THE DEAN'S FOREWORD

I should first like to welcome all new and re-enrolling students to the Faculty of Mathematics.

Whether 1987 marks the beginning or the continuation of your studies within the Faculty, it represents a year of promise and interest for all of us, for from the first of January this year the Faculty comprises the three distinct Departments of Mathematics, of Computer Science and of Statistics. This division represents a clear recognition of the separate identity of these disciplines, and, whilst embodied within the Faculty of Mathematics, they will nevertheless enjoy separate and individual development in their own right. Graduates in each of the disciplines are keenly sought in the private and public sector, and in areas which a few years ago would not have been considered the province of these subjects. Such is the dramatic development in the application of these subjects which are grouped within our Faculty.

Indeed, such is the demand for graduates in Computer Science that 1987 sees the introduction of the Bachelor of Computer Science degree, together with two new Masters programmes in Computer Science.

The areas of application of statistics, again, are diverging at such a rate as to ensure a sustained demand for graduates with a sound training in the subject.

And, of course, the central role of mathematics has always ensured its graduates had excellent prospects of employment in a wide variety of scientific, engineering and commercial activities.

Beyond this, a number of higher degrees are 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 1987.

C.A. Croxton,  
Dean, Faculty of Mathematics.
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General Information appears between the centre pages.

FACULTY OF MATHEMATICS

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.

FACULTY OFFICERS

Dean
Assoc.Prof. C.A.Croxton, BSc(Leicester), MA, PhD(Cambridge), FAIP, FInstP(Lond)

Sub-Dean
Assoc.Prof. W.Brisley, BSc(Sydney), MSc(New South Wales), PhD, DipEd(New England), MACS

Faculty Secretary
Helen Hotchkiss, BA, DipEd(New England)

DEPARTMENT OF COMPUTER SCIENCE

Professor
J.L.Keedy, BD(London), DPhil(Oxford), PhD(Monash), FACS, MBCS, AKC (Head of Department)

Senior Lecturers
D.W.E.Blatt, BSc, PhD(Sydney), MACS, MACM
I.Rosenberg, BSc, PhD(Monash)

Lecturers
B.Beresford-Smith, BSc, PhD(ANU)
Simon, BSc, BA(James Cook), DipCompSc, MMath
1 vacant position

Professional Officer
1 vacant position

Computer Programmers
A.Nymeyer, BMath, DipCompSc, PhD
L.Schembri, BMath

Departmental Secretary
1 vacant position

DEPARTMENT OF MATHEMATICS

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

Associate Professors
W.Brisley, BSc(Sydney), MSc (New South Wales), PhD, DipEd(New England), MACS
C.A.Croxton, BSc(Leicester), MA, PhD(Cambridge), FAIP, FInstP(Lond)
I.R.Giles, BA(Sydney), PhD, DipEd(Sydney), ThL
P.K.Smrz, PromPhys, CSc, RNDr(Charles) (Head of Department)
Senior Lecturers
R.B. Eggleton, BSc, MA(Melbourne), PhD(Calgary)
V. Ficker, PromMat, CSc, RNDr.(Comenius)
W.T.F. Lau, ME(New South Wales), PhD(Sydney)
D.L.S. McClelland, BSc(Queensland), PhD(York(Canada)), MACS
T.K. Sheng, BA(Marian College), BSc(Malaya & London), PhD(Malaya)
W.P. Wood, BSc, PhD(New South Wales), FRAS

Lecturers
C.J. Ashman, BA, LittB(New England), PhD
R.F. Berghout, MSc(Sydney)
J.G. Couper, BSc, PhD(New England)
M.J. Hayes, BA(Cambridge)
G.W. Southern, BA(New South Wales), M.Math, DipCompSc
W. Summerfield, BSc(Adelaide), PhD(Adelaide)
1 vacant position

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

Computer Programmer
C.S. Hoskins, BMath, PhD

Departmental Secretary
V. Piller

Office Staff
C.M. Clayton
J. Dennis
D. Dimmock, BMath(Wollongong), DipEd
J. Garnsey, BA(Sydney)

DEPARTMENT OF STATISTICS

Professor
A.J. Dobson, BSc(Adelaide), MSc, PhD(James Cook) (Head of Department)

Associate Professor
R.W. Gibberd, BSc, PhD(Adelaide)

Senior Lecturers
2 vacant positions

Departmental Secretary
C.M. Clayton

DEGREES AND POSTGRADUATE DIPLOMAS OFFERED IN THE FACULTY OF MATHEMATICS

Bachelor Degrees:
- Bachelor of Computer Science (B.Comp.Sc.)
- Bachelor of Computer Science (Honours) (B.Comp.Sc.(Hons))
- Bachelor of Mathematics (B.Math.)
- Bachelor of Mathematics (Honours) (B.Math.(Hons))

Coursework Master Degrees:
- Master of Computing (M.Comp.)
- Master of Medical Statistics (M.Med.Stats.)

Research Degrees:
- Master of Computer Science (M.Comp.Sc.)
- Master of Mathematics (M.Math.)
- Doctor of Philosophy (Ph.D.)

Diplomas:
- Diploma in Computer Science (Dip.Comp.Sc.)
- Diploma in Mathematical Studies (Dip.Math.Stud.)
- Diploma in Medical Statistics (Dip. Med. Stats.)

REVIEW OF ACADEMIC PROGRESS

Acting under the Regulations Governing Unsatisfactory Progress, as set out in Volume 1 of the Calendar, the Faculty Board will review:

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

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1 offered jointly with the Faculty of Medicine.
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.

Definitions

2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
   "course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
   "Dean" means the Dean of the Faculty;
   "the degree" means the degree of Bachelor of 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 recorded.

Enrolment

3. (1) A candidate's enrolment in any year must be approved by the Dean or the Dean's nominee.
   (2) A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the timetable for that year.
   (3) Except with the permission of the Dean given only if satisfied that the academic merit of the candidate so warrants:
      (a) a candidate shall not enrol in more than four subjects in any one academic year;
      (b) a candidate enrolling in four subjects in any one academic year shall not enrol in a Part III subject and not more than one Part II subject in that year; and
      (c) a candidate enrolling in three subjects in any one academic year shall not enrol in more than two Part III subjects in that year.

Qualification for Admission to the Degree

4. (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 some 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 II and Computer Engineering III;
      (b) at least three Part I subjects from the Schedule;
      (c) Computer Science IIIA 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 an 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>(b)  4</td>
<td>(c)  5</td>
</tr>
<tr>
<td>(b)  4</td>
<td>(a)  2</td>
<td>(b)  2</td>
</tr>
<tr>
<td>(a)  2</td>
<td>(c)  3</td>
<td>(a)  2</td>
</tr>
</tbody>
</table>

Subject

5. (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.

Standing

6. (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 another degree or diploma obtained by that candidate, except to such an extent as the Faculty Board may permit.
   (3) The Dean shall determine the classification of each subject as a Part I, Part II or Part III subject.

Prerequisites and Corequisites

7. (1) Except with the permission of the Faculty Board granted after considering any recommendation made by the Head of the Department, no candidate may enrol in a subject unless that candidate has passed any subjects prescribed as its prerequisites at any grade which may be specified and has already passed or concurrently enrolls in or is already enrolled in any subjects prescribed as its corequisites.
   (2) A candidate obtaining a Terminating Pass in a subject shall be deemed not to have passed that subject for prerequisite purposes.

Withdrawal

8. (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 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.

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

Time Requirements
10. 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.

Relaxing Provision
11. 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 Computer Science

Subject
Part I
Computer Science I
Mathematics I

Computer Engineering I

Part II
Computer Science II
Mathematics IIC
Computer Engineering II\(^1\)

Part III
Computer Science IIIA
Computer Science IIIB
Computer Engineering III\(^1\)

Remarks including Prerequisites and Corequisites

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

Corequisite Mathematics I

Prerequisite Computer Science I
Prerequisite Mathematics I
Prerequisite Computer Engineering I

Prerequisite Computer Science II
Prerequisite Computer Science II, Mathematics IIC
Corequisite Computer Science IIIA
Prerequisite Computer Engineering I

1 A candidate may select Computer Engineering II or Computer Engineering III, but not both.

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.

Definitions
2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
"course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
"Dean" means the Dean of the Faculty;
"the degree" means the degree of Bachelor of 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;

Admission to Candidature
3. 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 approved by the Faculty Board, or have already been admitted to that degree;
(b) have satisfactorily completed any additional work prescribed by the Head of the Department; and
(c) have obtained approval to enrol given by the Dean on the recommendation of the Head of the Department.

Qualification for Admission to the Degree
4. 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

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

Withdrawal
6. (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.
Relaxing Provision

8. 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 ORDINARY DEGREE OF BACHELOR OF MATHEMATICS

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

Definitions

2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
   "course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;
   "Dean" means the Dean of the Faculty;
   "the degree" means the degree of Bachelor of Mathematics;
   "Department" means the Department offering a particular subject and includes any other body so doing;
   "Faculty" means the Faculty of Mathematics;
   "Faculty Board" means the Faculty Board of the Faculty;
   "Schedule" means a Schedule 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 II A and Mathematics II B Part II shall together count as one subject.

Enrolment

3. (1) A candidate’s enrolment in any year must be approved by the Dean or the Dean’s nominee.
   (2) A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the timetable for that year.
   (3) Except with the permission of the Dean given only if satisfied that the academic merit of the candidate so warrants:
       (a) a candidate shall not enrol in more than four subjects in any one academic year;
       (b) a candidate enrolling in four subjects in any one academic year shall not enrol in a Part III subject and not more than one Part II subject in that year; and
       (c) a candidate enrolling in three subjects in any one academic year shall not enrol in more than two Part III subjects in that year.

Qualification for Admission to the Degree

4. (1) To qualify for admission to the degree a candidate shall pass nine subjects, including
   (a) at least two Part III subjects from Schedules A or B,
   (b) at least one of Mathematics IIA, Mathematics IIB and Statistics III,
   (c) at least five subjects from Schedule A, including at least two Part II subjects from that Schedule.
   (2) Up to four subjects from those offered in other degree courses in the University may, with the permission of the Dean, be counted as qualifying subjects for the degree. When approving a subject, the Dean shall determine whether it shall be classified as Part I, Part II or Part III.

Subject

5. (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.

Standing

6. (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) Subject to sub-regulation (3) a candidate may not be granted standing in more than four subjects.
   (3) A candidate who is an undergraduate candidate enrolled for a different degree at the University may transfer enrolment to the degree of Bachelor of Mathematics with such standing as the Faculty Board deems appropriate.

Prerequisites and Corequisites

7. (1) Except with the permission of the Faculty Board granted after considering any recommendation made by the Head of the Department, no candidate may enrol in a subject unless that candidate has passed any subjects prescribed as its prerequisites at any grade which may be specified and has already passed or concurrently enrols in or is already enrolled in any subjects prescribed as its corequisites.
   (2) A candidate obtaining a Terminating Pass in a subject shall be deemed not to have passed that subject for prerequisite purposes.

Withdrawal

8. (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 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.
Results

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

Time Requirements

10. 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.

Relaxing Provision

11. 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

General

12. 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 the Faculty Board of the Faculty offering that other
    Bachelor degree.

13. Admission to a combined degree course:
    (a) shall be subject to the approval of the Deans of the two Faculties;
    (b) shall, except in exceptional circumstances, be at the end of the candidate's
        first year of enrolment in a degree; and
    (c) shall be restricted to candidates with an average of at least credit level who
        have passed Mathematics I at 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 quantity and quality than if the two courses were taken separately as shall be
nenrolled by the Deans of the two Faculties.

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.

Arts/Mathematics

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

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

Mathematics/Science

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

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

1 Regulations governing a combined degree in Mathematics/Computer Science are currently being
drafted. Anyone interested in undertaking such a degree should consult the Dean of the Faculty of
Mathematics.
Mathematics/Commerce

18. To qualify for admission to the ordinary degrees of Bachelor of Commerce and Bachelor of Mathematics, a candidate shall pass seventeen subjects as follows:
   (a) four subjects, being Mathematics I, Mathematics 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) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Commerce.

Mathematics/Engineering

19. To qualify for admission to the degree of Bachelor of Engineering and the ordinary degree of Bachelor of Mathematics, a candidate shall pass:
   (a) Mathematics I, Mathematics 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) other subjects selected from the programme of subjects approved for the degrees of Bachelor of Engineering (Mechanical), Bachelor of Engineering (Industrial), Bachelor of Engineering (Electrical), Bachelor of Engineering (Chemical), Bachelor of Engineering (Civil) or Bachelor of Engineering (Computer), totalling a minimum of 48 units as calculated for those degrees.

Mathematics/Economics

20. To qualify for admission to the ordinary degree of Bachelor of Economics and Bachelor of Mathematics, a candidate shall pass seventeen subjects as follows:
   (a) four subjects, being Mathematics I, Mathematics 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) twelve subjects which shall by themselves satisfy the requirements for the degree of Bachelor of Economics.

SCHEDULES OF SUBJECTS

Bachelor of Mathematics

<table>
<thead>
<tr>
<th>SCHEDULE A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subject</strong></td>
</tr>
<tr>
<td>Part I</td>
</tr>
<tr>
<td>Mathematics I</td>
</tr>
</tbody>
</table>

Computer Science I

<table>
<thead>
<tr>
<th>Part II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIA</td>
</tr>
<tr>
<td>Mathematics IIC</td>
</tr>
<tr>
<td>Statistics II</td>
</tr>
<tr>
<td>Computer Science II¹</td>
</tr>
</tbody>
</table>

Part III

| Mathematics IIIA |
| Mathematics IIIB |
| Statistics III¹ |
| Computer Science III¹ |

¹ Transition arrangements for candidates enrolled in the course prior to 1986 will be determined in particular cases by the Faculty Board.
Communications & Automatic Control
Digital Computers & Automatic Control
Economics IIIC
Geology IIIC
Industrial Engineering I
Mechanical Engineering IIIC
Physics IIIA
Psychology IIIC

PREREQUISITES

Mathematics IIA.

Mathematics IIA.

Prerequisite Mathematics IIA.

Economics IIIC.

Prerequisite Economics IIIC.

Physics IIA & Geology IIA.

Prerequisite Mathematics IIA.

Mathematics IIA & Mathematics IIC (see Engineering Handbook).

Physics II & Mathematics IIA.

Psychology IIA.

Psychology IIA.

Prerequisite Mathematics IIA.

Prerequisite Mathematics IIA & Psychology IIA and Psychology IIB.

REGULATIONS GOVERNING THE HONOURS DEGREE OF BACHELOR OF MATHEMATICS

1. 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.

Definitions

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

"course" means the programme of studies prescribed from time to time to qualify a candidate for the degree;

"Dean" means the Dean of the Faculty;

"the degree" means the degree of Bachelor of Mathematics (Honours);

"Department" means the Department or Departments 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;

Admission to Candidature

3. 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 of the University of Newcastle or to any other degree approved by the Faculty Board, or have already been admitted to that degree;

(b) have satisfactorily completed any additional work prescribed by the Head of the Department offering the honours subject; and

(c) have obtained approval to enrol given by the Dean on the recommendation of the Head of the Department offering the honours subject.

Qualification for Admission to the Degree

4. 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 one of the honours subjects listed in the Schedule of Subjects to these Regulations.

Subject

5. (1) To 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 Department shall require.

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

Withdrawal

6. (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.

Classes of Honours

7. There shall be three classes of honours: Class I, Class II and Class III. Class II shall have two divisions, namely Division 1 and Division 2.

Relaxing Provision

8. 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

Prerequisite Mathematics IIIA and one of Mathematics IIIIB, Statistics III, or Computer Science III.

Computer Science IV

Prerequisites Computer Science III and one of Mathematics IIIA or Mathematics IIIIB or Statistics III.

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 IIIC.

Mathematics IV/Psychology IV

Prerequisites Mathematics IIIA & Psychology IIIC.

The Dean, Faculty of Mathematics, should be consulted to ensure that the appropriate Statistics background material for Econometrics I is covered.
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. An application for admission to candidature for a degree of Master shall be made prescribed.

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

4. A degree of Master shall be conferred in one grade only.

5. To be eligible for admission to candidature an applicant shall:
   (a) (i) have satisfied the requirements for admission to a degree of Bachelor in the University of Newcastle as specified in the Schedule; or
       (ii) have satisfied the requirements for admission to a degree or equivalent qualification, approved for the purpose by the Faculty Board, in another tertiary institution; or
       (iii) have such other qualifications and experience as may be approved by the Senate on the recommendation of the Faculty Board or otherwise as may be specified in the Schedule; and
   (b) have satisfied such other requirements as may be specified in the Schedule.

6. Unless otherwise specified in the Schedule, applications for admission to candidature shall be considered by the Faculty Board which may approve or reject any application.

7. An applicant shall not be admitted to candidature unless adequate supervision and facilities are available. Whether these are available shall be determined by the Faculty Board unless the Schedule otherwise provides.

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

9. REGULATIONS GOVERNING MASTERS DEGREES

PART II - EXAMINATION AND RESULTS

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

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

PART III - PROVISIONS RELATING TO 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.

(2) The thesis shall not contain as its main content any work or material which has previously been submitted by the candidate for a degree in any tertiary institution unless the Faculty Board otherwise permits.

13. The candidate shall give to the Secretary to the University three months' written notice of the date he expects to submit a thesis and such notice shall be accompanied by any prescribed fee1.

14. (1) The candidate shall comply with the following provisions concerning the presentation of a thesis:

(a) the thesis shall contain an abstract of approximately 200 words describing its content;

(b) the thesis shall be typed and bound in a manner prescribed by the University;

(c) three copies of the thesis shall be submitted together with:

(i) a certificate signed by the candidate that the main content of the thesis has not been submitted by the candidate for a degree of any other tertiary institution; and

(ii) a certificate signed by the supervisor indicating whether the candidate has completed the programme and whether the thesis is of sufficient academic merit to warrant examination; and

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

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

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

16. (1) For each candidate two examiners, at least one of whom shall be an external examiner (being a person who is not a member of the staff of the University)

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1 At present there is no fee payable.

SCHEDULE 17 - MASTER OF COMPUTER SCIENCE

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

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

(a) have satisfied all the requirements for admission to the degree of Bachelor of Computer Science with honours class I or class II of the University of Newcastle or to an honours degree, approved for this purpose by the Faculty Board, of the University of Newcastle or any other university; or

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

(c) in exceptional cases produce evidence of possessing such academic or professional qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department of Computer Science.

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

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

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

4. Except with the permission of the Faculty Board, which shall be given only in special circumstances, a candidate shall

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

(b) take part in research seminars within the Department of Computer Science.

5. Except with the special permission of the Faculty Board:

(a) a full time candidate shall complete the programme in not less than two and not more than three calendar years from its commencement;

(b) a part time candidate shall complete the programme in not less than three and not more than five calendar years from its commencement.

SCHEDULE 18 - MASTER OF COMPUTING

1. The Faculty of Mathematics shall be responsible for the course leading to the degree of Master of Computing.
2. To be eligible for admission to candidature an applicant shall:
   (a) (i) have satisfied all the requirements for admission to a degree of Bachelor of Computer Science of the University of Newcastle or to any other degree approved for this purpose by the Faculty Board; or
   (ii) in exceptional cases produce evidence of possessing such academic or professional qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department of Computer Science; and
   (b) complete such additional work and pass such examinations as the Faculty Board may determine.

3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of
   (a) the subject Computer Science IV M, and
   (b) a project prescribed by, and carried out under the direction of, the Head of the Department of Computer Science.

4. The Faculty Board may grant standing to a candidate on such conditions as it may determine in respect of work undertaken by the candidate for an uncompleted qualification. Standing shall not be granted for more than half the programme.

5. Except with the permission of the Faculty Board:
   (a) a full time candidate shall complete the programme in not less than two and not more than three calendar years from its commencement;
   (b) a part-time candidate shall complete the programme in not less than three and not more than five calendar years from its commencement.

SCHEDULE 8 - MASTER OF MATHEMATICS

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

2. To be eligible for admission to candidature an applicant shall:
   (a) have satisfied all the requirements for admission to a degree of Bachelor of the University of Newcastle with honours in the area of study in which he proposes to carry out his research or to an honours degree, approved for this purpose by the Faculty Board, of another University; or
   (b) have satisfied all the requirements for admission to a degree of the University of Newcastle or to a degree, approved for this purpose by the Faculty Board, of another tertiary institution and have completed such work and sat for such examinations as the Faculty Board may have determined and have achieved a standard at least equivalent to that required for admission to a degree of Bachelor with second class honours in an appropriate subject; or
   (c) in exceptional cases produce evidence of possessing such academic or professional qualifications as may be approved by the Faculty Board.

3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of:
   (a) such examinations and other such work as may be described by the Faculty Board; and
   (b) a thesis embodying the results of an original investigation or design.

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

5. A part-time candidate shall, except with the permission of the Faculty Board, which shall be given only in special circumstances:
   (a) conduct the major proportion of the research or design work in the University; and
   (b) take part in research seminars within the Department in which he is working.

6. Any third examiner shall be an external examiner.

REGULATIONS GOVERNING 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.

Definitions

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 Chairman" means the Chairman of the Board of Studies in Medical Statistics;
   "the degree" means the degree of Master of Medical Statistics.

Grading of Degree

3. 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) (i) 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;
   (ii) in exceptional circumstances produce evidence of possessing such academic and professional qualifications as may be approved by the Board; and
   (b) 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 subjects totalling at least four units are to be selected from the Group B subjects listed; 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.

Standing

10. 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.

Progress

11. (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 cause 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.

Duration

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

Leave of Absence

13. 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.

Withdrawal

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

Relaxing Provision

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

SCHEDULE OF SUBJECTS

Master of Medical Statistics

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Epidemiological Methods</td>
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</tr>
<tr>
<td>Study Design</td>
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</tr>
<tr>
<td>Health Care Evaluation</td>
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</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 I*</td>
<td>1</td>
</tr>
<tr>
<td>Biostatistics II</td>
<td>1</td>
</tr>
<tr>
<td>Applied Statistics* (AS)</td>
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<tr>
<td>Probability and Statistics (PS)</td>
<td>2</td>
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<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>
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<tr>
<td>Systems Design (SD)</td>
<td>1</td>
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<tr>
<td>Project worth at least 1 unit.</td>
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<tr>
<td>* At most one of Biostatistics I and Applied Statistics can be counted</td>
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Group B

<table>
<thead>
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<th>Subject</th>
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<tr>
<td>Survey Sampling Methods (SS)</td>
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<tr>
<td>Linear Statistical Models (LM)</td>
<td>1</td>
</tr>
<tr>
<td>Theory of Statistics (TS)</td>
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<tr>
<td>Demography and Survival Analysis</td>
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</tr>
<tr>
<td>Generalised Linear Statistical Modelling</td>
<td>1</td>
</tr>
<tr>
<td>Analysis of Categorical Data</td>
<td>1</td>
</tr>
<tr>
<td>Statistical Consulting</td>
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</tr>
</tbody>
</table>
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.

Definitions

2. In these Regulations, unless the context or subject matter otherwise indicates or requires:
   "course" means the programme of studies prescribed from time to time to qualify a candidate for the Diploma;
   "Dean" means the Dean of the Faculty;
   "Department" means the Department offering a particular subject and includes any other body so doing;
   "Diploma" means the Diploma in Computer Science;
   "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 recorded.

Admission to Candidature

3. (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.

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

Enrolment

5. (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.

6. (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.

Standing

7. (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.

Prerequisites and Corequisites

9. (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 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.

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

Withdrawal

10. (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 fourth Monday in Third Term;
   (c) in the case of any other subject - the last Monday in Second Term.

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

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

Time Requirements
13. (1) Except with the special permission of the Faculty Board:
   (a) 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;
   (b) a part-time candidate shall complete the requirements for the Diploma in not less than two and not more than five 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.

Relaxing Provision
14. 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

Diploma in Computer Science

Prerequisites

Preliminary Subject
Introduction to Programming (IP)

Data Structures and Algorithms (DS&A)
Commercial Programming (CP)
Assembly Language and Operating Systems (AL&OS)
Comparative Programming Languages (CPL)
Systems Analysis (SA)

Systems Design (SD)
Numerical Analysis (NA)
Linear Algebra (LA)
Discrete Mathematics (DM)
Random Processes and Simulation (RP)
Switching Theory and Logical Design (ST&LD)
Microprocessor Systems and Applications (MS&A)

Subjects with a Unit Value of Three
Software Engineering (SE)
Advanced Programming (AP)
Database Design (DD)
Compiler Design (CD)
Artificial Intelligence Programming Techniques (AIT)
Computer Graphics (CG)
Computer Networks (CN)
Theory of Computation (TC)

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 adviser for each candidate.

6. (1) To qualify for the Diploma, a candidate shall, in not less than 2 years of part-time study or 1 year of full-time study, pass a programme of subjects comprising 12 units of advanced work.¹

   (2) The programme shall consist of subjects offered by the Department of

¹ No more than 3 units at the Part II level may be counted.
Mathematics, Statistics and Computer Science or another Department offering courses with considerable mathematical content.

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

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

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

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

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

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

(a) in the case of any subject offered in the first half of the academic year - the last Monday of First Term;

(b) in the case of any subject offered in the second half of the academic year - the fourth Monday in Third Term;

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

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

REGULATIONS GOVERNING THE DIPLOMA IN MEDICAL STATISTICS

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

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

"the Board" means the Board of Studies in Medical Statistics;

"the Diploma" means the Diploma in Medical Statistics.

3. The Diploma shall be awarded in two grades, namely:

Diploma in Medical Statistics with Merit

Diploma in Medical Statistics.

4. An applicant for admission to candidature for the diploma shall:

(a) have satisfied all the requirements for admission to a degree of the University of Newcastle, or to a degree of any other tertiary institution approved for this purpose by the Board, or

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

5. (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.

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

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

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

(2) The programme shall consist of

at least two units from Schedule A (Epidemiology)
at least four units from Schedule B (Statistics)
at least one unit from Schedule C (Computing)
at least one unit from Schedule D (Project)

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

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

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

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

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

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

(2) A candidate who withdraws from any subject after the relevant date shall be...
deemed to have failed in that subject unless granted permission by the Chairman of the Board to withdraw without penalty. The relevant date shall be:
(a) in the case of any subject offered in the first half of the academic year - the last Monday in first term;
(b) in the case of any subject offered in the second half of the academic year - the fourth Monday in third term;
(c) in the case of any other subject - the last Monday in second term.

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

SCHEDULES OF SUBJECTS

Diploma in Medical Statistics

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Topic</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Epidemiology)</td>
<td>Epidemiologic Methods</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Study Design</td>
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<tr>
<td></td>
<td>Health Care Evaluation</td>
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<tr>
<td></td>
<td>Behavioural Change</td>
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<td></td>
<td>Assessing Health Problems</td>
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<td></td>
<td>Population Research Seminar</td>
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<tr>
<td>B (Statistics)</td>
<td>Biostatistics I*</td>
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</tr>
<tr>
<td></td>
<td>Biostatistics II</td>
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</tr>
<tr>
<td></td>
<td>Applied Statistics* (AS)</td>
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<tr>
<td></td>
<td>Probability and Statistics (PS)</td>
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<tr>
<td></td>
<td>Random Processes and Simulation (RP)</td>
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</tr>
<tr>
<td></td>
<td>Survey Sampling Methods (SS)</td>
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</tr>
<tr>
<td></td>
<td>Linear Statistical Models (LM)</td>
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</tr>
<tr>
<td></td>
<td>Theory of Statistics (TS)</td>
<td>1</td>
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<tr>
<td></td>
<td>Demography and Survival Analysis</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Generalised Linear Statistical Modelling</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Analysis of Categorical Data</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statistical Consulting</td>
<td>1</td>
</tr>
</tbody>
</table>

* At most one of Biostatistics I and Applied Statistics can be counted.

Schedule C (Computing)

| Introduction to Programming (IP) | 1 |
| Data Structures and Algorithms (DS&A) | 1 |
| Comparative Programming Languages (CPL) | 1 |
| Systems Analysis (SA) | 1 |
| Systems Design (SD) | 1 |

Schedule D - Project worth at least one unit.

NOTES ON DEGREES AND DIPLOMAS

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 has 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 it is planned that two new subjects, Computer Science IIA and Computer Science IIB, will replace the existing Computer Science III subject. Meanwhile the old Computer Science III is being offered in 1987. The computer science subjects and topics being offered in 1987 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 will be permitted to enrol in the transitional subject Computer Science IIT.

It is expected that a transitional subject Computer Science IIIIT will be available from 1988 for the same group of students.

Degrees Which Include Computer Science Subjects

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

Bachelor 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 B.Math. degree students may also take the honours subject Computer Science II.

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 (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 elective units.

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 course, which is being introduced in 1987, has been designed to provide opportunities 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 B.Comp.Sc. degree, students must pass nine subjects. At least seven of these subjects must be from the Schedule, including three Part I subjects, the Part III subject Computer Science IIIA and one other Part 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 IICS, Y
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 subject is Computer Engineering II, but further subjects may be added to the Schedule. Alternatively a student can choose a Part II subject from the list below.

Students who wish to transfer from some other 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 IIIB. 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:

<table>
<thead>
<tr>
<th>Part I</th>
<th>Part II</th>
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<tbody>
<tr>
<td>Accounting I</td>
<td>Biology IIA</td>
</tr>
<tr>
<td>Biology I</td>
<td>Chemistry IIA</td>
</tr>
<tr>
<td>Chemistry I</td>
<td>Classical Civilisation IIA</td>
</tr>
<tr>
<td>Classical Civilisation I</td>
<td>Economics IIA</td>
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<tr>
<td>Drama I</td>
<td>Education II</td>
</tr>
<tr>
<td>Economics IA</td>
<td>Electronics and Instrumentation IIA</td>
</tr>
<tr>
<td>English I</td>
<td>English IIA</td>
</tr>
<tr>
<td>French IA or IS</td>
<td>French IIA</td>
</tr>
<tr>
<td>Geography I</td>
<td>Geography IIA</td>
</tr>
<tr>
<td>Geology I</td>
<td>Geology IIA</td>
</tr>
<tr>
<td>German IIS or IN</td>
<td>German IIA</td>
</tr>
<tr>
<td>Greek I</td>
<td>History IIA</td>
</tr>
<tr>
<td>History I</td>
<td>Japanese I</td>
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<td>Mathematics IIA</td>
</tr>
<tr>
<td>Philosophy I</td>
<td>Philosophy IIA</td>
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<tr>
<td>Physics I or IB</td>
<td>Physics II</td>
</tr>
<tr>
<td>Psychology I</td>
<td>Psychology IIA</td>
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<tr>
<td>Sanskrit I</td>
<td>Psychology II</td>
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<td>Sociology I</td>
<td>Statistics II</td>
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</table>

For part-time students the degree patterns described above can be adjusted appropriately over not more than seven years.

Essay Requirement

Students of the B.Comp.Sc. degree must complete an essay on some aspect of the history or philosophy of computer science or the social issues raised by computer technology. This will normally be completed in a student's second or third year. Details will be discussed at the beginning of the Computer Science II lectures each year. This involves reading several books and articles in preparation, so it should not be left until the last minute. The degree cannot be awarded until the essay has been satisfactorily completed.

Students wishing to transfer from other degrees

Standing for subjects taken as part of other degree courses should be discussed in the first instance with the Head of the Department of Computer Science.

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 IIIA (or its equivalent) with 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 IIIB for students who have not already taken these).

Diploma in Computer Science

A post-graduate 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 (e.g. having previously completed Computer Science II).

Transition Arrangements

Students who enrolled in the Diploma before 1987 should consult the Diploma Coordinator to determine whether they should continue under the old regulations or transfer to the new. In the latter case standing may be given for subjects previously passed.

Master of Computing

This is a new post-graduate coursework masters degree which requires two years full-time (or the equivalent part-time) study. To qualify for the M.Comp. a student must pass the subject Computer Science IVM, which involves about one full year of coursework (normally based on that of Computer Science IIIB and IV) together with a very substantial one-year research project, usually associated with one of the research projects being carried out in the Department of Computer Science.

Applications will be considered from graduates who have completed Computer Science IIIA or its equivalent (e.g. including the Diploma in Computer Science). The course commences at the beginning of the academic year.
Master of Computer Science and Doctor of Philosophy

The M.Comp.Sc. and the Ph.D. are research degrees by thesis, requiring an original contribution to knowledge in the area of computer science. The entry requirement is a B.Comp.Sc. (Hons) or equivalent honours degree with at least second class honours. Candidates are normally recommended to enrol initially in the M.Comp.Sc. and if their work is of an exceptional quality they can later transfer into the Ph.D. 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.

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

It continues to be the case that Mathematics subjects may be taken in any degree course in the University. (However, in the Faculty of Architecture and the Faculty of Medicine certain "elective" regulations must be used). Mathematics majors continue to 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 Faculty of Economics and Commerce.

There are two major sequences in Mathematics. These are:
(i) Mathematics I, Mathematics IIA plus Mathematics IIC, followed by Mathematics IIIA.
(ii) Mathematics I, Mathematics IIA, Mathematics IIB.

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

A new subject Mathematics II has been introduced in 1987 which is composed of topics considered appropriate for student of the B.Comp.Sc. course.

Combined Degrees

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

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.

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.

Master of Mathematics and Doctor of Philosophy

These are research degrees by thesis requiring original contribution to knowledge in the area of Mathematics. 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.

Choice of Subjects in the B.Math. 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.

Enrolment in the following subjects is restricted as indicated below.

Economics IIA - Students should also include the Part II Statistics Topic PS, Probability and Statistics, in their course.

Economics IIB - This subject would not normally be included in the Bachelor of Mathematics course. However if permission is given to include this subject then the content should be discussed with the Dean.

A student may not include both Physics IA and Physics IB in his course.

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

Although there is a wide range of optional subjects in the degree course for the Bachelor of Mathematics it is essential that these be chosen with care, especially by those candidates who aim to apply Mathematics to some specific discipline. In many such cases it is essential to include certain Part I subjects in the first year of the degree course if it is to be completed in minimum time. Examples of programmes are given below; the list is not exhaustive and students are invited to consult the Dean concerning other possible programmes, including part-time programmes.

B.Math. with Computer Science

Year 1  Mathematics I, Computer Science I and two other subjects.
Year 2  Mathematics IIA, Mathematics IIC and Computer Science II.
Year 3  Mathematics IIA and Computer Science III.

B.Math. with Statistics

Year 1  Mathematics I and three other subjects.
Year 2  Mathematics IIA, Mathematics IIC and Statistics II.
Year 3  Mathematics IIA and Statistics III.

B.Math. with Computer Science and Statistics

Year 1  Mathematics I, Computer Science I and two other subjects.
Year 2  Mathematics IIA, Computer Science II and Statistics II.
Year 3  Computer Science III and Statistics III.

B.Math. with Accounting¹

Year 1  Mathematics I, Accounting I, Economics IA, Computer Science I.
Year 2  Mathematics IIA, Mathematics IIC, Accounting IIC.
Year 3  Mathematics IIA, Accounting IIC (Accounting III B and Foundations of Finance option).

B.Math. with a discipline from the Faculty of Science, e.g. Psychology

Year 1  Mathematics I, Psychology I and two other subjects.
Year 2  Mathematics IIA, Mathematics IIC and Psychology IIC.
Year 3  Mathematics IIA, Psychology IIC.

B.Math. with an Engineering discipline, e.g. Civil Engineering

Year 1  Mathematics I, Engineering I and two other subjects
(Physics I A is recommended).
Year 2  Mathematics IIA, Mathematics IIC and Civil Engineering IIM.
Year 3  Mathematics IIA and Civil Engineering IIM.

STATISTICS COURSES

From 1987 it will be possible for students to take a major sequence in statistics consisting of the following subjects: Mathematics I, Statistics II, Statistics III. This sequence can be taken as part of the Bachelor degrees in Mathematics, Science, Arts, Commerce and Economics.

¹ Note: In order to complete the educational requirements for the professional bodies, it is necessary to pass additional subjects.

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 transition arrangement for 1987 students enrolling in the Part III subject Statistics III must have already passed the Mathematics II topical: H (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, i.e. parts of Statistics II and Statistics III, are also available as parts of other subjects. For example, Topic AS: Applied Statistics may be included in Mathematics IIA and is part of several Engineering programmes, and Topic RP: Random Processes and Simulation is part of Mathematics IIC.

Honours Courses

Honours level topics in Statistics are available as part of Mathematics IV and it is hoped to offer a subject Statistics IV within the next year or so.

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 Medical Statistics

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

Master of Mathematics and Doctor of Philosophy

Research master and doctoral degrees are available in Statistics. The requirements for these degrees are given elsewhere in this handbook. Further details may be obtained from the Department of Statistics.

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.

B.Comp.Sc. and another Degree

At the time of going to press combined degree regulations for B.Comp.Sc. students have not yet been approved. Students interested in a combined degree course should discuss their plans with the appropriate Dean(s).

B.Math. and another Degree

Arts/Mathematics

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

**Year 1**  Mathematics I and three other Part I subjects.

**Year 2**  three Part II subjects including Mathematics IIA and Mathematics IIC and another subject which should be a Part I or Part II subject approved for the degree of Bachelor of Arts.

**Year 3**  Mathematics IIIA plus two other subjects which must include at least one Part III subject.

**Year 4**  either Mathematics IIIB, Computer Science III, Statistics III or a Schedule B subject from the requirements of Bachelor of Mathematics Plus two other subjects which will complete the requirements for the Arts degree.

**Commerce/Mathematics**

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

**Year 1**  Mathematics I
  Introductory Quantitative Methods
  Economics I
  Accounting I

**Year 2**  Mathematics IIA
  Mathematics IIC
  One B.Com. subject

**Year 3**  Mathematics IIIA
  Three B.Com. subjects

**Year 4**  Mathematics IIIB, Computer Science III, Statistics III or Part III Schedule B subject from the requirements for Bachelor of Mathematics
  Two B.Com. subjects

**Year 5**  Three B.Com. subjects.

**Economics/Mathematics**

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

Candidates wishing to enrol in a combined degree should liaise with the relevant Head of Department and the Dean of the Faculty of Mathematics concerning approved subjects. See the 1987 Faculty of Engineering Handbook for subject/unit descriptions.

**Mathematics/Science**

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

The course could be pursued in the following manner:

**Year 1**  Mathematics I and three other Part I subjects.

**Year 2**  three Part II subjects including Mathematics IIA and Mathematics IIC and another Part I subject.

**Year 3**  Mathematics IIIA plus two other subjects which must include at least one Part III subject.

**Year 4**  one of Mathematics IIIB, Computer Science III, Statistics III or a Schedule B subject from the requirements for Bachelor of Mathematics, plus two other subjects which will complete the requirements for the Science degree.
NOTES FOR INTENDING TEACHERS

Prerequisites for Diploma in Education Units

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

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

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

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

(b) Primary

Prerequisites

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

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

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

Mathematics Education Subjects

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

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.

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

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

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

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

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

(d) Texts are essential books recommended for purchase.

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

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

Computer Science I  Dr. B. Beresford-Smith
Computer Science II/III  Dr. J. Rosenberg
Computer Science III  Simon
Computer Science IV/IVM  Prof. J.L. Keedy
Research degrees  Prof. J.L. Keedy
Diploma in Computer Science  Dr. D.W.E. Blatt

DESCRIPTION OF COMPUTER SCIENCE SUBJECTS AND TOPICS

Further information about computer science courses appears in the section Notes on Degrees. Computer Science subjects do not formally enrol in their constituent topics. However, Computer Science III, IV and IVM 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 consult the Head of the Department of Computer Science.

PART I COMPUTER SCIENCE SUBJECT

681100  Computer Science I

Prerequisite  Mathematics I

Hours  3 lecture hours and 3 laboratory hours per week.

Examinations  Two 2-hour papers and one mid-year paper.

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 (compilers and operating systems). Applications of computers. Social issues raised by computers. An extensive introduction to programming in Pascal.

Texts


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

PART II COMPUTER SCIENCE SUBJECTS

Computer Science II is the normal Part II computer science subject for students enrolled in all degrees. As a special transitional arrangement only, students who enrolled in a B.Math. degree before 1986 and who have not taken Computer Science I may enrol in Computer Science II. In exceptional circumstances, and only with the explicit permission of the Head of the Department of Computer Science, students who need to repeat the old Computer Science II Part 2 may be granted permission to enrol in a part of Computer Science IIT specified by the Head of Department.

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

Content

This subject comprises the four topics:

Assembly Language & Operating Systems
Commercial Programming
Comparative Programming Languages
Data Structures & Algorithms

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

682900  Computer Science IIT

Prerequisite  Mathematics I

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

Examinations  By topic

Content

This subject comprises the four topics:

Introduction to Programming
Assembly Language & Operating Systems
Comparative Programming Languages
Data Structures & Algorithms

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

PART III COMPUTER SCIENCE SUBJECTS

683100  Computer Science III

Note: This subject will be replaced in 1988 by Computer Science IIIA and IIIB.

Prerequisites  Computer Science II and any further prerequisites dictated by particular topic choice.

Hours  See individual topics

Examinations  By topic

Content

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

684100  Computer Science IV

This subject is the one-year full-time or two-year part-time honours subject in the B.Comp.Sc.(Hons) and B.Math.(Hons) degrees. A student desiring admission to this subject should apply in writing to the Head of Department before 20th December of the preceding year.

Prerequisites  Computer Science III

Hours  Approx. 162 lecture hours

Examination  Six 2-hour papers or equivalent assessment.

Content

A selection of six Part IV topics, chosen from the Part IV Computer Science Topics listed below. (In exceptional circumstances the Head of Department may approve other topics.) Each topic is worth 10% of the final assessment.

Students are also required to complete a substantial practical project (involving approximately 400 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.

The topics for Computer Science IV (Honours) are listed below. Their descriptions are the same as the corresponding subject descriptions for the Diploma in Computer Science. Students must advise the Head of the Department of Computer Science at the beginning of the year which six 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 their 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. Details of other Diploma in Computer Science subjects are either not available until 1988 or are described in the Mathematics and Statistics sections of this Handbook, as indicated:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Department</th>
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<tbody>
<tr>
<td>Computer Science Topic</td>
<td></td>
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<tr>
<td>680118  Software-Oriented Computer Architecture</td>
<td>Old</td>
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<tr>
<td>680108  Computer Graphics</td>
<td>Revised</td>
</tr>
<tr>
<td>680117  Software Engineering</td>
<td>Revised</td>
</tr>
</tbody>
</table>

DIPLOMA IN COMPUTER SCIENCE

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 20th December of the preceding year.

Prerequisites  Computer Science III

Hours  Approx. 270 lecture hours

Examination  Ten 2-hour papers or equivalent assessment.

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.

The topics for Computer Science IVM (Master of Computing) available in 1987 are the same as those for Computer Science IV. Several further topics will become available in 1988. 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.

Computer Number  Topic                               Dip.Comp.Sc. Regulations

680101  Advanced Operating Systems                   Old
680103  Artificial Intelligence                      Old
680110  Concurrency, Complexity and VLSI            Old
680113  Formal Semantics of Programming Languages    Old
**680116 Project**
Projects are allocated from a list available from the Computer Science Office.

**680114 Introduction to Programming** - D.W.E. Blatt

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

*Examination*  
Assignments and a 2-hour paper

*Content*  
An introduction to structured programming and the design of algorithms. The high level language Pascal is covered in some detail. It is used to demonstrate the techniques of structured programming and stepwise refinement, good coding style and documentation and methods of program debugging and testing. Topics include the formal definition of high level languages, conditional statements, looping, case statements, the role of goto constructs, procedures, recursion and basic data structures.

**680112 Data Structures and Algorithms** - B. Beresford-Smith

*Prerequisite*  
Computer Science I or 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*  
Basic data structures and the design and analysis of algorithms which use these data structures are investigated. Topics covered will include a review of elementary data structures, an introduction to the concept of an abstract data type and the abstraction and implementation of data types including lists, stacks, queues, trees, graphs and sets. Particular attention is given to the problem of sorting and some common algorithm design techniques such as divide-and-conquer, backtracking and greedy algorithms.

**Text**

**References**
- Aho, A.V., Hopcroft, J.E. & Ullman, J.D.  
  *Data Structures and Algorithms* (Addison-Wesley 1983)
- Dahl, O.J., Dijkstra, E.W. & Hoare, C.A.R.  
- Knuth, D.E.  
  *The Art of Computer Programming* (vol. 1, 3) (Addison-Wesley 1968, 1973)
- Tenebaum, A.M. & Augenstein, M.J.  
  *Data Structures using Pascal* (Prentice-Hall 1981)
- Welsh, J., Elder, J. & Bustard, D.  
  *Sequential Program Structures* (Prentice Hall 1984)
- Wirth, N.  
  *Algorithms + Data Structures = Programs* (Prentice Hall 1976)

**680105 Assembly Language and Operating Systems** - J. Rosenberg

*Prerequisite*  
Computer Science I or 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 provides an introduction to computer organisation and assembly language programming. Topics covered include data representation, computer structures, 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, memory management and file systems.

**Text**

- Deitel, H.M.  
  *An Introduction to Operating Systems* (Addison-Wesley 1984)

**680106 Comparative Programming Languages** - Simon

*Prerequisite*  
Computer Science I or 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.

Several programming languages will be introduced and studied during the course. These will probably include FORTRAN, SNOBOL and C.

**Text**

- Pratt, T.W.  
  *Programming Languages - Design and Implementation*
Compiler Design - D.W.E. Blatt

**Prerequisite**
Assembly Language and Operating Systems

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

**Examination**
One 2-hour paper plus assignments


The course consists of lectures and a small project assignment.

**References**
Aho, A.V., Sethi, R. & Ullman, J. D.


Software Engineering - J.L. Keedy

**Prerequisite**
Computer Science I or Introduction to Programming, Data Structures & Algorithms, Assembly Language & Operating Systems

**Hours**
2 lecture hours per week (first semester),
plus a major assignment (second semester)

**Examination**
One 2-hour paper plus assignment

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

Computer Graphics - D.W.E. Blatt

**Prerequisite**
Computer Science I or Introduction to Programming, Data Structures & Algorithms, Assembly Language & Operating Systems, Linear Algebra, Numerical Analysis

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

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

**References**
Angell, I.O.


Brown, M.D.

*Understanding PHIGS* (Template/Megatek 1985)

Enderle, G., Kansy, K. & Pfaff, G.


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


Freedman, H.


Gibori, W.K.


Gourand, H.

*Computer Display of Curved Surfaces* (Garland 1979)

Harrington, S.


Hopgood, F.R.A. et al.


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


Pavlidis, T.

*Algorithms for Graphics and Image Processing* (Springer 1982)

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


Rogers, D.F.

organisations.
Structured techniques, as applied to COBOL programming, are emphasised. Structure diagrams, pseudo-code, programming standards, etc.

Students are expected to complete assignments using both COBOL 74 and COBOL 85.

**Tests**  
To be advised

**440123 Systems Analysis** - B.Check

**Prerequisites**  
Experience of at least one programming language

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

**Examination**  
One 2-hour paper plus progressive assessment

**Content**  
Structured Analysis and Design Methodology will be introduced. Specific topics include: characteristics of a system, information systems, the role of the systems analyst, the system life-cycle, interview techniques, report writing, documentation techniques (data flow diagrams, data dictionary, flowcharts, etc), cost-benefit analysis, implementation techniques.

**Tests**  
To be advised

**440124 Systems Design** - B.Check

**Prerequisites**  
Systems Analysis

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

**Examination**  
One 2-hour paper plus progressive assessment

**Content**  
Using techniques introduced in the Systems Analysis course students will work in small groups to design and implement small on-line computer based information processing systems. Specific topics include: file design techniques, form design, security controls and backup, system testing and implementation, the on-going maintenance of systems.

**Texts**  
To be advised

**533221 Switching Theory and Logical Design**

**Prerequisite**  
Mathematics I

**Hours**  
3 hours of lectures, tutorials and practical work per week for the first Semester

**Examination**  
Progressive assessment and final examination

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

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

**Text**  
To be advised

**503003 Microprocessor Systems and Applications**

**Prerequisite**  
Assembly Language & Operating Systems

**Hours**  
3 hours per week for second half of year

**Content**  

Cantoni, A.  
An Introduction to Microprocessor Systems:  
Course Notes, Department of Electrical and Computer Engineering

**DIPLOMA IN COMPUTER SCIENCE (OLD REGULATIONS)**

The following are subjects offered by the Department of Computer Science in the (old) Diploma in Computer Science. Some of them may also be available as subjects, topics or units in other courses. Students registered for the old Diploma may also apply for approval to enrol in subjects for the revised Diploma.

**680115 Programming Languages and Systems** - Simon

**Prerequisite**  
Knowledge of Pascal

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

**Examination**  
One 2-hour paper

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

**References**  
Bratko, I.  
Prolog Programming for Artificial Intelligence  
(Addison-Wesley 1986)

Clocksin, W.F. & Mellish, C.S.  
Programming in Prolog, 2nd edn  
(Springer Verlag 1984)

Griswold, R.E. et al.  
The SNOBOLA Programming Language, 2nd edn  
(Prentice Hall 1971)

Siklossy, L.  
Let's talk LISP  
(Prentice Hall 1975)

Winston, P.H. & Horn, B.K.P.  
LISP, 2nd edn (Addison-Wesley 1984)
680103 Artificial Intelligence - Simon

Prerequisite

Programming Languages & Systems

Hours

2 lecture hours per week (one semester)

Examination

One 2-hour paper

Content

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

References

Barr & Feigenbaum: Artificial Intelligence and Natural Man

Bodgen: The Handbook of Artificial Intelligence

Winston: Artificial Intelligence

Nilsson: Problem Solving Methods in Artificial Intelligence

680110 Concurrency, Complexity and VLSI - B. Beresford-Smith

Prerequisite

Theory of Computing

Hours

2 lecture hours per week (one semester)

Examination

One 2-hour paper

Content

This course provides an introduction to aspects of VLSI systems which are relevant to those with a software bent. The fundamentals of VLSI 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 the theoretical computer models and algorithms appropriate to such structures are investigated. Complexity and other issues arising from the prospect of building machines with very many parallel processing elements and a high level of concurrency are discussed.

References

Evans, D.J. (ed.): Parallel Processing Systems

Hopcroft, J.E. & Ullman, J.D.: Introduction to Automata Theory, Languages and Computation


Savage, J.E.: The Complexity of Computing

Traub, J.F. (ed.): Algorithms and Complexity

Ullman, J.D.: Computational Aspects of VLSI

680113 Formal Semantics of Programming Languages - Simon

Prerequisite

Programming Languages & Systems

Hours

2 lecture hours per week (one semester)

Examination

One 2-hour paper

Content

The syntax of programming languages is generally described quite concisely and unambiguously in syntax diagrams, BNF or the like; but the semantics, the meaning or 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 at such systems in general, and at one of them, denotational semantics, in detail.

Texts

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


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

References

Evans, D.J. (ed.): Parallel Processing Systems

Hopcroft, J.E. & Ullman, J.D.: Introduction to Automata Theory, Languages and Computation


Savage, J.E.: The Complexity of Computing

Traub, J.F. (ed.): Algorithms and Complexity

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:

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<tr>
<th>Mathematics I</th>
<th>Dr. W.P. Wood</th>
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<td>Mathematics II</td>
<td>Dr. W.Summerfield</td>
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<td>Mathematics III</td>
<td>Mr. M.I.Hayes</td>
</tr>
<tr>
<td>Mathematics IV</td>
<td>Dr. J.G.Couper</td>
</tr>
<tr>
<td>Research Degrees</td>
<td>Assoc. Prof. P.K.Smrz</td>
</tr>
<tr>
<td>Diploma in Mathematical Studies</td>
<td>Assoc. Prof. W. Brisley</td>
</tr>
</tbody>
</table>

**DESCRIPTION OF MATHEMATICS SUBJECTS:**

### Preliminary Notes

The Department of Mathematics offers and examines subjects, most being composed of topics, each single-unit topic consisting of about 27 lectures and 13 tutorials. Each of the Part I, Part II and Part III subjects consists of the equivalent of four single-unit topics. For Mathematics I and Mathematics IIC there is no choice of topics; for Mathematics IIA, IIB and IIC there is some choice available to students; for Mathematics IIA and IIB 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 year has been better than that student’s performance in the final examination, then the year’s work will be taken into account in determining the final result. On the other hand, when a student’s performance during the year has been worse than that student’s performance in the final examination, then the year’s work will be ignored in determining the final result. However, performance during the early part of the year is taken into account when considering exclusion for “unsatisfactory progress”.

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

**PART I MATHEMATICS SUBJECT**

### 661100 Mathematics I

#### Advisory Prerequisite

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

- **Hours**
  - 4 lecture hours and 2 tutorial hours per week
- **Examination**
  - Two 3-hour papers

#### Content

The following four topics:

- Algebra
- Real Analysis
- Calculus
- Statistics and Computing

**MATHEMATICS I TOPIC DESCRIPTIONS**

**Algebra** - P.K. Smrz


#### References

- Brisley, W
- Kolman, B
- Liebeck, H
- Lipschutz, S
- J.G. Couper

**Real Analysis** - J.G. Couper


#### References

- Apostol, T
- Giles, J.R.
- Spivak, M
- Stein, S.K.

**Calculus** - R.F. Berghout


#### References

- Ayres, F
- Stein, S.K.
Statistics & Computing - W.P. Wood

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

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

References for Pascal
Cooper, D. & Clancy, M
Koffman, E.B.
Savitch, W.J.

Koffman, E.B.

Other References
Conte, S.D. & de Boor, C.
Hoel, P.G.
Huntsberger, O.V.
& Billingsley, P.

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 IIB and IIC. Students who wish to include Mathematics IIA in their third year programme must succeed in both Mathematics IIA and IIC.

The Department also offers the subject Mathematics IIC (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

All Part II Topics have Mathematics I as prerequisite

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<th>Corequisite or Prerequisite Topic</th>
<th>Part III Topic having this Part II Topic as Prerequisite</th>
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</thead>
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<td>A Mathematical Models</td>
<td>CO</td>
<td>-</td>
</tr>
<tr>
<td>B Complex Analysis</td>
<td>CO</td>
<td>Q, W</td>
</tr>
<tr>
<td>CO Vector Calculus &amp; Differential</td>
<td>-</td>
<td>M, N, P, PD, Q</td>
</tr>
<tr>
<td>Equations (Double Topic)</td>
<td></td>
<td>QS, TC, W, Z</td>
</tr>
<tr>
<td>D Linear Algebra</td>
<td>-</td>
<td>P, T, W, X, Z</td>
</tr>
<tr>
<td>E Topic in Applied Mathematics</td>
<td>CO</td>
<td>-</td>
</tr>
<tr>
<td>e.g. Mechanics and Potential Theory</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>F Numerical Analysis &amp; Computing</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G Discrete Mathematics</td>
<td>-</td>
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K Topic in Pure Mathematics

T, W, X

e.g. Group Theory

L Analysis of Metric Spaces

CO V, W

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

Notes

1. Students whose course includes a Schedule B subject may have their choice of topics specified further than is set out in the rules below.

2. Students whose course include Physics IIA are advised to include topics CO, B and at least one of D, F 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 S (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 IIC together with Mathematics IIA will substitute a suitable topic for D in Mathematics IIA.

662100 Mathematics IIA

Prerequisite
Mathematics I

Hours
4 lecture hours and 2 tutorial hours per week

Examination
Each topic is examined separately

Content

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

662200 Mathematics IIB

Prerequisite
Mathematics I

Hours
4 lecture hours and 2 tutorial hours per week

Examination
Each topic is examined separately

Content

Four topics chosen from A to 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 or more 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 IIB in two parts, each consisting of two topics.

662300 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.

662410 Mathematics ICS

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 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 Mathematics.

Students wishing to proceed to Mathematics IV are required to take Mathematics IIIA and at least one of Mathematics IIIE, 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 IIIC are prerequisites for entry to Mathematics IIIIB. 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.

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.

Topic

| M | General Tensors and Relativity |
| N | Variational Methods and Integral Equations |
| O | Mathematical Logic and Set Theory |
| P | Ordinary Differential Equations |
| PD | Partial Differential Equations |
| Q | Fluid Mechanics |
| QS | Quantum and Statistical Mechanics |
| S | Geometry |
| T | Group Theory |
| TC | Theory of Computing |
| V | Measure Theory & Integration |
| W | Functional Analysis |

Prerequisite(s)

| CO |
| CO |
| CO, D |
| CO |
| CO, B |
| CO |
| D, K |
| CO |
| L |
| B, CO, D, K, L |

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

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

Notes

1. In order to take both Mathematics IIIA and Mathematics IIIB, a student must study at least eight topics from the above with due regard to the composition of Mathematics IIIA.

2. Students aiming to take Mathematics IV may be required to undertake study of extra topics. They should consult the Head of Department concerning the arrangements.

663100 Mathematics IIIA

Prerequisites Mathematics IIIA & IIC

Hours 4 lecture hours and 2 tutorial hours per week

Examination Each topic is examined separately

Content

A subject comprising Topic Q, together with three other topics chosen from those listed above, at least one of which should be from the set (P, S, T, V, W, X) and one from (M, N, PD, Q, QS, TC, Z). The final choice of topics must be approved by the Head of the Department.

663200 Mathematics IIIB

Prerequisite Mathematics IIIA

Hours 4 lecture hours and 2 tutorial hours per week

Examination Each topic is examined separately

Content

A subject comprising four topics chosen from those listed above. In some circumstances, a suitable third year topic from another Department in the Faculty of Mathematics may be included. Students should consult members of academic staff regarding their choice of topics. The final choice of topics must be approved by the Head of the Department.

PART IV MATHEMATICS SUBJECTS

NOTE: A meeting will be held on the first Tuesday of first term in Room V107 at 1.00 pm to determine the timetable for Mathematics IV topics.

664100 Mathematics 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 IIIA and at least one of Mathematics IIIB, 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
Examination
At least eight 2-hour final papers.
A thesis, i.e. a study under direction of a special topic using relevant published material and presented in written form. Work on this thesis normally starts early in February.

Content
A selection of at least eight Part IV topics. The topics offered may be from any branch of Mathematics including Pure Mathematics, Applied Mathematics, Statistics, Computer Science and Operations Research as exemplified in the publication Mathematical Reviews. Summaries of topics are 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 of study from courses given in those departments.)
The University of Newcastle Calendar consists of the following volumes:

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

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

Volume 3 — Handbook, Faculty of Architecture

Volume 4 — Handbook, Faculty of Arts

Volume 5 — Handbook, Faculty of Economics and Commerce

Volume 6 — Handbook, Faculty of Education

Volume 7 — Handbook, Faculty of Engineering

Volume 8 — Handbook, Faculty of Mathematics

Volume 9 — Handbook, Faculty of Medicine

Volume 10 — Handbook, Faculty of Science

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

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

All volumes except Volume 2 Staff are available on microfiche.

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

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### PRINCIPAL DATES 1987

(See separate section for Faculty of Medicine)

#### January
- **1 Thursday**: Public Holiday — New Year’s Day
- **9 Friday**: Last day for return of Application for Re-enrolment Forms — Continuing Students
- **14 Wednesday**: Deferred Examinations begin
- **23 Friday**: Deferred Examinations end
- **26 Monday**: Public Holiday — Australia Day
- **31 Thursday**: Closing date for applications for residence in Edwards Hall

#### February
- **4 Wednesday**: New students attend in person to enrol and pay charges
- **6 Friday**: Re-enrolment Approval Sessions for Re-Enrolling
- **10 Tuesday to 16 Monday**: Students
- **17 Tuesday**: Late enrolment session for new students
- **23 Monday**: *First Term* begins

#### March
- **17 Friday**: Good Friday — Easter Recess commences
- **22 Wednesday**: Lectures resume
- **25 Saturday**: Public Holiday — Anzac Day
- **27 Monday**: Last day for withdrawal without academic penalty from first half year subjects (See page (vii) for Dean’s discretion)

#### April
- **17 Friday**: *First Term* ends
- **18 Monday**: Examinations begin
- **22 Friday**: Examinations end
- **25 Monday**: *Second Term* begins

#### May
- **8 Monday**: Public Holiday — Queen’s Birthday
- **12 Friday**: Last day for return of *Confirmation of Enrolment* forms
- **29 Monday**: Examinations begin
- **30 Tuesday**: Closing date for Applications for Selection to the Bachelor of Medicine course in 1988

#### June
- **10 Thursday**: Examinations end
- **14 Monday**: Last day for withdrawal without academic penalty from full year subjects (See page (vii) for Dean’s discretion)
- **17 Monday**: Examinations begin
- **21 Friday**: Examinations end

#### September
- **7 Monday**: *Third Term* begins
- **28 Monday**: Last day for withdrawal without academic penalty from second half year subjects (See page (vii) for Dean’s discretion)

#### October
- **1 Thursday**: Closing date for Applications for Enrolment 1988 (Undergraduate courses other than Medicine)
- **5 Monday**: Public Holiday — Labor Day
- **30 Friday**: *Third Term* ends

#### November
- **9 Monday**: Annual Examinations begin
- **27 Friday**: Annual Examinations end

#### January
- **11 Monday**: Deferred Examinations begin
- **22 Friday**: Deferred Examinations end

#### February
- **22 Monday**: *First Term* begins

Note: * Date not finalised
TERM DATES FOR THE B.MED. PROGRAMME 1987

<table>
<thead>
<tr>
<th>Year I</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 1</td>
<td>Feb. 23 - May 1</td>
<td>10 week term including Easter break (17/4/87 - 21/4/87)</td>
</tr>
<tr>
<td>Vacation</td>
<td>May 4 - May 22</td>
<td></td>
</tr>
<tr>
<td>Term 2</td>
<td>May 25 - Aug. 14</td>
<td>9 week term 25/5/87 to 24/7/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 week consolidation 27/7/87 to 31/7/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 week mini-elective 3/8/87 to 14/8/87</td>
</tr>
<tr>
<td>Vacation</td>
<td>Aug. 17 - Aug. 28</td>
<td></td>
</tr>
<tr>
<td>Term 3</td>
<td>Aug. 31 - Nov. 20</td>
<td>9 week term 31/8/87 to 30/10/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 week Stuvac 2/11/87 to 6/11/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 week assessment period 9/11/87 to 20/11/87</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year II</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 1</td>
<td>Feb. 23 - May 1</td>
<td>10 week term including Easter break (17/4/87 to 21/4/87)</td>
</tr>
<tr>
<td>Vacation</td>
<td>May 4 - May 22</td>
<td></td>
</tr>
<tr>
<td>Term 2</td>
<td>May 25 - Aug. 14</td>
<td>9 week term 25/5/87 to 24/7/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 week consolidation 27/7/87 to 31/7/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 week mini-elective 3/8/87 to 14/8/87</td>
</tr>
<tr>
<td>Vacation</td>
<td>Aug. 17 - Aug. 28</td>
<td></td>
</tr>
<tr>
<td>Term 3</td>
<td>Aug. 31 - Nov. 27</td>
<td>9 week term 31/8/87 to 30/10/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 week Stuvac 2/11/87 to 6/11/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 week assessment period 9/11/87 to 20/11/87</td>
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<table>
<thead>
<tr>
<th>Year III</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Term 1</td>
<td>Feb. 9 - April 16</td>
<td>10 week term</td>
</tr>
<tr>
<td>Easter</td>
<td>April 17 - April 24</td>
<td></td>
</tr>
<tr>
<td>Term 2</td>
<td>April 27 - June 19</td>
<td>8 week term</td>
</tr>
<tr>
<td>Vacation</td>
<td>June 22 - June 26</td>
<td></td>
</tr>
<tr>
<td>Term 3</td>
<td>June 29 - Aug. 21</td>
<td>8 week term</td>
</tr>
<tr>
<td>Review</td>
<td>Aug. 24 - Aug. 28</td>
<td>(All students in Newcastle)</td>
</tr>
<tr>
<td>Stuvac</td>
<td>Aug. 31 - Sept. 4</td>
<td>1 week</td>
</tr>
<tr>
<td>Assessment</td>
<td>Sept. 7 - Sept. 25</td>
<td>3 weeks</td>
</tr>
<tr>
<td>Vacation</td>
<td>Sept. 28 - Oct. 9</td>
<td>2 weeks</td>
</tr>
<tr>
<td>(Note: second assessments will be held during this period)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective term</td>
<td>Oct. 12 - Dec. 4</td>
<td>8 week term</td>
</tr>
<tr>
<td>Third Assessments</td>
<td>Dec. 7 - Dec. 11</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year IV</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Term 1</td>
<td>Feb. 9 - March 20</td>
<td>6 week term</td>
</tr>
<tr>
<td>Term 2</td>
<td>March 23 - May 8</td>
<td>6 week term and Easter break (17/4/87 to 24/7/87)</td>
</tr>
<tr>
<td>Vacation</td>
<td>May 11 - May 15</td>
<td></td>
</tr>
<tr>
<td>Term 3</td>
<td>May 18 - June 26</td>
<td>6 week term</td>
</tr>
<tr>
<td>Vacation</td>
<td>June 29 - July 3</td>
<td></td>
</tr>
<tr>
<td>Term 4</td>
<td>July 6 - Aug. 28</td>
<td>6 week term 6/7/87 to 14/8/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 week G.P. training period 17/8/87 to 28/8/87</td>
</tr>
<tr>
<td>Term 5</td>
<td>Aug. 31 - Oct. 9</td>
<td>6 week term</td>
</tr>
<tr>
<td>Term 6</td>
<td>Oct. 12 - Nov. 27</td>
<td>6 week term 12/10/87 to 20/11/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 week assessment period 23/11/87 to 27/11/87</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year V</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 1</td>
<td>Feb. 2 - March 20</td>
<td>2 week GP term 2/2/87 to 13/2/87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 week term 16/2/87 to 20/3/87</td>
</tr>
<tr>
<td>Term 2</td>
<td>March 23 - May 1</td>
<td>5 week term, plus Easter break</td>
</tr>
<tr>
<td>Term 3</td>
<td>May 4 - June 5</td>
<td>5 week term</td>
</tr>
<tr>
<td>Assessment Period 1</td>
<td>June 9 - June 12</td>
<td>1 week</td>
</tr>
<tr>
<td>Vacation</td>
<td>June 15 - June 19</td>
<td>1 week</td>
</tr>
<tr>
<td>Term 4</td>
<td>June 22 - July 24</td>
<td>5 weeks</td>
</tr>
<tr>
<td>Stuvac</td>
<td>July 27 - July 31</td>
<td>1 week</td>
</tr>
<tr>
<td>Assessment Period 2</td>
<td>Aug. 3 - Aug. 21</td>
<td>3 weeks (to include second assessment for period 2)</td>
</tr>
<tr>
<td>Term 5</td>
<td>Aug. 24 - Sept. 25</td>
<td>5 weeks (second assessments for period 2 to be held in last week of this term)</td>
</tr>
<tr>
<td>Elective</td>
<td>Sept. 28 - Nov. 20</td>
<td>8 weeks</td>
</tr>
<tr>
<td>Third Assessments</td>
<td>Nov. 23 - Nov. 27</td>
<td>1 week</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:

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Faculty Secretary</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>Ms Dianne Oughton</td>
<td>685711</td>
</tr>
<tr>
<td>Arts</td>
<td>Mr Peter Day</td>
<td>685296</td>
</tr>
<tr>
<td>Economics &amp; Commerce</td>
<td>Mrs Linda Harrigan</td>
<td>685695</td>
</tr>
<tr>
<td>Education</td>
<td>Mr Peter Day</td>
<td>685296</td>
</tr>
<tr>
<td>Engineering</td>
<td>Mr Geoff Gordon, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ms Dianne Oughton</td>
<td>685711</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Ms Helen Hotchkiss</td>
<td>685565</td>
</tr>
<tr>
<td>Medicine</td>
<td>Mr Brian Kelleher</td>
<td>685613</td>
</tr>
<tr>
<td>Science</td>
<td>Ms Helen Hotchkiss</td>
<td>685565</td>
</tr>
</tbody>
</table>

All Faculty Secretaries except for Mr Kelleher (Medicine) and Mr Gordon (Engineering) are located in the McMullin Building on the Ground Floor (northern end) in the Student Administration Office. Faculty Secretary for Medicine is located in room 607A in the Medical Sciences Building. Faculty Secretary for Engineering (Mr. G. Gordon) is located in EA209, Engineering Buildings.

For enquiries regarding particular studies within a faculty of department, Sub-dean, Deans or Departmental Heads (see staff section) should be contacted.

**Cashier's Office** - 1st Floor McMullin Building. Hours 10am - 12 noon and 2pm - 4pm. Accommodation Officer - Mrs Kath Dacey, phone 685520 located in the temporary buildings opposite Mathematics.

**Careers and Student Employment Officer** - Mr Hugh Floyer, phone 685466 located in the temporary buildings opposite Mathematics.

**Counselling Service** - phone 685255 or 685501 located on the Lower Ground Floor (northern end) of the McMullin Building.

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**II GENERAL INFORMATION**

**ADVICE AND INFORMATION**

**ENROLMENT OF NEW STUDENTS**

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

**TRANSFER OF COURSE**

Students currently enrolled in an undergraduate Bachelor degree course who wish to transfer to a different undergraduate Bachelor degree course must complete an Application for Course Transfer form and lodge it with their Application for Re-enrolment at the Student Administration Office by 9 January 1987.

**RE-ENROLMENT BY CONTINUING STUDENTS**

There are four steps involved for re-enrolment by continuing students:

- collection of the re-enrolment kit
- lodging the Application for Re-enrolment form with details of your proposed programme
- attendance at the Great Hall for enrolment approval, and
- payment of the General Service Charge.

(Students who are in research higher degree programmes re-enrol and pay charges by mail).

**Re-enrolment Kits**

Re-enrolment kits will be available for collection from 20 to 24 October 1986 from the Tanner Room, Level Three University Union and thereafter from the Student Administration Office in the McMullin Building. The re-enrolment kit contains the student's Application for Re-enrolment form, the 1987 Class Timetable, the Statement of Charges Payable for 1987 and re-enrolment instructions.

**Lodging Application for Re-Enrolment Forms**

The Application for Re-enrolment form must be completed carefully and lodged at the Student Administration Office by 9 January 1987. It can be lodged in November or December, but in general students should know their examination results before completing the form. There is no late charge payable if the form is late, but it is very important that the Application for Re-enrolment form is lodged by 9 January 1987 as late lodgement will mean that enrolment approval will not be possible before the late re-enrolment session to the disadvantage of the student.

**Enrolment Approval**

All re-enrolling students are required to attend at the Great Hall on a specific date and time during the period 10-16 February 1987. Enrolment Approval dates are on posters on University Noticeboards and are included in the enrolment kits issued to students in October. When attending for Enrolment Approval students will collect their approved 1987 programme and student card. Any variations to the proposed programme must be clarified and submitted for approval. Enrolments in tutorial or laboratory sessions will be arranged. Staff from academic Departments will be available to answer enquiries.

Fare concessions forms will also be issued, providing the General Services Charge has been paid.

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

The re-enrolment kit issued to re-enrolling students includes a Statement of Charges payable form which must accompany the payment of charges for 1987. These charges may be paid at any time after receiving the re-enrolment kit.

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

Payment by cash at the Cashier’s Office may lead to queues at enrolment time.

The Cashier’s Office will be open for extended hours during the enrolment approval sessions in the period 9-16 February 1987. Afterwards any further payments should be by mail only.

LATE PAYMENT

Payment of the General Services Charge is due before or upon re-enrolment. The final date for payment is the date of the Re-enrolment Approval session for the course concerned in the period 9-16 February 1987, after which a late charge applies at the rate of:

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

Thereafter enrolment will be cancelled if charges remain unpaid.

STUDENT CARDS

When attending for Enrolment Approval, students will be given their Approved Programme form which incorporates the Student Card. The Student Card should be carried by students when at the University as evidence of enrolment. The Student Card has machine readable lettering for use when borrowing books from the University Library, and contains the student’s interim password for access to facilities of the Computing Centre. Students are urged to take good care of their Student Card. If the card is lost or destroyed, there is a service charge of $5 payable before the card will be replaced.

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

RE-ADMISSION AFTER ABSENCE

A person wishing to resume an undergraduate degree course who has been enrolled previously at the University of Newcastle, but not enrolled in 1986, is required to apply for admission again through the Universities and Colleges Admissions Centre, Box 7049 G.P.O. Sydney. Application forms may be obtained from the UCAC or from the Student Administration Office and closed with the UCAC on 1 October each year. There is a $40 fee for late applications.

ATTENDANCE STATUS

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

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

CHANGE OF ADDRESS

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

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

It should be noted that examination results will be available for collection in the Drama Workshop in mid December. Results not collected will be mailed to students. Students who will be away during the long vacation from the address given to the University for correspondence should make arrangements to have mail forwarded to them.

CHANGE OF NAME

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

CHANGE OF PROGRAMME

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

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

WITHDRAWAL

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

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

<table>
<thead>
<tr>
<th>Full Year Subjects</th>
<th>First Half Year Subjects</th>
<th>Second Half Year Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawal Dates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monday</td>
<td>10 August 1987</td>
<td>28 September 1987</td>
</tr>
<tr>
<td>Monday</td>
<td>27 August 1987</td>
<td></td>
</tr>
</tbody>
</table>

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

If a student believes that a failure should not be recorded because of the circumstances leading to his or her withdrawal, it is important that full details of these circumstances be provided with the application to withdraw.
CONFIRMATION OF ENROLMENT
In May each year the University mails to all students a Confirmation of Enrolment form which also serves as the application to sit for examinations. This form must be checked carefully, signed and returned by all students (including non-degree students and postgraduate students not taking formal subjects) to confirm that they are actively pursuing subjects for which they are enrolled and that the information on University records is correct and complete.

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

LEAVE OF ABSENCE
A student who does not wish to re-enrol for any period up to three years should write to The Secretary and ask for leave of absence. Leave of absence is normally granted only to those students who are in good standing. Applications should be submitted before the end of first term in the first year for which leave of absence is sought. Leave of absence will not be granted for more than three years and will not be granted retrospectively.
In the case of the B.Med. degree 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 normally be granted for more than one year.
Application for re-admission to undergraduate degree courses must be made through the UCAC (see p. vii).

ATTENDANCE AT CLASSES
Where a student’s attendance or progress has not been satisfactory, action may be taken under the Regulations Governing Unsatisfactory Progress.
In the case of illness or absence for some other unavoidable cause, a student may be excused for non attendance at classes.
All applications for exemption from attendance at classes must be made in writing to the Head of the Department offering the subject. Where tests or term examinations have been missed, this fact should be noted in the application.
The granting of an exemption from attendance at classes does not carry with it any waiver of the General Services Charge.

GENERAL CONDUCT
In accepting membership of the University, students undertake to observe the by-laws and other requirements of the University.
Students are expected to conduct themselves at all times in a seemly fashion. Smoking is not permitted during lectures, in examination rooms or in the University Library. Gambling is forbidden.
Members of the academic staff of the University, senior administrative officers, and other persons authorised for the purpose have authority to report on disorderly or improper conduct occurring in the University.

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

STUDENT MATTERS GENERALLY
The main notice board is the display point for notices concerning enrolment matters, scholarships, University rules and travel concessions, etc. This notice board is located on the path between the Union and the Library.
III EXAMINATIONS

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

EXAMINATION PERIODS

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

- End of First Term: 18 to 22 May, 1987
- Mid Year: 29 June to 10 July, 1987
- End of Second Term: 17 to 21 August, 1987
- End of Year: 9 to 27 November, 1987

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

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

SITTING FOR EXAMINATIONS

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

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

Calculators may be used, if permitted by the examiner in any examination. They must be
hand held, battery operated and non-programmable* and students should note that no
concession will be granted:
(a) to a student who is prevented from bringing into a room a programmable calculator;
(b) to a student who uses a calculator incorrectly; or
(c) because of battery failure.

RULES FOR FORMAL EXAMINATIONS

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

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

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

(h) a candidate shall not take from the examination room any examination answer,
book, graph paper, drawing paper or other material issued to him for use during the
examination;
(i) no candidate may smoke in the examination room.

Any infringement of these rules constitutes an offence against discipline.

EXAMINATION RESULTS

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

Results not collected will be mailed.

No results will be given by telephone.

After the release of the annual examination results a student may apply to have a result
reviewed. There is a charge of $8.00 per subject, which is refundable in the event of an error
being discovered. Applications for review must be submitted on the appropriate form
together with the prescribed review charge by 5 January 1987.

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

SPECIAL CONSIDERATION

All applications for special consideration should be made in writing to the Secretary
explaining the circumstances. Relevant evidence should be attached to the application (see
Regulation 12(2) of the Examination Regulations, Calendar Volume 1). Also refer to
Faculty Policy.

If a student is affected by illness during an examination and wishes to ask for special
consideration, he or she must report to the supervisor in charge of the examination and then
make written application to the Secretary within three days of the examination (see
Regulation 12(3) of the Examination Regulations, Calendar Volume 1). Also refer to
Faculty Policy.

Applicants for special consideration should note 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 preparation 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 and specify that the applicant was unfit to attend an examination on
a particular day or could attend but that the performance of the applicant would be affected
by the disability. If the period of disability extends beyond one day the period should be
stated.

DEFERRED EXAMINATIONS

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

(xiv)
IV UNSATISFACTORY PROGRESS

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

Students who become liable for action under the Regulations will be informed accordingly by mail after the release of the End of Year examination results and will be informed of the procedure to be followed if they wish to ‘show cause’.

Appeals against exclusion must be lodged together with Application for Re-enrolment forms by Friday 9 January, 1987.

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

REGULATIONS GOVERNING UNSATISFACTORY PROGRESS

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

   (2) These Regulations shall apply to all students of the University except those who are candidates for a degree of Master or Doctor.

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

   “Admissions Committee” means the Admissions Committee of the Senate constituted under By-law 2.3.5.;

   “Dean” means the Dean of a Faculty in which a student is enrolled;

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

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

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

   (b) failure to complete laboratory work;

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

   (d) failure to complete field work.

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

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

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

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

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

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

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

   (i) in the course; or

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

   (iii) in the Faculty;

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

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

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

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

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

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

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

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

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

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

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

   (c) exclude the student from the University.

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

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

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

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

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

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

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

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

V CHARGES

The General Services Charge (details below) is payable by all students. New undergraduate students are required to pay all charges when they attend to enrol.

Re-enrolling students receive in October each year, as part of their re-enrolment kit, a statement of charges payable. Students are expected to pay charges in advance of re-enrolment and payment by mail is requested. The last date for payment of charges without incurring a late charge is the date of the Re-enrolment Approval session for the particular course (in the period 9-16 February, 1987).

CHARGES

1. General Services Charge

   (a) Students Proceeding to a Degree or Diploma .................................. $179 Per annum

   Plus Students joining Newcastle University Union for the first time .................................................. $20

   (b) Non-Degree Students

      Newcastle University Union charge ................................................................. $80 Per annum

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

2. Late Charges

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

   — if received up to and including 7 days late .................................................. $10

   — if received between 8 and 14 days late ...................................................... $20

   — if received 15 or more days late ............................................................... $30

3. Other Charges

   (a) Examination under special supervision ....................................................... $15 per paper

   (b) Review of examination results ...................................................................... $8 per subject

   (c) Statement of matriculation status for non-members of the University ....

   (d) Statement of matriculation status for non-members of the University ....

   (e) Replacement of Re-enrolment kit ............................................................... $10

   (f) Replacement of Student Card ................................................................. $5

   (g) Re-enrolment after the prescribed re-enrolment approval session .......... $10

4. Higher Education Administration Charge

   $250

5. Indebted Students

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

METHOD OF PAYMENT

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

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

LOANS

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

REFUND OF CHARGES

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

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

<table>
<thead>
<tr>
<th>Notification Date</th>
<th>Refund Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>on or before Monday, 23 February, 1987</td>
<td>100%</td>
</tr>
<tr>
<td>on or before Friday, 20 March, 1987</td>
<td>90%</td>
</tr>
<tr>
<td>on or before Friday, 26 June, 1987</td>
<td>50%</td>
</tr>
</tbody>
</table>

No refund will be made before 31 March, 1987.

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 enrolment is effective from First or Second Term, the General Services charge covers the period from the first day of the term to the Friday immediately preceding the first day of First Term in the following academic year. Where enrolment is on or after the first day of Third Term, the General Services charge paid will cover liability to the end of the long vacation following the next academic year.

The Higher Education Administration charge applies to each academic year, e.g., if enrolment is on the first day of third term a charge of $250 is payable for that term. On enrolment in the subsequent years a further charge is payable for each year.

VI CAMPUS TRAFFIC AND PARKING

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

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

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

The Traffic and Parking Regulations are stated in full in the Calendar, Volume 1.
DESCRIPTION OF MATHEMATICS TOPICS:

PART I MATHEMATICS TOPICS
The topics for Mathematics I are described with the subject entry.

PART II MATHEMATICS TOPICS


Corequisite  Topic CO
Hours  1 lecture hour per week and 1 tutorial hour per fortnight
Examination  One 2-hour paper
Content
This topic is designed to introduce students to the idea of a mathematical model. Several realistic situations will be treated beginning with an analysis of the non-mathematical origin of the problem, the formulation of the mathematical model, solution of the mathematical problem and interpretation of the theoretical results.

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

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

Corequisite  Topic CO
Hours  1 lecture hour per week and 1 tutorial hour per fortnight
Examination  One 2-hour paper
Content
662109  Topic CO - Vector Calculus & Differential Equations - W. Summerfield

Prerequisite  Nil

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

Examination  One 3-hour paper


Text

Complex Variables and Applications (McGraw-Hill 1984)

References
Grover, E.A. & Ladas, G.

Introduction to Complex Variables (Houghton Mifflin 1974)

Kreyszig, E.

Advanced Engineering Mathematics (Wiley 1979)

Powers, D.L.

Theory and Problems of Complex Variables (McGraw-Hill 1964)

Tall, D.O.

Functions of a Complex Variable I and II (Routledge and Kegan Paul 1970)

662104  Topic D - Linear Algebra - G.W. Southern

Prerequisite  Nil

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

Examination  One 2-hour paper


Text
Kreyszig, E.

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

References
Amazigo, J.C. & Rubenfield, L.A.

Advanced Calculus and its Applications to the Engineering and Physical Sciences (Wiley 1980)

Boyce, W.E. & Di Prima, R.C.

Elementary Differential Equations and Boundary Value Problems (Wiley 1986)

Churchill, R.V. & Brown, J.W.

Differential and Integral Calculus Vol.II (Wiley 1968)


Calculus and Analytic Geometry (Prentice-Hall 1982)

Finizio, N. & Ladas, G.

O'Neill, P.V.


Piskunov, N.


References
Anton, H.

Elementary Linear Algebra 4th edn (Wiley 1984)

Bloom, D.M.

Linear Algebra and Geometry (Cambridge 1979)

Brisley, W.

A Basis for Linear Algebra (Wiley 1973)

Lipschutz, S.

Linear Algebra (Schaum 1974)

Nering, E.D.

Linear Algebra and Matrix Theory (Wiley 1964)

Reza, F.

Linear Spaces in Engineering (Ginn 1971)

Roman, S.

An Introduction to Linear Algebra (Saunders 1985)

Rorres, C. & Anton, H.

Applications of Linear Algebra (Wiley 1979)

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

Corequisite  Topic CO

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

Content


Text

Nil

References

(See references given in Topic CO)

Chorlton, F. Textbook of Dynamics (Van Nostrand 1963)
Goodman, L.E. Dynamics (Blackie 1963)
Marion, J.B. Classical Dynamics (Academic 1970)

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

Prerequisite

Nil

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper

Content


Text

Nil

References

Atkinson, K.E. An Introduction to Numerical Analysis (John Wiley)
Cooper, D. & Clancy, M. Oh! Pascal! (Wiley 1985)
Crawley, J.W.& Miller, C.E. A Structured Approach to Fortran (Prentice-Hall 1983)
Eiter, D.M. Problem Solving with Structured Fortran 77 (Benjamin 1984)
Eiter, D.M. Structured Fortran 77 for Engineers and Scientists (Benjamin 1983)
Gerald, C.F. & Wheatly, P.O. Applied Numerical Analysis (Addison-Wesley)
Marateck, S.L. Fortran 77 (Academic 1983)
McCracken, D.D. Computing for Engineers and Scientists

662203 Topic G - Discrete Mathematics

Prerequisite

Nil

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper

Content


Text

Nil

References

Grimaldi, R.P. Discrete and Combinatorial Mathematics (Addison-Wesley 1985)
Kalmanson, K. An Introduction to Discrete Mathematics and its Applications (Addison-Wesley 1986)

662303 Topic K - Topic in Pure Mathematics e.g. Group Theory - W. Brisley

Prerequisite

Nil

Hours

1 lecture hour per week and 1 tutorial hour per fortnight

Examination

One 2-hour paper

Content


Text

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

References

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

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

Examination: One 2-hour paper

Content:

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

PART III MATHEMATICS TOPICS

663101 Topic M - General Tensors and Relativity - P.K. Smrz
Prerequisite: Topic CO

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

Examination: One 2-hour paper

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

References:
Abram, J. Tensor Calculus through Differential Geometry (Butterworths 1965)
Lichnerowicz, A. Elements of Tensor Calculus (Methuen 1962)
Tyldesley, J.R. An Introduction to Tensor Analysis (Longman 1975)
Willmore, T.J. An Introduction to Differential Geometry (Oxford 1972)

663102 Topic N - Variational Methods and Integral Equations - C.J. Ashman

Prerequisite: Topic CO

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

Examination: One 2-hour paper

Content:
Problems with fixed boundaries: Euler’s equation, other governing equations and their solutions; parametric representation. Problems with movable boundaries: transversality condition; natural boundary conditions; discontinuous solutions; corner conditions. Problems with constraints. Isoperimetric problems. Direct methods. Fredholm’s equation; Volterra’s equation; existence and uniqueness theorems; method of successive approximations; other methods of solution. Fredholm’s equation with degenerate kernels and its solutions.

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

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

Prerequisite: Topics K & L are recommended but not essential, but some maturity in tackling axiomatic systems is required.

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

Examination: One 2-hour paper

Content:

References:
Crossley, J. et al. What is Mathematical Logic? (Oxford 1972)
Halmo’s, P.R. Naive Set Theory (Springer 1974; Van Nostrand 1960)
Lipschutz, S. Set Theory and Related Topics (Schaum 1964)
Margaris, A. First Order Mathematical Logic (Blaisdell 1967)
Mendelson, E. Introduction to Mathematical Logic 2nd edn (Van Nostrand 1979, paperback)
663104 Topic P - Ordinary Differential Equations - D.L.S. McElwain

Prerequisites
Topics CO & D

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

Examination
One 2-hour paper

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

Text
Nil

References
Arrowsmith, D.K. & Place, C.M.
Ordinary Differential Equations (Chapman & Hall 1982)
Hirsch, M.W. & Smale, S.
Differential Equations, Dynamical Systems and Linear Algebra (Academic 1974)
Jordan, D.W. & Smith, P.
Nonlinear Ordinary Differential Equations (Oxford 1977)

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

Prerequisite
Topic CO

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

Examination
One 2-hour paper

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

Text
Nil

References
Courant, R. & Hilbert, D.
Methods of Mathematical Physics Vol.II Partial Differential Equations (Interscience 1966)
Epstein, B.
Haack, W. & Wendland, W.
Lectures on Partial and Phaffian Differential Equations (Pergamon 1972)
Smith, M.G.
Introduction to the Theory of Partial Differential Equations (Van Nostrand 1967)
Sneddon, I.N.
Elements of Partial Differential Equations (McGraw-Hill 1957)

663105 Topic Q - Fluid Mechanics - W.F.T. Lau

Prerequisites
Topics B, CO

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

Examination
One 2-hour paper

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

Text
Nil

References
Batchelor, G.K.
An Introduction to Fluid Dynamics (Cambridge 1967)
Chirgwin, B.H. & Plumpton, C.
Elementary Classical Hydrodynamics (Pergamon 1967)
Curle, N. & Davies, H.J.
Modern Fluid Dynamics Vols I & II (Van Nostrand 2968, 1971)
Goldstein, S. (ed)
Modern Development in Fluid Dynamics Vols I & II (Dover 1965)
Milne-Thompson, L.M.
Theoretical Hydrodynamics (Macmillan 1962)
Panton, R.
Incompressible Flow (Wiley, 1984)
Paterson, A.R.
A First Course in Fluid Dynamics (Cambridge 1983)
Roberson, J.H.
Hydrodynamics in Theory and Application (Prentice-Hall 1965)

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

Prerequisite
Topic CO

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

Examination
One 2-hour paper

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

Text
Nil

References
Croxton, C.A.
Introductory Eigenphysics (Wiley 1975)
663107  Topic S - Geometry  - T.K. Sheng

**Prerequisite**
Nil

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

**Examination**
One 2-hour paper

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

**Text**
Nil

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

663201  Topic T - Group Theory  - W. Brisley

**Prerequisites**
Topics D and K

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

**Examination**
One 2-hour paper

**Content**
A continuation from elementary group theory, dealing with structure theorems for both Abelian and non-Abelian groups. The Sylow theorems. Free groups, and generator-relation representations. An introduction to matrix representations.

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

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

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

**Prerequisite**
Topic CO. Topic K is recommended but not essential

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

**Examination**
One 2-hour paper

**Content**
This course will attract science, mathematics and engineering students who are interested in the theoretical foundations of computer science. Topics studied include the following: Mathematical Models of Computers: Finite Automata are introduced as a first approximation to a model of a computer and some of their properties are studied. Three equivalent models of computation are then introduced and compared. These models are Turing machines, counter machines, and recursive functions. Some of the limits of models of computation (unsolvability) are also discussed. Algorithmic Aspects of Computation: How "good" an algorithm do we have for performing some computation? Is there any way in which we can say that some algorithm is the "best" for accomplishing some task? Program Correctness: Methods of program verification are introduced and discussed. Formal Languages and Parsing: Methods of systematically and formally specifying the syntax of programming languages are discussed. Some parsing methods are introduced.

**Text**
Nil

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

663203  Topic V - Measure Theory & Integration  - J.G. Couper

**Prerequisite**
Topic L

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

**Examination**
One 2-hour paper

**Content**

**Text**
Nil

**References**
Bartle, R.G. The Elements of Integration (Wiley 1966)
de Barra, G. Introduction to Measure: Theory (Van Nostrand 1974)
Halmos, P.R. Measure Theory (Van Nostrand 1950)
Kolmogorov, A.N. & Fomin, S.V.

Munroe, M.E.

Introduction to Measure and Integration (Addison Wesley 1953)

663204  Topic W - Functional Analysis - J.R. Giles

Prerequisites
Topics B, CO, D, K, L

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

Examination
One 2-hour paper

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

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

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

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

Giles, J.R.
Analysis of Metric Spaces (University of Newcastle 1975)

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

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

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

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

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

Wilansky, A.
Functional Analysis (Blaisdell 1964)

663217  Topic X - Fields and Equations - R.F. Berghout

Prerequisites
Topics D & K

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

Examination
One 2-hour paper

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

Text
Birkhoff, G.D. & MacLane, S.
A Survey of Modern Algebra (Macmillan 1953)

Charles, M.
Field Theory (Holden-Day 1973)

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

Isaacson, E. & Keller, H.M.
Analysis of Numerical Methods (Wiley 1966)

Lambert, J.C.
Numerical Methods for Ordinary Differential Equations (Wiley 1983)

Numrich, R.E.
To Compute Numerically: Concepts and Strategies (Little, Brown & Co. 1983)

Poler, S.M. & Wallace, V.L.

References
Ames, W.F.
Numerical Analysis 3rd edn (Prindle, Weber & Schmidt 1985)

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

Cohen, A.M. et al.

Conte, S.D. & de Boor, C.
Computational Methods for Mathematical Computations (Prentice-Hall 1977)

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

Dahlquist, G. & Börn, C.B.
Computational Methods in Ordinary Differential Equations (Wiley 1973)

Davies, R.M. & Ellingwood, B.R.
The Finite Element Method in Partial Differential Equations (Wiley 1977)

Farley, G.B. & Steward, D.C.
Introduction to Numerical Analysis (Wiley 1983)

Ivić, D.
Elementary Theory of Elliptic Functions (Van Nostrand Reinhold 1984)

Lambert, J.C.
Numerical Methods for Ordinary Differential Equations (Wiley 1983)

Putnam, R.E.

References
Ames, W.F.
Numerical Analysis 3rd edn (Prindle, Weber & Schmidt 1985)

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

Cohen, A.M. et al.

Conte, S.D. & de Boor, C.
Computational Methods for Mathematical Computations (Prentice-Hall 1977)

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

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Elementary Theory of Elliptic Functions (Van Nostrand Reinhold 1984)

Lambert, J.C.
Numerical Methods for Ordinary Differential Equations (Wiley 1983)

Putnam, R.E.
PART IV MATHEMATICS TOPICS

664179 History of Analysis to Around 1900 - R.F. Berghout
Prerequisite
Nil
Hours
About 27 lecture hours
Examination
One 2-hour paper
Content
A course of 26 lectures on the history of mathematics with emphasis on analysis. Other branches of mathematics will be referred to putting the analysis into context. Where feasible, use will be made of original material, in translation. The course will be assessed by essays and a final 2-hour examination. Topics to be covered include: pre-Greek concepts of exactness and approximation; Greek number systems and their equivalents; scholastic mathematics; virtual motion; Renaissance quadrature/cubature by infinitesimals and by other methods; and their treatment in Elements V, XII and the works of Archimedes; developments of number systems and their equivalents; scholastic mathematics; virtual motion; Renaissance quadrature/cubature by infinitesimals and by “geometry”; Cartesian geometry; 17th and 18th century calculus; rigorization of analysis in the 19th century with stress on the developments of number systems, continuity, function concept, differentiability, integrability.

Text
Nil
References
Lists will be presented during the course.

664151 Radicals & Annihilators - R.F. Berghout

Prerequisite
Topics T or X
Hours
About 27 lecture hours
Examination
One 2-hour paper
Content
This topic will briefly outline the classical theory of finite dimensional algebras and the emergence of the concepts of radical, idempotence, ring, chain conditions, etc. Hopefully thus set in perspective, the next part will deal with the Artin-Hopkins-Jacobson ring theory and the significance of other radicals when finiteness conditions are dropped. The relations between various radicals, noetherian rings, left and right annihilators and the Goldie-Small theorems will end the topic.

Text
Nil
References
Cohn, P.
Divinsky, N.
Herstein, I.N.
Kaplansky, I.
McCoy, N.
Algebra Vol. 2 (Wiley 1977)
Rings and Radicals (Allen-Unwin 1964)
Non-commutative Rings (Wiley 1968)
Fields and Rings (Chicago 1969)
The Theory of Rings (McMillan 1965)

664166 Symmetry - W. Brisley

Prerequisite
Topics D and K
Hours
About 27 lecture hours
Examination
One 2-hour paper
Content
This course studies various aspects of symmetry. Matters discussed may include: invariance of lattices, crystals and associated functions and equations; permutation groups; finite geometries; regular and strongly-regular graphs; designs; tactical configurations, “classical” simple groups, Matrix groups, representations, characters.

Text
Nil
References
Biggs, N.
Carmichael, R.D.
Harris, D.C. & Bertolucci, M.D.
Rosen, J.
Shubnikov, A.V. & Koptskl, V.A.
Weyl, H.
White, A.T.
Finite Groups of Automorphisms (Cambridge 1971)
Groups of Finite Order (Dover reprint)
Symmetry and Spectroscopy (Oxford 1978)
Symmetry Discovered (Cambridge 1975)
Symmetry in Science and Art (Plenum Press 1974)
Symmetry (Princeton 1973)
Graphs, Groups and Surfaces (North-Holland 1973)

664106 Combinatorics - W. Brisley

Prerequisite
Topic K
Hours
About 27 lecture hours
Examination
One 2-hour paper
Content
Permutations and combinations, inclusion-exclusion and generating functions. Pólya’s theorem and its application to counting various kinds of structures and graphs will be discussed. Also asymptotic analysis of many of the exact results.

Text
Nil
References
Beckenback, E.F. (ed.)
Hall, M.
Harary, F. & Palmer, E.M.
Liu, C.L.
Riordan, J.
Applied Combinatorial Mathematics (Wiley 1964)
Combinatorial Theory (Blaisdell 1967)
Graphical Enumeration (Academic 1974)
Introduction to Combinatorial Mathematics (McGraw Hill 1968)
Combinatorial Analysis (Wiley 1958)

664169 Nonlinear Oscillations - J.G. Couper

Prerequisite
Topic P
Hours
About 27 lecture hours
Examination
One 2-hour paper
Content
Physical problems often give rise to ordinary differential equations which have oscillatory solutions. This course will be concerned with the existence and stability of periodic solutions of such differential equations, and will cover the following subjects; two-dimensional autonomous systems, limit sets, and the Poincare-Bendixon theorem. Brouwer’s fixed point theorem and its use in finding periodic solutions. Non-critical linear systems and their perturbations. The method of averaging. Frequency locking, jump phenomenon, and subharmonics. Bifurcation of periodic solutions. Attention will be paid to applications throughout the course.
664192 Fluid Statistical Mechanics - C.A. Croxton

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

References
Croxton, C.A. Liquid State Physics - A Statistical Mechanical
Introduction (Cambridge 1974)

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

664120 Quantum Mechanics - C.A. Croxton

Prerequisite Nil

Hours About 27 lecture hours

Examination One 2-hour paper

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

Texts
Croxton, C.A. Introductory Eigenphysics (Wiley 1974)
Matthews, P.T. Introduction to Quantum Mechanics (McGraw Hill 1965)

664153 Algebraic Graph Theory - R.B. Eggleton

Prerequisite Topic O

Hours About 27 lecture hours

Examination One 2-hour paper

Content

Text
Biggs, N. Algebraic Graph Theory (Cambridge 1974)

References
Bondy, J.A. & Murty, U.S.R. Graph Theory with Applications corrected edn
(Macmillan 1977)
Harary, F. Graph Theory (Addison-Wesley 1969)
Lancaster, P. Theory of Matrices (Academic 1969)
Wilson, R.J. Introduction to Graph Theory (Longman 1972)
of graphs; chromatic number of a surface and some details of the proof of the Four Colour Theorem by Appel and Haken; transsection-free chain decompositions of graphs embedded in surfaces.

Text
References
Bondy, J.A. & Harary, F. Graph Theory with Applications corrected cdn (Macmillan 1977)
Ore, O. The Four Colour Problem (Academic 1967)
Ringel, G. Map Colour Theorem (Springer 1974)
White, A.T. Graphs, Groups and Surfaces (North/Holland American Elsevier 1973)
Wilson, R.J. Introduction to Graph Theory (Olliver & Boyd 1972)

664103 Basic Algebra - J.R. Giles
Corequisite Topic W
Hours About 27 lecture hours
Examination One 2-hour paper
Content
A Banach Algebra is a mathematical structure where the two main strands of pure mathematical study - the toplogical and the algebraic - are united in fruitful contact. The course will cover the following subject matter. Normed algebras; regular and singular elements; the spectrum of an element and its properties; the Gelfand-Mazur theorem; topologocal divisors of zero; the spectral radius and spectral mapping theorem for polynomials; ideals and maximal ideals. Commutative Banach algebras; the Gelfand theory and the Gelfand representation theorem. Weak topologies, the Banach-Alaoglu theorem, the Gelfand topology. Involutions in Banach algebras; hermitian involutions; the Gelfand-Naimark representation theorem for commutive B* algebras. Numerical range of an element in a normed algebra; relation of the numerical range to the spectrum; B* algebras are symmetric, discussion of the Gelfand-Naimark representation theorem for B* algebras. Applications of Banach algebra theory.

Text
Zelazko, W. Banach Algebras (Elsevier 1973)

References
Bonsall, F.F. & Duncan, J. Complete Normed Algebras (Springer 1973)
Diestel, J. Normed Rings (Noordhoff 1959)
Rickart, C.E. General Theory of Banach Algebras (Van Nostrand 1960)
Simmons, G.F. Introduction to Topology and Modern Analysis (McGraw-Hill 1963)
Wilansky, A. Functional Analysis (Blaisdell 1964)

664158 Convex Analysis - J.R. Giles
Corequisite Topic W
Hours About 27 lecture hours
Examination One 2-hour paper
Content
Convexity has become an increasingly important concept in analysis: much of current research in functional analysis concerns generalising to convex functions, properties previously studied for the norm; much of interest in convexity has arisen from areas of applied mathematics related to fixed point theory and optimisation problems. We begin with a study of convex sets and functions defined on linear spaces; gauges of convex sets, separation properties. We then study topology on linear spaces generated by convex sets: metrisability, normality and finite dimensional cases. We examine continuity and separation for locally convex spaces, continuity for convexity properties and Banach-Alaoglu Theorem. We study extreme points of convex sets, the Krein-Milman theorem. We give particular attention to the study of differentiation of convex functions on normed linear spaces: Gateaux and Frechet derivative, Mazur's and Asplund's theorems.

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

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

664150 General & Algebraic Topology - M.J. Hayes
Prerequisite Topic L
Hours About 27 lecture hours
Examination One 2-hour paper
Content
Topological spaces are sets with enough properties on which to study continuity. These lectures will concentrate on the geometric aspects of these spaces, and will include the following topics: separation, relative and product topologies, compactness, connectedness,

**Text**

References
- Cairns, S.S.  
  *Introduction to Topology* (Ronald 1961)
- Lefschetz, S.  
  *Introduction to Topology* (Princeton 1949)
- Simmons, G.P.  
  *Introduction to Topology and Modern Analysis* (McGraw-Hill 1963)
- Wallace, A.H.  
  *An Introduction to Algebraic Topology* (Pergamon 1961)

664114 Linear Operators - M.J. Hayes

**Prerequisites**
- Topics V & W

**Hours**
- About 27 lecture hours

**Examination**
- One 2-hour paper

**Content**

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

**Text**

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

References
- Bachman, G. & Narici, L.  
  *Functional Analysis* (paperback Academic 1966)
- Dunford, N. & Schwartz, J.  
  *Linear Operators* (Interscience 1958)
- Lorch, E.  
  *Spectral Theory* (Oxford 1962)
- Rudin, W.  
- Schmeidler, W.  
  *Linear Operators on Hilbert Space* (Academic 1954)
- Taylor, A.  
  *Functional Analysis* (Wiley 1958)

664145 Viscous Flow Theory - W.T.F. Lau

**Prerequisite**
- Topic Q

**Hours**
- About 27 lecture hours

**Examination**
- One 2-hour paper

**Content**

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

**Text**

References
- Batchelor, G.K.  
  *An Introduction to Fluid Dynamics* (Cambridge 1967)
- Landau, L.D. & Lifshitz, E.M.  
  *Fluid Mechanics* (Pergamon 1959)
- Langlois, W.E.  
  *Slow Viscous Flow* (Macmillan 1964)
- Pi, S.I.  
- Rosenhead, L. (ed.)  
  *Laminar Boundary Layers* (Oxford 1963)
- Schlichting, H.  
  *Boundary Layer Theory* (McGraw-Hill 1968)
- Teman, R.  
  *Navier-Stokes Equations - Theory and Numerical Analysis* (North Holland 1976)

664118 Perturbation Theory - D.L.S. McElwain

**Prerequisites**
- Topics CO, P

**Hours**
- About 27 lecture hours

**Examination**
- One 2-hour paper

**Content**


**Text**

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

664164 Number Theory - T.K. Sheng

**Prerequisite**
- Nil

**Hours**
- About 27 lecture hours

**Examination**
- One 2-hour paper

**Content**


**Text**

References
- Andrews, G.E.  
  *Number Theory* (Saunders 1971)
- Hardy, G. & Wright, E.M.  
  *Introduction to Number Theory* (Oxford 1960)
- Niven, I. & Auckerman, H.S.  
  *An Introduction to the Theory of Numbers* (Wiley 1968)

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

**Prerequisite**
- Topic CO

**Hours**
- About 27 lecture hours

**Text**

References


664165 Mathematical Physiology - 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 in the lungs, mass transport between lungs and blood and blood and tissue, metabolic exchanges within tissues, enzyme kinetics, signal conduction along nerve fibres, sperm transport in the cervix, .... Indeed, mathematical engineering might now be said to be part of the conspiracy to produce super humans (e.g. see "Fast Running Tracks" in Dec. 1978 issue of Scientific American).

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

**Text**

References


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

Mann, H.B. *Addition Theorems of Group Theory and Number Theory* (Interscience 1965)

Raghavarao, D. *Combinatorics and Combinatorial Problems in Design of Experiments* (Wiley 1971)

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


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

664168 Astrophysical Applications of Magnetohydrodynamics - W.P. Wood

**Prerequisites**

Topics CO and PD

**Hours**

About 27 lecture hours

**Examination**

One 2-hour paper

**Content**

The normal state of matter in the universe is that of a plasma, or ionized gas, permeated by magnetic fields. Moreover, these fields (unlike that of the earth) may be dominant, or at least significant, in controlling the structure of the region. The aim of this course is to investigate the effects of astrophysical magnetic fields, ranging from $10^6$ gauss in the...
galaxy to $10^{12}$ gauss in a neutron star.

References

Chandrasekhar, S.
Cowling, T.G.
De Jong, T. & Maeder, A.(eds.)
Mestel, L.
Moffatt, H.K.
Spiegel, E.A. & Zahn, J.P.(eds)

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

### DEPARTMENT OF STATISTICS

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 appears in the section *Notes on Degrees and Diplomas*.

### DESCRIPTION OF STATISTICS SUBJECTS:

#### PART II STATISTICS SUBJECT

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Prerequisite Hours</th>
<th>Examination Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>692100</td>
<td>Statistics II</td>
<td>Mathematics I</td>
<td>By topic</td>
</tr>
</tbody>
</table>

**Prerequisite**

Mathematics I

**Hours**

See individual topics

**Examination**

By topic

**Content**

This subject consists of the following topics:

- **PS**: Probability & Statistics
- **AS**: Applied Statistics
- **RP**: Random Processes and Simulation

Topic **PS**: Probability and Statistics is a double topic which runs throughout the year while **AS**: Applied Statistics is in Semester 1 only and **RP**: Random Processes and Simulation is in Semester 2 only.

#### PART III STATISTICS SUBJECT

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Prerequisites Hours</th>
<th>Examination Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>693100</td>
<td>Statistics III</td>
<td>In 1987 topics H, I and CO</td>
<td>By topic</td>
</tr>
</tbody>
</table>

**Prerequisites**

In 1987 topics H, I and CO

**Hours**

See individual topics

**Examination**

By topic

**Content**

In 1987 this subject consists of the following topics:

- **TS**: Theory of Statistics
- **LM**: Linear Statistical Models
- **SS**: Survey Sampling
- **RP**: Random Processes and Simulation

Topics **TS**: Theory of Statistics and **LM**: Linear Statistical Models are in Semester 1 only and Topics **SS**: Survey Sampling and **RP**: Random Processes and Simulation are in Semester 2 only. In 1987 only Topic **RP**: Random Processes and Simulation will be offered in both Statistics II and Statistics III; additional work will be required of Students taking it as part of Statistics III.
PART IV SUBJECT
The following topics in Statistics are offered as part of Mathematics IV and are also available to students undertaking postgraduate diplomas and degrees:

- Demography and Survival Analysis
- Generalised Linear Statistical Modelling
- Analysis of Categorical Data
- Statistical Consulting

DIPLOMA AND COURSEWORK MASTER SUBJECTS
Subjects taught by the Department of Statistics for the Diploma in Medical Statistics and Master of Medical Statistics are described in detail in the next section, under the topics of the same name. Students enrolling in these subjects should note that a different computer number applies (see end of this handbook). Some of these subjects are also available in other diplomas (e.g. Diploma in Computer Science).

DESCRIPTION OF STATISTICS TOPICS:
PART II STATISTICS TOPICS
692102  PS : Probability and Statistics
Prerequisite Mathematics I
Hours Two lecture hours and one tutorial hour per week for both Semester 1 and Semester 2.
Examination Assignments, tests and one 3-hour examination.

Content
This is the core topic of Statistics II and introduces the major theoretical and practical concepts of statistical inference. Statistical computing programs such as MINITAB and BMDP are used in this course.

Text

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
In this course emphasis is placed on data analysis using the statistical computer program MINITAB. Exercises and examples relate to the analysis of experimental and observational studies and quality control.
Topics covered include: descriptive statistics, elementary probability theory, sampling, confidence intervals and hypothesis testing for means and proportions from single, paired and unpaired samples, simple linear regression and contingency tables.

Text

References

692103  RP : Random Processes and Simulation
Prerequisite Mathematics I
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 is about modelling random processes, mathematically and by simulation. Topics covered include: Discrete and continuous stochastic processes. Difference equations, Random walks, Markov chains and queues and the computer simulation of these processes. Propagation of errors. Reliability models.

Note: Students taking this course in 1987 as part of Statistics III will be required to do some additional work.

Text
References
To be announced.

Morgan B.J.T. Elements of Simulation (Chapman and Hall, 1984)

PART III STATISTICS TOPICS
693103  TS : Theory of Statistics
Prerequisite In 1987 the prerequisites are Topics I and CO
Hours Three hours per week for Semester 1 only.
Examination Assignments, tests and one 2-hour examination

Content

Text
Nil.
References
Hogg, R.V. & Craig, A.J. Introduction to Mathematical Statistics
Silvey, S.D. Statistical Inference (Chapman & Hall 1975)

693101 LM : Linear Statistical Models
Prerequisite
In 1987 the prerequisites are Topic I and knowledge of matrix algebra.
Hours
Two lecture hours and one tutorial hour per week for Semester 1 only
Examination
Assignments, tests and one 2-hour examination

Content
Linear statistical models for regression, analysis of variance and experimental designs are used widely in the fields of management, biological and social sciences. This course covers the underlying theory and the practical problems encountered in using these models. Topics include: general concept of regression, general linear model, point estimation, sample distribution of estimators, tests of hypotheses and subhypotheses, analysis of variance approach, descriptive measures of association and practical considerations. The most common experimental designs and the steps necessary to plan a good experiment are discussed. Analysis of single and multiple factor experiments is covered using analysis of variance and multiple regression techniques. Students will implement these methods using Minitab and BMDP which form an important part of the course.

Text
Nil

References
Neter, I. & Wasserman, W. Applied Linear Statistical Models
(Irwin 1974)
Ryan, B.F., Joiner, B.L. & Ryan, T.A. Minitab Handbook 2nd edition
(Duxbury Press, Boston 1985)

693102 SS : Survey Sampling
Prerequisite
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 analysing data from finite populations. Topics covered include: simple random sampling, ratio and regression estimators, stratified sampling and cluster sampling, and other relevant sections from the text. Some consideration of the practical problems will be obtained through the class projects.

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

References
Kish, L. Survey Sampling (Wiley 1965)

PART IV STATISTICS TOPICS

694103 Generalised Linear Statistical Modelling - A.J. Dobson
Prerequisite
For 1987 Topics R and U
Hours
About 27 hours
Examination
Assignments and one 2-hour examination.

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

Text
Dobson, A.J. An Introduction to Statistical Modelling
(Chapman & Hall 1983)

694101 Analysis of Categorical Data - D.L. O'Connell
Prerequisite
For 1987 Topic R
Hours
About 27 hours
Examination
Assignments and one 2-hour examination

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 (r x c) 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
Fleiss, J.L. Statistical Methods for Rates and Proportions
2nd edition (Wiley 1982)

694102 Demography and Survival Analysis - R.W. Gibberd
Prerequisite
For 1987 Topic I
Hours
About 27 hours
Examination
Assignments and one 2-hour examination

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

References
Cox, D.R. and Oakes, D.
Elandt-Johnson, R.c.
& Johnson, N.L.
Kalbfleisch, J.D.
& Prentice, R.L.
Keyfitz, N.
Pollard, J.H.

694104 Statistical Consulting

Prerequisite
Statistics III or equivalent subjects

Hours
About 27 hours

Examination
Based on assignments and project reports.

Content
The aim of this course is to develop the skills necessary for effective statistical consulting. The course will include discussion of papers and other materials about statistical consulting; consideration of aspects such as study design, sample size estimation and data management; and practical experience of consulting projects including statistical computing and report writing.

SUBJECTS OFFERED BY OTHER FACULTIES
This section of the handbook contains descriptions of subjects taught by departments outside the Faculty of Mathematics which are included in the schedules of degrees and diplomas for which the Faculty Board of Mathematics is responsible.

SUBJECTS IN THE SCHEDULE OF THE B.Comp.Sc. 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

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

Part 1

Part 2
PART I SUBJECTS

541100 Engineering I

Advisory Prerequisites 3-unit Mathematics & multistrand Science at the 4-unit level
Corequisite Mathematics I
Hours To be advised
Examination To be advised
Content

Four of the following units to be chosen.

(i) 521105 CE111 Mechanics and Structures
Prerequisites Nil
Hours 42
Examination To be advised
Content

Introduction to the behaviour of structures. Statics; forces as vectors, resultant, equilibrium in two dimension. Beams, trusses; method of joints, method of sections. Statical determinacy. Compatibility, properties of sections, stress, strain, Mohr’s circle. Columns; stability, Buler’s formula.

(ii) 541105 ME111 Graphics
Prerequisites Nil
Hours 42
Examination Progressive Assessment
Content

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

(iii) 511108 ChE141 Industrial Process Principles
Prerequisites Nil
Hours 1½ hours per week
Examination One 3-hour paper
Content

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 woods; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical magnetic, optical and thermal properties of solid materials.

Text

(v) 531205 EE130 Introduction to Electrical Engineering
Corequisite Mathematics I
Advisory Prerequisites 3 unit Mathematics and 2 unit Physics
Hours 42 hours of lectures and tutorials
Examination To be advised
Content

This unit is a service course offered by the Department of Electrical and Computer Engineering.

PART II SUBJECTS

412700 Accounting IIC
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 II B and one for Accounting II A

Content

(iv) 501102 GE151 Introduction to Materials Science
Prerequisites Nil
Hours 42 hours of lectures, plant visits and demonstrations (students are not required to perform laboratory work)
Examination To be advised
Content

The course provides a general introduction to materials of engineering significance and to the relationships which exist between structures, properties and applications. The detailed treatment of various aspects is left to the later stages of the degree programme.

The following sections are given approximately equal amounts of time and emphasis:

Atomic bonding; atomic arrangements in metals, glasses and polymers; the effects of stress and temperature on simple metals; the control of metallic structures by composition and thermal treatments; common metals of engineering importance; the structures and properties of ceramics and cement products.

Polymers, rubbers and woods; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical magnetic, optical and thermal properties of solid materials.

Text
Accounting IIA and Accounting IIB

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

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

Texts
Henderson, S. & Peirson, G.
Johnson, T.R. et al.
Taylor, R.B. & O'Shea, B.P.
Craig, R. & Tippett, M.
Morse, W.J. & Roth, H.P.

522700 Civil Engineering IIM

Prerequisites
Mathematics I, CE111, ME131, GE112 and ME111

Hours
5 lecture hours and 2 1/2 tutorial hours per week

Examination
Five 3-hour papers

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

For descriptions of these units, consult the 1987 Faculty of Engineering Handbook

752300 Psychology IIC

Prerequisites
Psychology I & Mathematics I

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

Examination
Two 3-hour papers plus an assessment
monographs, including the following:

American Accounting Association

American Institute of Certified Public Accounts

Beaver, W.H.

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

Chambers, R.J.

Financial Accounting Standards Board

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

413200 Accounting IIB

Examination

Content

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

Texts

Fatseas, V.A. & Vagg, T.R.

Kaplan, R.S.

References

Bailey, E.

Corcoran, A.

Gordon, L.A. et al.

Mintzberg, H.

O'Connor, R.

413619 Foundations of Finance

Prerequisites

Accounting I, Economics I and Introductory Quantitative Methods

Hours

2 lecture hours and 1 tutorial hour per week

Examination

One 2½-hour mid-year paper

and one 3-hour final paper

Content

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

Texts

Pierson, G. & Bird, R.

Business Finance latest edn (McGraw-Hill)

References

Ball, R. et al.

Share Markets and Portfolio Theory

(Queensland Univ. Press)

Hart, W.L.

Corporate Finance (Holt, Rinehart & Winston)

713200 Biology IIB

Prerequisites

Mathematics IIA & IIC & either Biology IIA or IIB

Hours

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

Examination

Content

Biology IIB consists of three of the following topics. (Not all topics are available each year.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisite</th>
<th>Year Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1987</td>
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<tr>
<td>713104 Cell Processes</td>
<td>Biochemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>713207 Ecology and Evolution</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>713110 Environmental Plant Physiology</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>713105 Immunology</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>713107 Mammalian Development</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>713108 Molecular Biology of Plant Development</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>713109 Plant Structure and Function</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>713106 Reproductive Physiology</td>
<td>-</td>
<td>No</td>
</tr>
</tbody>
</table>

For topic descriptions consult the 1987 Faculty of Science Handbook.

523700 Civil Engineering IIM

Prerequisite

Civil Engineering IIM, Mathematics IIA & IIC

Hours

6 lecture hours & 4½ tutorial/laboratory hours per week

Examination

Content

Four 3-hour papers, one 2-hour paper & two 1½-hour term papers

(i) CE324 Soil Mechanics
(ii) CE314 Theory of Structures II
(iii) CE333 Fluid Mechanics III
(iv) CE334 Open Channel Hydraulics
(v) CE351 Civil Engineering Systems
For unit descriptions consult the 1987 Faculty of Engineering Handbook.

539900 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) 530006 GE361 Automatic Control
(ii) 533133 EE344 Communications
(iii) 534134 EE447 Digital Communications

For unit descriptions consult the 1987 Faculty of Engineering Handbook.

539901 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) 533222 EE362 Switching Theory & Logic Design - see entry under Diploma in Computer Science subjects

423800 Economics IIIC

Prerequisites
Mathematics IIA & IIC & Economics IIA

Hours
As indicated in the description of the components

Examination
To be advised

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

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

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

Prerequisite
Economic Statistics II or Statistical Analysis

Hours
2 lecture hours per week

Examination
One 3-hour paper

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

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

Text
Conlarti, D.
Johnston, J.

References
Goldberger, A.
Hadley, G.
Huang, D.S.
Koutsoyiannis, A.
Kmenta, J.
Pindyck, R.S.
Rubinfeld, D.L.
Judge, G., Griffiths, W.,
Lutkepohl, H. & Lee, T.

(ii) 423204 Mathematical Economics

Prerequisites
Economics II or IIA

Hours
3 lecture hours per week

Examination
One 3-hour paper

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

Text
Tu, P.N.V.

References
Archibald, G.C.
Lipsey, R.G.
Benavie, A.
Chiang, A.C.
Dernburg, T.F.

Fundamental Methods of Mathematical Economics
2nd edn (McGraw-Hill)

Macroeconomic Analysis: An Introduction to Comparative Statics and Dynamics
(Addison-Wesley 1969)

Introductory Optimization Dynamics
(Springer-Verlag 1984)

An Introduction to a Mathematical Treatment of Economics 3rd edn (Weidenfeld & Nicholson 1977)

Mathematical Techniques for Economic Analysis (Prentice-Hall 1972)
An Elementary Survey

The effects of government intervention in the economy through the budget and through the operation of publicly-owned business undertakings and inter-governmental fiscal relationships are examined.

At the 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

Brown, C.V. & Jackson, P.M. Public Sector Economics (Martin Robertson)
Buchanan, J.M. & Flowers, M.R. Public Finances (Irwin)
Calbertson, J.M. Macroeconomic Theory and Stabilisation Policy (McGraw-Hill)
Groenewegen, P.D.(ed.) Australian Taxation Policy (Longman-Cheshire)
Groenewegen, P.D. Public Finance in Australia: Theory and Practice (Prentice-Hall)
Johansen, L. Public Economics (North-Holland)
Misran, E.J. Cost-Benefit Analysis (Allen & Unwin)
Shoup, C.S. Public Finance (Weidenfeld & Nicolson)
Wilkes, J. (ed.) The Politics of Taxation (Hodder & Stoughton)
The course is devoted to a study of the various dimensions of the evolution and "motion" of the capitalist economic system through time. It considers explanations of capital accumulation and structural change, real economic growth and fluctuations in growth rates. Specific topics will include expanding reproduction and balanced growth, capital accumulation and income distribution, short-term fluctuations, long-wave fluctuations and the role of innovations and technological change in growth and fluctuations.

References
Dujin, J. van
Harris, D.J.
Hecfajs, A.
Kalecki, M.
Kregel, J.
Lowe, A.
Steindl, J.

(vii) 423115 Topics in International Economics
Prerequisite
Economics II
Hours
2 lecture hours per week for half the year
Examination
One 3-hour paper and progressive assessment
Content
This course provides a more advanced theoretical treatment of selected topics introduced in the International Economics course. It also uses empirical studies and policy materials to provide a more detailed exposition and analysis of trade policy problems. The content consists of:

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

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

(viii) 423116 Advanced Economic Analysis
Prerequisite
Economics II
Hours
2 lecture hours per week
Examination
Two 2-hour papers and progressive assessment
Content
(i) Macroeconomics:
The course covers a series of macroeconomic issues in both theory and policy. These will include the management of fiscal policy, discretionary stabilisation policy in the open-economy situation, the nature of "monetarist" and "rational expectations" based macroeconomics, dimensions of the capitalist "stagflation crisis", and the role of price formation and income distribution in the determination of economic activity.

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

References
(i) Macroeconomics:
Cornwall, J.
Frichs, H.
Kaldor, N.
Mayer, T.
Sawyer, M.C.

(ii) Microeconomics:
Douglas, E.J.
Ferguson, C.E.
Koutsoyiannis, A.
Tisdell, C.A.

733380 Geology IIIC
Prerequisites
Physics I, Mathematics IIA, IIC & Geology IIA
Hours
3 lecture hours, 6 laboratory hours per week & 12 days field work
Examination
Two 2-hour papers in Geology plus assessment. Appropriate paper(s) in the selected Mathematics topic.
Sedimentology - the petrogenesis of sedimentary rocks. Economic geology - principles of formation of economic mineral deposits; major Australian ore deposits; ore mineralogy. Structural geology - structural aspects of geosynclinal concept; orogenies; continental drift; global tectonics. Photogrammetry and Photogeology - basic principles of interpretation; aerial photographs and their use in stratigraphic and structural studies. Exploration Geophysics: geophysical techniques - their interpretation and the application in petroleum and mining exploration, and hydrogeological and engineering investigations. Appropriate Computer Science or Mathematics topic not previously taken in the course (to be decided in consultation with the Head of Department).

**Texts**

Consult lecturers concerned

### 543500 Industrial Engineering I

**Prerequisites**

Mathematics IIA & IIC

**Hours**

Approximately 6 lecture hours per week

**Examination**

Progressive assessment & examination

**Content**

Four of the following:

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

For unit descriptions consult the 1987 Faculty of Engineering Handbook.

### 553900 Mechanical Engineering IIIC

**Prerequisites**

Mathematics IIA & IIC (including Topics F & H)

**Hours**

6 hours per week

**Examination**

Progressive assessment

**Content**

Four units:

(i) GE361 Automatic Control
(ii) ME505 Advanced Numerical Programming
(iii) ME487 Operations Research - Fundamental Techniques
(iv) ME488 Operations Research - Planning, Inventory Control and Management

For unit descriptions consult the 1987 Faculty of Engineering Handbook.

### 743100 Physics IIIA

**Prerequisites**

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

**Hours**

Approximately 120 lecture hours

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**Examination**

Assessment to the equivalent of 12½ hours of examination time

**Content**

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

**Classical Physics**

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

**Quantum Physics**

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

**Laboratory**

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

**Texts**

Refer to the Physics Department notice board. Students should retain their Physics II texts.
COMBINED SUBJECTS IN THE B.Math.(Hons) DEGREE

Note: Students desiring admission to any of the following combined honours subjects must apply in writing to the Dean of the Faculty of Mathematics before 20 December of the preceding year.

664210 Mathematics/Economics IV

Prerequisites: Mathematics IIIA and Economics IIIC and such additional work as is required for combined honours students by the Departments of Mathematics and/or Statistics.

Hours: To be advised. A project of mathematical and economic significance jointly supervised.

Examination: Assessment will be in the appropriate Mathematics and Economics topics. In addition, the project will be evaluated by independent examiners.

Content:
The student shall complete not less than 4 topics from the Mathematics IV list and topics equivalent to 4 points from the Economics IV list chosen appropriately and approved jointly by the Heads of the Departments concerned.

664500 Mathematics/Geology IV

Prerequisites: Geology IIIC and Mathematics IIIA and such additional work as is required for combined honours students by the Departments of Mathematics and/or Statistics.

Hours: To be advised.

Examination: To be advised.

Content:
At least four topics chosen from those available to honours students in Mathematics for the current year together with work offered by the Department of Geology for that year. The subject will also include a major thesis which embodies the results of a field research project involving the application of mathematical studies to a particular geological problem. Other work e.g. seminars and assignments may be required by either Department.

Texts: To be advised

References: To be advised

664300 Mathematics/Physics IV

Prerequisites: Mathematics IIIA & Physics IIIA & such additional work as is required for combined honours students by the Departments of Mathematics and/or Statistics.

Hours: To be advised. A project of mathematical and physical significance, jointly supervised.

Examination: Assessment will be in the appropriate Mathematics & Physics topics selected. In addition the research project will be assessed on the basis of a written report and a seminar on the project.

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

664200 Mathematics/Psychology IV

Prerequisites: Mathematics IIIA, Psychology IIIC

Hours: To be advised

Examination: To be advised

Content:
4 Mathematics topics chosen from the Part IV Mathematics topics. A selection of seminars from Psychology IV which may include mathematical applications in Psychology. A thesis involving the application of Mathematics in Psychology.

EXTRANEOUS SUBJECTS

160406 Mathematics Education II - (not offered in 1987)

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

160407 Mathematics Education III - (not offered in 1987)

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 emphasised, as this is required for effective teaching. In the observation periods, lesson plans will be studied and compared with the results in the classroom.

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

Formal enrolment in this course is not required.

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

Hours
Approximately 27 lecture hours

Examination
None

Content

This is a voluntary course designed to give students and members of staff a working reading knowledge of scientific and technical Russian. Translation from Russian into English is costly, and only a very small proportion of the Soviet Union's technical literature is routinely translated into English; often translation of the abstract alone is sufficient to determine whether a complete translation is warranted. Emphasis throughout the course will be on translation from Russian into English, although both written and spoken Russian will necessarily be involved. The course should provide a good introduction for those seeking a somewhat more literary understanding of the language.

FACULTY OF MATHEMATICS RESEARCH PROGRAMMES

The Faculty of Mathematics is active in research in a wide variety of areas. Enquiries about individual research projects should be directed to the staff member(s) responsible.

RESEARCH IN THE DEPARTMENT OF COMPUTER SCIENCE

Artificial Intelligence

Simon is working on aspects of Artificial Intelligence, with particular regard to computer processing of natural language.

Computer Architecture

The MONADS Research Team is investigating aspects of computer architecture which directly affect the execution of system and applications software (including addressing, protection, synchronisation and support for modularity and for high level programming languages). (See The MONADS Project.)

Computer Graphics

Dr. Blatt is working on generative computer graphics. Improved algorithms for hidden line and hidden surface removal are being developed. Also, techniques for the generation of high quality colour shaded images are being studied.

Computer Networks

The MONADS Research Team is investigating a technique for implementing local area networks involving the transfer of information in a large uniformly addressed virtual memory. (See The MONADS Project.)

Computer Performance Evaluation

Execution of computer programs in a system can be traced so that patterns of the references to main storage are observed. These patterns, which are of fundamental importance in determining the performance of virtual memory systems, are relatively poorly understood. Research being carried out by Dr. Blatt with Dr. Hannaford of the Department of Computer Science at Purdue University, has aimed at furthering the understanding of program referencing behaviour, with a view to developing realistic models of referencing behaviour and improved memory management strategies.

Database Techniques

An unconventional approach to database design is being explored by the MONADS Team which at the physical level involves the use of a virtual memory with very large unique addresses (currently 60 bits) and capability based protection and at the logical level involves the use of the LEIBNIZ language, based on sets, sequences and tuples. (See The MONADS Project.)

The MONADS Project

The MONADS Project is the main research project being undertaken in the Department of Computer Science. It is concerned with the investigation of a wide variety of techniques for improving software engineering methodology and for safeguarding the privacy of information in computer systems. The theoretical research results are being embodied in a practical system consisting of the MONADS-PC computer, the MONADS Operating System and the LEIBNIZ Programming Language.
The project is led by Professor Keedy and Dr. Rosenberg, and various aspects of the research are also carried out by Dr. Blatt, Dr. Beresford-Smith and Simon. In addition, several post-graduate students are involved. There is close collaboration with other institutions, including hardware work with Dr. D. Abramson of the CSIRO Division of Information Technology and programming language design work with Dr. M. Evered of the Technical University of Darmstadt, West Germany.

**Multiprocessor Systems and Compiler Design**

A small multiprocessor computing system has been set up by Dr. Blatt to study the solution of problems in this environment. For compute-bound processing, enormous cost/performance advantages are potentially available for this type of system. Following a survey of attempts by other research groups to construct multiprocessor facilities, it became apparent that although the hardware is relatively easy to construct, this type of system has not gained wide acceptance due to inherent software problems in moving realistic compute-bound problems onto this type of equipment. We are studying these problem areas, with a view to building a multiprocessor software "toolkit" for moving single user applications onto the multiprocessor system. Coupled with this, we are looking at optimizing compiling techniques appropriate for multiprocessor configurations.

**Operating Systems**

The MONADS Team is developing techniques for simplifying the structure of operating systems, for unifying file memory and virtual memory, for introducing flexible and highly secure user identification and information protection mechanisms and for simplifying synchronisation. (See The MONADS Project.)

**Programming Language Design**

Research is in progress to formulate very high level programming language features, making use of ideas based on sets, sequences and tuples, to allow algorithms and data structures to be expressed in an abstract way, independently of computer concepts such as arrays, pointers, files, etc. This is being combined with advanced ideas concerning the specification, design and implementation of modules, and classes of modules, into a new high level language, LEIBNIZ. (See The MONADS Project.)

**Realtime Process Control by Networked Computers**

This project is designed to use realtime magnetic field measurements for monitoring and fault protection in high voltage electrical switchyards. Following an initial theoretical evaluation of the problem, a computer simulation was performed, and then a model was constructed using analogue techniques. A larger model with digital control was then constructed, and after successful testing, a full prototype control system has been set up in the 132 KV substation at Merewether, near Newcastle. The Merewether system consists of 24 microcomputer monitoring stations in the switchyard, networked back to a control computer with a graphics display. A realtime consistency checking algorithm identifies and localizes faults in milliseconds, so that they can be appropriately isolated. The system also allows realtime monitoring of waveforms derived from mathematical transformations of bursts of digitized readings of magnetic fields around the switchyard.

The project is being run by Dr. Blatt in cooperation with Engineers from the Electricity Commission of N.S.W., with both direct support and research funding through the Electrical Research Board. The simulation software was developed by Prof. J. Blatt whilst at the University of N.S.W. In addition, several graduate research students at Newcastle have been involved in work on the project.

**Software Engineering**

The areas of software engineering of particular interest are the structure of large software systems (including the specification, design and implementation of modules) and the provision of a software engineering support environment and database. (See The MONADS Project.)

**VLSI**

Dr. B. Beresford-Smith is interested in VLSI systems, the development of software tools to aid their design and the analysis of algorithms which take advantage of the concurrent structures offered by VLSI.

**RESEARCH IN THE DEPARTMENT OF MATHEMATICS**

**Algebra**

Associate Professor W. Brisley is working on some problems in group theory which arise from graph theory, and on general problems associated with Symmetry.

**Astrophysics**

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

**Biomathematics**

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

**Combinatorial Theory and Operations Research**

Dr R. B. Eggleton is interested in all aspects of combinatorial mathematics, particularly graph theory. His research projects include graphic sequences, eulerian graphs, graph colouring, difference graphs, rectilinear graphs, crossing numbers of graphs, combinatorial game theory and combinatorics of cables and braids.

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

Mr G. W. Southern is working on constructions of block designs.

**Differential Geometry and Relativity**

Associate Professor P. K. Smrz is working on generalizations of Einstein's theory of relativity using modern differential geometry - in particular, the theory of Lie groups and fibre bundles.

**Dynamical Systems**

Dr J. G. Couper is working on stable and generic properties of flows and diffeomorphisms.

**Fluid Mechanics**

Professor A. J. Guttmann is studying the problem of extrapolating regular perturbation series in fluid mechanics.

Dr W. T. F. Lau is concerned with viscous flow problems, particularly those involving free boundaries.
Dr W. Summerfield is interested in all phenomena in which fluid dynamics plays a significant role; for example, ocean waves, turbulence, estuarine-dynamics, weather prediction, sailing vessels, surfing, animal propulsion, breathing, blood flow.

Functional Analysis
Associate Professor J. R. Giles is carrying out research in the geometry of Banach spaces. In particular, he is interested in the differentiability theory for the norm and convex functions. He is working on the developing theory of differentiation of locally Lipschitz functions with a view to applying it to several geometrical problems in Banach spaces.

Dr V. Ficker and Dr C. J. Ashman are working in measure theory, particularly in some problems of families of sets.

History of Mathematics
Mr R. F. Berghout is pursuing research into the development of algebra, notably modern algebra, as well as the relations between this and classical occidental and oriental algebra. Mr Berghout is also working on Greek mathematics and architecture.

Integral Geometry
Dr R. B. Eggleton studies special integral triangles, triangle decomposition of squares into distinct integer-sided triangles, and fine structure of distribution of lattice points inside circles.

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

Mathematical Biology
Dr D. L. S. McElwain is developing mathematical models of biological systems including solid tumours, transporting epithelia and facilitated transport of oxygen in tissue.

Number Theory
Dr R. B. Eggleton is interested in number theory, particularly in combinatorial aspects of the subject, such as distribution of prime factors in runs of consecutive integers, and partitions of a number into summands which are divisors of that number.

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

Protein Structure
Associate Professor C. A. Croxton is working on statistical mechanical techniques being applied to the prediction of the three-dimensional structure of globular proteins, and to the folding pathways by means of which these folded structures are achieved from the primary amino acid sequence.

Associate Professor C. A. Croxton is also applying Monte Carlo techniques to the prediction of transfer RNA structures, and their subsequent folding.

Professor A. J. Guttmann is working on the theory of equilibrium critical phenomena. He is particularly interested in the analysis of power series expansions which are frequently used to study systems exhibiting phase transition.

Professor A. J. Guttmann is using renormalisation group and series analysis methods to study the critical behaviour of systems with free surfaces.

Medical Statistics
Professor Dobson is investigating statistical problems which arise in medical research, especially the analysis of longitudinal data; epidemiology of heart disease; case-control study of peptic ulcer; surveillance of occupational health.

Hospital Statistics
Associate Professor Gibberd is working on the collection and use of hospital statistics: diagnosis of related groups, models for hospital use, trends in heart disease.
Computer Numbers

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.

Computer Numbers of Bachelor of Computer Science Subjects

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

<table>
<thead>
<tr>
<th>Computer Number</th>
<th>Subject Name</th>
<th>Name of Components</th>
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<tbody>
<tr>
<td>531600</td>
<td>Computer Engineering I</td>
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<tr>
<td>681100</td>
<td>Computer Science I</td>
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<td>Mathematics I</td>
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<table>
<thead>
<tr>
<th>Part II Subjects</th>
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<tbody>
<tr>
<td>682100 Computer Science II</td>
</tr>
<tr>
<td>662410 Mathematics ICS</td>
</tr>
<tr>
<td>***** Computer Engineering II (not available until 1988)</td>
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<table>
<thead>
<tr>
<th>Part III Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>***** Computer Science IIIA (not available until 1988)</td>
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<tr>
<td>***** Computer Science IIIB (not available until 1988)</td>
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<tr>
<td>***** Computer Engineering III (not available until 1988)</td>
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Computer Numbers of Bachelor of Computer Science (Honours) Subjects

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Computer Numbers of Bachelor of Mathematics Subjects

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<th>Part I Subjects</th>
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<td>411100 Accounting I</td>
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<td>711100 Biology I</td>
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<tr>
<td>721100 Chemistry I</td>
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<tr>
<td>311400 Classical Civilisation I</td>
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<tr>
<td>681100 Computer Science I</td>
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<td>261100 Drama I</td>
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<td>421300 Economics I</td>
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<th>Part II Subjects</th>
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<tr>
<td>422000 Economics II</td>
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<th>Part III Subjects</th>
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<tbody>
<tr>
<td>312502 Classical Civilisation II</td>
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<th>Computer Numbers of Bachelor of Mathematics Subjects</th>
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<td>341100 French I</td>
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<tr>
<td>341300 French II</td>
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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 I</td>
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<td>361600 German II</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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<tr>
<td>311200 Latin I</td>
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<td>451100 Legal Studies I</td>
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<td>271100 Linguistics I</td>
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<td>661100 Mathematics I</td>
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<td>381100 Philosophy I</td>
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<tr>
<td>381106 Moral Problems</td>
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<tr>
<td>381107 Psychology &amp; Philosophy</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>381113 Logic</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>741500 Physics II</td>
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<tr>
<td>311300 Sanskrit I</td>
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<tr>
<td>501100 Sociology I</td>
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<th>Computer Numbers of Bachelor of Mathematics Subjects</th>
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<tr>
<td>412700 Accounting IIC</td>
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<tr>
<td>712100 Biology IIA</td>
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<td>712200 Biology IIB</td>
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<td>712108 Biological Methods</td>
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<td>712103 Biochemistry</td>
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<td>712107 Population Dynamics</td>
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<td>722200 Chemistry IIA</td>
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<td>522700 Civil Engineering IIM</td>
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<tr>
<td>522102 CE212 Mechanics of Solids I</td>
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<td>522202 CE231 Fluid Mechanics I</td>
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<tr>
<td>522114 CE213 Theory of Structures I</td>
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<td>522204 CE232 Fluid Mechanics II</td>
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<td>522112 CE224 Civil Engineering Materials</td>
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<th>Computer Numbers of Bachelor of Mathematics Subjects</th>
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**Part III Subjects**

- **Either**
  - Accounting IIIA
  - Accounting IIB and two Part III Maths topics
  - Accounting IIB and Foundations of Finance

**Course Code**

- 713200 Biology IIIB
- 523700 Civil Engineering IIIIM
- 533900 Communications and Automatic Control
- 683100 Computer Science III
- 53901 Digital Computers and Automatic Control
- 423800 Economics IIIC
- 733300 Geology IIIC
- 543500 Industrial Engineering I
- 663100 Mathematics IIIA
- 663200 Mathematics IIIB
Computer Numbers of Bachelor of Mathematics (Honours) Subjects

553900 Mechanical Engineering IIIC
   (4 components)
   503006 GE361 Automatic Control
   540143 ME505 Advanced Numerical Programming
   544467 ME487 Operations Research - Fundamental Techniques
   544468 ME488 Operations Research - Planning, Inventory Control and Management

743100 Physics IIIA
   693100 Statistics III
   693101 LM : Linear Statistical Models
   693102 SS : Survey Sampling
   093103 TS : Theory of Statistics

Computer Numbers of Master of Computing Subjects

684101 Computer Science IVM

Computer Numbers of Revised Diploma in Computer Science Subjects

680101 Computer Science IVM

New Computer Numbers of (Old) Diploma in Computer Science Subjects

The computer numbers of subjects in the old Dip.Comp.Sc. which are not listed below remain unchanged from 1986 and can be obtained from the Faculty Secretary.

Computer Numbers of Master of Medical Statistics and Diploma in Medical Statistics Subjects

690101 Analysis of Categorical Data
690102 Applied Statistics
690103 Demography and Survival Analysis
690104 Generalised Linear Statistical Modelling
690105 Linear Statistical Models
690106 Probability and Statistics
690107 Project - 1 unit
690108 Project - 2 units
690109 Project - 3 units
690110 Project - 4 units
690111 Random Processes and Simulation
690112 Statistical Consulting
690113 Survey Sampling Methods
690114 Theory of Statistics
690115 Thesis
850007 MS - Epidemiologic Methods
850008 MS - Study Design
850009 MS - Health Care Evaluation
850010 MS - Behavioural Change
850011 MS - Assessing Health Problems
850022 MS - Biostatistics I
850023 MS - Biostatistics II
850004 MS - Population Research Seminar
680114 Introduction to Programming
680112 Data Structures and Algorithms
680106 Comparative Programming Languages
440123 Systems Analysis
440124 Systems Design