maps, matrix representation, rank and nullity, Eigenvectors and eigenvalues, Applications.
- **Real Analysis**
- **Algebra**
- **Linear Algebra**
- **Real Analysis: An Introductory Course**
- **Calculus**

**References**
- Tutorial Notes (1988)
- University of Newcastle Tutorial Notes (Wiley 1987)
- Elementary Linear Algebra (Harcourt Brace Jeonovich 1987)

**References**
- Tutorial Notes (1988)
- University of Newcastle Tutorial Notes (Wiley 1987)
- Elementary Linear Algebra (Harcourt Brace Jeonovich 1987)
- A Basis for Linear Algebra (Wiley 1973)
- Linear Algebra (Schum 1974)

**Real Analysis**

- **Lecturer** J.R. Giles
- The real number system, convergence of sequences and series, Limits and continuity of functions, The theory of differentiation and integration, Polynomial approximation and Taylor’s series.

**References**
- **Elementary Mathematical Analysis**
- **Elementary Linear Algebra**

**Real Analysis**

- **Lecturer** R.F. Berghout
equations with constant coefficients, Simple three-dimensional geometry of curves and surfaces.

References
Ayres, F.
Calculus (Schuman 1974)

Calculus and Analytical Geometry (Prentice-Hall 1982)

Stein, S.K.

Statistics & Computing
Lecturers A.J. Dobson & W.P. Wood
An introduction to elementary numerical analysis and computing, including finding roots and estimating integrals.

Programming in Pascal starts early in the course, and students are required to compose and carry out laboratory work.

An introduction to statistics: exploratory data analysis, uncertainty and random variation, probability, use of MINITAB.

Note:
Students intending to pursue computing studies should also obtain one of the references for Pascal listed below.

Text
Freedman, D., Pisani, R. & Purves, R.
Statistics (W.W. Norton & Co. 1978)

References for Pascal
Cooper, D. & Clancy, M.
Old Pascal 2nd edn (W.W. Norton & Co. 1982)

Koffman, E.B.
Problem Solving and Structured Programming in Pascal 2nd edn (Addison-Wesley 1985)

Savitch, W.J.
Pascal, An Introduction to the Art and Science of Programming (Benjamin/Cummings)

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

Ryan, B.F., Jeanner, B.L. & Ryyn, T.A.

661200 MATHEMATICS I

Lecturer M.J. Hayes
This subject is designed to help the students who are likely to find great difficulty in passing Mathematics I. The Mathematics Department strongly recommends that students who have done only 2-unit mathematics, or 3-unit mathematics with a mark of less than 110, in the Higher School Certificate, should enrol in Mathematics II rather than in Mathematics I. We recommend this because of the very high failure rate for such students in previous years.

Mathematics II will consist of one half of Mathematics I, namely the calculus, statistics and computing sections, some revision work in basic school mathematics, and some work introductory to the remaining algebra and analysis sections of Mathematics I. It will have 6 hours of lectures and tutorials a week for the full year, the same as Mathematics I. It will be taught in small groups, where the accent will be on the students doing much more supervised practice in solving problems than is possible in Mathematics I.

Students wishing to proceed to a second year mathematics subject, for example students in the Engineering and Mathematics Faculties, after they have passed Mathematics II, must then pass Mathematics 102, which consists of the remaining algebra and analysis sections of Mathematics I. These students may count Mathematics II and Mathematics 102, as the equivalent of the full subject Mathematics I, in their degree.

It is possible for students in the Arts and Science Faculties to count Mathematics II as a full subject in their degree, though it would not qualify these students to pursue computing studies should they wish to do so.

Examinations: To be advised
Content


Text
Freedman, D., Pisani, R. & Purves, R.
Statistics (W.W. Norton & Co. 1978)

(Tests for calculus and computing to be advised.)

References
Ayres, F.
Calculus (Schuman 1974)

Calculus and Analytical Geometry (Prentice-Hall 1982)

Stein, S.K.

Cooper, D. & Clancy, M.
Old Pascal 2nd edn (W.W. Norton & Co. 1982)

Koffman, E.B.
Problem Solving and Structured Programming in Pascal 2nd edn (Addison-Wesley 1985)

Savitch, W.J.
Pascal, An Introduction to the Art and Science of Programming (Benjamin/Cummings)

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

Ryan, B.F., Jeanner, B.L. & Ryyn, T.A.

661300 MATHEMATICS 102

This is a half subject, which is an upgrade for students who have passed Mathematics II.

Hours 2 lecture hours and 1 tutorial hour per week

Examinations: One 3 hour paper

Content
As for the topics "Algebra" and "Real Analysis" in Mathematics I.

Note:
Mathematics I is not a sufficient prerequisite for any further Mathematics subjects, except Mathematics 102. However, Mathematics II followed by Mathematics 102 is acceptable as a prerequisite in all cases where Mathematics I is acceptable as a prerequisite.

PART II MATHEMATICS SUBJECTS

The Department offers three Part II Mathematics subjects. The subject Mathematics IIA is a pre- or corequisite for Mathematics IIB, and IIA is a prerequisite for both Mathematics IIC and IIB. Students who wish to include Mathematics IIA in their third year programme must succeed in both Mathematics IIA and IIB. The Department also offers the subject Mathematics ICS (jointly with the Department of Statistics).

When selecting topics for Part II subjects, students are advised to consider the prerequisites needed for the various Part III topics offered in the Faculty of Mathematics.

List of Topics for Part II Mathematics subjects

<table>
<thead>
<tr>
<th>Topic</th>
<th>Corequisite or Prerequisite Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Mathematical Models</td>
<td>CO</td>
</tr>
<tr>
<td>B Complex Analysis</td>
<td>CO</td>
</tr>
<tr>
<td>CO Vector Calculus &amp; Differential Equations</td>
<td>Double Topic</td>
</tr>
<tr>
<td>D Linear Algebra</td>
<td>CO</td>
</tr>
<tr>
<td>E Topic in Applied Mathematics e.g. Mechanics and Potential Theory</td>
<td>CO</td>
</tr>
<tr>
<td>F Numerical Analysis &amp; Computing</td>
<td>CO</td>
</tr>
<tr>
<td>K Discrete Mathematics</td>
<td>CO</td>
</tr>
<tr>
<td>L Analysis of Metric Spaces</td>
<td>CO</td>
</tr>
</tbody>
</table>

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

Notes:
1. Students whose course includes a Schedule II subject may have their choice of topics specified further than is set out in the rules below.
2. Students whose course includes Physics IIA are advised to include topics CO, D and at least one of C or E in their Mathematics Part II subjects.
3. Students who take all three subjects Mathematics IIA, IIB, IIC will be required to take the nine topics above together with either Probability and Statistics or Topic II (Geometry) with some other suitable third year topic. Such students should consult the Head of the Department concerning the appropriate choice.
4. Students who take Mathematics IICS together with Mathematics IIA will substitute a suitable topic for II in Mathematics IIA.

661210 MATHEMATICS IIA

Prerequisite Mathematics I

Hours 4 lecture hours and 2 tutorial hours per week

Examinations: Each topic is examined separately

Content
Topics B, CO and D. In exceptional circumstances and with the consent of the Head of the Department some substitution of topics may be allowed.

661220 MATHEMATICS IIB

Prerequisite Mathematics I

Hours 4 lecture hours and 2 tutorial hours per week

Examinations: Each topic is examined separately
SECTION FOUR UNDERGRADUATE MATHEMATICS SUBJECT DESCRIPTIONS

Content
Four topics chosen from A to G, 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 of the topics from Statistics II (offered by the Department of Statistics), K or L may be included. Students in the Faculty of Mathematics may, with the consent of the Dean, take Mathematics III in two parts, each consisting of two topics.

663100 MATHEMATICS IIC
Prerequisite Mathematics I
Corequisite Mathematics IIA
Hours 4 lecture hours and 2 tutorial hours per week
Examination Each topic is examined separately
Content
Topics K, L plus either two topics chosen from A to G, or Probability and Statistics (the double topic offered by the Department of Statistics), or one topic chosen from A to G together with Random Processes and Simulation (offered by the Department of Statistics). Under exceptional circumstances, and with the consent of the Head of the Department, some substitution may be allowed.

663110 MATHEMATICS IICS
Prerequisite Mathematics I
Hours 4 lecture hours and 2 tutorial hours per week
Examination Each topic is examined separately
Content
Topics D, G, F and Random Processes and Simulation (offered by the Department of Statistics).

PART II MATHEMATICS TOPICS
663101 TOPIC A - MATHEMATICAL MODELS
Lecturers W.T.F. Lau (1st Semester) A. Serna-Karwat (2nd Semester)
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 polynomials 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
Kreyzig, E.
Advanced Engineering Mathematics 5th edn (Paperback, Wiley 1979) (5th edn is preferable but 4th edn will suffice)

References
Complex Variables and Applications (McGraw-Hill 1966)
Grove, E.A. & Ladas, G.
Introduction to Complex Variables (Houghton Mifflin 1974)
Kreyzig, E.
Advanced Engineering Mathematics (Wiley 1979)
Levinson, N. & Redheffer, R.M.
Complex Variables (Holden-Day 1970)

663102 TOPIC B - COMPLEX ANALYSIS
Lecturer M.J. Haynes
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 polynomials 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
Kreyzig, E.
Advanced Engineering Mathematics 5th edn (Paperback, Wiley 1979) (5th edn is preferable but 4th edn will suffice)

References
Complex Variables and Applications (McGraw-Hill 1966)
Grove, E.A. & Ladas, G.
Introduction to Complex Variables (Houghton Mifflin 1974)
Kreyzig, 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)
Spiegel, M.R.
Tall, D.O.

663103 TOPIC C - VECTOR CALCULUS & DIFFERENTIAL EQUATIONS
Lecturer W. Summerfield
Prerequisite Nil
Hours 2 lecture hours per week and 1 tutorial hour per week
Examination One 3-hour paper

Content

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

References
Complex Variables and Applications (McGraw-Hill 1966)
Grove, E.A. & Ladas, G.
Introduction to Complex Variables (Houghton Mifflin 1974)
Kreyzig, 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)
Spiegel, M.R.
Tall, D.O.

663104 TOPIC D - LINEAR ALGEBRA
Lecturer R.B. Eggleton
Prerequisite Nil
Hours 1 lecture hour per week and 1 tutorial hour per fortnight
Examination One 2-hour paper

Content


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

References
Complex Variables and Applications (McGraw-Hill 1966)
Grove, E.A. & Ladas, G.
Introduction to Complex Variables (Houghton Mifflin 1974)
Kreyzig, 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)
Spiegel, M.R.
Tall, D.O.

663105 TOPIC E - NUMERICAL ANALYSIS
Lecturer M.J. Haynes
Corequisite Topic CO
Hours 1 lecture hour per week and 1 tutorial hour per fortnight
Examination One 2-hour paper

Content
First semester: Basics of numerical methods, root finding, interpolation, curve fitting, numerical differentiation and integration, numerical solutions of first and second order differential equations, numerical linear algebra, direct and iterative methods, fast Fourier transforms.


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

References
Complex Variables and Applications (McGraw-Hill 1966)
Grove, E.A. & Ladas, G.
Introduction to Complex Variables (Houghton Mifflin 1974)
Kreyzig, 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)
Spiegel, M.R.
Tall, D.O.
Lipschutz, S.  
Linear Algebra (Schaum 1974)

Nering, E.D.  
Linear Algebra and Matrix Theory (Wiley 1966)

Reza, F.  
Linear Spaces in Engineering (Ginn 1971)

Ronan, S.  
An Introduction to Linear Algebra (Saunders 1985)

Rollett, C. & Anton, H.  
Applications of Linear Algebra (Wiley 1979)

662201 TOPIC E - TOPIC IN APPLIED MATHEMATICS E.G. MECHANICS AND POTENTIAL THEORY

Lecturer C.A. Croxon
Corequisite Topic CO

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

Examination One 2-hour paper

Content

Text
Prindle, Weber & Schmidt
Numerical Analysis 3rd edn

References
Rutishauser, K.E.  
An Introduction to Numerical Analysis (John Wiley)

Balfour, A. & Marwick, D.H.  
Programming in Standard Fortran 77 (Heinemann 1986)

Cheyney, W. & Finic, D.  
Numerical Mathematics and Computing 2nd edn (Beekes-Cole 1985)

Crapo, D. & Clancy, M.  
Old Pascal (Wiley 1985)

Crawley, J.W. & Miller, C.F.  
A Structured Approach to Fortran (Prentice-Hall 1983)

Eller, D.M.  
Problem Solving with Structured Fortran 77 (Benjamin 1984)

Eller, D.M.  
Structured Fortran 77 for Engineers and Scientists (Benjamin 1983)

Gerald, C.F. & Wheatly, P.O.  
Applied Numerical Analysis (Addison-Wesley)

Monateck, S.L.  
Fortran 77 (Academic 1983)

McClelland, D.D.  
Computing for Engineers and Scientists with Fortran 77 (Wiley 1984)

McKenzie, P.G.  
Structured Programming Using Fortran 77 (Harcourt 1985)


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

662203 TOPIC F - DISCRETE MATHEMATICS

Lecturer R.B. Eggleton

Prerequisite Nil

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

Examination One 2-hour paper

Content

References

Dov sync & Robinson, W.B.  
Discrete Mathematics with Computer Science Applications (Benjamin/Cummings 1986)

Kalmanson, K.  
An Introduction to Discrete Mathematics and its Applications (Addison-Wesley 1986)

Dierker, P.F. & Vossman, W.L.  
Discrete Mathematics (Harcourt Brace Jovanovich 1986)

Giles, J.R.  
Introduction to the Analysis of Metric Spaces (Wiley 1976)

Goldberg, K.K.  
The Elements of Real Analysis (Wiley 1976)

Goldberg, K.K.  
Real Analysis: An Introductory Course (Wiley 1971)

Goldberg, L.K.  
Methods of Real Analysis (Ginn Blaisdell 1964)

Simpson, F.R.  
Introduction to Topology and Modern Analysis (McGraw-Hill 1962)

White, A.J.  
Real Analysis (Addison-Wesley 1965)

PART III MATHEMATICS SUBJECTS

The Department offers Mathematics IIIA and Mathematics IIIB, each comprising four topics chosen from the list below.

Students proceeding to the degree of Bachelor of Mathematics and taking either Mathematics IIIA or Mathematics IIIB will be required to complete an essay on a topic chosen from the history or philosophy of Mathematician.

Students wishing to proceed to Mathematics IV are required to take Mathematics IIIA and at least one of Mathematics IIIB, Statistics III or Computer Science III. Students who wish to proceed to Honours will normally be required to study additional topics as prescribed by the Heads of the Departments concerned. Students proceeding to Honours are required to prepare a seminar paper under supervision, and deliver it in a half-hour session. They may submit this paper as their essay requirement.

Both Mathematics IIIA and II B are prerequisites for entry to Mathematics IIIA. Mathematics IIIA is the prerequisite for Mathematics IIIB.

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.

Content


References

Giles, J.R.  
Introduction to the Analysis of Metric Spaces (CUP 1967)

Bartle, R.G.  
The Elements of Real Analysis (Wiley 1976)

Giles, J.R.  
Real Analysis: An Introductory Course (Wiley 1971)

Goldberg, K.K.  
Methods of Real Analysis (Ginn Blaisdell 1964)

Simpson, F.R.  
Introduction to Topology and Modern Analysis (McGraw-Hill 1962)

White, A.J.  
Real Analysis (Addison-Wesley 1965)
### List of Topics for Part III Mathematics Subjects

Students who are relying on second-year subjects taken before 1986 should consult the lecturers concerned for transition arrangements for prerequisite topics.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisite(s)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>General Tensors and Relativity</td>
<td>First order equations; canonical conditions; suitable forms; transverse conditions; integrability conditions; Euler-Lagrange equations; some nonlinear equations; conservation laws.</td>
</tr>
<tr>
<td>N</td>
<td>Variational Methods and Integral Equations</td>
<td>Existence and uniqueness theorems; calculus of variations; constrained variational problems; direct methods; Frechet derivatives;coordinate systems; line integrals; Jacobian determinant; Lagrange multipliers; variational principles.</td>
</tr>
<tr>
<td>O</td>
<td>Mathematical Logic and Set Theory</td>
<td>Independent systems of axioms; logical systems; completeness; independence; interpretability; diagonalisation; Löwenheim-Skolem theorem; Robinson's non-standard analysis; compactness theorem; incompleteness theorems.</td>
</tr>
<tr>
<td>P</td>
<td>Ordinary Differential Equations</td>
<td>Linear, nonlinear; homogenous, non-homogenous; Cauchy-Euler equations; Frobenius method; Sturm-Liouville theory; Green's functions; stability and oscillation; boundary value problems.</td>
</tr>
<tr>
<td>PD</td>
<td>Partial Differential Equations</td>
<td>First order equations; Laplace's equation; Poisson's equation; Helmholtz equation; Schrödinger equation; Schrödinger equation for the hydrogen atom.</td>
</tr>
<tr>
<td>Q</td>
<td>Fluid Mechanics</td>
<td>Linear and non-linear; incompressible, compressible; Navier-Stokes; Euler's equations; boundary conditions; conservation laws.</td>
</tr>
<tr>
<td>QS</td>
<td>Quantum and Statistical Mechanics</td>
<td>One-dimensional systems; harmonic oscillator, harmonic oscillator with potential; wavefunction, orthogonality, normalization; Schrödinger equation; solutions to Schrödinger equation; time independent; time dependent.</td>
</tr>
<tr>
<td>S</td>
<td>Geometry</td>
<td>Curvature, tensor calculus, isoperimetric problems.</td>
</tr>
<tr>
<td>T</td>
<td>Basic Combinatorics</td>
<td>Counting, probability; generating functions; recurrence relations.</td>
</tr>
<tr>
<td>U</td>
<td>Introduction to Optimisation</td>
<td>Convex functions; necessary and sufficient conditions; Lagrange multipliers.</td>
</tr>
<tr>
<td>V</td>
<td>Measure Theory &amp; Integration</td>
<td>Measurable functions; Lebesgue integral; summability of integrable functions.</td>
</tr>
<tr>
<td>W</td>
<td>Functional Analysis</td>
<td>Banach spaces; Lp spaces; Hilbert spaces; spectral theory.</td>
</tr>
<tr>
<td>X</td>
<td>Fields &amp; Equations</td>
<td>Algebraic closure of a field; finite fields; Galois theory.</td>
</tr>
<tr>
<td>Z</td>
<td>Mathematical Principles of Numerical Analysis</td>
<td>Accuracy of algorithms; iterative methods; root finding; interpolation; numerical differentiation.</td>
</tr>
</tbody>
</table>

### Section Four

Other methods of solution. Fredholm's equation with degenerate kernels and its solutions.

- **Text Nil**
- **References**

### Section Five

- **Arthurs, A.M.** Completemary Variational Principles (Pergamon 1963)
- **Chambers, L.G.** Integral Equations: A Short Course (International 1979)
- **Elsgolc, L.E.** Calculus of Variations (Pergamon 1963)
- **Kanwal, R.P.** Linear Integral Equations (Academic 1971)
- **Weinrock, R.** Calculus of Variations (McGraw-Hill 1952)
- **Tyldesley, J.R.** Elements of Tensor Calculus (McGraw-Hill 1962)
- **Lichnerowicz, A.** Covariant and contravariant vectors, general systems of coordinates, covariance and contravariance. 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.
- **References**
- **Abram, J.** Tensor Calculus through Differential Geometry (Butterworths 1965)
- **Willmore, T.J.** An Introduction to Differential Geometry (Oxford 1972)

### Section Six

- **Courant, R. & Hilbert, D.** Methods of Mathematical Physics Vol.II Partial Differential Equations (Interscience 1966)
663381 Topic P - Basic Combinatorics

Lecturer: W. Bolley

Prerequisites: At least one part I mathematics subject (UA or UB or RC or ICS)

Introduction: 1 lecture hour per week and 1 tutorial hour per fortnight

Examination: One 2-hour paper

Concept:

Basic counting ideas, Combinatorial identities. Different interpretations of “the same”. Paritions, Recurrence relations, Generating functions. Polynonial methods and extensions. Equivalence of some “classical numbers”. Construction of some designs and codes.

Test Nil

References:

Lin, C.L., Introduction to Combinatorial Mathematics (McGraw-Hill) 1967

Kristanekkhi, V., Combinatorics: Theory and Applications (Wiley) 1986

B hand.

Introductory Combinatorics (South Holland 1977)

Bartle

Introductory Combinatorics (Plimmon 1985)

Tucker

Applied Combinatorics (Wiley) 1985

Street, A.P. and Wallis, W.D., Combinatorics: A First Course (Charles Babbage Research Centre 1983)

663382 Topic Q - Introduction to Optimization

Lecturer: A. Stanis-Wawrz

Prerequisite: Topic CO

Complementary Topic 664158 Convex Analysis

Hours: About 20 lecture hours

Examination: One 2-hour paper

Concept:

This topic will introduce basic concepts in optimization theory. It will provide background for solving mathematical problems that arise in economics, engineering, the social sciences and the mathematical sciences. The following topics will be covered: convex and quasi-convex functions; hatal and global minima; Farkas’ lemma, alternative theorems; Lagrangian saddle points; necessary and sufficient conditions of optimality, regularity conditions, subjacent, subdifferentiability, stable problems, duality for convex problems, differential problems, finite many constraints, problems with equality constraints, the Kuhn-Tucker necessary condition, regularity conditions for differential problems, recovery and sufficiency conditions of optimality for differential problems, duality of differential problems conversely.

Test Nil

References:


de Barba, U., Introduction to Measure and Integration (Van Nostrand 1934)
SECTION FOUR  UNDERGRADUATE MATHEMATICS SUBJECT DESCRIPTIONS

Halinos, I.R.
Mixture Theory (Van Nostrand 1958)

Kolmogorov, A.N. & Fomin, S.V.
Introductory Real Analysis (Prentice-Hall 1970)

Munoz, M.E.
Introduction to Measure and Integration (Addison Wesley 1953)

663204 TOPIC W - FUNCTIONAL ANALYSIS
Lecturer I.R. Giles
Prerequisites Topics B, CO, D, K, L
Hours 2 lecture hours and 1 tutorial hour per week for 1st half year
Examination One 2-hour paper

Content
Hilbert space, the geometry of the space and the representation of continuous linear functionals. Operators on Hilbert space, adjoint, self-adjoint and projection operators. Complete orthonormal sets and Fourier analysis on Hilbert space.

Banach spaces, topological and isometric isomorphisms, finite dimensional spaces and their properties. Dual spaces, the Hahn-Banach Theorems and reflexivity. Spaces of operators, conjugate operators.

Tests
Giles, I.R.
Introduction to Analysis of Metric Spaces (CUP 1987)

Giles, I.R.
Introduction to Analysis of Normed Linear Spaces (Uni of Newcastle Lecture Notes 1988)

References
Bachman, G. & Narici, L.
Functional Analysis (Academic 1966)

Banach, S.
Theorie des Operations Lineaires 2nd edn (Chelsea)

Brown, A.J. & Page, A.
Elements of Functional Analysis (Van Nostrand 1970)

Breseniter, C.J.O.
Topology and Normed Spaces (Chapman-Hall 1974)

Kolmogorov, A.N. & Fomin, S.V.
Elements of the Theory of Functions and Functional Analysis Vol I (Graylech 1957)

Kreyzig, E.
Introductory Functional Analysis with Applications (Wiley 1978)

Linstenick, L.A. & Sobolev, U.J.
Elements of Functional Analysis (Frederick Ungar 1961)

Simonov, G.F.
Introduction to Topology and Modern Analysis (McGraw-Hill 1963)

Taylor, A.E.
Introduction to Functional Analysis (Wiley 1958)

Vilenka, A.
Functional Analysis (Blaisdell 1964)

663217 TOPIC X - FIELDS AND EQUATIONS
Lecturer R.F. Bergbott
Prerequisites Topics D & K
Hours 1 lecture hour per week and 1 tutorial hour per fortnight
Examination One 2-hour paper

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

Test

References
Birkhoff, G.D. & MacLum, S.
A Survey of Modern Algebra (Macmillan 1958)

Endres, H.M.
Galois Theory (Springer 1984)

Herstein, I.N.
Topics in Algebra (Wiley 1975)

Kaplansky, I.
Fields and Rings (Chicago 1969)

Sewart, I.
Galois Theory (Chapman & Hall 1973)

663207 TOPIC Z - MATHEMATICAL PRINCIPLES OF NUMERICAL ANALYSIS
Lecturer W.P. Wood
Prerequisites Topics CO and D; High-level language programming ability is assumed.
Hours 2 lecture hours and 1 tutorial hour per week for 1st half year
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 results, 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 multi-step methods of initial value problems involving ordinary differential equations. Investigation of stability of linear marching schemes. Boundary value problems. Finite-difference and finite-element methods of solution of partial differential equations. If time permits, other numerical analysis problems such as integration, solution of non-linear equations etc. will be treated.

Test

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

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

Ames, W.F.

Cohen, A.M. et al.
Numerical Analysis (McGraw-Hill 1973)

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

Forsey, G.E., Malcolm, M.A. & Moler, C.B.
Computer Methods for Mathematical Computations (Prentice-Hall 1977)

Isaccson, R. & Keller, H.M.
Analysis of Numerical Methods (Wiley 1966)

Lambert, J.D. & Wait, R.
Computational Methods in Ordinary Differential Equations (Wiley 1973)

Mitchell, A.R. & Wait, R.
The Finite Element Method in Partial Differential Equations (Wiley 1977)

Pizer, S.M. & Wallace, V.L.
To Compute Numerically: Concepts and Strategies (Little, Brown & Co. 1983)

Smith, G.D.

SECTION FOUR  UNDERGRADUATE STATISTICS SUBJECT DESCRIPTIONS

Details of courses offered by the Department of Statistics can be obtained from the Departmental Secretary or from Professor Dolson. Further information about statistics courses also appears in the section Notes on Degrees and Diplomas.

PART II STATISTICS SUBJECT
692100 STATISTICS II
Prerequisite Mathematics I

Hours 3 lecture hours and 1 tutorial hour per week for Semester 1 only.
Examination Assignments, tests and one 3-hour examination.

Content

This subject consists of the following topics:
Probability & Statistics
Random Processes and Simulation
Design and Analysis of Experiments

Probability and Statistics is a double topic which is available in Semesters 1 and 2, and it is a prerequisite for Random Processes and Simulation and Design and Analysis of Experiments which are single topics available in Semesters 3 and 4.

Notes

This is a double topic. As the core Statistics topic, this course introduces the key concepts of probability theory, mathematical statistics and data analysis. The emphasis is on current statistical thinking, and the statistical computer program Minitab is used extensively.

Topics covered include: descriptive statistics and exploratory data analysis, probability distributions, random variables, sampling distributions, parameter estimation and confidence intervals, hypothesis testing, goodness-of-fit tests, contingency tables, correlation and simple linear regression, an introduction to experimental design and analysis of variance, nonparametric statistics, and quality control.

Test

Larson, R.J. and Marx, M.L.

References
Koopmans, L.H.
Introduction to Contemporary Statistical Methods 2nd edition (Duxbury 1987)

Ryan, B.F., Joiner, B.L. and Ryan, T.A.
MINITAB Handbook 2nd edition (Duxbury 1985)
SECTION FOUR UNDERGRADUATE STATISTICS SUBJECT DESCRIPTIONS

692101 APPLIED STATISTICS
Prerequisite: Mathematics I
Hours: Two lecture hours per week and practical work for Semester 1 only.
Examination: Assignments, tests and one 2-hour examination.
Content: This course is about the theory and practice of Time Series Analysis - the analysis of data collected at regular intervals in time (or space). Topics covered include: stationary processes, ARMA models, models for periodic phenomena, and analysis using MINITAB and other Time Series packages.
Text: Cryer, J.D.
Time Series Analysis (Duxbury Press 1986)
Fuller, W.A.
Introduction to Statistical Time Series (Wiley 1976)
Box, G.E.P. and Jenkins, G.M.
Time Series Analysis: Forecasting and Control (Holden Day 1976)

692102 SURVEY SAMPLING
Prerequisite: Probability and Statistics
Hours: Two lecture hours and one tutorial hour per week for Semester 2 only.
Examination: Assignments, tests and one 2-hour examination.
Content: This course covers the statistical principles that are used to construct and assess methods for collecting and analyzing data from finite populations. Topics covered include: simple random sampling, ratio and regression estimators, stratified sampling and cluster sampling, and other relevant sections from the text. An introduction to the use of computers for processing and analyzing survey data will be given. Some consideration of the practical problems will be obtained through the class projects.
Text: Davoli, V.
Elements of Sampling Theory (U.I.P. 1976)
References:
Cochrane, W.G.
Sampling Techniques 3rd edition (Wiley 1977)
Kish, L.
Survey Sampling (Wiley 1965)
Subjects in the Schedule of the Bachelor of Computer Science Degree

531600 Computer Engineering I

Note: This subject is available only to students enrolled in the Bachelor of Computer Science degree course.

Corequisite: Mathematics I

Hours: To be advised

Examination: To be advised

Consent: Electrical and Computer Engineering I is an introductory course to electrical circuits and digital systems. The lectures are supported by tutorials and extensive laboratory work. The laboratory component includes an introduction to oscilloscopes, function generators, electronic power supplies and other laboratory instruments.

Part 1


Part 2


Subjects in Schedule B of the Bachelor of Mathematics Degree

Part 1: Subjects

541100 Engineering I

Advisory Prerequisites: 3 units Mathematics, 2 units Physics and 2 units Chemistry (emphasis may vary depending on the components selected)

Corequisite: Mathematics I

Hours: Each unit requires approximately 42 contact hours

Examination:

Progressive Assessment and Examination Content:

Four units chosen from CE111, CE114, CE113 (2 units), GE101, GE113 and ME111 described below. Other units may be substituted with the approval of the Dean of the Faculty.

(i) 521105 ME111 MECHANICS AND STRUCTURES


Text:

Atkins, K.J., et al

Mechanics and Structures (Science Press)

Atkins, K.J.

Teaching Programmes in Mechanics and Structures (Science Press)

Atkins, K.J. and Darwall, P.

Mechanics and Structures: Worked Problems (Science Press)

(ii) 511108 CE141 INDUSTRIAL PROCESS PRINCIPLES


(iii) 511111 CH113 CHEMICAL AND MANUFACTURING PROCESSES

An introduction to the structure and organisation of the chemical and metallurgical industries in Australia, with reference to the world scene. Description of processes used in the manufacture of the major industrial chemicals, including hydrogenation and smelting operations. Outline of typical unit operations. Description of various processes used in the fabrication and utilisation of materials. Visits to a number of industrial plants illustrative of the course material, and preparation of process flow diagrams.

Text:


Examination:

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

Content:

Accounting IIA and Accounting IIB

Accrafair IIA


541102 GE111 INTRODUCTION TO MATERIALS SCIENCE

The course provides a general introduction to materials of engineering significance and to the relationship 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 structures and properties of ceramics and cement products. Polymers, rubbers and adhesives; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical, magnetic, optical and thermal properties of solid materials.

Text:

Ashford, D.R.


or

Flinn, R.A. and Trojan, P.K.

Engineering Materials and Their Applications 2nd or 3rd edn. (Houghton, Mifflin 1981)

541104 ME111 GRAPHICS AND ENGINEERING DRAWING

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

Text:


541106 PART II SUBJECTS

413400 ACCOUNTING I

Prerequisites: Accounting I, Mathematics I

Hours: 4 lecture hours and 4 tutorial hours per week

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

Content:

Accounting IIA and Accounting IIB

Accrafair IIA


541107 GE112 INTRODUCTION TO MATHEMATICS SCIENCE

The course provides a general introduction to materials of engineering significance and to the relationship 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 structures and properties of ceramics and cement products. Polymers, rubbers and adhesives; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical, magnetic, optical and thermal properties of solid materials.

Text:

Ashford, D.R.


or

Flinn, R.A. and Trojan, P.K.

Engineering Materials and Their Applications 2nd or 3rd edn. (Houghton, Mifflin 1981)

541104 ME111 GRAPHICS AND ENGINEERING DRAWING

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

Text:


541106 PART II SUBJECTS

413400 ACCOUNTING I

Prerequisites: Accounting I, Mathematics I

Hours: 4 lecture hours and 4 tutorial hours per week

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

Content:

Accounting IIA and Accounting IIB

Accrafair IIA

American Accounting Association
A Statement of Basic Accounting Theory

American Institute of Certified Public Accountants
Objectives and Functions of Financial Statements

Beaver, W.H.
Financial Reporting: An Accounting Revolution (Prentice-Hall)

Brennan, M. & Hopwood, A. (eds)
Essays in British Accounting Research

Chambers, R.J.
Accounting, Evaluation and Economic Behavior (Prentice-Hall)

Financial Accounting Standards Board

Principles of Financial Accounting Concepts

Parker, R.H. & Harcourt, G.C.
Readings in the Concept of Measurement of Income (Cambridge U.P.)

Accounting IIB

Prerequisites: Accounting I and Accounting IIB

Hours: 2 lecture hours per week

Content:
The application of analytical reasoning to the use of cost accounting in formal models of organizational decision making: financial modelling, decision analysis, cost estimation and allocation, product mix decisions. Significant use is made of the contents of Introductory Quantitative Methods.

Text:
Kaplan, R.S.

Advanced Management Accounting (Prentice-Hall)

References:

Bailey, E.

Pricing Practices and Strategies (Conference Board)

Corcoran, A.

Cost (Wiley)

Gordon, L.A. et al.

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

Mintel, R.

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

O'Connor, R.

Planning under Uncertainty: Multiple Scenarios and Contingency Planning (The Conference Board)

413619 FOUNDATIONS OF FINANCE

Prerequisites: Accounting 1, Introductory Quantitative Methods and Economics 1

Hours: 2 lecture hours and 1 tutorial hour per week

Examination: One 3-hour final paper

GENERAL INFORMATION

(See separate entry for Faculty of Medicine)

JANUARY
1. Friday Public Holiday — New Year's Day
2. Friday Last day for return of Application for Re-Enrolment Forms — Continuing Students
3. Wednesday Deferred Examinations begin
4. Friday Deferred Examinations end
5. Thursday Public Holiday — Australia Day
6. Monday First Term begins

February
1. Monday First Term begins

TERM DATES FOR THE BACHELOR OF MEDICINE PROGRAMME 1985

Year 1

Term 1
Feb 25 — Apr 29 10 weeks

instructor
Jan 14/85 10.4.85

Vacation
May 3 — May 20 3 weeks

Term 2
May 23 — July 22 9 weeks

Autumn
Oct 21 — Nov 4 2 weeks

Mini-elective
Nov 7 — Nov 18 2 weeks

Year 2

Term 1
Feb 22 — Apr 29 10 weeks

instructor
Jan 14/85 10.4.85

Vacation
May 2 — May 20 3 weeks

Term 2
May 23 — July 22 9 weeks

Consolidation
July 25 — July 29 1 week

Vacation
Aug 1 — Aug 12 2 weeks

Term 3
Aug 15 — Oct 14 9 weeks

Consolidation
Oct 17 — Oct 21 1 week

Semester
Oct 24 — Nov 28 4 weeks

Autumn
Nov 30 — Apr 11 11 weeks

Mini-elective
Nov 14 — Nov 25 2 weeks

Year 3

Term 1
Feb 8 — Apr 22 10 weeks

instructor
Jan 14/85 10.4.85

Vacation
Apr 25 — Apr 29 1 week

Term 2
May 3 — Jun 24 8 weeks

Vacation
Jun 27 — Jul 1 1 week

Term 3
Jul 4 — Aug 26 8 weeks

Review
Aug 29 — Sep 5 1 week

Semester
Sep 5 — Sep 9 1 week

Autumn
Oct 22 — Dec 30 3 weeks

Vacation
Oct 3 — Dec 7 1 week

Election 1
Oct 10 — Dec 2 9 weeks

Note: Date not finalised
### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Year IV</th>
<th>TERM 1</th>
<th>Feb 1</th>
<th>March 11</th>
<th>6 weeks</th>
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</thead>
<tbody>
<tr>
<td>TERM 2</td>
<td>Mar 14</td>
<td>April 29</td>
<td>6 weeks</td>
<td></td>
</tr>
<tr>
<td>plus Easter</td>
<td>1/4/88</td>
<td>8/4/88</td>
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<td>Vacation</td>
<td>May 31</td>
<td>May 2</td>
<td>2 weeks</td>
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<tr>
<td>TERM 3</td>
<td>May 31</td>
<td>June 24</td>
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<td>June 27</td>
<td>Aug 5</td>
<td>6 weeks</td>
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<tr>
<td>GP Training</td>
<td>Aug 1</td>
<td>Aug 17</td>
<td>11/2 weeks (inclusive)</td>
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<tr>
<td>Academic Holiday</td>
<td>June 30</td>
<td>6/2 weeks</td>
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<td>Term 4</td>
<td>Aug 19</td>
<td>Aug 6</td>
<td>12 weeks</td>
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<td>Term 5</td>
<td>Aug 29</td>
<td>Oct 7</td>
<td>6 weeks</td>
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<tr>
<td>Term 6</td>
<td>Oct 10</td>
<td>Nov 18</td>
<td>6 weeks</td>
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</tr>
<tr>
<td>Summer</td>
<td>Nov 21</td>
<td>Nov 23</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Assessments</td>
<td>Nov 28</td>
<td>Dec 1</td>
<td>2 week</td>
<td></td>
</tr>
</tbody>
</table>

### ADVICE AND INFORMATION

Advice and information on matters concerning the Faculties of the University can be obtained from a number of people.

**Faculty Secretaries**
For general enquiries about University regulations, Faculty rules and policies, studies within the University and so on, students may consult:

- **Faculty Secretary**: 685711
- **Department**: 685711
- **Arts**: 685296
- **Economics & Commerce**: 685695
- **Education**: 685417
- **Engineering**: 685630
- **Mathematics**: 685565
- **Medicine**: 685613
- **Science**: 685565

### GENERAL INFORMATION

Some arrangements may be obtained by the UCAC or from the Student Administration Office and close with the UCAC on 1 October each year. There is a $40 fee for late applications.

### ATTENDANCE STATUS
A candidate for any qualification other than a postgraduate qualification who is enrolled in three quarters or more of a semester course 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.

### 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.

### CHANGE OF NAME
Students who change their name should advise the Student Administration Office. Marriage or death 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 or changing course status (for example from full-time to part-time) or transferring to a different degree or faculty.

### WITHDRAWAL
Application to withdraw from a subject should be made on the Variation of Programme Form which is submitted to the Student Administration Office and lodged at the Student Administration Office or mailed in the Secretary.

Requests for courses and where appropriate documentation in the form of medical or other appropriate certificates must be submitted.

### WITHDRAWAL DATES

<table>
<thead>
<tr>
<th>Fall Year</th>
<th>First Half-Year</th>
<th>Second Half-Year</th>
<th>Sat, Sun</th>
<th>Mon, Tues</th>
<th>Mon, Tues</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 or her withdrawal, it is important that full details of these circumstances be provided with the application to withdraw.

CONFINEMENT OF ENROLMENT

Students should ensure that all details on their Approved Program Form are correct. Failure to check this data could create problems at examination time. A Confined Enrolment form will not be sent in 1988.

FAILURES TO PAY OUTSTANDING DEBT

Any student who is required to the University by reason of non-payment of fees, to pay any part of any fine imposed, or who has failed to pay any overdue debts shall not be permitted to:

- complete a course in a following year;
- receive a transcript of academic record; or
- graduate or be awarded a Diploma until such debts are paid.

Students are expected to pay any debts incurred without delay.

LEAVES OF ABSENCE

A student who does not wish to enrol for any period up to three years should write to the Secretary and request for leave of absence. Leave will be granted to those students who are in good standing. Applications should be submitted before the end of the first week of the first term for which leave is to be granted, or in the course of the second week of the following term. Leave of absence will not generally be granted for more than three years and will not be granted prospectively.

In the case of the I-Maked, degrees the following applies:

at the completion of an academic year, a candidate whose performance is deemed by the Faculty Board to be satisfactory may be granted leave of absence under such conditions as the Faculty Board may determine. Such leave will not generally be granted for more than one year.

Application for leave of absence by an undergraduate degree course must be made through the UCAC (see p. II).

ATTENDANCE AT CLASSES

Where a student's attendance at classes has not been satisfactory, notice may be taken under the Regulations Governing Unsatisfactory Progress. In the case of illness or absence for other measurable 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 internal 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 or the Higher Education Administration Charge.

GENERAL CONDUCT

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

Students are expected to conduct themselves at all times in a proper 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 for whom the purpose have authority to report on disorderly or improper conduct occurring in the University.

NOTICES

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

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

STUDENT MATTERS GRANDLY

The main notice board is the display point for notices concerning enrolment matters, scholarship enquiries, University rules and timetables, etc. This notice board is located on the path between the Union and the Library.

EXAMINATIONS

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

EXAMINATION PERIODS

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

- End of First Term: 16 to 20 May 1988
- Mid-Year: 27 June to 5 July 1988
- End of Second Term: 7 to 25 November 1988

Except in the case of the I-Maked, degrees the following applies:

at the completion of an academic year, a candidate whose performance is deemed by the Faculty Board to be satisfactory may be granted leave of absence under such conditions as the Faculty Board may determine. Such leave will not generally be granted for more than one year.

Application for leave of absence by an undergraduate degree course must be made through the UCAC (see p. II).

EXAMINATION PERIODS

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

- End of First Term: 16 to 20 May 1988
- Mid-Year: 27 June to 5 July 1988
- End of Second Term: 7 to 25 November 1988

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

Examinations are normally held in the Great Hall area and (in November) the Achurch Spciei.-ium. The examination list for examinations will be placed on the Noticeboard of the Department offering the subjects, and on a noticeboard outside the examination room.

Students can take into the examination room an approved dictionary, instrument, drawing instrument or eraser. Logarithmic tables may not be taken in; they will be available from the proctor if needed. Calculators are only allowed if specified in a permitted aid. They must be hand held, history operated and non-programmable and students should note that no connection will be granted:

- to a student who is prevented from bringing into a laboratory or examination room a programmable calculator;
- to a student who uses a calculator unnecessarily;
- because of battery failure.

RULES FOR FINAL EXAMINATIONS

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

- candidates shall comply with any instructions given by a supervisor relating to the conduct of the examination;
- before the examination begins candidates shall not read the examination paper until granted permission by the supervisor which shall be given at the start of the examination;
- no candidate shall enter the examination room after thirty minutes from the time the examination has commenced;
- no candidate shall leave the examination room during the first thirty minutes or the last ten minutes of the examination;
- no candidate shall re-enter the examination room after he has left it unless during the full period of his absence. No less than ten approved supervisors;
- a candidate shall not bring into the examination room any bag, paper, booklet, written material, device or aid whatever, other than such as may be specified for the particular examination;
- a candidate shall not by any means obtain or communicate to any other candidate, or attempt any breach of good order;
- a candidate shall not take from the examination room any examination answers book, graph paper, question paper or other material issued to him for the purpose of the examination;
- no candidate may invoke in the examination room. Any infringement of these rules constitutes an offence against discipline.

EXAMINATION RESULTS

Examination results and re-enrolment papers will be available for collection at the University Building on December 1988. The dates for collection will be put on noticeboards outside the main examination rooms in November.

Results not collected will be mailed.

No results will be given by telephune.

After the release of the annual examination results a student may apply to have a result reviewed. There is a charge of $5.00 per subject, which is refundable in the event of an examination being offered again.

Applications for review must be submitted on the appropriate form together with the prescribed fees by 15 January 1988. 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 CONSIDERATION

All applications for special consideration should be made in writing, on the form provided. Relevant evidence should be attached to the application (see Regulation 17(2) of the Examination Regulations, Calendar Volume 1). Also refer to Faculty Policy.

Applications for special consideration are available from the Student Administration Office and the University Health Service. Before a student's application for special consideration will be considered on the grounds of personal illness it will be necessary for a medical certificate to be furnished to the Student Affairs Office.

If a student is affected by illness during an examination and wishes to sit for special consideration, he or she must report to the proctor in charge of the examination and then make written application to the Secretary within three days of the examination (see Regulation 17(2) of the Examination Regulations, Calendar Volume 1). Also refer to Faculty Policy.

Applications for special consideration should state that a Faculty Board is not obliged to grant a special examination. The evidence presented should state the reason why the applicant was unable to attend an examination, or how preparations for an examination was disrupted. If the evidence is in the form of a medical certificate the Doctor should state the nature of the disability not specified that the applicant is unsuited to attend examination on a particular day or could attend but that the performance of the applicant would be affected adversely by a period of disability exceeding beyond one day the period should be stated.

DEFERRED EXAMINATIONS

The Senate of the Faculty of Architecture, Engineering, and Mathematics has graciously deferred examination for such examinations, if granted, will be held in January-February and candidates will be advised by mail of the time and results of the examination.

UNSATISFACTORY PROGRESS

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

Students who become liable for action under the Regulations will be informed accordingly by mail after the release of the final outcomes of their examinations results and will be informed of the procedure to be followed if they wish to 'speak'.

Appeals against exclusion must be lodged together with Application for Re-enrolment forms by Friday 8 January 1988.

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

REGULATIONS GOVERNING UNSATISFACTORY PROGRESS

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

2. Students who are required to pass courses in order to continue to enrol at the University may only apply for Re-enrolment when they have obtained a pass in all courses and have fulfilled all other requirements set out in University Regulations.

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

1 A programmable calculator will be permitted provided program cards and details are not taken into the examination room.
The enrolment of a student.

4. Where the progress of a student who is enrolled in a combined course or who has previously been enrolled for an 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) or (4) of these Regulations shall be in such form as may be prescribed by the Admissions Committee and shall be made within fifteen (15) days from the date of posting to the student of the notice of the decision of the Board or shall, if further period as the Admissions Committee may accept.

5. (3) 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.

The appellate and the Dean or his nominee shall have the right to be heard in person by the Admissions Committee.

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 in respect of any of these Regulations.

The Admissions Committee shall consider any case referred to it by a Faculty Board and may:

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

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

(c) exclude the student from the University.

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

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. A student who has been excluded from further enrolment in a Faculty may enrol in a course in another Faculty or Faculty 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.

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 thereupon 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;

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

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

A student whose application to enrol pursuant to Regulation 8 (3) (b) of these Regulations is rejected by the Admissions Committee may appeal to the Vice-Chancellor.

CHARGES

The General Services Charge (details below) is payable by all students. New undergraduate students are required to pay charges when they enroll to complete their first registration. Re-enrolling students receive in October each year, as part of their re-enrolment kit, a statement of charges payable. Students are expected to pay charges in advance of enrolment and payment is due in the last day of the Re-enrolment Approval period for the particular course (prior to 9.11.1988).

1. General Services Charge and or Diploma/Admission Fees.

PhD Students joining Newcastle University Union for the fee of $157.

(b) Non-Degree Students

Newcastle University Union Charge for the fee of $50.

(c) Service Personnels with proven grounds on basis of inviability.

2. Other Charges

(a) Examination under special supervision

( ) Exam per subject

(b) Review of examination results

( ) $8 per subject

(c) Statement of remedial work for non-graduates of the University

( ) $4

(d) Replacement of Re-enrolment kit

( ) $10

(e) Re-enrolment Kit Replacement of Re-enrolment approval statement

( ) $10

(f) Replacement of Student Card

4. Higher Education Administration Charge

( ) $263

5. Indelible Students

( ) $50

6. Higher Education Administration Charge

HIGHER EDUCATION ADMINISTRATION CHARGE

Subject to certain exemptions listed below, the charge will apply uniformly to students in universities and colleges throughout education instituting full award courses, or equivalent or individual subjects which could form part of a higher education award.

The charge will apply to students enrolled on a full-time, part-time, or external basis and will be imposed in the time of enrolment.

The following categories of students will be exempted from the charge:

Category

Evidence Required

(i) Supporting Parent, Care, or Invalid Pensioner.

(ii) Widow of a pensioner

(iii) Widow of an invalid pensioner

(iv) Student on full maintenance

Concession Card (includes TransportConcession), or Social Security Card, or other Pharmaceutical Benefits Concession Card or Pensioner Health Benefit Card, including dependency children.

A notice of award of a Newcastle University Scholarship, or the value of living allowance in excess of $1,000, not including dependents' allowance.

Applicants in obvious evidence from the Office of the Department of Veterans Affairs.

APPENDIX

Evidence Required

(i) Supporting Parent, Care, or Invalid Pensioner.

(ii) Widow of a pensioner

(iii) Widow of an invalid pensioner

(iv) Student on full maintenance

Concession Card (includes Transport Concession), or Social Security Card, or other Pharmaceutical Benefits Concession Card or Pensioner Health Benefit Card, including dependency children.

A notice of award of a Newcastle University Scholarship, or the value of living allowance in excess of $1,000, not including dependents' allowance.

Applicants in obvious evidence from the Office of the Department of Veterans Affairs.

APPENDIX

Evidence Required

(i) Supporting Parent, Care, or Invalid Pensioner.

(ii) Widow of a pensioner

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(iv) Student on full maintenance

Concession Card (includes Transport Concession), or Social Security Card, or other Pharmaceutical Benefits Concession Card or Pensioner Health Benefit Card, including dependency children.

A notice of award of a Newcastle University Scholarship, or the value of living allowance in excess of $1,000, not including dependents' allowance.

Applicants in obvious evidence from the Office of the Department of Veterans Affairs.
The following groups will be effectively exempted from the charge by receiving a special allowance to offset the charge:
- beneficiaries of an Award;
- holders of an award under the Postgraduate Awards Scheme, and
- holders of an Alumni Gift.

Students in these categories will be reimbursed through the student payments arrangements.

Overseas students who are liable for the Overseas Students Charge (OSSC) will be required to pay the administration charge to the University, but the OSSC calculated each year will be reduced by the amount of the administration charge.

**Assistance**

(a) **Assistants**

Higher education assistants on Assistant Allowance will receive a special payment of $300 to cover the administration charge.

(b) **Loans**

Loans are available to eligible students in lieu of university charges. The loan period is normally 36 months but in appropriate circumstances may be taken over 12 months. Enquiries should be directed to Mr. J. Birch, Student Administration Office.

**METHOD OF PAYMENT**

Students are requested to pay charges due by mailing their cheque and the Statement of Charges Payable form to the University Cashier. The cheques must be deposited at the Cashier's Office or the McClunin Building. Cheques drawn on another bank and not accepted are subject to a $10 charge. The University and Cashier's Office require 5 working days for payment to be deposited into the bank account. The Cashier's Office will continually monitor the accounts of students with accounts in arrears and will contact students by mail or phone if such circumstances arise.

**CAMPUS TRAFFIC AND PARKING**

Persons wishing to bring motor vehicles (including motor cycles) on to the campus are required to complete a parking registration form for each vehicle. Completed forms must be submitted to the Student (Patrol) Office located off the foyer of the Great Hall. All persons must comply with the University's Traffic and Parking Regulations including parking in approved parking areas, complying with road signs and a speed limit of 35 k.p.h. on campus. Persons who are Habitual Offenders, or persons who have been convicted of traffic offences, including speeding and parking in arc, may be prevented from entering the campus.

The University administration reserves the right to impose a penalty of $30 to $150 for each offence as determined by the Court. Legal fees and costs of collection will be charged against the offender. Penalties imposed for traffic offences may result in dismissal from the University or disciplinary measures, including expulsion, at the discretion of the University. The University reserves the right to add traffic fines to the University fee schedule.

**SCHOLARSHIP HOLDERS AND SPONSORED STUDENTS**

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

**LOANS**

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

**REFUND OF CHARGES**

A refund of the General Services Charge paid on a course of study will be made when the student notifies the Student and Faculty Administration Office of a complete withdrawal from studies by the following dates:

- Notification on or before 15th March 1988: 100% refund
- Notification on or before 24th June 1988: 50% refund
- After 24th June 1988: No refund

A refund cheque will be mailed to a student or if applicable a sponsor. Any change of address must be advised.

A refund will not be made before 31 March 1988.

The Higher Education Administration Charge will only be refunded if notification of complete withdrawal is received on or before 15th February 1988. A refund of the charge for complete withdrawal will not be made after that date.

**HIGHER DEGREE CANDIDATES**

Higher degree candidates are required to pay the Higher Education Administration charge and the General Services charge and Union Entrance charge, if applicable. Where the candidate is in receipt of First or Second Tier, the General Services charge is reduced from the first day of the term to the Friday immediately preceding the first day of First Tier in the following academic year. Where enrolment is on or after the first day of Third Tier, the General Services charge paid will cover the period to the end of the long vacations following the next academic year. The Higher Education Administration charge applies to each academic year, e.g. if enrolment is on the first day of third term the charge is payable for that year. On enrolment in the subsequent years a further charge is payable for each year.

**CAMPUS TRAFFIC AND PARKING**

Persons wishing to bring motor vehicles (including motor cycles) on to the campus are required to complete a parking registration form for each vehicle. Completed forms must be submitted to the Student (Patrol) Office located off the foyer of the Great Hall. All persons must comply with the University's Traffic and Parking Regulations including parking in approved parking areas, complying with road signs and a speed limit of 35 k.p.h. on campus. If the Manager, Buildings and Grounds, after affording the persons a period of seven days in which to submit a written statement is satisfied that any person is in breach of Regulations, he may:

(a) warn the person against committing any further breach; or

(b) impose a fine; or

(c) refer the matter to the Vice-Chancellor.

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

- Parking in areas not set aside for parking: up to $5
- Parking in special service areas, e.g. bowling bays, fire hydrants, etc: up to $5
- Driving offences including speeding and dangerous driving: up to $30
- Falling to stop when signalled to do so by an attendant: up to $30
- Refusing to give information to an attendant: up to $30
- Falling to obey the directions of an attendant: up to $30
- The Traffic and Parking Regulations are stated in full in the Calendar, Volume 1.

**SECTION FOUR**

**DESCRIPTION OF MAJOR SUBJECTS FROM OTHER FACILITIES**

<table>
<thead>
<tr>
<th>Content</th>
<th>Description of Major Subjects from Other Facilities</th>
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</thead>
<tbody>
<tr>
<td>Fluid Mechanics</td>
<td>CE333</td>
</tr>
<tr>
<td>Channel Hydraulics</td>
<td>CE334</td>
</tr>
<tr>
<td>Civil Engineering Systems</td>
<td>CE351</td>
</tr>
</tbody>
</table>

For unit descriptions consult the 1988 Faculty of Engineering Handbook.

**533900 COMMUNICATIONS AND AUTOMATIC CONTROL**

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

**Hours** 6 lecture, tutorial & laboratory hours per week

**Examination** Progressive assessment & final examination

**Content**

(i) 503006 GE361 Automatic Control

(ii) 533113 EE354 Communications

(iii) 533143 EE447 Digital Communications

For unit descriptions consult the 1988 Faculty of Engineering Handbook.

**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) 503006 GE361 Automatic Control - see entry under Communications and Automatic Control

(ii) 532116 EE264 Assembly Language and Operating Systems - see CS II topic: Introduction to Assembly Language and Operating Systems

(iii) 533902 EE362 Switching Theory & Logical Design - see entry under Diploma in Computer Science subjects

**433800 ECONOMICS IIC**

**Prerequisites** Mathematics IIA & IIC & Economics IIA

**Hours** As indicated in the description of the component

**Examination** To be advised

**Content**

Two points of the following so as to include Economics I or Mathematical Economics or both;

(i) 423308 ECONOMICS I 1.0 point

(ii) 423309 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
An introduction to theoretical and economic application of the calculus of variations, and optimal control techniques.

Text

Archibald, G.C. & Lightning, R.S.
An Introduction to a Mathematical Treatment of Economics 3rd edn (Weidenfeld & Nicolson 1977)

References

Tu, Prieve N.V.
Introduction to Optimisation Dynamics (Springer-Verlag 1983)

Benavie, A.
Mathematical Techniques for Economic Analysis (Prentice-Hall 1973)

Chiang, A.

Durnburg, T. & L.
Macroeconomic Analysis: An Introduction to Comparative Statics and Dynamics (Addison-Wesley 1969)

Dowling, E.T.

Hodley, G. & Kemp, M.C.
Finite Mathematics in Business and Economics (North Holland 1972)

Harcaster, J.T. & Pangel, R.S.
Introduction to Economic Analysis 2nd edn (Reston Publishing Co. Inc. 1976)

Henderson, J.M. & Quah, R.

Intiligator, M.D.
Mathematical Optimization and Economic Theory (Prentice-Hall)

Yamane, T.
Mathematics for Economists: An Elementary Survey (Prentice-Hall latest edition)

(iii) 423113 DEVELOPMENT

Lecturer: C.W. Stahl

Prerequisites: Mathematics II

Hours: 2 lecture hours per week for half of the year

Examination: One 3-hour paper

Content

The course commences with a discussion of the concepts of development and poverty. Major topics to follow are: the role and scope for international specialisation, the gains from trade, optimal trade intervention, the effects of trade at the national and international levels and the theory of preferential trade. Australian illustrations are used wherever possible.

Texts

Carbaugh, R.J.
International Economics 2nd edn (Wadsworth, Calif. 1985)

Hunter, J. & Wood, J.
International Economics (Sydney, Harcourt Brace 1983)

McEner, G.M.

Reference

Baldwin, R.E. and Richardson, S.E. (eds)
International Trade and Finance 3rd edn (Boston, Little Brown & Co. 1980)

(vii) 423103 INTERNATIONAL ECONOMICS

Lecturer: C. Stanton

Prerequisites: Economics II

Hours: 2 lecture hours per week for half the year

Examination: Two 2-hour papers and progressive assessment

Content

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

References

Browne, C.V. & Jackson, P.M.
Public Sector Economics (Martin Robertson)

Buchanan, J.M. & Flowers, M.R.
The Public Finances (Irwin)

Cullbertson, J.M.
Microeconomic Theory and Stabilisation Policy (McGraw-Hill)

Groseweg, P.D. (ed)
Australian Taxation Policy (Longman Cheshire)

Groseweg, P.D.
Public Finance in Australia: Theory and Practice, (Penguin-Hall)

Houghton, R.W. (ed)
Public Finance (Penguin)

Johansen, L.
Public Economics (North Holland)

Mishan, E.J.
Cost-Benefit Analysis (Allen & Unwin)

Musgrave, R.A. & P.B.
Public Finance in Theory and Practice (McGraw-Hill)

Rees, Ray
Public Enterprise Economics 2nd edn (Weidenfeld & Nicolson 1964)

Shoup, C.S.
Public Finance (Weidenfeld & Nicolson)

Veale, J. et al.

Wilkes, J. (ed)
The Politics of Taxation (Holder & Stougham)
(vii) 423114 GROWTH AND FLUCTUATIONS
Lecturer: S. Shezory
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:
(i) The neo-classical theory of international trade and equilibrium, the modern theory of trade, its classification, 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.
(ii) International monetary economics, the foreign exchange market and the role of arbitrage, extension of the analysis of the flexible exchange 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.

Texts
Gehrke, Herbert G.
International Economics (Irwin 1981)
Kenen, P.B.
The International Economy (Prentice-Hall 1985)

(viii) 423116 ADVANCED ECONOMIC ANALYSIS
Lecturers: D. B. Hughes, J. Stoner, J. Burgess

This course is a prerequisite for Economics IV
Prerequisite: Economics II
Hours: 2 lecture hours per week
Examination: Two 2-hour papers and progressive assessment

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

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

References

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SECTION FOUR: DESCRIPTION OF MAJOR SUBJECTS FROM OTHER FACULTIES

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

Sawyer, M.C.
Macroeconomic in Question: The Keynesian-Monetarist Orthologies and the Kalesnikoff Alternative (Weidenfeld 1982)

Shaw, R.
Issues in Macroeconomics (Martin Robertson 1981)

Douglas, E.J.
Intermediate Microeconomic Analysis (Prentice-Hall 1982)

Ferguson, C.E.
Microeconomic Theory (Irwin 1973)

Koutsoujian, A.
Modern Microeconomics 2nd ed. (Macmillan 1979)

Tobich, C.A.
Macroeconomics of Markets (Wiley, Brisbane 1982)
SECTION FOUR
DESCRIPTION OF MAJOR SUBJECTS FROM OTHER FACULTIES

Text
To be advised

EXTRANEOUS SUBJECTS

160-046 MATHEMATICS EDUCATION II
(only not offered in 1988)

Prerequisite Mathematics I

Corequisite A Part II Mathematics subject or Statistics II

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

Examination One 2-hour paper

Content

Learning accommodations, stages of development as delineated by Piaget and others, discovery method and its limitations, Breuer 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 illustrate 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. Psycholinguistic 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.

160-047 MATHEMATICS EDUCATION III
(not offered in 1988)

Prerequisite Mathematics Education II

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 observatory model, lesson plans will be studied and compared with the results in the classroom.

RUSSIAN FOR THE SCIENTIST AND MATHEMATICIAN

Formal enrolment in this course is not required.

Lecturer C.A. Crodick

Prerequisite None, although familiarity with a modern language would be an advantage.

Hours Approximately 27 lecture hours

Examination None

Content

This is a voluntary course designed to give students and researchers of various fields an introduction to fundamental 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.

SECTION FIVE
POSTGRADUATE COURSES OFFERED IN THE FACULTY OF MATHEMATICS

Coursework Honours Degree

Bachelor of Computer Science (Honours)

Bachelor of Mathematics (Honours)

Diplomas:

Diploma in Computer Science (DipCompSc)

Diploma in Mathematical Studies (DipMathStud)

Diploma in Medical Statistics (DipMedStats)

Coursework Master Degrees:

Master of Computing (MComp)

Master of Medical Statistics (MMedStats)

Research Degrees:

Master of Computer Science (MCompSc)

Master of Mathematics (Math)

Doctor of Philosophy (PhD)

Bachelor of Computer Science (Honours)

This is a separate degree from the Bachelor of Computer Science, which may be taken full-time over one year or part-time over two years. Entry requires at least Computer Science IIB (or its equivalent) and at least a credit result. It consists of the single subject Computer Science IV, which includes a major project in addition to lecture topics (which will include topics from Computer Science IIB for students who have not already taken here).

Bachelor of Mathematics (Honours)

This is a separate degree from the Bachelor of Mathematics, and may be taken full-time over one year or part-time over two years. It consists of the single subject Mathematics IV. Honours level topics in Statistics are available as part of Mathematics IV and Statistics IV is available for students undertaking a Bachelor of Mathematics (Honours) degree.

Diploma in Computer Science

A postgraduate diploma, the Diploma in Computer Science has undergone a complete revision which takes effect in 1987. The new regulations assume that students already have a sound knowledge of basic programming in Pascal. Students who cannot demonstrate that they have such a background must first complete the preliminary subject Introduction to Programming (or Computer Science I) before taking the main subjects. The new regulations basically require students to complete subjects consisting of about half the second year and half the third year topics of the Bachelor of Computer Science degree (or exceptionally a full third year for students with a suitable background), together with a project involving about 100 hours of work.

The diploma is intended as a part-time course and prerequisites make it difficult to complete in a single full-time year, unless the candidate already has a good background (eg having previously completed Computer Science II).

Diploma in Mathematical Studies

This course is intended for graduates who wish to study more Mathematics than was available in their first degree. The course is sufficiently flexible to meet most graduates' needs.

Diploma in Medical Statistics

This is a postgraduate course offered jointly by the Faculties of Mathematics and Medicine. The programme consists of coursework and a project involving the application of statistics in a medical research study.

Master of Compuing

This is a new postgraduate coursework masters degree which requires two years full-time (or the equivalent part-time) study. To qualify for the MComp a student must pass the subject Computer Science IVM, which involves about one full year of coursework (normally based on that of Computer Science IIB and IV) together with a very substantial one-year research related project, usually associated with one of the research projects being carried out in the Computer Science Department. Applications will be considered from graduates who have completed Computer Science IIB or its equivalent (eg including the Diploma in Computer Science). The course commences at the beginning of the academic year.

Master of Medical Statistics

This degree is offered jointly by the Faculties of Mathematics and Medicine. It consists partly of coursework (mainly units offered in the Diploma in Medical Statistics) and a major project.

Master of Computer Science and Doctor of Philosophy

The MCompSc and the PhD are research degrees by thesis, requiring an original contribution to knowledge in the area of computer science. The entry requirement is a BCompSc(Hons) or equivalent honours degree with at least second class upper credit. Candidates are normally recommended to enrol initially in the MCompSc if their work is of an exceptional quality they can later transfer into the PhD programme. The area of research is usually associated with one of the research projects being carried out in the Department of Computer Science. Enrolment can take place at any time in the year. Scholarships are available (competitively); applications close about October each year.

Master of Mathematics and Doctor of Philosophy

These are research degrees by thesis requiring an original contribution to knowledge in the area of Mathematics or Statistics. Entry into either degree would normally require the Honours degree. Enrolment can take place at any time in the year. Scholarships are available (competitively); applications close about October each year.

5 Offered jointly with the Faculty of Medicine.
REGULATIONS GOVERNING THE HONOURS DEGREE OF BACHELOR OF COMPUTER SCIENCE

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

2. Definitions

In these Regulations, unless the context or subject matter otherwise indicates:

- "course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
- "Dip" means the Diploma of the Faculty;
- "the degree" means the degree of Bachelor of Computer Science (Honours);
- "Department" means the Department offering the honours subject and includes any other body so doing;
- "Faculty" means the Faculty of Mathematics;
- "Faculty Board" means the Faculty Board of the Faculty;
- "honours" subject includes all the following Bachelor programmes:
  - Bachelor of Computer Science of the Newcastle and are made in accordance with the powers vested in the Council under By-Law 5.2.1.

3. Admission to Candidature

In order to be admitted to candidature for the degree, an applicant shall

(a) have completed the requirements for admission to the ordinary degree of Bachelor of Computer Science or to any other degree the Faculty Board, or have already been admitted to that degree;
(b) have satisfactorily completed any additional work prescribed by the Dean of the Department and includes any other body so doing;
(c) have obtained approval to enrol given by the Dean on the recommendation of the Head of the Department.

4. Qualification for Admission to the Degree

To qualify for admission to the degree a candidate shall in one year of full-time study or two years of part-time study pass the following honours subject:

Computer Science IV

5. Subject

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

6. Withdrawal

(1) A candidate may withdraw from the honours subject only by informing 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 the honours subject after the last Monday in second term shall be deemed to have failed the subject save that, after consulting with the Head of the Department, the Dean may grant permission for withdrawal without penalty.

7. Classes of Honours

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 II.

8. Relaxing Provision

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.

REGULATIONS GOVERNING THE HONOURS DEGREE OF BACHELOR OF MATHEMATICS

These regulations prescribe the requirements for the honours 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.

2. Definitions

In these Regulations, unless the context or subject matter otherwise indicates:

- "course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
- "Dip" means the Diploma of the Faculty of Mathematics;
- "Faculty" means the Faculty of Mathematics;
- "Faculty Board" means the Faculty Board of the Faculty;
- "honours" subject includes all the following Bachelor programmes:
  - Bachelor of Mathematics of the Newcastle and are made in accordance with the powers vested in the Council under By-Law 5.2.1.

3. Admission to Candidature

In order to be admitted to candidature for the degree, an applicant shall

(a) have completed the requirements for admission to the ordinary degree of Bachelor of Mathematics or to any other degree the Faculty Board, or have already been admitted to that degree;
(b) have satisfactorily completed any additional work prescribed by the Faculty Board; and
(c) have obtained approval to enrol given by the Dean on the recommendation of the Head of the Department.

4. Qualification for Admission to the Degree

To qualify for admission to the degree a candidate shall in one year of full-time study or two years of part-time study pass the following honours subject:

Computer Science IV

5. Subject

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

6. Withdrawal

(1) A candidate may withdraw from the honours subject only by informing 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 the honours subject after the last Monday in second term shall be deemed to have failed the subject save that, after consulting with the Head of the Department, the Dean may grant permission for withdrawal without penalty.

7. Classes of Honours

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 II.

8. Relaxing Provision

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.

SCHEDULE OF SUBJECTS
Bachelor of Mathematics (Honours)

The prerequisites are to be taken as guides to the required background for candidates with degrees other than Bachelor of Mathematics from this University.

Mathematics IV

- Prerequisites: Mathematics IIIA and one of Mathematics IIIB, Statistics III, or Computer Science III.
- Computer Science IV

- Prerequisites: Computer Science III and one of Mathematics IIIA or Mathematics IIIB or Statistics III.
- Statistics IV

- Prerequisites: Statistics III and a Part III subject in either Mathematics or Computer Science.
- Mathematics IV/Economics IV

- Prerequisites: Mathematics IIIA & Economics IIIC
- Mathematics IV/Geology IV

- Prerequisites: Mathematics IIIA & Geology IIIC
- Mathematics IV/Physics IV

- Prerequisites: Mathematics IIIA & Physics IIIA

Mathematics IV/Psychology IV

Pre registers Mathematics IIIA & Psychology IIIC.

REGULATIONS GOVERNING THE DIPLOMA IN COMPUTER SCIENCE

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

2. Definitions

In these Regulations, unless the context or subject matter otherwise indicates:

- "course" means the programme of studies prescribed from time to time to qualify a candidate for the Diploma;
- "Dip" means the Diploma of the Faculty;
- "Faculty" means the Faculty of Mathematics;
- "Faculty Board" means the Faculty Board of the Faculty;
- "Schedule" means the Schedule of Subjects to these Regulations;
- "subject" means any of the courses for which a result may be recorded.

3. Admission to Candidature

(1) To be eligible for admission to candidature for the Diploma, an applicant shall

(a) have satisfied the requirements for admission to a degree of the University of Newcastle or to a degree of another University approved for this purpose by the Faculty Board; or
(b) have such other qualifications approved by the Faculty Board for the purpose of admission to candidature.

(2) An application for admission to candidature shall be considered by the Faculty Board, which may approve or reject any application.

4. The Faculty Board may require a candidate to complete work and/or examinations additional to the programme referred to in Regulation 6 if in its opinion the candidate has not reached the assumed standard of attainment on which the contents of any of the subjects for the Diploma are based.

5. Enrolment

(1) In any year a candidate shall enrol only in those subjects approved on the recommendation of the Head of the Department of Computer Science 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.
SECTION FIVE

POSTGRADUATE DEGREE REGULATIONS

(3) A candidate will not be permitted to enrol in a subject the content of which in the opinion of the Faculty Board is substantially equivalent to work previously counted towards another degree or diploma, except to such extent as the Faculty Board may permit.

6. Qualification for Admission to the Diploma

(1) To qualify for the award of the Diploma a candidate shall:
   (a) pass the Preliminary Subject referred to in the Schedule;
   (b) pass subjects from those listed in the Schedule, or subjects deemed by the Faculty Board to be their equivalent, with an aggregate unit value of at least twenty-two; and
   (c) complete a project prescribed by the Head of the Department of Computer Science to the satisfaction of that Head.

(2) The subjects presented for the Diploma shall include not fewer than four subjects selected from those listed in the Schedule with a unit value of three.

7. Subject

(1) To complete a subject a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written 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.

8. Standing

(1) The Faculty Board may grant standing in the course to a candidate on such conditions as it may determine, in recognition of work completed in this University or another institution.

(3) Except for the Preliminary Subject, a candidate may not be granted standing for work which has already counted towards a degree to which that candidate has been admitted or is eligible for admission.

(3) Standing granted to a candidate shall not exceed an aggregate unit value of twelve.

(4) The Dean shall determine the unit value of the work for which standing is granted.

9. Prerequisites and Corequisites

(1) The Faculty Board, on the recommendation of the Head of the Department, may prescribe prerequisites and/or corequisites for any subject comprising the course.

(2) Except with the approval of the Dean 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 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.

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

10. Withdrawal

(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 receipt of such notification.

(2) A candidate who withdraws from a subject after the relevant date shall be deemed to have failed the subject save that, after consulting with the Head of the Department, the Dean may grant permission for withdrawal 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 first Monday in Third Term;
   (c) in the case of any other subject - the last Monday in Second Term.

11. Results

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

12. Award of the Diploma

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

13. Time Requirements

(1) Except with the special permission of the Faculty Board, a full-time candidate shall complete the requirements for the Diploma in not less than one and not more than three calendar years from the commencement of the course;

(2) A candidate who has been granted standing in accordance with Regulation 8 of these Regulations shall be deemed to have commenced the course from a date to be determined by the Dean.

14. Relaxing Provision

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.

SECTION FIVE

SCHEDULE OF SUBJECTS

Diploma in Computer Science

Preliminary Subject

Prerequisites

Introduction to Programming (IP)

Subjects with a Unit Value of Two

Data Structures and Algorithms (OS&A) IP

Computer Programming (CP) IP

Assembly Language (AL) IP

Comparative Programming Languages (CPL) IP

System Analysis (SA) IP

Systems Design (SD) IP,SA

Microcomputers in Business (MB) IP

Numerical Analysis (NA) IP

Linear Algebra (LA) Mathematics 1

Discrete Mathematics (DM) Mathematics 1

Random Processes and Simulation (RPS) Mathematics 1

Switching Theory and Logical Design (ST&LD) Mathematics 1

Microprocessors and Systems Applications (M&SA) IP,AL&OS

Subjects with a Unit Value of Three

Software Engineering (SE) IP,DS&A,AL&OS

Operating Systems (OS) IP,DS&A,AL&OS

Database Design (DD) IP,DS&A,AL&OS,CP

Compiler Design (CD) IP,AL&OS,CP

Artificial Intelligence Programming Techniques (AIPPT) IP


Computer Networks (CN) IP,DS&A,AL&OS,IP

Theory of Computation (TC) IP

REGULATIONS GOVERNING THE DIPLOMA IN MATHEMATICAL STUDIES

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

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

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

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

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

6. (1) To qualify for the Diploma, a candidate shall, in not less than 2 years of part-time study or 1 year of full-time study, pass a programme of subjects comprising at least 24 units of advanced work.

7. The programme shall consist of subjects offered by the Department of Mathematics, Statistics and Computer Science or another Department offering courses with considerable mathematical content.

8. (1) The Faculty Board may approve a Project for inclusion in the candidate's programme, such a project shall have a unit value of 2.

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

6 No more than 5 units at the Part II level may be counted.

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

11. Results

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

12. Award of the Diploma

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

13. Time Requirements

(1) Except with the special permission of the Faculty Board, a full-time candidate shall complete the requirements for the Diploma in not less than one and not more than three calendar years from the commencement of the course;

(2) A candidate who has been granted standing in accordance with Regulation 8 of these Regulations shall be deemed to have commenced the course from a date to be determined by the Dean.

14. Relaxing Provision

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

REGULATIONS GOVERNING THE DIPLOMA IN MEDICAL STATISTICS
1. These Regulations prescribe the requirements for the award of Diplomas in Medical Statistics of the University of Newcastle and are made in accordance with the powers vested in the Council under By-law 5.2.1.
2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
   "the Board" means the Board of Studies in Medical Statistics;
   "the Diploma" means the Diploma in Medical Statistics.
3. The Diploma shall be awarded in two grades, namely:
   Diploma in Medical Statistics with Merit
   Diploma in Medical Statistics.

4. An applicant for admission to candidature for the diploma shall:
   (a) have satisfied all the requirements for admission to a degree of the University of Newcastle, or to a degree of any other tertiary institution approved for this purpose by the Board, or
   (b) have other qualifications approved for this purpose by the Senate on the recommendation of the Board.
5.(1) Notwithstanding the provisions of Regulation 4(a), a student with not more than the equivalent of one year of full-time studies remaining to qualify for a degree may be permitted to enrol as a part-time student for the Diploma with such programme as the Board may approve. Before making any decision the Board shall seek the agreement of the Heads of the Departments offering the subjects in which the student proposes to enrol and of the Dean of the Faculty responsible for the degree course in which the student is enrolled.
6. In no case will a Diploma be awarded until the requirements for the degree have been satisfied.
7. The Board may require a candidate to complete work and/or examinations additional to the programme referred to in Regulation 7 if, in its opinion, it has not reached the standard standard of attainment on which the content of any of the subjects for the diploma is based.

SECTION FIVE

POSTGRADUATE DEGREE REGULATIONS

Schedule B (Statistics)

Statistics 1
Statistics 2
Biostatistics
Probability and Statistics
Random Processes and Simulation (RPS)
Survey Sampling Methods (SSM)
Design and Analysis of Experiments (DAE)
Generalised Linear Models (GLM)
Analysis of Categorical Data (ACD)
Statistical Inference (SI)
Statistics Analysis (SA)
System Design (SD)

Schedule C (Computing)

Introduction to Programming (IP)
Data Structures and Algorithms (DSA)
Computational Programming Languages (CPL)
System Analysis (SA)
System Design (SD)

Schedule D - Project work to least one unit.

REGULATIONS GOVERNING MASTERS DEGREES

Part I - General

1.(1) These Regulations prescribe the conditions and requirements relating to the degrees of Master of Architecture, Master of Arts, Master of Commerce, Master of Computer Science, Master of Computing, Master of Education, Master of Educational Studies, Master of Engineering, Master of Engineering Science, Master of Letters, Master of Mathematics, Master of Medical Science, Master of Psychology (Clinical), Master of Psychology (Educational), Master of Science, Master of Scientific Studies, Master of Special Education and Master of Surveying.
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 University of Newcastle;
   "programme" means the programme of research and study prescribed in the Schedule;
   "schedule" means the Schedule of these Regulations prescribing the course in which a person is enrolled or is proposing to enrol;
   "the degree" means the degree of Bachelor of Science as specified in the Schedule.

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

4. To qualify for an award of a Master's degree a candidate shall satisfy the requirements of these regulations including the Schedule.

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

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

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

7. (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;
SECTION FIVE

POSTGRADUATE DEGREE REGULATIONS

(b) in the case of a subject offered in the second half of the academic year - the fourth Monday in that term;
(c) in the case of any other subject - the last Monday in that 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 prohibit the candidature or place such conditions on its continuation as it deems fit.

(c) A candidate against whom a report or report 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 its 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.

(f) 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;

(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 candidate shall be informed.

Part III — Provisions Relating to Theses

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.

(b) 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 other institution or for the candidature or place such conditions on its continuation as it deems fit.

(c) 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 its 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.

(f) 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;

(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 candidate shall be informed.

Part III — Provisions Relating to Theses

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.

(b) 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 other institution or for the candidature or place such conditions on its continuation as it deems fit.

(c) 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.
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 portion 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.

REGULATIONS GOVSHNG THE DEGREE OF MASTER OF MEDICAL STATISTICS
1. These Regulations prescribe the requirements for the degree of Master of Medical Statistics and are made in accordance with the powers vested in the Council under By-Law 5.2.1.

2. Definitions
   In these Regulations, unless the context or subject matter otherwise indicates or requires:
   (a) "the Board" means the Board of Studies in Medical Statistics;
   (b) "the Chairman" means the Chairman of the Board of Studies in Medical Statistics;
   (c) "the degree" means the degree of Master of Medical Statistics;
   (d) "Applicant" means an individual who has satisfied, or is considered to have satisfied, the requirements for admission to the degree of Master of Medical Statistics, as approved by the Board.

3. Grading of Degree
   The degree shall be conferred in one grade only.

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

5. To be eligible for admission to candidature, an applicant shall:
   (a) have satisfied, at a level approved by the Board, the requirements for admission to the degree of Bachelor of the University of Newcastle or other university or tertiary institution approved by the Board;
   (b) in exceptional circumstances produce evidence of possessing such academic and professional qualifications as may be approved by the Board; and
   (c) complete such work and pass such examinations as the Board may determine.

6. Applications for admission to candidature shall be considered by the Board which may approve or reject any application.

Qualification for the Degree
7. To qualify for admission to the degree a candidate shall have satisfied any condition imposed on admission to candidature under Regulation 5(b) and shall complete to the satisfaction of the Board a programme approved by the Board comprising:
   (a) subjects totalling 10 units selected from such of those listed in the Schedule of Subjects approved by the Board as are available from time to time, provided that a subject totalling at least four units are to be selected from the Schedule B subjects marked with an asterisk; and
   (b) a thesis, comprising half the course, embodying the results of an original investigation.

8. 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. The Board shall prescribe an alternative subject to any subject which a candidate might otherwise have to select.

9. (1) To complete a subject a candidate shall attend such lectures, tutorials, seminars and submit such written and other work as the body offering that subject may require.
   (2) To pass a subject a candidate shall complete it to the satisfaction of the Board and pass such examination as the Board shall require.

10. Standing
    A candidate may be granted standing on such conditions as the Board may determine in respect of work completed towards the Diploma in Medical Statistics or in respect of such other work as may be deemed appropriate by the Board.

11. Progress
    (1) If the 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) A candidate against whom a decision of the Board has been made under Regulation 11(1) of these Regulations may request that the Board consider the case to be reviewed. Such request shall be made to the Chairman within seven days from the date of posting to the candidate the advice of the Board's decision or such further period as the Chairman may accept.
    (3) A candidate may appeal to the Vice-Chancellor against any decision made following the review under Regulation 11(2) of these Regulations.

12. Duration
    The programme shall be completed in not less than two years and, except with the permission of the Board, not more than five years.

13. Leave of Absence
    Upon request by a candidate, the Board may grant leave of absence from the course. Such leave shall not be taken into account in calculating the period prescribed in Regulation 12 of these Regulations.

SCHEDULE OF SUBJECTS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Analysis of Experiments</td>
<td>1</td>
</tr>
<tr>
<td>Epidemiological Methods</td>
<td>1</td>
</tr>
<tr>
<td>Study Design</td>
<td>1</td>
</tr>
<tr>
<td>Health Care Evaluation</td>
<td>0.5</td>
</tr>
<tr>
<td>Behavioural Change</td>
<td>0.5</td>
</tr>
<tr>
<td>Assessing Health Problems</td>
<td>0.5</td>
</tr>
<tr>
<td>Population Research Seminar</td>
<td>0.5</td>
</tr>
<tr>
<td>Biostatistics</td>
<td>1</td>
</tr>
<tr>
<td>Biostatistics II</td>
<td>1</td>
</tr>
<tr>
<td>Applied Statistics (AS)</td>
<td>1</td>
</tr>
<tr>
<td>Probability and Statistics (PS)</td>
<td>2</td>
</tr>
<tr>
<td>Random Process and Simulation (RP)</td>
<td>1</td>
</tr>
<tr>
<td>Introduction to Programming (IP)</td>
<td>1</td>
</tr>
<tr>
<td>Data Structures and Algorithms (DS&amp;A)</td>
<td>1</td>
</tr>
<tr>
<td>Comparative Programming Languages (CPL)</td>
<td>1</td>
</tr>
<tr>
<td>Systems Analysis (SA)</td>
<td>1</td>
</tr>
<tr>
<td>Systems Design (SD)</td>
<td>1</td>
</tr>
<tr>
<td>Project worth at least 1 unit.</td>
<td></td>
</tr>
</tbody>
</table>

7 As must one of Biostatistics I and Applied Statistics can be chosen.
NOTE ON SUBJECT AND TOPIC DESCRIPTIONS

The subject and topic outlines and reading lists which follow 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.

Prequisites are subjects which must be passed before a candidate enrolls in a particular subject. The only prerequisite noted for topics are any topics or subjects which must be included as enrollment in the particular topic. To enroll in a subject the topic may be part of, the prerequisites for that subject must still be satisfied.

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

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 in the Department of Mathematics section headed "Progressive Assessment" referring to Mathematics subjects.

Tests are essential books recommended for purchase.

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

The following academic staff have been appointed course coordinators and should be consulted in case of difficulty:

Computer Science IV/VVVM Prof. J.L. Keedy
Research degrees Prof. J.L. Keedy
Diploma in Computer Science Simon

Further information about computer science courses appears in the section Notes on Degrees and Diplomas in Section Two. Students enrolling in Computer Science subjects do not formaly enroll in their constituent topics. However, Computer Science IV and VVVM students, and students who as part of any other Computer Science subject wish to take topics other than exactly as described in the relevant subject description, must first obtain permission from the Head of the Department of Computer Science.

PART IV COMPUTER SCIENCE SUBJECTS

This subject is the one-year full-time or two-year part-time honours subject in the BCompSci(Hons) and BMaths(Hons) degrees. A student desiring admission to this subject should apply in writing to the Head of Department before 30th December of the preceding year. A selection of six computer science topics from those listed below, their descriptions are embodied in a thesis, must be obtained from the Computer Science Office. The results of this project, worth 50% of the final assessment, must be embodied in a thesis. Work on the project normally starts early in February. Students should advise the Head of the Department of Computer Science at the beginning of each year which topics have been selected. Information about projects can be obtained from the Computer Science Office at the beginning of the academic year.

DIPLOMA IN COMPUTER SCIENCE

The following are subjects in the (revised) postgraduate Diploma in Computer Science. Some of them may also be available as subjects, topics or units in other courses. The specification of unit value refers to the value in the Diploma in Computer Science.

Subjects taught by the Departments of Computer Science, Management, and Electrical & Computer Engineering are described in this section. Subjects taught by the Departments of Mathematics and Statistics are described in the Mathematics and Statistics sections of this Handbook.

684101 COMPUTER SCIENCE IVM

This subject is available only to students enrolled in the coursework Master of Computing degree. A student desiring admission to this subject should apply in writing to the Head of Department before 30th December of the preceding year.

Prerequisites Computer Science III

Hours Approx 270 lecture hours plus a 100 hour project.

Examination Ten 2 hour papers or equivalent assessment. A thesis relating to the project undertaken.

Content

A selection of ten topics, normally consisting of at least six topics chosen from the list of Part IV computer science topics together with additional topics chosen from Part III computer science topics. (In exceptional circumstances the Head of Department may approve other topics.) Each topic is worth 5% of the final assessment.

Students are also required to complete a major research project (involving approximately 1000 hours of work) prescribed by the Head of Department. The results of this project, worth 50% of the final assessment, must be embodied in a thesis. Work on the project normally starts early in February. Students should advise the Head of the Department of Computer Science at the beginning of each year which topics have been selected. Information about projects can be obtained from the Computer Science Office at the beginning of the academic year.

DIPLOMA IN COMPUTER SCIENCE (REVISED REGULATIONS)

The following are subjects in the (revised) postgraduate Diploma in Computer Science. Some of them may also be available as subjects, topics or units in other courses. The specification of unit value refers to the value in the Diploma in Computer Science.

Subjects taught by the Departments of Computer Science, Management, and Electrical & Computer Engineering are described in this section. Subjects taught by the Departments of Mathematics and Statistics are described in the Mathematics and Statistics sections of this Handbook.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department</th>
</tr>
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<tbody>
<tr>
<td>Project</td>
<td>Computer Science</td>
</tr>
</tbody>
</table>

Preliminary Subject

Introduction to Programming Computer Science

Data Structures and Algorithms Computer Science
Assembly Language Computer Science
Comparative Programming Languages Computer Science
Software Techniques and Methods Computer Science
System Analysis Computer Science
System Design Computer Science
Microcomputers in Business Computer Science
Numerical Analysis Computer Science

Mathematics

Linear Algebra
Discrete Mathematics
Random Processes and Simulation
Switching Theory and Logical Design
Microprocessor Systems and Applications

Statistics

Elec & Comp Eng

Elec & Comp Eng

Elec & Comp Eng

Elec & Comp Eng

Elec & Comp Eng

Elec & Comp Eng

Elec & Comp Eng
**SECTION SIX POSTGRADUATE COMPUTER SCIENCE SUBJECT DESCRIPTIONS**

References
Wirth, N. *Algorithms + Data Structures = Programs* (Prentice Hall 1977)
N. Wirth, Programming in Modula-2 2nd ed (Springer 1982)

**680110 ASSEMBLER LANGUAGE**
Lecturer J. Rosenberg
Prerequisite Introduction to Programming
*Hours 2 lecture hours per week for one semester, plus tutorials and practical work*

**Examination Assignments and a 2-hour paper**

**Content**
This course is divided into two sections. The first section introduces the concept of computer organisation and assembly language programming. Topics covered include data representation, computer instructions, registers, addressing modes, instruction sets, subroutines and the use of stacks.

The second section of the course is an introduction to operating system principles. Topics covered include process management, synchronisation and resource allocation.

**References**
Baase, S. *VAX-11 Assembly Language Programming* (Prentice-Hall 1983)
Deitel, H.M. *An Introduction to Operating Systems* (Addison-Wesley 1984)

**680106 COMPARATIVE PROGRAMMING LANGUAGES**
Lecturer Simon
Prerequisite Introduction to Programming

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will examine the principles underlying the comparative study of programming languages. It will consider the essential control and data structure components of a programming language, and identify instances of those components in various languages. There will also be a brief introduction to the notions and techniques of program translation via compilers and interpreters.

The programming languages SNOBOL and C will be introduced during the course, to broaden the range of languages available for comparison.

**References**

**680117 SOFTWARE ENGINEERING**
Lecturer J.L. Keedy
Prerequisite Introduction to Programming, Data Structures & Algorithms, Assembly Language & Operating Systems

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will cover advanced computer software development topics such as software engineering principles, software project management, software maintenance and software testing.

**References**
Cox, R & Walsh, J. *Software Engineering* 2nd edn (Addison-Wesley 1985)

**680107 COMPILER DESIGN**
Lecturer D.W.E. Blatt
Prerequisite Assembly Language and Operating Systems

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will introduce the student to the design and implementation of compilers. Topics covered include Lexical Analysis, Syntax Analysis, Code Generation and Optimisation.

**References**
Sommerville, I. *Software Engineering* 2nd edn (Addison-Wesley 1985)

**680104 ARTIFICIAL INTELLIGENCE PROGRAMMING TECHNIQUES**
Lecturer Simon
Prerequisite Introduction to Programming

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will introduce the student to the design and implementation of compilers. Topics covered include Lexical Analysis, Syntax Analysis, Code Generation and Optimisation.

**References**
Sommerville, I. *Software Engineering* 2nd edn (Addison-Wesley 1985)

**680103 COMPUTER GRAPHICS**
Lecturer D.W.E. Blatt
Prerequisite Introduction to Programming, Data Structures & Algorithms, Assembly Language & Operating Systems, Linear Algebra, Numerical Analysis

**Hours 2 lecture hours per week for one semester**

**Examination Assignments and a 2-hour paper**

**Content**
This course will cover advanced computer graphics topics with relevant mathematical and programming techniques and an overview of graphics hardware design.

**References**

**680102 OPERATING SYSTEMS**
Lecturer J. Rosenberg
Prerequisite Introduction to Programming

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will cover advanced computer software development topics such as software engineering principles, software project management, software maintenance and software testing.

**References**
Cox, R & Walsh, J. *Software Engineering* 2nd edn (Addison-Wesley 1985)

**680101 COMPUTER PROGRAMMING TECHNIQUES**
Lecturer Simon
Prerequisite Introduction to Programming

**Hours 2 lecture hours per week for one semester, plus tutorials and practical work**

**Examination Assignments and a 2-hour paper**

**Content**
This course will introduce the student to the design and implementation of compilers. Topics covered include Lexical Analysis, Syntax Analysis, Code Generation and Optimisation.

**References**
Sommerville, I. *Software Engineering* 2nd edn (Addison-Wesley 1985)
SECTION SIX

POSTGRADUATE COMPUTER SCIENCE SUBJECT DESCRIPTIONS

Giloit, W.K.
Interactive Computer Graphics (Prentice Hall 1978)

Gourand, W.S.
Computer Display of Curved Surfaces (Gordon & Breach 1979)

Harrison, S.

Hopgood, B.A. et al.

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

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

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

Rogers, D.F.

680111 DATABASE DESIGN
Prerequisite Introduction to Programming, Data Structures & Algorithms, Assembly Language
Hours 2 lecture hours per week for one semester
Examination One 2-hour paper and assignments

This course provides a basic introduction to database systems, with particular emphasis on relational database systems. Topics covered will include: basic concepts and terminology, types of systems (hierarchic, relational, network, inverted list), physical/logical system design, data design, relational theory, relational algebra, relational calculus, data integrity/recovery, security, concurrency, distributed systems. A number of relational database systems will be studied in detail during the course.

Text
Nil

References
Date, D.J.
An Introduction to Database Systems vol 1, 4th edn (Addison-Wesley 1986)

680109 COMPUTER NETWORKS
Prerequisite Introduction to Programming, Data Structures & Algorithms, Assembly Language
Hours 2 lecture hours per week for one semester
Examination One 2-hour paper and assignments

This course provides a basic introduction to data communication networks, including both local and wide area computer networks. Topics include: network access mechanisms, packet switched and circuit-switched networks, network protocols, flow and congestion control, routing techniques and queuing mechanisms. A variety of network architectures will be discussed.

Text
Nil

References
Schwartz, M.
Telecommunication Networks: Protocols, Modelling and Analysis (Addison-Wesley 1987)

440166 COMMERCIAL PROGRAMMING
Lecturer B. Check
Prerequisites Introduction to Programming or equivalent
Hours 2 lecture hours per week for first semester
Examination One 2-hour paper plus progressive assessment

This course provides a practical introduction to microcomputers and their application in the business environment. During the workshop sessions students will gain "hands-on" experience using software packages such as electronic spreadsheets, database management systems and word processors.

Text
Nil

References

533902 SWITCHING THEORY AND LOGICAL DESIGN
Prerequisite Mathematics
Hours 3 hours of lectures, tutorials and practical work per week for the first semester
Examination Progressive assessment and final examination

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

**Text Nil**

References

Ongschot, E.I.
Computer Systems Organization, the B5500/6700 Series (Academic Press)

Siebenrock, D.P., Bell, C.G. and Newell, A. (eds)

680101 ADVANCED OPERATING SYSTEM PRINCIPLES

Lecturer J.J. Keely

Prerequisite Computer Operating Systems

Hours 2 lecture hours per week (one semester) plus regular assignments

Examination One 2-hour paper

Course

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

680113 FORMAL SEMANTICS OF PROGRAMMING LANGUAGES

Lecturer Simon

Prerequisite Programming Languages & Systems or Artificial Intelligence Programming Techniques

Hours 2 lecture hours per week (one semester)

Examination One 2-hour paper

Course

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

Text

Gordon, M.J.C.
The Denotational Description of Programming Languages (Springer Verlag 1979)

References

Milne & Starchey

Stoy
Denotational Semantics: The Scott-Strachey Approach to Programming Language Theory (MIT Press 1977)

680110 ARTIFICIAL INTELLIGENCE

Lecturer Simon

Prerequisite Programming Languages & Systems or Artificial Intelligence Programming Techniques

Hours 2 lecture hours per week (one semester)

Examinations One 2-hour paper

Course

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

References

Bar & Feigenbaum
The Handbook of Artificial Intelligence (Pitman 1981)

Bobda
Artificial Intelligence and Natural Man (Harvester Press 1977)

Charniak & McDermott
Introduction to Artificial Intelligence (Addison-Wesley 1985)

Nilsson
Problem Solving Methods in Artificial Intelligence (Addison-Wesley 1982)

Winograd
Artificial Intelligence, 2nd edn (Addison-Wesley 1984)

680110 CONCURRENCY, COMPLEXITY AND VLSI

Lecturer B. Beresford-Smith

Prerequisite Computer Science III or equivalent

Hours 2 lecture hours per week (one semester)

Examination One 2-hour paper and assignments

Course

This course provides an introduction to various aspects of VLSI systems. The fundamental ideas of VLSI design are introduced together with a description of the types of software design tools used. The opportunities which VLSI offers for the development of non-conventional computational structures and algorithms appropriate for machines with very many parallel processing elements at a high level of concurrency are discussed.

References

Evans, D.J. (ed.)
Parallel Processing Systems (Cambridge University Press 1982)

Hapcroft, J.C. & Ullman, J.D.
Introduction to Automata Theory, Languages and Computation (Addison-Wesley 1979)

High Speed Computer and Algorithm Organization (Academic Press 1977)

Mead, C.A. & Conway, L.A.
Introduction to VLSI Systems (Addison-Wesley 1980)

Savage, J.E.
The Complexity of Computing (Wiley 1976)

Thal, J.F. (ed)

Ullman, J.D.
Computational Aspects of VLSI (Computer Science Press 1984)

The following academic staff have been appointed course coordinators and should be consulted in case of difficulty:

Mathematics IV

Annes Prof. J.R. Giles

Research Degrees

Annes Prof. P.K. Simon

Diploma in Mathematical Studies

Annes Prof. A.W. Bradley

PART IV MATHEMATICS TOPICS

**NOTE:** The following term will be held on the first Tuesday of each term in Room V/107 at 1.00 pm to determine the timetables for both Mathematics IV and Mathematics V.

664100 MATHHEMATICS IV

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

Prerequisite Mathematics III and at least one of Mathematics III, Computer Science III or Statistics III and additional work as prescribed by the Heads of the Departments concerned.

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

Examination: At least eight 2-hour final papers.

A thesis, in a study under direction of a special topic using relevant published material and presented in written form, will be examined normally starts early in February.

Course

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 described in the following section of the Handbook, but the Department should be consulted for further details, including the current list of suitable topics from other Departments. (Students who have passed Computer Science III or Statistics III may, with the permission of the Head of Department, select some of their topics from courses given in these departments.)

PART IV MATHEMATICS TOPICS

664119 HISTORY OF ANALYSIS TO AROUND 1900

Lecturer R.P. Beechorn

Prerequisite Nil

Hours About 27 lecture hours

Examination One 2-hour paper

Course

A course of 26 lectures on the history of mathematics with emphasis on analysis. Other branches of mathematics will be referred to for putting the analysis into context. Where feasible, use will be made of original material for 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 concept of continuity, irrationality, infinity, infinitesimals, magnitude, ratio,

Text
Batten, L.J. M.

Combinatorics of Finite Geometries (CUP 1986)

664103 BANACH ALGEBRA
Lecturer J.R. Giles
Corequisite Topic W
Hours About 21 lecture hours
Examination One 2-hour paper

Content
A Banach Algebra is a mathematical structure where the two main stimuli of pure mathematical study – the topological and the algebraic – are united in fruitful contact. The course will cover the following subject matter. Nonscled algebras: regular and singular elements; the Gelfand–Naimark representation theorem for algebras. Functional Analysis: normed spaces, bounded linear operators. The theory will include the following topics: separation, and product topologies, continuity on convex sets, convexity, normability and finite dimensional cases. Metric spaces. Polar geometries: definition, properties, and normal, self-adjoint operators. We give special attention to the study of differentiation of convex functions on normed linear spaces. Convex sets: metrisability, normability and finite dimensional cases. We study extreme points, the spectral radius and spectral mapping theorem for polynomials, ideals and maximal ideals. Convex Analysis with Application in the Variational Theory of Functions (Pitman 1982)

References
Barbu, V, & Precupanu, T.

Convexity and Optimization in Banach Spaces
(Slofkh & Nordhoff 1978)

Clarke, F.H.

Optimization and Nonsmooth Analysis (Wiley 1983)

Day, M.M.

Normed Linear Spaces (Springer 1973)

Diestel, J.

Geometric Aspects of Banach Spaces - Selected Topics
(Springer 1975)

Ekeland, I., & Temam, R.

Convex Analysis and Variational Problems (North Holland 1976)

Giles, J.R.

Analysis of Normed Linear Spaces (University of Newcastle 1978)

Holmes, R.B.

Geometric Functional Analysis and its Applications
(Springer 1975)

Roberts, A.W., & Varberg, D.E.

Convex Functions (Academic 1970)

Simmons, G.F.

Introduction to Topology and Modern Analysis (McGraw-Hill 1963)

Waltersky, A.

Functional Analysis (Blaisdell 1964)

664158 CONVEX ANALYSIS
Lecturer J.R. Giles
Corequisite Topic W
Hours About 27 lecture hours
Examination Two 1-hour paper

Content
Convexity has become an increasingly important concept in analysis. Much of current research in functional analysis concerns generalizing 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, continuity for convexity. We give special attention to the study of differentiation of convex functions on normed linear spaces. Convex sets: metrisability, normability and finite dimensional cases. We study extreme points, the spectral radius and spectral mapping theorem for polynomials, ideals and maximal ideals. Convex Analysis with Application in the Variational Theory of Functions (Pitman 1982)

References
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(Springer 1975)

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Convex Functions (Academic 1970)

Simmons, G.F.

Introduction to Topology and Modern Analysis (McGraw-Hill 1963)

Waltersky, A.

Functional Analysis (Blaisdell 1964)

664150 GENERAL & ALGEBRAIC TOPOLOGY
Lecturer M.J. Hayes
Prerequisite Topic L
Hours About 27 lecture hours
Examination One 2-hour paper

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

References
Cairns, S.S.

Introductory Topology (Ronald 1961)

Diestel, J.

Introduction to Topology (Princetion 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 1964)

664145 VISCOS FLOW THEORY
Lecturer W.T.F. Lam
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.

References
Batchelor, G.K.

Introduction to Fluid Dynamics (Cambridge 1967)

Landau, L.D., & Lifshitz, E.M.

Fluid Mechanics (Pergamon 1959)

Langlois, W.E.

Slow Viscous Flow (Macmillan 1964)

Pai, S.L.


Roben, F., (ed.)

Laminar Boundary Layers (Oxford 1965)

Schlichting, H.

Boundary Layer Theory (McGraw-Hill 1968)

Temen, R.

Navier-Stokes Equations - Theory and Numerical Analysis (North Holland 1976)

664138 PERTURBATION THEORY
Lecturers W. Summerfield and D.L.S. McElwain
Prerequisite Topics CO, P
Hours About 27 lecture hours
Examination One 2-hour paper

Text
Brown, A. & Pagel, A.

Elements of Functional Analysis (Van Nostrand 1970)

References
Batchelor, G.K., & Nicolai, L.

Functional Analysis (paperback Academic 1966)

Dunford, N. & Schwartz, J.

Linear Operators (Interscience 1938)

Lorch, E.

Spectral Theory (Oxford 1962)

Rudin, W.

Functional Analysis (McGraw-Hill 1973)

Schmeidler, W.

Linear Operators on Hilbert Space (Academic 1955)

Taylor, A.

Functional Analysis (Wiley 1958)
Content
Regular perturbational methods, including parameter and coordinate perturbations. A discussion of the sources of nonuniformity in perturbation expansions. The method of strained coordinates and the methods of matched and composite asymptotic expansions. The method of multiple scales.

Text Nil
References

84330 MATHEMATICS/PHYSICS IV
Prerequisites
Mathematics IIIA and Physics II.
Additional work is required for combined honours students.
Hours To be advised
Examination Assessment
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 Physics 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 eg seminars and assignments may be required by either Department.

Texts To be advised
References To be advised

664165 MATHEMATICAL PHYSIOLOGY
Lecturer W. Summerfield
Prerequisite 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 with 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, etc. Indeed, mathematical engineering might now be said to be part of the conspiracy to produce super humans, e.g. the "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

644159 FOUNDATIONS OF MODERN DIFFERENTIAL GEOMETRY
Lecturer P.K. Smuck
Prerequisite Topi CO
Hours About 27 lecture hours
Examination One 2-hour paper
Content

Text Nil
References

664166 MUSICAL APPLICATIONS OF MAGNETOHYDRODYNAMICS
Lecturer 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, 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^-8 gauss in a globular star to 10^21 gauss in a massive star.

Text Nil
References

748170 SYSTEMS OF DIFFERENTIAL EQUATIONS
Lecturer W. Mathew
Prerequisites
Mathematics IIIB.
Hours About 27 lecture hours
Examination One 2-hour paper
Content
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
## Section Six
### Postgraduate Statistics Subject Descriptions

Research project will be assessed based on a written report and a seminar on the project.

**Content**

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examinations</th>
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<tr>
<td>694100</td>
<td><strong>Statistics IV</strong></td>
<td>Mathematics IIIA or equivalent</td>
<td>Approximately 6 lecture hours per week and completion of a substantial project</td>
<td>To be advised</td>
</tr>
</tbody>
</table>

**Content**

4 Mathematics topics chosen from the Part IV Mathematics topics.

A selection of seminars from Psychology IV which may include nonstatistical applications in Psychology.

A thesis involving the application of Mathematics in Psychology.

Details of courses offered by the Department of Statistics can be obtained from the Departmental Secretary or from Professor Dobson. Further information about statistics courses also appear in the section Notes on Degrees and Diplomas in Section Two.

### Part IV Subject

#### 694100 Statistics IV

**Prerequisites**

Statistics III and a Part III subject in either Mathematics or Computer Science.

**Hours**

Approximately 6 lecture hours per week and completion of a substantial project.

**Examination**

Six 2-hour examinations or equivalent assessments each worth 10% of the final assessment, and a thesis relating to the project undertaken worth 40% of the final assessment.

**Content**

Students are required to take six topics of which at least three must be chosen from the Part IV topics offered by the Department of Statistics. Other topics may be chosen from the Part IV topics offered by the Department of Mathematics or the Department of Computer Science or topics listed below offered by other departments.

Students are also required to complete a substantial project. The results of the project, worth 40% of the final assessment, must be embodied in a thesis. The project may be a practical one involving the analysis of data, or a theoretical one. Work on the project normally starts early in February.

The list of topics available for Statistics IV other than those offered by the Department of Statistics, the Department of Mathematics, or the Department of Computer Science is as follows:

- Management Science A and Management Science B offered by the Department of Management
- Estimation and System Identification, Adaptive Control and Advanced Digital Signal Processing offered by the Department of Electrical & Computer Engineering

#### 694101 Analysis of Categorical Data

**Lecturer**

D.L. O'Connell

**Prerequisites**

Statistics III or equivalent topics.

**Hours**

About 24 hours

**Examinations**

Assignments and one major project

**Content**

The course will discuss the analysis of categorical data. It will begin with a thorough coverage of 2 x 2 tables before moving on to larger (nxn) contingency tables. Topics to be covered include probability models for categorical data, measures of association, measures of agreement, the Mantel-Haenszel method for combining tables, applications of logistic regression and log-linear models.

**References**


**References**


**References**


**References**


**References**


**References**


**References**


**References**

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

**BACHELOR OF COMPUTER SCIENCE SUBJECTS**

This list contains only the scheduled subjects for the BCompSc degree. The non-scheduled subjects permitted in the BCompSc are listed under Notes on Degrees and Diplomas: Computer Science. The computer numbers for these subjects can be found under the computer numbers for the Bachelor of Mathematics.

<table>
<thead>
<tr>
<th>Computer Subject Name</th>
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<td><strong>Part I Subjects</strong></td>
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<tr>
<td>531600 COMPUTER ENGINEERING I</td>
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<tr>
<td>681100 COMPUTER SCIENCE I</td>
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<tr>
<td>661100 MATHEMATICS I</td>
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<td><strong>Part II Subjects</strong></td>
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<tr>
<td>682100 COMPUTER SCIENCE II</td>
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<tr>
<td>682110 DATA PROCESSING II</td>
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<tr>
<td>662410 MATHEMATICS ICS</td>
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<td>532600 COMPUTER ENGINEERING II</td>
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<td><strong>Part III Subjects</strong></td>
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<td>683200 COMPUTER SCIENCE IIIA</td>
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<td>683203 COMPUTER SCIENCE IIIC</td>
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**BACHELOR OF COMPUTER SCIENCE (HONOURS) SUBJECTS**

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(REVISED) **DIPLOMA IN COMPUTER SCIENCE SUBJECTS**

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<td>680106 COMPARATIVE PROGRAMMING LANGUAGES</td>
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<td>680107 COMPILER DESIGN</td>
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<tr>
<td>680108 COMPUTER GRAPHICS</td>
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<tr>
<td>680112 DATA STRUCTURES AND ALGORITHMS</td>
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<tr>
<td>680114 INTRODUCTION TO PROGRAMMING</td>
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<td>680117 SOFTWARE ENGINEERING</td>
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<td>680149 DISCRETE MATHEMATICS</td>
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<td>680150 LINEAR ALGEBRA</td>
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<td>680151 NUMERICAL ANALYSIS</td>
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<tr>
<td>680111 RANDOM PROCESSES AND SIMULATION</td>
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<tr>
<td>440105 COMMERCIAL PROGRAMMING</td>
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<tr>
<td>440123 SYSTEMS ANALYSIS</td>
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<tr>
<td>440124 SYSTEMS DESIGN</td>
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<tr>
<td>533900 SWITCHING THEORY AND LOGICAL DESIGN</td>
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<td>503003 MICROPROCESSOR SYSTEMS AND APPLICATIONS</td>
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<td>680120 OPERATING SYSTEMS</td>
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<td>680121 THEORY OF COMPUTATION</td>
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<td>680109 COMPUTER NETWORKS</td>
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<tr>
<td>680111 DATABASE DESIGN</td>
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<tr>
<td>680104 ARTIFICIAL INTELLIGENCE PROGRAMMING TECHNIQUES</td>
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**MASTER OF COMPUTING SUBJECTS**

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**SECTION SEVEN**  
**MATHEMATICS SUBJECT COMPUTER NUMBERS**

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<table>
<thead>
<tr>
<th>Computer Subject Name</th>
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<td>541100 ENGINEERING I (4 components)</td>
<td>511108 Che141 Industrial Process Principles</td>
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<td>521105 CE111 Mechanics and Structures</td>
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<tr>
<td>531205 EB130 Introduction to Electrical Engineering</td>
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<tr>
<td>541104 ME111 Graphics and Engineering Drawing</td>
<td>501102 GE151 Introduction to Materials Science</td>
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<table>
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<th>Part I Subjects</th>
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<td>351100 GEOGRAPHY I</td>
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<td>731100 GEOLOGY I</td>
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<td>361500 GERMAN IN</td>
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<td>311100 GREEK I</td>
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<td>371100 HISTORY I</td>
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<td>291100 JAPANESE I</td>
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<td>311200 LATIN I</td>
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<td>451100 LEGAL STUDIES I</td>
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<td>381100 PHILOSOPHY I</td>
<td>381111 Introduction to Philosophical Problems</td>
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<td>381106 Moral Problems</td>
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<td>381109 Philosophy of Religion</td>
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<td>381110 Critical Reasoning</td>
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<td>381117 Logic (Symbolic)</td>
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<td>381114 Political Philosophy</td>
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<td>381108 Knowledge &amp; Explanation</td>
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<td>741200 PHYSICS IA</td>
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<td>741300 PHYSICS IB</td>
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<td>751100 PSYCHOLOGY I</td>
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<td>311300 SANSKRIT I</td>
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<td>301100 SOCIOLOGY I</td>
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SECTION SEVEN

MATHMATIC SUBJECT COMPLETED NUMBERS

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<th>Computer Number</th>
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Computer Numbers must be shown on enrolment and course variation forms in the following manner. Candidates wishing to enrol in any subject not listed should consult the Faculty Secretary.

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<tr>
<th>Computer Number</th>
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**MATHEMATICS SUBJECT COMPUTER NUMBERS**

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<td>GE361 Automatic Control</td>
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<td>533113</td>
<td>EE344 Communications</td>
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**SECTION SEVEN**  
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**BACHELOR OF MATHEMATICS (HONOURS) SUBJECTS**

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**MASTER OF MEDICAL STATISTICS AND DIPLOMA IN MEDICAL STATISTICS SUBJECTS**

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