FACULTY OF MATHEMATICS
HANDBOOK 1973

THE UNIVERSITY OF NEWCASTLE
NEW SOUTH WALES 2308

Telephone — Newcastle 68 0401
Fifty Cents
GENERAL SECTION

CONSULT THE CALENDAR FOR:

- Academic Dress
- University of Newcastle Act, 1964 — 1970
- By-laws
- The Council
- The Senate
- Officers and Former Officers of the University
- Prizes and Scholarships
- University Medalists
- Lists of Graduates and Diplomates

PREFACE

Let me welcome all those students who have enrolled or are contemplating enrolling in the Faculty of Mathematics. I assure you that the staff of the Faculty is ready to help you with your proposed course and to discuss academic matters with you. In fact, we will be happy to try to help in any matters where you think we can be of assistance.

While I hope that you will enjoy your study of Mathematics, since this would seem to be a necessary condition for success in it, let me assure you that it is a most serious study indeed. Besides those of you who undertake study of Mathematics for its own sake, and there are a number of people who claim this is their orientation, the study of Mathematics is of rising importance in virtually every technical endeavour. It is, of course, passé to speak of the intensive use of Mathematics in all the subjects of Engineering and the Physical Sciences, but in recent years, Mathematics has started to play a dominant role in Biological Theory, Economics, Operations Research (Management) and, indeed, in so many fields that I would feel a fool to attempt to mention all of them. Someone has even analysed the various gaits of horses mathematically, and the work of the Dutch artist, M. C. Escher, has been subjected to a mathematical analysis which has in turn been used to enlighten the field of crystallography. At this writing, we are considering the possibility of using the Escher constructions in the design of the New Mathematics Building scheduled for occupancy in February, 1974. Subjects as varied as the heating of blunt bodies during hypersonic re-entry into the atmosphere and the very different electrical activities of the cells of the human organism have been successfully subjected to mathematical analysis and these analyses have proved to be basic in the understanding of associated phenomena. Thus, I would claim that the importance of the study you are now entering upon cannot possibly be over emphasized. There have been, over the years, many contentions regarding what distinguishes man from the other animals. His companions in this universe. I propose that one of them is that he can manipulate symbols and interpret them in such a way as to reveal new information concerning the universe about him.

I believe that you should consider the fact that we have a Faculty of Mathematics to be a substantial advantage. The establishment of such a Faculty at Newcastle was, perhaps, a precedent in Australia, since it was followed by the establishment of a School of Mathematics at Flinders University in South Australia. Overseas there are some Faculties of Mathematics and similar structures, such as Institutes of Mathematical Studies in the United States. The Mathematics Institutes on the Continent serve a similar purpose. Such structures are intended to allow the diverse orientations of mathematicians and of the uses of Mathematics to be contained under one roof where they can be appropriately associated. An example of the desirability of this association in the future may be in the ability to respond to the growing impetus for research in environmental...
Let me welcome all those students who have enrolled or are contemplating enrolling in the Faculty of Mathematics. I assure you that the staff of the Faculty is ready to help you with your proposed course and to discuss academic matters with you. In fact, we will be happy to try to help in any matters where you think we can be of assistance.

While I hope that you will enjoy your study of Mathematics, since this would seem to be a necessary condition for success in it, let me assure you that it is a most serious study indeed. Besides those of us who undertake study of Mathematics for its own sake, and there are a number of people who claim this is their orientation, the study of Mathematics is of rising importance in virtually every technical endeavour. It is, of course, passé to speak of the intensive use of Mathematics in all the subjects of Engineering and the Physical Sciences, but in recent years, Mathematics has started to play a dominant role in Biological Theory, Economics, Operations Research (Management) and, indeed, in so many fields that I would feel a fool to attempt to mention all of them. Someone has even analysed the various gaits of horses mathematically, and the work of the Dutch artist, M. C. Escher, has been subjected to a mathematical analysis which has in turn been used to enlighten the field of crystallography. At this writing, we are considering the possibility of using the Escher constructions in the design of the New Mathematics Building scheduled for occupancy in February, 1974. Subjects as varied as the heating of blunt bodies during hypersonic re-entry into the atmosphere and the many very different electrical activities of the cells of the human organism have been successfully subjected to mathematical analysis and these analyses have proved to be basic in the understanding of associated phenomena. Thus, I would claim that the importance of the study you are now entering upon cannot possibly be over emphasized. There have been, over the years, many contentions regarding what distinguishes man from the other animals, his companions in this universe. I propose that one of them is that he can manipulate symbols and interpret them in such a way as to reveal new information concerning the universe about him.

I believe that you should consider the fact that we have a Faculty of Mathematics to be a substantial advantage. The establishment of such a Faculty at Newcastle was, perhaps, a precedent in Australia, since it was followed by the establishment of a School of Mathematics at Flinders University in South Australia. Overseas there are some Faculties of Mathematics and similar structures, such as Institutes of Mathematical Studies in the United States. The Mathematics Institutes on the Continent serve a similar purpose. Such structures are intended to allow the diverse orientations of mathematicians and of the uses of Mathematics to be contained under one roof where they can be appropriately associated. An example of the desirability of this association in the future may be in the ability to respond to the growing impetus for research in environmental
developments. Such widely spread considerations as the travel of pollution in the air, or the developing contamination of an estuary, and many facets of Demography (patterns of growth and structure in populations) can be handled within this one Faculty. In fact, I would not be surprised if mathematicians played an important role in the future in the analysis of bird migrations, or even in the analysis of animal behaviour generally. Such mathematical disciplines as Statistics, Numerical Analysis, and Computing generally, hold the key to many new developments and it is aimed for our talents in these areas to be shared with all interested Departments in the University and not just with those of one Faculty, such as Science or Engineering.

It is our belief, and it was that of the University Senate in setting up the present structure, that it would best meet the needs of students requiring studies in Mathematics supplementary and complementary to their principal subject of study, and also the needs of students studying Mathematics as their major discipline. Accordingly, the Faculty has arranged for appropriate joint degree courses emphasizing several areas of application.

This handbook details the manner in which the Faculty of Mathematics is prepared to meet its obligations to students. We may mention that a Postgraduate Diploma in Computer Science was introduced in 1972 and it expected to remain very popular. It is, of course, a career oriented programme. Summaries of all topics offered in 1973 appear in this handbook.

Finally, may I encourage you to take an active part in other facets of University life. Besides the pleasant Library and Student Union, we also have available some sports amenities. A new element of life on our campus will enter this year in the form of a Department of Community Programmes, and it seems reasonable to believe that the year will see an increase in activities, such as public lectures, which can indeed form an extremely important part of your education.

H. M. LIEBERSTEIN  
Dean  
Faculty of Mathematics
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1973

JANUARY

1 Monday
Public Holiday — New Year's Day

5 Friday
Last day for lodgement of Re-Enrolment Forms
— Continuing Students

15 Monday
Deferred Examinations begin

19 Friday
Last day for lodgement of Applications for Admission from persons resident in Australia
who were enrolled in another Australian University in 1972 or who are seeking admission on
the basis of examination results which were not available by 1st November, 1972.
Last day for lodgement of applications for residence in Edwards Hall.

27 Saturday
Deferred Examinations end

29 Monday
Public Holiday — Australia Day

FEBRUARY

14 Wednesday
to
16 Friday
New students required to attend the University in person to have their enrolment approved.
Fees may be paid immediately after the enrolment form is approved and up to the last date
for payment of First Term fees.

20 Tuesday
Last day for lodgement of enrolment approvals
with the Cashier together with appropriate fees,
scholarship vouchers, fees warrants or extension
notices.

26 Monday
FIRST TERM begins

MARCH

16 Friday
Graduation Day

PRINCIPAL DATES

APRIL

16 Monday
Last day for withdrawal without academic penalty from Type A subjects in the Faculty
of Engineering.

20 Friday
Public Holiday — Good Friday

21 Saturday
to
24 Tuesday
Easter Recess

25 Wednesday
Public Holiday — Anzac Day

MAY

12 Saturday
FIRST TERM ends

JUNE

4 Monday
SECOND TERM begins

11 Monday
Public Holiday — Queen’s Birthday

15 Friday
Last day for payment of Second Term Fees without penalty
Last day for acceptance of applications for examinations.

JULY

9 Monday
Last day for withdrawal without academic penalty from courses in all faculties, except half
year subjects in the Faculty of Engineering.
For information regarding fees payable on withdrawal refer to page 32.

AUGUST

11 Saturday
SECOND TERM ends
PRINCIPAL DATES

SEPTEMBER

3 Monday
THIRD TERM begins

10 Monday
Last day for withdrawal without academic penalty from Type B subjects in the Faculty of Engineering.

14 Friday
Last day for payment of Third Term Fees without penalty.

OCTOBER

1 Monday
Public Holiday — Eight Hour Day

26 Friday
Third Term Lectures and other Classes cease

NOVEMBER

3 Saturday
THIRD TERM ends
Annual Examinations begin

24 Saturday
Annual Examinations end

1974

JANUARY

14 Monday
Deferred Examinations begin

25 Friday
Deferred Examinations end

MARCH

4 Monday
FIRST TERM begins

FACULTY OF MATHEMATICS

Dean
Professor H. M. Lieberstein

Sub-Dean
Associate Professor I. L. Rose

MATHEMATICS

Professors
R. G. Keats, B.Sc., Ph.D. (Adelaide), F.A.S.A.
(Head of Department)
H. M. Lieberstein, B.A., B.S. (Arkansas), M.A. (Kansas),
Ph.D. (Maryland)

Associate Professors
W. Brisley, B.Sc. (Sydney), M.Sc. (New South Wales),
Ph.D.; Dip.Ed. (New England)
I. L. Rose, B.E. (Sydney), Ph.D. (New South Wales)

Senior Lecturers
W. Ficker, Prom.Mat., C.Sc., RNDr. (Comenius)
J. R. Giles, B.A. (Sydney), Ph.D.; Dip.Ed. (Sydney)
W. T. F. Lau, M.E. (New South Wales), Ph.D. (Sydney),
M.A.I.A.A.
W. D. Wallis, B.Sc., Ph.D. (Sydney)

Lecturers
R. F. Berghout, M.Sc. (Sydney)
J. G. Couper, B.Sc., Ph.D. (New England)
A. J. Guttmann, M.Sc. (Melbourne), Ph.D. (New South Wales)
M. J. Hayes, B.A. (Cambridge)
L. Janos, C.Sc., RNDr. (Charles)
D. L. S. McElwain, B.Sc. (Queensland), Ph.D. (York, Canada)
T. K. Sheng, B.A. (Marian College), B.Sc. (Malaya & London),
Ph.D. (Malaya)
E. R. Smith, M.Sc. (Melbourne), Ph.D. (London)
P. K. Smrz, Prom.Phys., C.Sc., RNDr. (Charles)
W. C. Summerfield, B.Sc. (Adelaide), Ph.D. (Flinders)
R. J. Vaughan, B.Sc., M.Eng.Sc. (New South Wales),
Ph.D. (Adelaide)
Jennifer R. S. Wallis, B.Sc. (New South Wales)
M.Sc., Ph.D. (La Trobe)
W. P. Wood, B.Sc., Ph.D. (New South Wales)
Senior Tutors
G. W. Southern, B.A.(New South Wales)

Tutors
Winifred Frost, B.A.
S. J. Goodenough, B.Sc.
L. Kavalieris, B.Math.
G. S. Martin, B.A.(New South Wales)

Secretary
Mrs. K. E. Abraham

Stenographers
Mrs. R. A. Mills
Miss A. M. Nicholls

Assistant
Mrs. W. K. Jarvie, B.A.

ADMINISTRATIVE STAFF

Vice-Chancellor and Principal
Professor J. J. Auchmuty, C.B.E., M.A., Ph.D.(Dublin),

Vice-Principal and Deputy Vice-Chancellor
Professor B. Newton-John, M.A.(Cambridge), F.R.S.A.

Deputy Vice-Chancellor
Professor E. O. Hall, M.Sc.(New Zealand), Ph.D.(Cambridge),
F.R.S.A.

Personal Assistant to Vice-Chancellor
A. Nell Emanuel, B.A.(New South Wales)

-----x-----

BURSAR'S DIVISION

Bursar
L. W. Harris, A.A.S.A.(Senior), A.B.I.A.

Deputy Bursar
L. F. Norberry, A.A.S.A.

Accountant
G. W. Walker, A.A.S.A.

Assistant Bursar — Staff
R. J. Goodbody
ADMINISTRATIVE STAFF

SECRETARY'S DIVISION

Secretary
P. D. Alexander, B.A., Dip. Ed.(Sydney)

Student Administration
I. D. Todd, B.Com., A.A.S.A.
P. H. Beckett, B.A.(Sydney)
R. Weir, B.A.

Examinations
Glennie Jones, B.A.(New South Wales)

Faculty Secretariat
J. S. Boydell, M.A.(Cambridge)
T. G. Chapman, B.A.(Sydney)

Publications and Publicity
J. W. Armstrong, B.A.
E. Joan Bale, B.A.(New South Wales)

Statistics and Systems
D. L. Farmer, B.Sc., Dip.Ed.(Sydney)
D. S. Dunlop

PLANNER'S DIVISION

University Planner
Associate Professor E. C. Parker, A.S.T.C., F.R.A.I.A.

Assistant Planner

Staff Architect
W. J. Crook, B.Arch.(New South Wales), A.R.A.I.A.

Assistant Staff Architect
A. Lee, A.S.T.C.

Staff Engineer

UNIVERSITY COUNSELLING SERVICE

Senior Student Counsellor
A. P. T. Loftus, B.A.(Melbourne), M.A.Ps.S.

Student Counsellors
B. E. Hazell, M.A.(Sydney), M.A.Ps.S.

APPOINTMENTS OFFICE

Appointments Officer
H. Floyer, B.Ec.(Sydney)

COMPUTER CENTRE

Director
J. A. Lambert, B.Sc.(Sydney), M.Sc.(New South Wales), M.B.C.S.

Programmers
M. Capek
A. L. Tay, B.App.Sc.(Adelaide)
M. Wiseman, B.Sc.(Adelaide)

EDWARDS HALL

Warden
M. W. Blackmore, B.Sc., Ph.D.(Queen's, Belfast), A.R.I.C., A.R.A.C.I., A.C.I.A.
THE UNIVERSITY OF NEWCASTLE

The University of Newcastle began its existence as the Newcastle University College of the University of New South Wales, then known as the New South Wales University of Technology. The College was formally opened on 3rd December, 1951, and the first students were enrolled in the 1952 academic year. By the University of Newcastle Act of 1964 it became an autonomous institution on 1st January, 1965.

Enrolments in the first year of the College’s existence totalled 370 of whom only five were starting degree courses—the others were seeking a diploma or were converting their diplomas into degrees. In 1954 courses in the Faculty of Arts were offered for the first time. As the New South Wales University of Technology, whose courses were given in the College, had no Faculty of Arts, supervision of these courses was entrusted to the University of New England. This relationship continued until 1959 by which time the New South Wales University of Technology had become the University of New South Wales and was empowered to offer courses in the Faculty of Arts. Enrolments have steadily increased, reaching 1000 in 1960 and 3758 in 1972.

The Newcastle University College was established on the site of the Newcastle Technical College at Tighe's Hill. In 1960 an area of some 200 acres was acquired at Shortland and building commenced in 1964. The transfer of the University began at the end of 1965. Courses in all faculties are now given on the Shortland Campus.

The University is governed by a Council of twenty-four members. The Chancellor, who acts as chairman, is chosen either within the twenty-four members or from outside, the size of the Council being increased to twenty-five in the latter instance. The Council comprises representatives of the University staff, Convocation, the students, the Legislative Council and the Legislative Assembly; nominees of the Governor; and the Vice-Chancellor, who is the chief executive officer of the University.


THE LIBRARY STAFF

University Librarian

E. Flowers, M.A.(Sydney), A.L.A.A.

Assistant University Librarian (Technical Services)

M. Elizabeth Guilford, B.A.(New England), A.L.A.A.

Assistant University Librarian (Reader Services)

Joan E. Murray, B.A.(New England), A.L.A.A.

Assistant University Librarian (Acquisitions)

Barbara R. Cook, B.A.; Dip.Lib.(New South Wales), A.L.A.A.

Assistant University Librarian (Serials)

B. Mitcheson, B.A., A.L.A.A.

Assistant Librarians

Anna M. Lee, B.Sc., A.L.A.A.

Winifred Murdoch, B.Sc.(New England), A.L.A.A.

Mary E. Rabbitt, B.A.(New South Wales), A.L.A.A.


C. I. Walsh, B.A.(Western Ontario), Dip.Lib.(New South Wales)

Graduate Library Staff

L. Faidiga, B.A.

M. Fauchon, B.A.


Barbara E. Samojluk, B.A.

Jennifer M. Scobie, B.A., Dip.Ed.(Sydney)
The principal academic body in the University is the Senate comprising the Vice-Chancellor, Professors, a representative of each of the Faculty Boards, representatives of the students and certain other ex officio members. Teaching and research in each Faculty are supervised by a Faculty Board consisting principally of the permanent academic and teaching staff of the Departments in the Faculty and representatives of the students. A number of Boards of Studies have also been established, each board having the task of integrating or supervising activities in a particular area of interest.

The University is financed by grants from the New South Wales and Commonwealth Governments and fees paid by students. The State and Commonwealth Governments contribute equally to the cost of buildings and major items of equipment whilst with respect to recurrent expenditure, the Commonwealth contributes $1 for every $1.85 received by way of State grant and student fees.

MATRICULATION

The By-laws governing matriculation and admission to courses are set out below. The University does not conduct its own matriculation examination but recognises the New South Wales Higher School Certificate Examination and the University of Sydney Matriculation Examination for this purpose.

By-law 5.1 — Matriculation

1. (1) Except as provided in By-law 5.3.3, a candidate, before being admitted to matriculation, shall:

(a) have passed in the New South Wales Higher School Certificate Examination or the University of Sydney Matriculation Examination in at least five recognised matriculation subjects, one of which shall be English and any three of which shall be passed at least at second level; and

(b) have attained in that examination the aggregate of marks prescribed by the Senate from time to time and calculated in the manner determined by the Senate.

(2) The recognised matriculation subjects shall be:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Subject</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Greek</td>
<td>Chinese</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Latin</td>
<td>Japanese</td>
</tr>
<tr>
<td>Science</td>
<td>French</td>
<td>Hebrew</td>
</tr>
<tr>
<td>Agriculture</td>
<td>German</td>
<td>Dutch</td>
</tr>
<tr>
<td>Modern History</td>
<td>Italian</td>
<td>Art</td>
</tr>
<tr>
<td>Ancient History</td>
<td>Bahasa Indonesia</td>
<td>Music</td>
</tr>
<tr>
<td>Geography</td>
<td>Spanish</td>
<td>Industrial</td>
</tr>
<tr>
<td>Economics</td>
<td>Russian</td>
<td>Arts</td>
</tr>
</tbody>
</table>

(3) Mathematics and Science, both passed as full courses, together shall, for the purpose of sub-section (1) (a) of this section, be counted as three subjects, but otherwise, each shall count as one subject.

(4) The qualification for matriculation must be obtained at one examination.

2. A person who has applied to undertake a course of study as a matriculated student shall upon:

(a) the approval of his admission to a Faculty and the payment of such fees as may from time to time be determined by the Council; and
MATRICULATION

(b) signing the Matriculation Register of the University become a matriculated student of the University and shall be deemed to have accepted the privileges and obligations of membership of the University.

By-law 5.3 — Admission to Courses

1. (1) A candidate for any first degree of the University shall satisfy the conditions for admission to matriculation set out in By-law 5.1.1 or shall have been admitted to matriculation under section 3 of this By-law before entering on any course for such degree. Compliance with the conditions for admission to matriculation shall not in itself entitle a person to enter upon a course.

   (2) A person who has satisfied the conditions for admission to matriculation may on the payment of such fees as may be determined by the Council from time to time be provided with a statement to that effect.

2. A candidate for any degree shall before entering on the course for that degree have satisfied any special conditions prescribed under By-law 5.2.

3. The Council may, with the advice of the Senate, admit as a matriculated student, under such conditions and with such standing as it may determine, any person who has satisfied the Council that he has reached a standard of education sufficient to enable him to pursue his proposed course.

4. The Council may, with advice of the Dean of the Faculty concerned, permit any person to enrol in a subject or subjects on payment of such fees as may be determined from time to time by the Council: Such a person, not being a matriculated student, shall not have the privileges of a matriculated student and shall not be eligible to proceed to a degree.

PREREQUISITES

Although prerequisites are not prescribed, lectures in the following faculties, courses or subjects will be given on the assumption that students will have studied for the New South Wales Higher School Certificate the subjects listed below to the level indicated:

<table>
<thead>
<tr>
<th>FACULTY</th>
<th>ASSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLIED SCIENCE</td>
<td>Second level Short Course Mathematics and Science including Physics and Chemistry options.</td>
</tr>
<tr>
<td>ARCHITECTURE</td>
<td>Second level Short Course Mathematics and Science.</td>
</tr>
<tr>
<td>ARTS</td>
<td>Economics I — Second level Short Course Mathematics.</td>
</tr>
<tr>
<td></td>
<td>English 1 — Second level English.</td>
</tr>
<tr>
<td></td>
<td>French 1 — Second level French.</td>
</tr>
<tr>
<td>ECONOMICS AND COMMERCE</td>
<td>Second level Short Course Mathematics.</td>
</tr>
<tr>
<td>ENGINEERING</td>
<td>Second level Short Course Mathematics and Science including Physics and Chemistry options.</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>Second level Short Course Mathematics.</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Second level Short Course Mathematics and Science.</td>
</tr>
</tbody>
</table>
PROCEDURES

ENROLMENT

All forms relating to enrolment are obtainable from the Student Administration Office, Room G.63, Building “A”.

PERSONS SEEKING ADMISSION TO AN UNDERGRADUATE COURSE AT THE UNIVERSITY OF NEWCASTLE FOR THE FIRST TIME

Students seeking admission in the 1973 academic year will be required to lodge an “Application for Admission — 1973” with the Student Administration Office not later than

(a) 5.00 p.m. on Wednesday, 1 November, 1972, in the case of:
   — Persons Resident in Australia who are seeking admission on the basis of qualifications which they already hold at 30 September, 1972;
   — Persons Resident outside of Australia provided they already possess the results of the examination on which they are relying for admission in 1973.

   Persons resident outside Australia whose examination results will not be available by 1 November, 1972 will not be considered for admission in 1973. They may inquire in September, 1973 for admission in 1974.

(b) 5.00 p.m. on Friday, 19 January, 1973, in the case of:
   — Persons Resident in Australia who
      (i) are seeking admission on the basis of the results of examinations taken after 30 September, 1972;
      (ii) in 1972 have been enrolled in another Australian University; or
      (iii) have applied to attempt the University of Sydney Matriculation Examination in February, 1973.

   No guarantee can be given that applications received after the prescribed dates will be considered.

   Applications sent by post should be addressed to The Secretary, The University of Newcastle, N.S.W. 2308.

   Students proposing to attempt the University of Sydney Matriculation Examination in February, 1973 should indicate on the application for admission the subjects and levels proposed to be offered for examination, and must advise the Secretary of their results as soon as they are known.

   Documentary evidence must accompany each application where studies have been carried out at secondary educational institutions outside New South Wales or where previous University studies have been undertaken.

   Each student will be advised by letter of the outcome of his application and those accepted will be informed of the procedures to be followed for the completion of enrolment. However, it should be noted that new students will be required to attend the University in person to have their enrolment approved and to pay fees. The days Wednesday, 14 February to Friday 16 February, 1973 have been set aside for this purpose.

PERSONS RE-ENROLLING IN UNDERGRADUATE COURSES

Undergraduates re-enrolling will be required to complete a re-enrolment form and lodge it with the Student Administration Office on or before Friday, 5 January, 1973. Students enrolled in 1972 will be sent a re-enrolment form with the advice of their examination results in December.

A student who has taken a deferred examination or special examination will be required to lodge a re-enrolment form with the Student Administration Office within one week from the day of publication of the examination results.

Approval of Re-Enrolment

When a student’s re-enrolment programme has been approved the authorised re-enrolment form will be posted to the student at his home address unless he indicates that it should be posted to any other address.

STUDENTS WISHING TO RE-ENROL AFTER A PERIOD OF EXCLUSION OR ABSENCE

A student wishing to re-enrol after exclusion or a period of absence of two years or more should apply to the Student Administration Office for an Application for Readmission form.
CANDIDATES FOR POSTGRADUATE DIPLOMA COURSES

Intending candidates for the Postgraduate Diploma courses in Business Studies, Computer Science, Education, Industrial Engineering and Psychology, will be required to complete an Application To Register Form and lodge it with the Student Administration Office on or before Friday, 19 January, 1973.

Each student whose undergraduate studies were undertaken in another University, will be required to provide a full transcript of his academic record with his application.

For further information, intending candidates should consult the entry for the appropriate Diploma course.

CANDIDATES FOR HIGHER DEGREES (DOCTOR OF PHILOSOPHY OR MASTER DEGREES)

Candidates Re-Enrolling

A letter will be sent by the University to each candidate whose re-registration is approved. A higher degree enrolment form will be enclosed with the letter and the candidate will be required to complete the form and return it to the Student Administration Office on or before Friday, 5 January, 1973.

Candidates Registering for the First Time

Doctor of Philosophy or Research Master’s Candidate

Candidates wishing to register for the degree of Doctor of Philosophy or a Research Master’s degree must lodge an Application to Register Form no later than one month prior to the commencement of the term in which registration is sought.

Dates by which Applications to Register must be Lodged

- Friday, 26 January, 1973
- Friday, 4 May, 1973
- Friday, 3 August, 1973

Course Work Master’s Candidates

Candidates wishing to register for a Course Work Master’s degree must lodge an Application to Register Form no later than Friday, 19 January, 1973.

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PROCEDURES

ENROLMENT IN CORRECT SUBJECTS

Considerable inconvenience is caused to the University and to the student if he attends classes in a subject in which he has not enrolled. It is essential that the student consider carefully the subjects he is required, or wishes, to enrol in before submitting his Enrolment Form.

WITHDRAWAL FROM COURSE OR SUBJECT REGARDED AS FAILURE

Approval to withdraw from a course or a subject is not automatic. It should be noted that a student is regarded as having failed in a course if he enrols in it and does not pass the annual examinations — i.e. not sitting for the examination is regarded as not passing the examination (unless withdrawal without penalty has been approved).

A student is required to notify the Secretary to the University in writing of his withdrawal and the withdrawal shall take effect from the date of receipt of such notification in writing. Unless the Dean of his Faculty grants him permission to withdraw without penalty, a student who withdraws after the date shown below will be deemed to have failed in the subject or subjects from which he withdraws.

All Faculties except the Faculty of Engineering
Sixth Monday in Second Term

Faculty of Engineering
Type A Subjects
Eighth Monday in First Term

Type AB Subjects
Sixth Monday in Second Term

Type B Subjects
Second Monday in Third Term.

PROCEDURES

AMENDMENTS

Any action taken by a student which involves an amendment to or a variation in his course programme or enrolment status is required to be documented.

A student must formally apply for permission to do any of the following:
(a) completely withdraw from course
(b) withdraw from a subject or subjects
(c) substitute one subject for another
(d) add a subject to existing programme
(e) transfer from F/T to P/T within degree course
(f) transfer from P/T to F/T within degree course
(g) transfer from one degree course to another
(h) transfer from a degree course in one Faculty to a degree course in another Faculty

If the variation sought is not listed above, a brief indication of the nature of the change sought is required.

NOTES
1. Exemption in a subject unit or units, the substitution of a unit or units within a subject and exemption from practical work, is the responsibility of the Head of the Department concerned who will authorise such exemption or substitution.

2. Students are reminded that compliance with the degree or Diploma Requirements governing their courses is their responsibility. Approval of a Variation Application does not of itself entitle the applicant to any rights or privileges to which the completion of his previous programme might have entitled him.

HOW TO DOCUMENT WITHDRAWALS AND AMENDMENTS

All withdrawals and amendments should be recorded on a Variation Application Form.

It is essential that students notify the Student Administration of variations in their courses promptly. Automatic approval is not given; the student must have valid and sufficient reasons for making the change and these reasons should be stated on the Variation Form.

Variation Forms are available from the Student Administration Office.
PROCEDURES

CHANGE OF ADDRESS

Students are responsible for notifying the Student Administration Office in writing of any change in their address as soon as possible. Failure to do this 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.

A Variation Application Form should be used to notify a change of address.

It is essential that all students inform the University of an address for all correspondence from the end of the examination period to the end of the long vacation.

This is particularly important for students intending to travel overseas during this period.

A special form for this purpose will be available in October of each year.

IDENTITY CARDS

Each student wishing to obtain a travel concession, to borrow a book from the Library or to confirm his membership of the Newcastle University Union is required to produce on demand the identity card which will be given to him.

Identity cards will be issued to students at the Student Administration Office and should be available for collection soon after the commencement of First Term. The student will be required to produce his fee receipt before an identity card will be issued to him.

A notice will be displayed on notice boards and inserted in “University News” advising students when identity cards are available for collection.

Loss of Identity Card

If a student loses his identity card he should pay to the University Cashier the sum of 50 cents and present the receipt to the Student Administration Office for the purpose of obtaining a replacement card.

Return of Identity Card

Each student who during the academic year withdraws completely from his course will be required to hand his Identity Card to the Student Administration Office before leaving the University.

Non-Degree Students and Identity Card

Each non-degree student who does not elect to pay the General Services Fee will be issued with an identity card appropriately endorsed. It must be shown on request to prove status as a student of the University.

TRAVEL CONCESSIONS

The various transport authorities provide fare concessions for certain classes of students.

Application forms for these concessions may be obtained at the Student Administration Office, Building “A”.

The Student’s Identity Card has to be produced each time a concession is required.

OMNIBUS — Concessions are available to:

(a) students under 18 years of age irrespective of whether they are employed or receive income or remuneration.

(b) students who are 18 but under 30 years of age and who are not in employment nor in receipt of any income or remuneration. Note: Income or remuneration includes allowances paid to Colombo Plan students, Public Service trainees, etc. but does not include allowances paid to holders of Commonwealth Scholarships, Teachers’ College Scholarships or Bursaries granted by the State Bursary Endowment Board.

(c) Concessions are not available to students who are 30 years of age or over; or to married women or ordained clergymen.

TRAIN —

(a) Periodical tickets are available during term to full-time students not in employment nor in receipt of any remuneration.

(b) Daily concession fare tickets are available to part-time students, whether employed or otherwise, for the purpose of travelling to and from classes held in connection with their course of instruction.

(c) Vacation travel concessions are available to students qualifying under (a) above.
AIRCRAFT —  
Concession fares for travel overseas, inter-state and intra-state are available under the conditions ruling for the various operating companies.

LOST PROPERTY  
Inquiries regarding lost property should be directed to the Attendant (Patrol) between 9 a.m. and 5 p.m. Monday to Friday at the Attendants’ Office. This office is located in the north-eastern corner of the lowest floor of the Library building and may be reached from the pathway leading from the lower plaza to the footbridge.

FEES

GENERAL INFORMATION

COMPLETION OF ENROLMENT

Fees are determined by the University Council and are subject to alteration without notice.

Enrolment is not effective until fees for the course in which the student has enrolled, are paid. Fees should be paid on or before Tuesday, 20 February, 1973. After that, a late fee will apply. Enrolments will not be accepted after 31 March, 1973 without the Secretary’s special written approval. This will be given only in exceptional circumstances.

Payment of fees by mail is encouraged. Money Orders should be made payable at the Newcastle University Post Office, 2308. The Cashier’s Office is located on the first floor of the Administration Building. A continuous service will apply from 9.00 a.m. to 4.30 p.m. Monday to Friday throughout the year with the exception of vacation periods when the Cashier’s Office will be closed between 12.30 p.m. and 1.30 p.m.

Any alterations to the Cashier’s hours during enrolment periods will be published in the press and displayed on selected University notice boards.

PAYMENT OF FEES BY TERM

The Entrance Fee and General Services Fee must be paid in full at the time of enrolment. However, students may pay Course Fees by the term, in which case they are required to pay First Term Course Fees and the whole of the General Services Fee by the due date.

Students paying fees under this arrangement will receive accounts for Second and Third Term fees prior to the commencement of these terms.

EXTENSION OF TIME IN WHICH TO PAY FEES

Students who are unable to pay fees by the prescribed date may in exceptional circumstances be granted an extension of time in which to pay fees. Application must be made to the Vice-Principal and special forms are available for this purpose. Completed forms must be forwarded to the Vice-Principal’s Office before Wednesday, 14 February, 1973.
SCHOLARSHIP HOLDERS AND SPONSORED STUDENTS

Students holding scholarships or receiving other forms of financial assistance must attach to their authorised enrolment forms submitted to the Cashier, warrants or other forms of documentary evidence that their fees will be paid by Sponsors. The University looks to Sponsors to provide a separate voucher, warrant or letter for each student sponsored. Where such documentary evidence is not available, students are expected to make application for an extension of time in which to complete enrolment.

DATES FOR PAYMENT OF FEES IN 1973

<table>
<thead>
<tr>
<th>Term</th>
<th>Fees payable before or on</th>
<th>LATE PAYMENT FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST TERM</td>
<td>Tuesday February 20</td>
<td>$8.00 payable on and after</td>
</tr>
<tr>
<td></td>
<td>Wednesday February 21</td>
<td>$14.00 payable on and after</td>
</tr>
<tr>
<td></td>
<td>Thursday March 29</td>
<td></td>
</tr>
<tr>
<td>SECOND TERM</td>
<td>Monday June 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wednesday June 18</td>
<td></td>
</tr>
<tr>
<td>THIRD TERM</td>
<td>Monday September 17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tuesday October 2</td>
<td></td>
</tr>
</tbody>
</table>

* Refer to page 34 for other Late Fees

FAILURE TO PAY FEES

Students cease to be entitled to membership and privileges of the University where they are indebted to the University and fail to make settlement or satisfactory arrangements regarding their indebtedness. Such a student is not eligible to attend the annual examinations in any subject where any portion of his Course Fees or amounts due for other purposes are outstanding. In very special cases, the Vice-Principal may grant exemption from this disqualification upon receipt of a written statement setting out all the relevant facts.

FEE ADJUSTMENTS

Should an application to withdraw from a course or a subject be approved, the University will consider an application for an adjustment of course fees based on the student's last date of attendance at lectures or tutorials. ALL CORRESPONDENCE DEALING WITH ADJUSTMENTS TO FEES SHOULD BE ADDRESSED TO THE ACCOUNTANT.

Where notification of withdrawal from a course is received by the Secretary before the first day of First Term, a refund will be made of all Course Fees. Where a student for acceptable reasons withdraws from a course before the end of the fifth week of term, one-half of the Course Fees for the term may be refunded. If the student withdraws from a course after the end of the fifth week of term, no refund will be made for that term.

THE UNIVERSITY RESERVES THE RIGHT TO DEFER PROCESSING APPLICATIONS FOR FEE REFUNDS RECEIVED IN THE EARLY PART OF FIRST TERM UNTIL AFTER THE SIXTH WEEK OF FIRST TERM.

The University Administration does not refund any portion of the General Services Fee apart from the Library fee where a student withdraws before the first day of First Term. Students withdrawing from courses may enquire of the University Union, Sports Union and Students' Association regarding refund possibilities.

DESIGNATION OF STUDENTS

FULL-TIME STUDENTS

A Full-Time Student is a student who enrolls in more than half the subjects of a normal first year course and such a student remains classified as a full-time student until the written approval of the Dean of the Faculty is given that he be re-classified as a part-time student. This re-classification would be exceptional.

PART-TIME STUDENTS

A Part-Time Student is either one who enrolls in half or less than half of the subjects of a normal first year course or one who enrolls in a part-time course. In subsequent years, the enrolment as a part-time student requires the approval of the Dean of the Faculty.

NON-DEGREE STUDENTS

A Non-Degree Student is a student who is permitted to enrol in one or more subjects of a first degree course. Such a person is not eligible to proceed to a degree and cannot enjoy the privileges of a matriculated student. A student enrolled in the Professional Accounting Studies course in the Faculty of Economics and Commerce is classified as a Non-Degree student taking one subject.
FEES

All fees are subject to variation without notice.

GENERAL SERVICES FEE

(a) Students Proceeding to a Degree or Diploma

All registered students must pay a General Services fee of $42.00 per annum which includes a Library Fee. In addition, students joining the Newcastle University Union for the first time, are required to pay an entrance fee of $12.00. This fee must be paid by the prescribed date.

(b) Non-Degree Student

Payment of the General Services Fee by a non-degree student is optional. A non-degree student cannot elect to pay portion of this fee.

UNDERGRADUATE COURSE FEES

FULL-TIME

Amount

All other Faculties ............... 540 p.a.

PART-TIME

All Faculties ................. 267 p.a.
Non-Degree Subject ............. 147 p.a.

POSTGRADUATE DIPLOMA COURSE FEES

Full-time ................. 447 p.a.
Part-time .................. 267 p.a.

LATE FEES

(a) Late payment fee if fees due are not paid within stipulated times approved by the Vice-Chancellor ........ 8
(b) Additional amount payable if fees are not paid within an extended time approved by the Vice-Chancellor ........ 6
(c) Late re-enrolment fee where a continuing student fails to lodge an enrolment form with the Student Administration Office by the date approved by the Vice-Chancellor ........ 14
(d) Late enrolment fee where a student does not lodge the approved section of the enrolment form with the Cashier by the time approved by the Vice-Chancellor ........ 14

OTHER FEES

(1) Deferred examinations, per subject .............. 6
(2) Examination under special supervision, per paper ........ 10
(3) Review of examination results, per subject .......... 8
(4) Statement of matriculation status .......... 8

FEES FOR THE DEGREE OF MASTER

(a) Research and Thesis

Registration Fee .............. 6
Course & Supervision Fee (full-time) ........ 216 p.a.
Course & Supervision Fee (part-time) ........ 144 p.a.
Final Examination & Graduation Fee ........ 42

(b) Course Work and Dissertation or Formal Study Courses

Registration Fee .............. 6
Course & Supervision Fee (full-time) ........ 384 p.a.
Course & Supervision Fee (part-time) ........ 231 p.a.
Final Examination & Graduation Fee ........ 42

FEES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Qualifying Examination Fee (if applicable)* ........ 18
Registration Fee .............. 6
Course & Supervision Fee (full-time) ........ 216 p.a.
Course & Supervision Fee (part-time) ........ 132 p.a.
Final Examination & Graduation Fee ........ 59

*Payable when an examination is prescribed for the assessment of a student prior to registration as a higher degree candidate.
HIGHER DEGREE FEES

Course and Supervision Fee

This fee for Higher Degree candidates is assessed on a term basis, the period of registration being from the first day of the term to the Friday immediately preceding the first day of the following term. Candidates proceeding to a Higher Degree must enrol or re-enrol at the beginning of each academic year at the normal enrolment time. The usual late fees apply in respect of late enrolments.

All fees and moneys owing to the University by a Higher Degree candidate must be paid before the student's thesis can be lodged for examination.

Where a Higher Degree candidate withdraws from a course during a term, no portion of the term fee will be refunded.

General Services Fee

Higher Degree candidates are required to pay the General Services Fee (see page 34). Where a Higher Degree candidate's enrolment is effective from first or second term, the General Services Fee covers a period of registration from the first day of the term to the Friday immediately preceding the first day of first term in the following academic year. Where a Higher Degree candidate enrolls on or after the first day of third term, the General Services Fee paid will cover liability in respect of this fee to the end of the long vacation following the next academic year.

Submission and Re-submission of Thesis

Fees apply to the date of submission of a thesis.

A candidate required to re-submit a thesis, will not be required to pay further fees, unless laboratory work is involved, in which case the appropriate course and supervision fee will be payable on a term basis. The General Services Fee will also apply.

GENERAL REQUIREMENTS

The University tries to function with a minimum of formal regulations; it has, for instance, drawn up no code of conduct for students, beyond forbidding gambling in the precincts and smoking in lectures, examinations and the Library.

It is obvious, however, that there must be standard practice throughout the University in such diverse matters as examination procedures and car parking and an acceptance of certain requirements which are described in the following pages.

ACADEMIC REQUIREMENTS

The student is responsible for informing himself as to, and for complying with, University requirements, especially the requirements relating to admission and to the award of the degree to which he is proceeding.

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.

NOTICE BOARDS

EXAMINATIONS

A notice board has been placed on the wall opposite the entrance to the Main Lecture Theatre (B01) for the specific purpose of displaying examination timetables and notices concerning all procedural matters pertaining to examinations. Students are specifically requested to be acquainted with the notices periodically displayed thereon.

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 first floor at the top of the main staircase in Building "A".

ATTENDANCE AT CLASSES

Students are expected to be regular and punctual in attendance at all classes in the course or subject in which they are enrolled.

All applications for exemption from attendance at lectures or practical classes must be made in writing to the Head of the appropriate Department. If term examinations have been missed this fact should be noted in the application.
GENERAL REQUIREMENTS

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

Applications for exemption from re-attendance at classes, either for lectures or practical work, may only be approved on the recommendation of the Head of the appropriate Department. The granting of an exemption from attendance does not carry with it exemption from payment of fees. Where a student has attended less than 80 per cent. of the possible classes, he may be refused permission to sit for the annual examination in that subject.

OWNERSHIP OF STUDENTS WORK

Unless other arrangements have been agreed upon the University reserves the right to retain at its own discretion the original or one copy of any drawings, models, designs, plans and specifications, essays, theses, or other work executed by students as part of their courses, or submitted for any award or competition conducted by the University.

STUDENT IDENTIFICATION

Students are expected to carry their Identity Card as evidence that they are entitled to the rights and privileges afforded by the University.

Each student wishing to obtain a travel concession, to borrow a book from the Library or to confirm his membership of the Newcastle University Union is required to produce on demand his identity card.

Identity cards will be available for collection at the Student Administration Office soon after the commencement of First Term. The Student must produce his fee receipt before an identity card will be issued.

Loss of Identity Card

If a student loses his identity card he should pay to the University Cashier the sum of 50c. and present the receipt to the Student Administration Office for the purpose of obtaining a replacement card.

Return of Identity Card

Each student who during the academic year withdraws completely from his course will be required to hand his Identity Card to the Student Administration Office before leaving the University.
PARKING OF CARS
TRAFFIC REGULATIONS

1. “Authorised Person” means a person authorised in writing by the Vice-Chancellor for the purposes of these Regulations. “Notice” means a written advice signed by an authorised person on behalf of the Vice-Chancellor.

2. Any student, a member of staff of the University, or other person employed on the University site who wishes to bring a motor vehicle on to the Shortland site shall obtain a University parking permit. Upon receipt of a parking permit sticker the driver will fix this to the top left hand corner of the windscreen or in the case of a motorcycle in a prominent location on the cycle. Vehicles without this sticker may be refused entry to the campus.

3. No person shall park or leave any vehicle on the Shortland site except in places set aside from time to time for parking.

4. A person in charge of a vehicle entering or upon any part of the site shall:
   (a) Stop his vehicle at any manned control point or any other part of the site when signalled to do so by a Patrol Attendant.
   (b) Give to any such officer such information as he may reasonably require.
   (c) Obey any direction a Patrol Attendant may reasonably give in relation to the driving or parking of such vehicle.
   (d) Not drive at a speed greater than 20 m.p.h. or such speed limit as may be indicated by an appropriate sign for that section of road or part of the site.
   (e) Not commit or do any act which would be a breach of any Act or regulation of the State of New South Wales if he were driving or in charge of a vehicle upon a public road.
   (f) Not drive or park a vehicle on any lawn, grassed area, oval, garden, builders access road or undeveloped area of the site.
   (g) Comply with all other directions related to traffic indicated by appropriate signs installed on the site.

5. Any person who contravenes or fails to observe any of the above regulations may be advised in writing by a notice which may be posted or handed to the person or affixed to his vehicle by an authorised person.

6. Any person who contravenes or fails to observe any of these regulations shall be deemed guilty of a breach of regulations and may be dealt with accordingly.

7. The maximum penalty for the time being which may be applied under these regulations shall be the banning from the University site for a period of three months of any vehicle driven by the person concerned.

NOTE

Application forms for permits may be obtained from the Senior Attendant (Patrol) at the Attendants' Office. This office is located in the north-eastern corner of the lowest floor of the Library building and may be reached from the pathway leading from the lower plaza to the footbridge.
EXAMINATIONS

Examinations and other exercises may be held in any subject and at any time. In the assessment of a student's progress in a University course, consideration will be given to laboratory work and class exercises and to any term or other tests conducted throughout the year. The results of such examinations and class work may be incorporated with those of the annual examinations.

ANNUAL EXAMINATIONS

A student desiring to sit for an annual examination must lodge an application with the Secretary on the appropriate form by the prescribed date, 15 June, 1973.

A student who, because of religious convictions, would prefer not to sit for an examination on a particular day or particular day of the week should indicate this in writing when lodging his application to sit for examinations. While the University cannot guarantee to meet such requests it will be willing to co-operate where possible.

The cashier is authorised to receive application forms during the three weeks immediately following the prescribed closing date if they are accompanied by a late fee of $6.00. Applications submitted more than three weeks after the closing date will not be accepted except with the approval of the Secretary. Where an application is not accepted, the student concerned is not eligible to sit for the examination.

No student is eligible to attend the annual examination in any subject if any portion of fees or other charges due by him is outstanding by the end of the third week of third term.

The annual examinations take place in November-December. Timetables showing the time and place at which individual examinations will be held will be posted on the examinations notice board near the Main Lecture Theatre. Misreading of the timetable will not under any circumstances be an acceptable excuse for failure to attend an examination.

Examinations are conducted in accordance with the following rules and procedure:

(a) Candidates are required to obey any instruction given by a Supervisor for the proper conduct of the examination.

(b) Candidates are expected to be in their places in the examination room not less than ten minutes before the time for commencement of the examination.

(c) No bag, writing paper, blotting paper, manuscript or book, other than a specified aid, is to be brought into the examination room.

(d) No candidate shall be admitted to an examination after thirty minutes from the time for the commencement of the examination.

(e) No candidate shall be permitted to leave the examination room before the expiry of thirty minutes from the commencement of the examination.

(f) No candidate shall be re-admitted to the examination room after he has left it unless during the full period of his absence he has been under approved supervision.

(g) A candidate shall not by any improper means obtain or endeavour to obtain assistance in his work, give or endeavour to give assistance to any other candidate, or commit any breach of good order.

(h) Smoking is not permitted during the course of an examination.

(i) A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination and if detected at the time, to immediate expulsion from the examination room, and is liable to such further penalty as may be determined.

FURTHER EXAMINATIONS

After completion of the written annual examination papers, a student may be called upon by an examiner to complete further written, practical or oral tests as part of the annual examination. It is therefore important that the Examinations Section be advised of any change in address from that given on the Application for Admission to Examinations.

EXAMINATION RESULTS

A copy of the official examination results will be posted on the notice board at the top of the main staircase. Each student will be advised by mail of his examination results. A set of examination results will be offered to the newspapers for publication. No results will be given by telephone.

Examination results may be reviewed for a fee 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 fee by the date notified in the publication of results.
SPECIAL EXAMINATIONS

Special examinations may be granted according to the conditions contained in By-Law 5.9.3 which states:—

5. When a candidate is prevented by illness or by any other serious cause from presenting himself for the annual examination the appropriate Faculty Board may order a special examination for that candidate in the subject or subjects in which he was unable to present himself. The result of a special examination may be graded.

6. When a candidate's studies during the academic year have been gravely hampered by illness or any other serious cause, the appropriate Faculty Board upon application being made to the Secretary to the University before the commencing date of the examination supported by medical or other proper evidence may direct the examiners to take the circumstances into account in determining whether or not a special examination should be provided for the candidate in any subject in which he does not pass at the annual examination.

7. When a candidate at the annual examination is to a substantial degree affected by illness during the course of an examination in any subject the appropriate Faculty Board, upon application being made to the Secretary within three days after such examination or within such further period as the Vice-Chancellor may consider reasonable in the circumstances supported by medical or other proper evidence, may direct the examiners in that subject to take the circumstances into account in determining whether or not a special examination or test should be provided for him; provided that no such application shall be considered unless the candidate either during or immediately after such examination reports to the supervisor in charge the circumstances relied on in the application.

DEFERRED EXAMINATIONS

Deferred examinations may be granted in the Faculties of Applied Science, Architecture, Engineering, and Mathematics. The examinations will be held in January-February and results will be published in the same manner as for the annual examinations.

ACADEMIC PROGRESS REQUIREMENTS

GENERAL

The University has enacted certain By-laws relating to continuation in a course. The relevant By-laws are set out below.

BY-LAWS

By-law 5.4.1 — Unsatisfactory Progress

1. The Head of a Department in any Faculty may determine that a student taking a subject or course offered by the Department shall be excluded from any examination for which the Department is responsible for any or all of the following reasons:—

(a) unsatisfactory attendance at lectures;
(b) failure to complete laboratory work;
(c) failure to complete written work or other assignments;
(d) failure to complete field work.

2. The Faculty Board may review the academic progress of any student enrolled in the Faculty concerned who fails in, or is absent from, or is excluded under section 1 of this By-law from any examination and may determine:—

(a) that the student be excluded from further study in a subject;
(b) that the student may enrol in that Faculty only in such subject or subjects as the Faculty Board shall specify; or
(c) that the case be referred to the Admissions Committee if, in the opinion of the Faculty Board, the student should be excluded from a degree course, from the Faculty or from the University.

3. The Admissions Committee, in considering a referral under subsection (c) of section 2 and after giving the student an opportunity to be heard, may determine:—

(a) that the student be excluded from a degree course or from the Faculty;
(b) that the student shall be permitted to continue his course, subject to such conditions as the Admissions Committee may determine; or

c) that the case be referred to the Vice-Chancellor with the recommendation that the student be excluded from the University.

4. The Vice-Chancellor may, on the recommendation of the Admissions Committee, exclude from the University any student whose academic record in the opinion of the Vice-Chancellor and the Admissions Committee demonstrates the student's lack of fitness to pursue University studies.

By-law 5.4.2 — Show Cause

1. A student shall show cause why he should be allowed to repeat a subject in which he has failed more than once. Failure in a deferred examination as well as the annual examination counts for the purposes of this By-law as one examination.

2. (1) A full-time student shall show cause why he should be allowed to continue a course if all subjects of the first year of his course are not completed by the end of his second year of attendance.

(2) A part-time student shall show cause why he should be allowed to continue a course if all subjects of the first two stages of his course are not completed by the end of his fourth year of attendance.

3. (1) A student who has a record of failure at another University shall show cause why he should be admitted to the University.

(2) A student admitted to a course at the University following a record of failure at another University shall show cause, notwithstanding any other provision in this By-law, why he should be allowed to continue in that course if he is unsuccessful in the annual examinations in his first year of attendance at the University.

4. A student required to show cause shall have his application considered by the Admissions Committee which shall determine whether the cause shown is adequate to justify the student's being permitted to continue his course or to re-enrol as the case may be.

By-law 5.4.3 — Re-Enrolment

1. Any student who has been excluded from a Faculty shall not be allowed to enrol in another Faculty without the permission of the Faculty Board concerned.

2. Any student excluded from a degree course or from a Faculty or from the University may apply after two academic years to the Admissions Committee for re-admission to any such Faculty or to the University. If the Admissions Committee is satisfied that the condition or circumstances of any such student have so changed that there is reasonable probability that he will make satisfactory progress in his studies it may authorise the re-admission of that student under such condition as it may determine.

By-law 5.4.4 — Appeal Against Exclusion

1. A student who is refused permission to enrol under the provisions of section 1 of By-law 5.4.3 may appeal to the Senate.

2. A student who has been excluded from any degree course or from a Faculty or from the University may appeal to the Council.

PROCEDURES

The onus is on a student required to "Show Cause" to take the appropriate action should he wish to re-enrol. Such a student must lodge his "Show Cause" statement and completed re-enrolment form by the date prescribed each year to ensure consideration of his case.
THE LIBRARY

The Library, totalling approximately 210,000 volumes and made up of monographs, pamphlets, serials and microform sets, exists to acquire, preserve and make available for use all research materials needed by the staff and students of the University.

There is an almost complete freedom of access to the collections, and students are encouraged and aided to learn how to use, as soon as possible, the Library and its contents. On his first visit to the Library the student is provided with a brochure outlining the Library's resources, its services, such as the copying service, its special facilities, such as the microprint reading room, and procedure for borrowing.

The Library, fittingly, occupies a central position on the site, next to the Union.

HOURS OF OPENING

During academic year

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday-Friday</td>
<td>8.30 a.m. to 10.00 p.m.</td>
</tr>
<tr>
<td>(long vacation excepted)</td>
<td></td>
</tr>
<tr>
<td>Saturday and Public Holidays</td>
<td>9.00 a.m. to 5.00 p.m.</td>
</tr>
<tr>
<td>(all vacations excepted)</td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>1.00 p.m. to 5.00 p.m.</td>
</tr>
<tr>
<td>(all vacations excepted)</td>
<td></td>
</tr>
</tbody>
</table>

The Library is closed for the Easter Weekend, i.e., April 20-24, 1973 inclusive.

During long vacation

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, Wednesday, Friday</td>
<td>9.00 a.m. to 5.00 p.m.</td>
</tr>
<tr>
<td>Tuesday, Thursday</td>
<td>9.00 a.m. to 7.00 p.m.</td>
</tr>
</tbody>
</table>

UNIVERSITY SERVICES

AMENITIES

The Amenities Office is located in the temporary building adjacent to the main University building.

The Amenities Officer and his Staff assist students in the following fields:---

SPORT

The Amenities Office, Mr. Bradford is liaison officer for all sporting matters between the Sports Union, the University and all outside sporting organisations.

The Amenities Office assists student Sporting Clubs in the arranging of Inter-varsity contests and travel as well as giving help when required at club level.

ACCOMMODATION

The Amenities Office conducts a student accommodation service for students requiring housing and will deal with any accommodation problems which students may encounter while attending the University. A register is maintained of rooms, flats and private board available in Newcastle. Do not hesitate to use this service which is operated for the convenience of students.

INSURANCE

The Amenities section on behalf of the Sports Union and the Students' Representative Council is responsible for the operation of the Personal Accident Insurance Scheme.
APPOINTMENTS OFFICE

The Appointments Office was established in 1971 primarily to help students obtain information about careers and to assist graduating students find employment.

All new students are invited to consult the Appointments Office at some time during their first year at the University. Follow up consultations during second and third years may serve to bring the student to a state of mind where he or she feels confident that his or her chosen career is suitable and within the realms of possibility. The Appointments Office would hope to have available or to obtain information for the student in order that by a little research in the early years, frustration and disappointment can be avoided after graduation.

Careers Library
1. A section of the Careers Library will contain books, periodicals, articles, etc. giving general information on various professional occupations.
2. Information is being assembled about the manpower requirements of numerous employers — types of graduates needed, educational qualifications for appointment, experience gained, prospects etc.
3. Professional associations are being approached to supply information about the activities of their bodies, conditions of membership and application forms.

During 1973 it is hoped that the Appointments Office will move into Building “A”, when a Library and Reading Room will become available in which students may consult relevant material.

Employer Interviews

Some employers have representatives come to the University for the purpose of giving students first hand information about the kinds of graduates recruited, the job involvement, salaries, prospects etc.

Students make appointments to interview the representatives singly or in small groups.

Employment Vacancies

Some Government Departments inform the University on a regular basis of vacancies within their organizations, other employers only as specific vacancies occur.

The ‘Positions Vacant’ columns of a major local newspaper are always on hand.
CHAPLAINCY SERVICE

A Chaplaincy Service within the University of Newcastle for the benefit of students and members of staff is provided by the Christian Churches of Newcastle.

The service offers personal counselling and guidance, and also assistance in biblical and doctrinal studies. Opportunities for liturgical worship are also provided.

The Chaplains' office is situated on the Lower Ground Floor of the Main Administration Building at Shortland.

The Chaplains are in regular attendance at the University but they may also be contacted at their private addresses.

NAMES AND ADDRESSES OF CHAPLAINS

**Anglican** —

The Reverend Canon E. H. V. Pitcher,
M.A.(Sydney), Th.Schol.
(Acting Chaplain)
The Rectory,
MEREWETHER. Telephone 63 1388

**Baptist** —

The Reverend T. H. Binks,
133 Kemp Street,
HAMILTON. Telephone 61 4048

**Methodist** —

The Reverend W. D. Adams,
B.A.(Sydney), B.D.(Melbourne)
23 William Street,
HAMILTON. Telephone 61 4040

**Presbyterian** —

The Reverend H. F. Kat, B.A., B.D.(Utrecht)
4 Gregory Parade,
KOTARA. Telephone 57 1076

**Roman Catholic** —

The Reverend Father G. Tejón, S.T.L.(Avila),
B.Litt(Oxford)
11 Derna Road,
SHORTLAND. Telephone 51 2424
OR
The Presbytery,
SHORTLAND. Telephone 55 9364

EDWARDS HALL

Edwards Hall, in the first stage of construction, provides 183 residential places for students and staff of the University, including 7 positions for residential Subwardens. The Hall is situated near the southeastern boundary of the Sports Oval, close to the tennis and squash courts and is approximately 1 mile by road from the University Library. While the Hall is an integral part of the University and as such is subject to the decisions and directions of the University Council, major responsibility for the government of the Hall has been entrusted, by Council, to a Board of Trustees made up of three Council members, one Senate member, two senior resident students, one resident Subwarden and the Warden.

The residential fees for 1973 have not been determined but as a guide to prospective applicants, the current residential fees are as follows: Term 1, $264; Term 2, $240; Term 3, $264. Term residential fee entitles a member to a bed/study room, the supply of all bedding and fresh linen, the maintenance of the room and 16 meals a week, being breakfast and dinner each day and lunch on Saturday and Sunday.

Applications for residence should be sent to the Warden, Edwards Hall, The University of Newcastle, N.S.W. 2308. The closing date for applications for residence in 1973 will be January 19, 1973 and applications received after this date will not necessarily be considered.

Warden

M. W. Blackmore, B.Sc., Ph.D.(Queen's Belfast),
A.R.I.C., A.R.A.C.I., A.C.I.A.
UNIVERSITY SERVICES

OVERSEAS STUDENTS

The Overseas Student Adviser is on campus solely to help overseas students with any problems which may arise. Because of her specialized knowledge, she may be able to give direct assistance, may refer the student to someone in an appropriate field, (e.g., legal, health, insurance, etc.) or she may speak at the student’s request and on his behalf with government officers, staff members or others.

Any discussion with the Overseas Student Adviser is completely confidential. She may be contacted either through the University Counselling Service or in the Temporary Building (T.10).

Overseas Student Adviser

Mrs. Robin Loftus, B.A. (Adelaide)

STUDENT LOAN FUND

The Council of the University has established a Student Loan Fund which is managed by a committee consisting of the Deputy Chairman of Senate, the Bursar and the Vice-Principal (Chairman).

Loans may be made to an undergraduate where the committee is of the opinion that his academic performance is of sufficient merit and his financial circumstances warrant a loan.

The total outstanding accommodation to any one undergraduate shall not normally exceed $200 at any one time and an undergraduate granted a loan is required to enter into an agreement.

Repayment must commence not later than twelve months after graduation or when the borrower fails or withdraws from his course or on demand as required by the University. No interest is charged while the borrower is an undergraduate but interest at a rate of not less than 5% per annum on the balance owing from time to time is charged from the date of graduation or the date on which an undergraduate fails or withdraws from a course.

In special circumstances the Committee may grant a loan to a student other than an undergraduate.

Any student wishing to seek assistance from the Fund may apply in person to the Vice-Principal or through the President of the Students’ Representative Council or his nominee.

STUDY AT THE UNIVERSITY LEVEL

The University Counselling Service published a brief but comprehensive book on this subject in 1967 and although it was produced specifically for the students of this University, and reflects the attitudes of several Heads of Departments here, it is already widely used in other Universities and tertiary institutions throughout Australia. A Revised Edition was published in November, 1969 as the first printing had sold out. It may be purchased from the Cashier at 40 cents per copy.

LOCATION

The Secretary to the University Counselling Service and two Counsellors are located in the Administration Building (Room G75—entrance at the N.W. end of building). It is generally most satisfactory for students, both full-time and part-time, to make appointments through the U.C.S. Secretary. Counsellors are available for evening appointments.
UNIVERSITY SERVICES

UNIVERSITY COUNSELLING SERVICE STAFF

Senior Student Counsellor — A. P. T. Loftus, B.A. (Melbourne), M.A.Ps.S.

B. E. Hazell, M.A. (Sydney), M.A.Ps.S.

Secretary — Mrs. Joy Hoesli
Stenographer — Mrs. Vicki Lloyd

UNIVERSITY HEALTH SERVICE

Pending the establishment of a Health Centre, an interim service, located in the Union, functions during term time. The medical officer, Dr. John Raschke attends each Tuesday and Thursday morning and qualified nurses are on duty on the other days.

The service, which is free, is essentially diagnostic and does not undertake continuing treatments.

UNIVERSITY ORGANISATIONS

CONVOCATION

Convocation provides an opportunity for graduates to maintain a positive interest and influence in University affairs. It has the right to discuss and to pronounce an opinion on any matter relating to the University, and to communicate directly with the Council or Senate of its own volition or at the request of either body.

Public meetings at which topics of interest are discussed are conducted by Convocation as well as general meetings. Convocation is controlled through a Standing Committee of 14 elected members including the Chairman, who is called the Warden of Convocation, and the Immediate Past Warden, who is the Deputy Chairman.

Membership is automatic for graduates of this University, and for those graduates of the University of New England and of the University of New South Wales who spent at least three years as students of Newcastle University College; for present and past members of the University Council; and for present full time members of the academic staff and graduate permanent members of the administrative, library and technical staff.

Council may admit as members of Convocation upon payment of a fee determined by Council:—

(a) Graduates of other Universities who are resident in the Hunter Valley or North Coast areas; and

(b) such other University graduates as the Council may approve.

Five members of the University Council are elected by Convocation.

OFFICE BEARERS

Warden — Mr. W. G. Derkenne, LL.B. (Sydney), B.A.

Secretary — Miss F. M. Burns, B.A.

Treasurer — Mr. R. W. Gibbins, B.Com. (Queensland), A.C.A.

Immediate Past Warden — Mr. J. P. Talty, B.D.S. (Sydney)
CONVOCATION

Standing Committee Members — Mr. J. W. Armstrong, B.A.

Mr. C. J. A. Cornelius, B.Com.

Professor E. O. Hall,
M.Sc.(New Zealand),
Ph.D.(Cambridge), F.Inst.P.,
M.Aus.I.M.M.,
F.I.M.(London), F.A.I.P.,
F.R.S.A.

Mrs. E. G. Hamilton,
B.A.(New South Wales)

Mr. K. G. Hoffman,
B.Arch.(New South Wales)

Mr. P. A. Marquet, B.A.(Sydney),

Mr. K. J. Moss, B.E.

Dr. P. N. Richards, B.E.(Met.),
M.E., D.App.Sc.(Melbourne)

Dr. N. Rutherford,
B.A.(New South Wales),
Ph.D.(Australian National)

Mr. J. A. Sara, B.Arch.

NEWCASTLE UNIVERSITY UNION

The objects of the Union are to provide a common meeting ground and social centre for men and women who are members of the University; to promote the education and the intellectual culture of its members by debates and otherwise and, generally, to secure the co-operation of University men and women in furthering the interests of the University.

The Union maintains a fine building at Shortland which provides recreational and common room facilities for its members; a complete range of catering services; rooms for meetings and functions of all kinds including a film viewing room (16mm); billiards, table tennis, chess and music rooms; a reading room; a stationery shop catering for all members' academic needs; and the University Co-operative Bookshop. The offices of the Students' Representative Council and the Students' Counsellor together with the Australian Union of Students Travel Service, New South Wales Banking facilities and the Student Health Centre are also situated within the building.

Membership of the Union, obligatory for all registered students, is open to graduates, members of the University Council and the permanent staff of the University.

The conduct of the affairs of the Union is vested in the Board of Management comprising:

Two members appointed by the Council of the University

Ten members of the Union (at least two of whom must be graduates) elected by the members of the Union

Two members of the Union who are members of the Students' Representative Council

One member of the Union who is a committee member of the Sports Union

and

The Secretary Manager of the Union.

Elections for the Board are held in the month of April.


Secretary Manager — Mr. W. V. Bridgwater
THE UNIVERSITY OF NEWCASTLE COMPANY

The University of Newcastle Company is the Citizen Military Force’s Unit affiliated with the University. The Company was formed in 1957 as a Sub-Unit of the University of Technology Regiment which is now called The University of New South Wales Regiment. The current strength of the Company is 100.

The function of the Company is to train graduates and undergraduates for commissioned rank in the C.M.F. and the training designed with this in view, is done on an Infantry basis and consists of:

(a) An Annual Camp for three weeks in February
(b) An optional camp of fourteen days in December
(c) Two weekend bivouacs a year
(d) Parades on Friday nights of two hours duration
(e) Weekend day parades

The training programme is designed to fit in with vacations, examinations, and deferred examinations and there is practically no commitment in third term. Leave is available from activities where a good reason exists.

Enlistment in the Company is voluntary and is open to all graduates or undergraduates who are 17 years of age or over.

Members of the University of Newcastle Company are eligible for the following benefits:

An opportunity to reach commissioned rank in 2-3 years.
Tax-free pay for all training undertaken.
Refund of travelling expenses.
An alternative to 2 years full-time National Service.
Opportunities for attendance at Regular Army Courses and short time attachments to Army units in Malaysia or New Guinea.
Free meals and accommodation at camps and bivouacs.
Free Uniforms.

Enquiries regarding conditions of service, and enlistment procedure should be made at the Training Depot which is in King Street, Newcastle West (opposite Birdwood Park). Phone No. 61 2121.

OFFICERS AND STAFF

Officer Commanding — Capt. D. Levenspiel
Full-time Staff — WO2 M. Grovenor
S/Sgt. P. Toohey

THE UNIVERSITY OF NEWCASTLE SPORTS UNION

The Sports Union is the student organisation responsible for the promotion and control of sporting activities within the University. All students are automatically members of the Sports Union. There are twenty-six affiliated clubs: Athletics, Australian Rules, Badminton, Men's Basketball, Women's Basketball, Cricket, Fencing, Golf, Men's and Women's Hockey, Mountainciding, Netball, Men's and Women's Rowing, Rugby Union and Rugby League, Sailing, Ski-ing, Soccer, Softball, Squash, Surfriding, Swimming, Squash, Table Tennis, Tae Kwon-Do, Tennis, Volleyball, most of which participate in local competitions and send teams to Inter-varsity contests each year. Inter-Faculty Contests conducted throughout the year aim to stimulate friendly rivalry among the various Faculties, and to encourage a higher student participation in sport. Each club has a student representative on the Sports Union Committee, which meets monthly. The Executive consists of the President, Vice-President, Secretary, Treasurer, a representative of the University Council and the Amenities Officer. The Sports Union’s annual income is derived from a portion of the General Services Fee and is used to meet such costs as equipment, affiliation fees and Inter-varsity contests.

For outstanding individual performance in sport, the University awards “Blues” each year at the Annual “Blues” Dinner.

The number of constituent clubs is increasing continually, and students interested in participating in any sport are urged to contact the Amenities Officer, Mr. Bradford, or one of the Sports Union Executive for further information. The Sports Union Amenities office is located in the temporary building adjacent to the main University building.

President — Professor R. G. Tanner,
M.A. (Melbourne and Cambridge)
Secretary — Miss C. F. Clarke, B.A.
Amenities Officer — Mr. H. Bradford
THE UNIVERSITY OF NEWCASTLE STUDENTS' ASSOCIATION

All students proceeding to a degree or a diploma are members of the Students' Association.

Included in the General Services Fee, which you all pay or have paid for you, is $8.00 subscription to the Newcastle University Students' Association (N.U.S.A.). You are all financial members of this Association and have every right — and a duty to yourselves — to take part in the running of the Association and the administration of its collective assets.

Each year, the Students' Association elects a number of students (22 at present) to the Students' Representative Council. This Council's purpose is:

1. to give money and other aid to the various clubs and societies, including religious, political and social groupings on campus;
2. when needed, to act as the students' voice in submissions to the University administration, the mass media, and various government departments;
3. to work for student welfare. The S.R.C., for example, helps run the free Health Centre in the Union and provides automatic accident insurance cover for the students. It is also responsible for printing various student publications such as OPUS, the student newspaper, the Orientation Handbook, Nimrod, the annual literary magazine and the weekly Bulletin;
4. to implement student association policy on matters academic, political or administrative. N.U.S.A. policy is decided at official lunchtime meetings where all students may attend and vote.

With its various committees, for example, the welfare and education committees, and its officers such as the education campaign director, the travel officer and so on, N.U.S.A. attempts to facilitate as many expressions of cultural activity as possible, as well as organizing action to effect student policy on conscription, aboriginal rights, apartheid and so on.

Each year, the Association organizes, with some help, Orientation week and early in July, Autonomy Day, which is the equivalent of Commem., Foundation Day, or similar activities at other universities.

As the Students' Association is a constituent member of the Australian Union of Students, students of the University may take part in the activities of this body. Some of these activities which affect students more directly are the several intervarsity cultural festivals, travel to New Zealand and many countries in Asia, village schemes in Papua/New Guinea, raising money for aboriginal scholarships and World University Service, national campaigns on education, and the national student newspaper, National 'U'.

The Association, via general student meetings, ad hoc committees, and its officers, pursues policy on a wide variety of social, political, educational and welfare activities both internal to the campus and affecting our society as a whole. Frequently, controversial issues are raised and discussed. The ultimate decision on what your Association does, and how your money is spent, depends on all of you. The executive officers of your association are not there to decide policy, but to carry out your decisions.

It is more important than ever that new students help run the association. At the moment too few students do much of the work, and as the older students leave, the new ones must fill the gap or the association will collapse as a functioning unit. How can you help? Come to the general student meetings and vote; vote also in the S.R.C. elections and stand for positions that interest you. In general, try not to be apathetic or disinterested.

President — Mrs. Anne Kumm
Secretary — Mr. M. Pavlovic
1. Definitions

In these Requirements, unless the contrary intention appears, "the Faculty" means the Faculty of Mathematics and "the Faculty Board" means the Faculty Board of the Faculty of Mathematics.

2. Grading of Degree

The degree of Bachelor of Mathematics may be conferred either as an ordinary degree or as an honours degree.

3. Approval of First Enrolment

A candidate when enrolling in the Faculty for the first time shall report in person to the Dean, or his nominee, to have his enrolment for that year approved.

4. Timetable Requirements

No candidate may enrol in any year for any combination of subjects which is incompatible with the requirements of the timetable for that year.

5. Annual Examinations

The Annual Examinations shall normally be held at the end of third term and shall be conducted by means of written examinations supplemented by such oral or practical work testing as the examiners think fit.

6. Special Examinations

A candidate may be granted a special examination in accordance with the provisions of By-law 5.9.3.

7. Examination Grades

The results of successful candidates at Annual Examinations and Special Examinations shall be classified: High Distinction, Distinction, Credit, Pass.

8. Withdrawal

(a) A candidate may withdraw from a subject only by notifying the Secretary of the University in writing of his withdrawal within seven days of the date of withdrawal.

(b) A candidate who withdraws after the sixth Monday in second term from a subject in which he has enrolled shall be deemed to have failed in that subject. However, such a candidate may apply to the Dean, who, after consultation with the Head of Department concerned, may allow him to withdraw without penalty.

9. Subjects Offered

(a) A candidate shall select at least five of his subjects from the Schedules appended to these Requirements and shall comply with the rules relating to the selection of subjects set out in the Schedule.

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

10. Relaxing Clause

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

THE ORDINARY DEGREE

11. A subject

(a) To complete a subject qualifying towards the degree, hereinafter called a subject, a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written work as the Department concerned shall require.

(b) To pass a subject a candidate shall satisfy the requirements of the previous clause and pass such examinations as the Faculty Board concerned shall require.
12. **Degree Patterns**

(a) To qualify for the ordinary degree a candidate shall pass nine subjects provided that:
   (i) at least five are subjects in Mathematics;
   (ii) at least two are Part III Mathematics subjects; and
   (iii) no more than five are Part I subjects.

(b) Notwithstanding the provisions of subsection (a) of this clause, a candidate may substitute for one Part III Mathematics subject another Part III subject from the Schedule of subjects with a substantial mathematical content. (Schedule B)

13. **Pre-requisites and Co-requisites**

No candidate may enrol in a subject unless he has satisfied the pre-requisites and co-requisites for that subject.

14. **Progression**

(a) Progression in the course is by subject. A full-time student is required to pass four subjects, of which three must be Part I subjects, and a part-time student is required to pass two Part I subjects in the first two years of his course. A part-time student is required to pass four subjects in the first four years of his course.

(b) The following restrictions on yearly course loads shall apply. The Dean may, in individual cases, relax restrictions (i), (ii), (iii), but only if he is satisfied that the academic merit of the candidate warrants such relaxation.
   (i) No one academic year is to involve more than four subjects.
   (ii) If four subjects are taken in any one year, at least three of them must be Part I subjects, and none may be a Part III subject.
   (iii) If three subjects are taken in any one year, not more than two of them may be a Part III subject.

(c) A degree will not be awarded if a course of study continues for more than nine years, unless special approval is obtained from the Faculty Board for an extension of time.

15. **Standing**

(a) A graduate or an undergraduate of another University, University College or other Faculty of the University may be granted standing in recognition of the work completed in such other University, University College or Faculty, provided that:
   (i) the subjects for which credit is given shall have a reasonable correspondence with those offered in the Faculty;
   (ii) an undergraduate of another University, or University College shall not receive credit for more than four subjects;
   (iii) a graduate of another University, University College or Faculty shall not receive credit for more than four subjects and if granted credit may not include as a qualifying subject any subject equivalent to one included in his previous degree.

(b) Notwithstanding the provision of section (a) (i) of this clause, a graduate or undergraduate of another University or University College may be given credit for subjects not offered for the degree of Bachelor of Mathematics in the University of Newcastle provided that:
   (i) the candidate complies with all other conditions of these Requirements;
   (ii) the candidate has his proposed pattern of course approved at the time at which the concession is granted and does not depart from the proposed pattern without the approval of the Dean.

(c) A degree will not be awarded until the successful completion of at least two years of an approved course of study.

16. **Preparation for Honours**

(a) A candidate who wishes to enrol in an Honours course must obtain the approval of the Head of the appropriate Department, or Departments, by the dates specified.

(b) A candidate wishing to enrol in an Honours course will be required to complete extra work concurrently with work for the ordinary degree.
17. Honours in Mathematics

To qualify for admission to Honours in Mathematics a candidate shall:

(i) have satisfied the requirements for admission to the ordinary degree; the subjects Mathematics IIIA and Mathematics IIIB must be included;

(ii) have completed additional work concurrently with his ordinary degree, as prescribed by the Department of Mathematics;

(iii) pass the subject Mathematics IV.

18. Combined Honours

To qualify for admission to combined Honours, a candidate shall:

(i) have satisfied the requirements for admission to the ordinary degree and have included in his course such prerequisite subjects as may be prescribed for admission to the combined Honours subject or subjects;

(ii) have completed such additional work concurrently with his ordinary degree as may be prescribed by the Department of Mathematics and the other Department concerned;

(iii) pass the combined Honours subject or subjects. (Schedule C)

19. Time Requirements

(a) Except with the special permission of the Faculty Board, a candidate for Honours shall complete the requirements within five years from the commencement of his degree course, provided that where it is deemed practical to allow a part-time student to become a candidate for Honours, the corresponding period shall be seven years.

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

(b) The Dean may permit a part-time candidate for Honours to complete the Honours subject or subjects over two successive years.

20. Classes of Honours

There shall be three classes of Honours, namely Class I, Class II and Class III. Class II shall have two divisions, namely Division (i) and Division (ii).

21. Medal

In each Honours subject, including combined subjects, the most distinguished candidate of the year may be awarded a University Medal.

22. Equivalent Honours

(a) On the recommendation of a Head of Department in the Faculty and with the permission of the Dean, a graduate who, in the disciplines concerned, has not completed a fourth year Honours subject either as a full-time or a part-time student at this or at any other Australian University, may enrol in fourth year Honours as a full-time or a part-time student.

(b) Such a graduate who has completed all of the requirements of fourth year Honours shall be issued with a statement to this effect by the Secretary; the statement shall indicate the Honours level equivalent to the standard achieved by the student in completing fourth year Honours.
## SCHEDULE A — MATHEMATICS SUBJECTS

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>REMARKS INCLUDING PRE-REQUISITES AND CO-REQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART I</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td>It is assumed that students have studied Higher School Certificate Mathematics at second level short course or higher.</td>
</tr>
<tr>
<td>Mathematics IIA</td>
<td>Pre-requisite: Mathematics I.</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td>Pre-requisite: Mathematics I. This subject is offered to part-time students in 2 parts each of three terms duration.</td>
</tr>
<tr>
<td>Mathematics IIC</td>
<td>Pre-requisite: Mathematics I; Pre- or co-requisite: Mathematics IIA.</td>
</tr>
<tr>
<td><strong>PART II</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IIA</td>
<td>Pre-requisite: Mathematics IIA.</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td>Pre-requisite: Mathematics IIA and Mathematics IIC.</td>
</tr>
<tr>
<td><strong>PART III</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IIIA</td>
<td>Pre-requisite: Mathematics IIIA and Mathematics IIA.</td>
</tr>
<tr>
<td><strong>PART IV</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IV</td>
<td>Pre-requisites: Mathematics IIIA and Mathematics IIA.</td>
</tr>
</tbody>
</table>

## SCHEDULE B — SUBJECTS WITH A SUBSTANTIAL MATHEMATICAL CONTENT

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>REMARKS INCLUDING PRE-REQUISITES AND CO-REQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART I</strong></td>
<td></td>
</tr>
<tr>
<td>Civil Engineering IIM</td>
<td>It is assumed that students have studied Higher School Certificate Mathematics and Science, including Physics and Chemistry, at second level short course or higher.</td>
</tr>
<tr>
<td><strong>PART II</strong></td>
<td></td>
</tr>
<tr>
<td>Civil Engineering IIM</td>
<td>Pre-requisite: Civil Engineering IIM and Mathematics I.</td>
</tr>
<tr>
<td><strong>PART III</strong></td>
<td></td>
</tr>
<tr>
<td>Accounting IIC</td>
<td>Pre-requisite: Mathematics IIA and Mathematics IIC and either Accounting IIA or Accounting IIB.</td>
</tr>
<tr>
<td>Economics IIC</td>
<td>Pre-requisite: Economics IIA</td>
</tr>
<tr>
<td>Chemical Engineering IIC</td>
<td>Pre-requisite: Chemical Engineering IIC, Mathematics IIA and Mathematics IIC, (including Topics E and F).</td>
</tr>
<tr>
<td>Civil Engineering IIM</td>
<td>Pre-requisite: Civil Engineering IIM, Mathematics IIA and Mathematics IIC, (including Topic E).</td>
</tr>
<tr>
<td>Communications and Automatic Control</td>
<td>Pre-requisite: Mathematics IIA and Mathematics IIC (including Topics D and E).</td>
</tr>
<tr>
<td>Mechanical Engineering IIC</td>
<td>Pre-requisite: Mathematics IIA and Mathematics IIC, (including Topics E, F and H).</td>
</tr>
<tr>
<td>Physics IIA</td>
<td>Pre-requisite: Physics II</td>
</tr>
<tr>
<td>Psychology IIC</td>
<td>Pre-requisite: Psychology IIA</td>
</tr>
</tbody>
</table>

* A candidate with better than pass level in Physics I and Chemistry I and the ability to write real situations in mathematical terms and to read around his subject, could complete the components of Chemical Engineering IIC without Chemical Engineering I, and may, after interview, be granted exemption by the Head of the Department of Chemical Engineering.
SCHEDULE C — COMBINED HONOURS SUBJECTS

SUBJECT REMARKS INCLUDING PRE- REQUISITES AND CO-REQUISITES

Mathematics/Physics IV Pre-requisite: Mathematics IIIA and Physics IIIA

Mathematics/Psychology IV Pre-requisite: Mathematics IIIA and Psychology IIIC

DEPARTMENT OF MATHEMATICS

DESCRIPTION OF SUBJECTS

SCHEDULE A

MATHEMATICS I

A subject of four lectures and two tutorial hours per week for three terms comprising the following topics. Summaries of these topics, text books and reference books appear on page 81 of this handbook.

Topic
AN Real Analysis
AL Algebra
CA Calculus
NM Numerical Mathematics

PART II SUBJECTS

The following topics are offered by the Mathematics Department. Certain combinations of these topics specified below will comprise the Part II subjects offered by the Department; each topic consists of about 27 lectures and 13 tutorials. A pass in Mathematics I is a pre-requisite for entry to each Part II subject given by the Department; in addition some topics will require other topics as a co-requisite or pre-requisite as shown. Summaries of these topics, text books and reference books appear on page 83 of this handbook.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Co-requisite or Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Analysis of metric spaces ........ C</td>
</tr>
<tr>
<td>B</td>
<td>Complex analysis ........ C</td>
</tr>
<tr>
<td>C</td>
<td>Calculus and vector calculus .......</td>
</tr>
<tr>
<td>D</td>
<td>Linear algebra ..........</td>
</tr>
<tr>
<td>E</td>
<td>Differential equations and integral transforms .... C</td>
</tr>
<tr>
<td>F</td>
<td>Numerical analysis and computing .......</td>
</tr>
<tr>
<td>G</td>
<td>Fourier series, partial differential equations and special functions .... C, E</td>
</tr>
<tr>
<td>H</td>
<td>Probability and statistics .... C</td>
</tr>
<tr>
<td>I</td>
<td>Topic in statistics, e.g. non-parametric methods .... H</td>
</tr>
<tr>
<td>J</td>
<td>Topic in applied mathematics, e.g. mathematical models ....</td>
</tr>
<tr>
<td>K</td>
<td>Topic in pure mathematics, e.g. group theory ....</td>
</tr>
<tr>
<td>L</td>
<td>Topic in pure mathematics, e.g. differential geometry .... C</td>
</tr>
</tbody>
</table>
MATHEMATICS IIA

A subject of four lectures and two tutorial hours per week for three terms comprising topics A, B, C and D. In exceptional circumstances and with the consent of the Head of Department one topic from E, F, G or H may be substituted for A.

MATHEMATICS IIB

A subject of four lectures and two tutorial hours per week for three terms comprising four topics chosen from A to H 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 I, J, K or L may be included.

MATHEMATICS IIC

A subject of four lectures and two tutorial hours per week comprising either topics E, I, K and L or topics H, I, K and L. Subject to the consent of the Head of the Department one topic from A to H may be substituted for topics K or L.

NOTES
1. Part-time students may take Mathematics IIB in two parts each of two lectures per week for three terms.
2. In order to pass both Mathematics IIA and Mathematics IIB a student must study all the topics A to H above and offer them for examination.
3. Mathematics IIA is a co-requisite or pre-requisite for Mathematics IIC.
4. In order to pass in all three Part II subjects a student must study all twelve topics and offer them for examination.
5. Students whose course includes Physics IIIA are advised to include topics C, E, G and H in their Part II mathematics subjects.
6. Students whose course includes a Schedule B subject may have their choice of topics further restricted.

TRANSITION ARRANGEMENTS

A student who has passed some Part II subjects prior to 1969 and wishes to continue with Mathematics may proceed according to the pattern detailed on p.155 of the 1970 handbook for the Faculty of Arts, a copy of which is available in the Library.

PART III SUBJECTS

The Mathematics Department offers two Part III subjects, each comprising four topics. Students wishing to proceed to Honours in Mathematics only are required to take both these subjects. Students wishing to proceed to Combined Honours are required to take Mathematics IIIA together with the appropriate subject from Schedule B. Students proceeding to Honours will also be required to study additional topics as prescribed by the Heads of the Departments concerned. Subject to the transition arrangements below a pass in Mathematics IIA and Mathematics IIC is a pre-requisite for entry to Mathematics IIIA. Students taking Mathematics IIB are required to study Mathematics IIIA as a pre-requisite or co-requisite. Certain combinations of the topics specified below, will comprise the Part III subjects offered by the Department; each topic consists of about 27 lectures and 13 tutorials. It is assumed that every student enrolling for a Part III Mathematics subject has studied the Part II topics B, C, D and K. Some Part III topics require additional Part II topics as pre-requisites as shown. Summaries of these topics, text books and reference books appear on page 90 of this handbook.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pre-requisite</th>
<th>Co-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
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<td>B</td>
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</tr>
<tr>
<td>C</td>
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<tr>
<td>Y</td>
<td></td>
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<tr>
<td>Z</td>
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</tr>
</tbody>
</table>

MATHEMATICS IIIA

A subject of four lectures and two tutorial hours per week for three terms. This subject comprises four topics which must include O, and either P, Q, R or U.
MATHEMATICS IIB

A subject of four lectures and two tutorial hours per week for three terms comprising four topics chosen from the fifteen listed above.

NOTES
1. In order to pass both Mathematics IIA and Mathematics IIB, a student must study eight topics from M to Z above. Topic O, and either P, Q, R or U must be included in these eight topics.
2. Students whose course includes a subject from Schedule B may have their choice of topics further restricted.

TRANSITION ARRANGEMENTS

A student who has passed Pure Mathematics IIA, Pure Mathematics IIB, Applied Mathematics IIA or Applied Mathematics IIB may with the permission of the Head of Department be admitted to Mathematics IIA.

A student who has passed Pure Mathematics IIA or Pure Mathematics IIB and one other Part II mathematics subject may with the permission of the Head of Department be admitted to both Mathematics IIA and Mathematics IIB.

A student who has passed exactly one Part III subject prior to 1970 and wishes to obtain one more mathematics major must satisfy the following conditions.
1. He must have passed two Part II Mathematics subjects.
2. If he has passed Pure Mathematics IIA or Pure Mathematics IIB, he must study topic O, one of M, N, Q or R, and two other topics which must not include P or T.
3. If he has passed Applied Mathematics IIA or Applied Mathematics IIB, he must study topic O and three other topics which must not include topics M, N, Q, R, Y or Z.

MATHEMATICS IV

A student desiring admission to this subject must apply in writing to the Head of Department before 7th December of the preceding year. This subject extends over one full-time or two part-time academic years and will be examined by about eight papers, each of two hours duration. Each student will be required to present a thesis; i.e., a study under direction of a special topic using relevant published material and presented in written form.

The topics offered may be chosen from any branch of Mathematics including Pure Mathematics, Applied Mathematics, Statistics and Computing Science as exemplified in the publication Mathematical Reviews. In any one year it is hoped that up to 20 topics, each of about 27 lectures, will be offered. Students will be expected to present about eight of these for examination. Summaries of topics which may be offered in 1973 appear on page 99 of this handbook.

DESCRIPTION OF SUBJECTS

SCHEDULE B

PART I SUBJECT

CIVIL ENGINEERING IIM

This subject consists of the following four topics.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE111</td>
<td>Statics</td>
</tr>
<tr>
<td>ME131</td>
<td>Dynamics</td>
</tr>
<tr>
<td>CE231</td>
<td>Fluid Mechanics I or ME251 Fluid Mechanics</td>
</tr>
<tr>
<td>CE212</td>
<td>Mechanics of Solids I</td>
</tr>
</tbody>
</table>

PART II SUBJECT

CIVIL ENGINEERING IIIM

This subject consists of the following three topics.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE313A</td>
<td>Structural Analysis I</td>
</tr>
<tr>
<td>CE332</td>
<td>Fluid Mechanics II</td>
</tr>
<tr>
<td>ME301</td>
<td>Engineering Computations</td>
</tr>
</tbody>
</table>

PART III SUBJECTS

ACCOUNTING IIC

A subject of four lectures and one tutorial hour per week comprising either Accounting IIA or Accounting IIB and two appropriately chosen Part III topics (e.g., topics U and R) offered by the Department of Mathematics and approved by the Head of the Department.

ECONOMICS IIC

In order to pass Economics IIC a student must study the topics Econometrics I, Growth and Development and one of the topics Public Economics or International Economics and offer them for examination.
CHEMICAL ENGINEERING IIIC

This subject consists of the following topics.
Stage Transfer Processes
Continuous Contacting Processes
Particulate Systems — Granular Materials
Particulate Systems — Fluid-solid Separations
Transport Theory II
Reaction Engineering I
Chemical Process Control

NOTE
Heat Transfer III may be studied as an alternative to Transport Theory II or to two other topics.

CIVIL ENGINEERING IIM

In order to pass Civil Engineering IIM a student must study topics CE414A and CE324, and any two of the other four topics and offer them for examination.
CE414A Structural Analysis II
CE324 Soil Mechanics
CE415A Structural Analysis — Continua
CE415B Structural Analysis — Plasticity
CE434A Fluid Mechanics — Theoretical Hydrodynamics
CE434B Fluid Mechanics — Open Channel Flow

COMMUNICATIONS AND AUTOMATIC CONTROL

This subject consists of the following four topics
EE341 Automatic Control
EE342 Automatic Control
EE442 Modern Control
EE444 Communication Systems

MECHANICAL ENGINEERING IIIC

Students enrolling in this subject may choose one of the following alternatives (a), (b), (c) or (d). However it is not anticipated that all four alternatives will be available each year.

(a) ME361 Automatic Control
    ME401 Systems Analysis
    ME402 Systems Planning, Organisation and Control
    ME487 Operations Research — Deterministic Models
(b) ME402 Systems Planning, Organisation and Control
    ME487 Operations Research — Deterministic Models
    ME488 Operations Research — Probabilistic Models
    ME489 Operations Research — Applications in Industry
(c) ME402 Systems Planning, Organisation and Control
    ME403 Resources Planning and Allocation
    ME404 Mathematical Programming
    ME488 Operations Research — Probabilistic Models
(d) ME361 Automatic Control
    ME434 Advanced Kinematics and Dynamics of Machines
    ME449 Reliability Analysis for Mechanical Systems
    and either
    ME446 Introduction to Plastic Analysis
    or
    ME448 Introduction to Photomechanics

PHYSICS IIIA

This subject consists of the following topics.
1. Analytical Mechanics
2. Electromagnetic Field Theory
3. Relativity
4. Quantum Mechanics
5. Statistical Mechanics
6. Electronics

PSYCHOLOGY IIIC

This subject consists of the following topics.
1. Factor Analysis
2. Personality Assessment
3. Personality
4. Cognition
5. Perception
6. Physiological Psychology
7. One or more other topics chosen in consultation with the Head of the Department.
DESCRIPTION OF SUBJECTS

SCHEDULE C

MATHEMATICS/PHYSICS IV

A student desiring admission to this subject must apply in writing to the Dean of the Faculty of Mathematics before 7th December of the preceding year, and must have completed the subjects Mathematics IIIA and Physics IIIA and such additional work as is required for combined honours students by the Department of Mathematics.

Each student shall present a minor thesis in Mathematics, written with physical applications in view, and complete a major project in Physics, which will be experimental. The student shall also complete four topics from Mathematics IV, chosen for their application to Physics. He must also attend selected topics in Physics IV. Examinations will be held on the Mathematics and Physics topics.

MATHEMATICS/PSYCHOLOGY IV

A student desiring admission to this subject must apply in writing to the Dean of the Faculty of Mathematics before 7th December of the preceding year, and must have completed the subjects Mathematics IIIA and Psychology IIIA and such additional work as is required for combined honours students by the Departments of Mathematics and Psychology.

Each student shall present a minor thesis in Mathematics, written with psychological applications in view, and complete a major project in Psychology, which will be experimental but will be based on a mathematical model of the phenomenon being studied. The student shall also complete four topics from Mathematics IV, chosen for their application to Psychology. He must also attend a seminar on measurement (which meets for 1½ hours each week). Examinations will be held on the four Mathematics topics, the measurement seminar, and prescribed reading in the area of the major project.

SUMMARIES OF TOPICS, TEXT BOOKS
AND REFERENCE BOOKS

SCHEDULE A

MATHEMATICS I

TOPIC. AN — REAL ANALYSIS — J. R. Giles

Properties of the real numbers; the study of convergence of sequences and series; limits and continuity of real mappings; the theory of differentiability and integrability of real mappings.

Text:

Real Analysis — an introductory course ....... J. R. Giles
(Wiley, 1972)

Reference:

Calculus ..... M. Spivak
(W. A. Benjamin Inc., 1967)

Calculus Vol. I, 2nd ed. ..... T. Apostol
(Ginn Blaisdell, 1967)

Introduction to Real Analysis ..... C. Goffman
(Harper, 1966)

Intermediate Mathematical Analysis ..... A. E. Labarre
(Holt, Rinehart, Winston, 1968)

Introduction to Real Analysis ..... B. K. Youse
(Allyn & Bacon, 1972)

TOPIC. AL — ALGEBRA — W. Brisley

Introduction to algebraic concepts. Vector spaces: definitions and properties; matrices; linear equations. Complex numbers.

Text:

A Basis for Linear Algebra ..... W. Brisley
(Wiley, 1973)

References:

Calculus Vol. I, 2nd Ed. ..... T. Apostol
(Ginn Blaisdell, 1967)

Linear Algebra ..... S. Lipschutz
(Schaum, 1968)

Linear Algebra ..... D. Zelinsky
(Academic Press, 1968)

Introduction to Algebra ..... S. Perlis
(Ginn Blaisdell, 1966)

Introduction to Modern Algebra ..... N. McCoy
(Allyn & Bacon, 1968)

Calculus and Linear Algebra ..... H. S. Wilf
(Harcourt Brace & World Inc., 1966)
TOPIC. CA — CALCULUS — M. J. Hayes


Text:

Calculus Vol. I, 2nd Edition ... T. Apostol
(Ginn Blaisdell, 1967)

References:

Calculus and Analytic Geometry ... J. R. Britton, R. B. Kriehg & L. W. Rutland (Freeman, 1966)

First Year Calculus ... E. Hille & S. Salas (Ginn Blaisdell, 1968)

Calculus and Linear Algebra Vol. I ... W. Kaplan & D. J. Lewis
(International Textbook Series)

TOPIC. NM — NUMERICAL MATHEMATICS — A. J. Guttmann

Introduction to computers, algorithms, flowcharts and Fortran coding. Elementary data analysis: calculations of sample moments and order statistics and programming of these operations. Introduction to statistical analysis and numerical analysis with computer illustrations. The writing of successful computer programs is a required part of this topic.

Text:

Introduction to Fortran IV Programming ... J. M. Blatt
(Computer Systems of Australia Pty., Ltd., 1969)

References:

1900 Series Fortran (Technical Publication 4088) ... International Computers Ltd.

Statistical Computations on a Digital Computer W. J. Hemmerle (Ginn Blaisdell, 1967)

A First Course in Numerical Analysis ... A. Ralston
(McGraw-Hill, 1965)

TOPIC. A — ANALYSIS OF METRIC SPACES — J. R. Giles

Examples of metric spaces and normed linear spaces; topology of metric spaces, cluster points, open and closed sets, separability, convergence of sequences and continuity of mappings. Uniform convergence of sequences and series of real mappings, applications to differentiation and integration of sequences and series of real mappings, applications to power series. Compactness, equivalence of the various forms of compactness for metric spaces. Connectedness, arcwise connectedness.

Text:

No prescribed text.

References:

Real Analysis ... A. J. White (Addison-Wesley, 1968)

Introduction to Topology ... B. Mendelson (Blackie, 1963)

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

Foundations of Modern Analysis ... J. Dieudonné (Academic Press, 1960)

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

TOPIC. B — COMPLEX ANALYSIS — W. C. Summerfield


Texts:

Complex variables ... N. Levinson & R. M. Redheffer (Holden Day, 1970)

OR

Theory and Problems of Complex Variables ... Murray R. Spiegel (McGraw-Hill, 1964)
PART II TOPICS

TOPIC. C — CALCULUS AND VECTOR CALCULUS —
W. T. F. Lau


Text:

References:
- *Advanced Calculus* by H. K. Nickerson, D. C. Spencer & N. E. Steenrod (Van Nostrand, 1959)

TOPIC. D — LINEAR ALGEBRA — T. K. Sheng

Linear spaces, subspaces, span sum of subspaces, linear dependence, basis, dimension. Inner product spaces, Cauchy-Schwarz inequality, orthogonality, orthonormal sets, Gram-Schmidt orthogonalisation, orthogonal complements. Linear mappings, kernel and image, invertible mappings, the linear space of linear mappings, the algebra of linear operators. Matrix representation of linear mappings, change of basis, equivalence, similarity, Hermite normal form. Unitary operators, change of orthonormal basis. Eigenvalues and eigenspaces, characteristic polynomial, algebraic and geometric multiplicity. Hermitian operators, diagonalisation of Hermitian matrices, quadratic forms, identification of quadric surfaces.

Text:
*Linear Algebra* by S. Lipschutz (Schaum, 1968)

References:

PART II TOPICS

TOPIC. E — DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS — J. G. Couper


Text:

TOPIC. F — NUMERICAL ANALYSIS AND COMPUTING — D. L. S. McElwain


Texts:

Reference:
*Elementary Numerical Analysis* by S. D. Conté (McGraw-Hill, 1965)
PART II TOPICS

TOPIC. G — FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS — E. R. Smith


Texts:

_A First Course in Partial Differential Equations_ H. F. Weinberger

_AND_

_Fourier Series_ I. N. Sneddon

Reference:

_Advanced Calculus_ W. Kaplan

PART II TOPICS

TOPIC. H --- PROBABILITY AND STATISTICS --- R. G. Keats

This topic is an introduction to the Theory of Probability and Statistics. No previous knowledge of Probability or Statistics will be assumed. The lectures will include a discussion of the following. Finite probability space; simple random variable, expectation, mean, variance, independence, frequency function, distribution function, joint frequency function, moments and binomial variates. Chebichev inequality and the weak law of large numbers. Elementary random variables, Poisson's theorem and the strong law of large numbers will be mentioned. Conditional probability; Bayes' theorem, tree diagrams. Continuous random variables, frequency function, expectation, joint frequency function, moments. Normal variates. Classification of experimental data, histograms, empirical moments, measures of location and scatter. Statistical inference, hypothesis testing, types of error, power function, sampling theory, maximum likelihood estimation; frequency functions of the mean (X), difference of two means (X−Y), and the statistics \( \chi^2, S^2, T \) and \( F \) with applications.

Text:

_Mathematical Statistics_ 2nd Ed. J. E. Freund

_OR_

_Introduction to Mathematical Statistics_ 3rd Ed. P. G. Hoel

References:

_Theory and Problems of Probability_ S. Lipschutz

_(Schaum, 1968)_

_An Introduction to Probability Theory_ P. A. P. Moran

_(Oxford University Press, 1968)_

_Principles of Mathematics_ Chapter 12 C. B. Allendoerfer

_AND C. O. Oakley

_(McGraw-Hill, 1955)_


_(N.Y. Wiley, 1968)_

_The Theory of Probability_ Chapters I & II B. V. Gnedenko

_(Chelsea, 1962)_

_Foundations of the Theory of Probability_ A. N. Kolmogorov

_(Chelsea, 1950)_

_Probability Theory_ pp. 1-18 M. Loève

_(Van Nostrand, 1960)_
TOPIC. I—TOPIC IN STATISTICS, e.g. NON-PARAMETRIC METHODS — W. Ficker

This topic is an introduction to some non-parametric methods in statistics which are used to test hypotheses and also to estimate parameters of probability distributions. The lectures will include tests concerning one-sample, two-sample, and k-sample problems, randomized blocks, goodness-of-fit tests, and tests involving independence, correlation, and regression.

Text:

Nonparametric Statistical Inference ..... J. D. Gibbons
( McGraw-Hill, 1971)

OR

Practical Nonparametric Statistics ..... W. J. Conover
(Wiley, 1971)

References:

Statistical Tables ..... F. J. Rohlf & R. R. Sokal
(Collier-Macmillan, 1969)

A Non-parametric Introduction to Statistics ..... C. H. Kraft & C. van Eeden
(Collier-Macmillan, 1968)

Elements of Non-parametric Statistics ..... G. E. Noether
(Wiley, 1967)

TOPIC. J—TOPIC IN APPLIED MATHEMATICS, e.g.

MATHEMATICAL MODELS — D. L. S. McElwain

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

Text:

Using Digraphs ..... D. F. Robinson
(University of Canterbury, 1971)

References:

Prisoner's Dilemma ..... Anatol Rapoport & A. M. Shnhah
(University of Michigan Press, 1965)

Mathematical Methods of Operations Research ..... Thomas L. Saaty
(N.Y. McGraw-Hill, 1959)

Mathematical Models in Social Sciences ..... J. G. Kemeny & J. L. Snell
(Ginn Blaisdell, 1963)

TOPIC. K—TOPIC IN PURE MATHEMATICS, e.g.

GROUP THEORY — M. J. Hayes

Groups, definition and examples, permutations. Isomorphism, cyclic groups, Cayley’s theorem, automorphism groups. Subgroups, cosets, Lagrange’s theorem. Normal subgroups, quotient groups, isomorphism theorems, centre of a group and commutator subgroup. Direct products.

Text:

The Theory of Groups ..... I. D. Macdonald
(Oxford University Press, 1968)

OR

Group Theory ..... B. Baumslag & B. Chandler
(Schaum, 1968)

Reference:

The Theory of Groups: an Introduction ..... J. J. Rotman
(Allyn & Bacon, 1966)

TOPIC. L—TOPIC IN PURE MATHEMATICS, e.g.

DIFFERENTIAL GEOMETRY — T. K. Sheng


Text:

Differential Geometry ..... M. M. Lipschutz
(Schaum, 1969)
PART III TOPICS

TOPIC. M — GENERAL TENSORS — P. K. Smrz


Text:

*Tensor Calculus* ... J. Abram (Butterworths, 1965)

References:

*Elements of Tensor Calculus* ... A. Lichnerowicz (Methuen, 1962)

*Applications of Tensor Calculus* ... A. J. McConnel (N.Y. Dover, 1957)

*Tensor Calculus* ... B. Spain (Oliver & Boyd, 1953)

TOPIC. N — VARIATIONAL METHODS — W. P. Wood


Text:

*Calculus of Variations* ... L. E. Elsgolc (Pergamon Press, 1963)

OR

*Calculus of Variations* ... R. Weinstock (N.Y. McGraw-Hill, 1952)

References:

*Methods of Applied Mathematics* ... F. B. Hildebrand (Prentice-Hall, 1952)

*Methods of Mathematical Physics* Vol. I ... R. Courant & D. Hilbert (Interscience, 1953)

TOPIC. O — MATHEMATICAL LOGIC — W. Brisley

Introduction; inference rules as a formalisation of deductive processes; sets; axiomatic theories; predicates. The sentential calculus, predicate calculus and predicate calculus with equality. First order theories; consistency, independence and completeness. Examples will be taken from the usual axiomatically defined Mathematical systems, and Gödel's theorem will be discussed briefly.

Text:

*First Order Mathematical Logic* ... A. Margaris (Ginn Blaisdell, Mass., 1967)

References:

*An Introduction to Mathematical Logic* ... Gerson B. Robison (Prentice-Hall, 1969)

*Elements of Mathematical Logic* ... P. S. Novikov (Addison-Wesley, 1963)

*Mathematical Logic* ... S. C. Kleene (Wiley, 1967)

*Symbolic Logic* ... I. Copi (Macmillan, 1967)

TOPIC. P — DIFFERENTIAL AND INTEGRAL EQUATIONS — J. G. Couper

Differential equations: existence and uniqueness theorem for first order differential equations; linear equations with constant coefficients; autonomous systems and phase space; stability for non-autonomous equations; Liapunov's direct method. Integral equations: introduction; existence and uniqueness theorems; solution of integral equations of the second kind by successive substitutions; solution of Fredholm's equation expressed as a ratio of two integral series; Hilbert-Schmidt theory of integral equations with symmetric kernels.

Texts:

*Ordinary Differential Equations and Stability Theory: an Introduction* ... D. A. Sanchez (Freeman, 1968)

AND

*Linear Integral Equations* ... W. V. Lovitt (N.Y. Dover, 1950)
TOPIC. PD — THEORY OF PARTIAL DIFFERENTIAL EQUATIONS — H. M. Lieberstein

An exhaustive study of the simplest linear homogeneous equations of second in two independent variable presented as an "outline" of the field of boundary value problems and followed by the presentation of successively more difficult and general theorems building eventually to a research level. Theory of characteristics and type classification, Picard iteration, Riemann method, Cauchy-Kovalevskii theorem, classical potential theory, Green's function in n-dimensions, variational principles for estimating eigenvalues and other quadratic functionals, retarded potentials and the wave equation in n-dimensions, a priori estimates, an Abstract Existence Principle in Functional Analysis, existence of $L^p$-weak solutions of boundary value problems for elliptic-parabolic type (second order, n-dimensions, variable coefficients). Applications and numerical methods are indicated throughout and complete treatment of transmission line theory is presented.

Text

*Theory of Partial Differential Equations* — H. M. Lieberstein
(Academic Press, 1972)

References

(Interscience, 1962)

*Foundations of Potential Theory* — O. D. Kellogg
(Dover, 1953)

*Generalized Functions and Partial Differential Equations* — A. Friedman
(Prentice-Hall, 1963)

*Partial Differential Equations — an Introduction* — B. Epstein
(McGraw-Hill, 1962)

*A First Course in Partial Differential Equations with Complex Variables and Transform Methods* — H. F. Weinberger
(Ginn Blaisdell, 1965)

(Harper & Row, 1969)

TOPIC. Q — FLUID DYNAMICS — W. T. F. Lau

Introduction; basic equations; potential flow. Two-dimensional motions; flow involving sources, sinks, doublets and vortices: the method of images; Milne-Thomson's circle theorem; Blasius' theorem and Lagally's theorem. Conformal transformation and its applications to two-dimensional problems: elementary transformations; Joukowskii's transformation: the theorem of Kutta and Joukowskii; the Schwarz-Christoffel transformation. Axisymmetrical motions: Stokes' stream function; motions involving sources; sinks and doublets.

Text:

*Elementary Classical Hydrodynamics* — B. H. Chirgwin & C. Plumpton
(Pergamon Press, 1967)

*Theoretical Hydrodynamics* 5th Ed. — L. M. Milne-Thomson
(London: Macmillan, 1968)

TOPIC. R — PROBABILITY AND STATISTICS — P. K. Smrz

This topic consolidates and extends the study of probability and statistics made in Topic H. Items studied include random vectors, generating functions of random vectors. Multinomial and multivariate normal random vectors. Sampling theory, the t and F distributions. Point and interval estimation. Decision theory, Bayes decision rules. Hypothesis testing, Neyman-Pearson Lemma, likelihood ratio. Linear regression and analysis of variance.

Text:

*Probability Distributions and Statistics* — Peter W. Zehna

References:

*Statistics and Experimental Design in Engineering and the Physical Sciences* (2 Vols.) — N. L. Johnson & F. C. Leone
(Wiley, 1964)

*The Advanced Theory of Statistics* (3 Vols.) — M. G. Kendall & A. Stuart
(Griffin, 1958-1966)

*Statistical Theory* 2nd Ed. — B. W. Lindgren
(Collier-Macmillan, 1968)

*Problems in Probability Theory, Mathematical Statistics and Theory of Random Functions* — A. A. Sveshnikov (ed.)
(W. B. Saunders, 1968)

*Mathematical Statistics* 2nd Ed. — S. S. Wilks
(Wiley, 1962)
PART III TOPICS

TOPIC. S — GEOMETRY — R. F. Berghout

Origins of projective geometry; projective space; duality; projectivities; Desargues' theorem; Pascal's theorem. Axiomatic approach: notions from algebra; incidence axioms in the plane; groups of transformations of the plane; invariance; affine and projective planes; Desargues' and Pappus' configurations; co-ordinates in the plane.

Texts:

An Introduction to Finite Projective Planes ....... A. A. Albert & R. Sandler (Holt-Rinehart-Winston, 1968)

Projective Geometry ....... F. Ayres (Schaum, 1967)

References:

Lectures on Modern Geometry ....... B. Serge (Cremonese, 1961)
Transformations and Geometries ....... D. Gans (Appleton Century Crofts, 1969)

Axiomatic Projective Geometry ....... A. Heyting (Noordhoff-North Holland, 1963)

TOPIC. T — GROUP THEORY — L. Janos

Finite Abelian groups.

Infinite Abelian groups; torsion, torsion-free, free Abelian, finitely generated and divisible groups.

Finite groups; Sylow theorems and their application to an analysis of isomorphism classes.

Series; Jordan-Hölder theorem, soluble and nilpotent groups.

Text:


OR

Group Theory ....... B. Baumslag & B. Chandler (Schaum, 1968)

Reference:

The Theory of Groups ....... J. J. Rotman (Allyn & Bacon, 1966)

TOPIC. U — TOPIC IN OPERATIONS RESEARCH — R. J. Vaughan

This course will consider mainly the mathematics of deterministic models in operations research. Topics covered will include game theory; linear programming; graphs, flows and networks; activity analysis; dynamic programming.

Text:


OR


References:


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

Methods and Models of Operations Research ....... A. Kaufmann (Prentice-Hall, 1963)


Mathematical Programming ....... S. Vajda (Addison-Wesley, 1961)


Games and Decisions ....... R. D. Luce & H. Raiffa (Wiley, 1957)

Integer Programming and Network Flows ....... T. C. Hu (Addison-Wesley, 1969)

TOPIC. V — MEASURE THEORY AND INTEGRATION — W. Ficker

PART III TOPICS

Text:

*The Elements of Integration* ... R. G. Bartle
(N.Y., Wiley, 1966)

References:

*Measure Theory* ... P. R. Halmos
(Van Nostrand, 1950)

*Measure Theory and Integration* ... S. K. Berberian
(Macmillan, 1965)

*A First Course in Integration* ... E. Asplund & L. Bungart
(Holt, Rinehart & Winston, 1966)

TOPIC. W — ANALYSIS OF NORMED LINEAR SPACES — M. J. Hayes

Banach spaces; continuous linear mappings; topological and isometric isomorphisms. Finite dimensional spaces and their special properties. Dual spaces; the form of continuous linear functionals on example spaces. Hilbert space; the representation of continuous linear functionals. Hahn-Banach theorem; reflexivity. Category and Baire's theorem; the open mapping, closed graph and uniform boundedness theorems. Conjugate mappings; adjoint and self-adjoint operators in Hilbert space. Projection, normal and unitary operators in Hilbert space. Complete orthonormal sets in Hilbert space.

Text:

*Elements of Functional Analysis* ... A. L. Brown & A. Page
(Van Nostrand Reinhold, 1969)

References:

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

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

*Théorie des Opérations Linéaires* 2nd Ed. ... S. Banach
(Chelsea)

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

(Grayloch Press, Rochester, N.Y., 1957)

TOPIC. Y — TOPIC IN APPLIED PROBABILITY; e.g., INFORMATION THEORY — W. P. Wood

This topic is an introduction to that theory of information which originated in the work of C. E. Shannon in 1948. The uniqueness theorem for the information content will be proved followed by proof of several inequalities involving this function. The concept of a channel and its capacity will be introduced and Shannon's fundamental theorem for discrete channels without memory will be proved.

If time permits some other aspects of information theory, e.g. Wiener prediction and filtering, will be discussed.
PART III TOPICS

Text:

Information Theory

R. Ash
(John Wiley, N.Y., 1965)

OR

Foundations of Information Theory

A. Feinstein
(McGraw-Hill, N.Y., 1958)

References:

An Introduction to Information Theory

F. M. Reza
(McGraw-Hill, N.Y., 1961)

Information Theory & Reliable Communication

R. G. Gallagher
(Wiley, 1968)

Recent Results in Information Theory

S. Kotz
(Methuen, London, 1966)

Science & Information Theory

L. Brillouin
(Academic Press, 1962)

Mathematical Foundations of Information Theory

A. I. Khinchin
(Dover, 1957)

TOPIC Z — NUMERICAL ANALYSIS — H. M. Lieberstein

The general theory of convergence of linear iterative methods for approximating solutions of linear systems of algebraic equations and its efficient utilization to approximate solutions of boundary value problems by way of finite difference or "continuous" discretizations. Adaptation to the understanding of asymptotic stability of linear marching schemes and the general importance of numerical stability in the numerical handling of initial-value problems. Numerical treatment of non-linear systems of algebraic equations and nonlinear marching schemes. The existence question for certain initial value problems and the importance for associated marching schemes. Serious fluid, elastic, and electric applications are completely analyzed, an attempt being made throughout to motivate all developments by a discussion of the sort of application areas that bred them. Some analysis background is assumed but no prerequisites of numerical analysis courses will be expected.

Text:

A Course in Numerical Analysis

H. M. Lieberstein
(Harper & Row, 1968)

References:

Analysis of Numerical Methods

E. Isaacson & H. B. Keller
(Wiley, 1966)

Computational Methods of Linear Algebra

D. K. Faddeev & V. N. Faddeeva
(W. H. Freeman, 1963)

Introduction to Numerical Analysis

Carl-Erik Froberg
(Addison-Wesley, 1965)

PART IV TOPICS

SIGNAL DETECTION — R. G. Keats

This topic will cover the detection and processing of signals with applications. It will be assumed that students have studied Topic II and are studying or have studied Topic R. The topic will discuss the application of likelihood ratio, Bayes and other tests to signal detection and processing in a variety of situations including known signals in white Gaussian noise and known signals in coloured Gaussian noise. The Shannon sampling theorem, Karhunen-Loève expansion, sequential detection and the effect of clipping will also be discussed.

Text:

No prescribed text.

References:

Statistical Theory of Signal Detection

C. W. Helstrom
(Pergamon Press, N.Y., 1960)

Detection, Estimation & Modulation Theory

H. L. Van Trees
(Prentice-Hall, 1969)

Signal Theory

L. E. Franks
(Wiley, 1967)

Detection Theory

I. Selin
(Princeton Univ. Press, 1965)

Introduction to Statistical Communication Theory

J. B. Thomas
(Wiley, 1969)

Topics in Communication Theory

D. Middleton
(McGraw-Hill, 1965)

Introduction to the Theory of Random Signals and Noise

W. B. Davenport & W. L. Root
(McGraw-Hill, 1958)

An Introduction to the Principles of Communication Theory

J. C. Hancock
(McGraw-Hill, 1961)

Signals and Noise in Communication Systems

H. E. Rowe
(Van Nostrand, 1965)

Signal Detection Theory

J. C. Hancock & P. A. Wintz
(McGraw-Hill, 1966)

Introduction to Statistical Communication Theory

D. Middleton
(McGraw-Hill, 1960)

Probability and Information Theory with Application to Radar

P. M. Woodward
(Pergamon Press, 1960)

Selected Papers on Noise and Stochastic Processes

N. Wax (Ed.)
(Dover, 1954)
TOPLOGICAL GROUPS — P. K. Smrz

Topological or continuous groups play a special role in the group theory: this is where differential geometry and algebra come to a close contact. The course will cover the following subject matter: The concept of a group. Fundamentals of the abstract group theory. The concept of a topological space and topological group. Elementary representation theory of compact topological groups. Manifolds and the concept of a Lie group. Exponential mapping. Integrability conditions. Structural coefficients. Weights and roots. Classification of Lie groups. Examples of applications of the theory in physical sciences.

Text:
No prescribed text.

References:
Topological Groups L. Pontryagin (Princeton Univ. Press, 1946)
Lectures on Lie Groups J. F. Adams (W. A. Benjamin, 1969)

TOPICS IN FINITE MATHEMATICS — W. D. Wallis

A selection from the following topics: tournaments, zero-one matrices, difference sets, integer programming, factorization of graphs, finite geometries, group decision processes, binary codes, groups and graphs.

Text:
No prescribed text.

References:
Topics on Tournaments J. W. Moon (Holt-Rinehart-Winston, 1968)
An Introduction to Finite Projective Planes A. A. Albert & R. Sandler (Holt-Rinehart-Winston, 1968)
Combinatorial Theory M. Hall (Ginn Blaisdell, 1967)
Theory of Finite and Infinite Graphs D. König (Chelsea, 1971)
Cyclic Difference Sets L. D. Baumert (Springer, 1971)

CATEGORICAL ALGEBRA — R. F. Berghout or W. Brisley

A course of some twenty-seven lectures introducing the notions of category, functor, limits, natural transformation. Examples will be drawn from Analysis and Algebra so it is advisable that students be familiar with the rudiments of Ring Theory and Group Theory. The course will study categories of modules and more generally, abelian categories, in some depth and also problems associated with adjunction. Depending on the background of the class, there may also be applications to Universal Algebra.

Texts:
Categories for the Working Mathematician S. MacLane (Springer, 1971)
An Introduction to Categorical Algebra S. Dickson (available from Maths. Dept.)

References:
Abelian Categories P. Freyd (Harper & Row, 1964)
Categories and Functors I. Bucur & A. Deleanu (Wiley, 1968)
Algebra S. MacLane & G. Birkhoff (Collier-Macmillan, 1967)
Homology S. MacLane & G. Birkhoff (Collier-Macmillan, 1967)

RANDOM AND RESTRICTED WALKS — W. P. Wood

Problem of Random walk; lattice walks; walks in continuous time; spatial restrictions; correlated walks; self-avoiding walks; diffusion and Brownian motion; applications to polymer physics, astronomy, numerical analysis and solid state physics.

Text:
No prescribed text.
PART IV TOPICS

References:

Random and Restricted Walks ... M. N. Barber & B. W. Ninham (Gordon & Breach, 1970)
Selected Papers on Noise and Stochastic Processes N. Wax (Ed.) (Dover N.Y., 1954)
Principles of Random Walk ... F. Spitzer (Van Nostrand N.Y., 1964)

ASYMPTOTIC METHODS IN ANALYSIS — W. P. Wood

This topic will outline methods useful in the solution of a wide class of problems occurring in Applied Mathematics. The topic will include an introduction to asymptotics, asymptotic series, implicit functions, summation formulae, Mellin transforms, the Laplace method for integrals, the saddle point method, the method of steepest descents, indirect asymptotics, iterated functions, differential equations with a large parameter, singularities of differential equations, estimation of the remainder in an asymptotic expansion, numerical quadrature and asymptotic expansions, some examples of asymptotic problems in mathematical physics, e.g., motion in a stratified atmosphere, instability of shear flows, spiral structure of disc galaxies.

Text:

No prescribed text.

References:

Asymptotic Methods in Analysis 3rd Ed. ... N. G. De Bruijn (North Holland, 1970)
Asymptotic Expansions ... E. T. Copson (Cambridge Univ. Press, 1965)
Asymptotic Solutions of Differential Equations and Their Applications ... C. Wilcox Ed. (Wiley N.Y., 1964)
Asymptotic Estimates and Entire Functions ... M. A. Evgrafov (Gordon & Breach N.Y., 1961)
Asymptotic Approximations ... H. Jeffreys (Oxford Univ. Press, 1962)
Asymptotic Expansions ... A. Erdélyi (Dover N.Y., 1956)
Asymptotic Expansions ... H. A. Lauwerier (Mathematisch Centrum, Amsterdam, 1966)

DIFFERENCE SETS — W. D. Wallis or Jennifer Wallis

Existence theorems, properties and construction of difference sets in groups (especially cyclic and abelian groups), generalized difference sets and supplementary difference sets. Applications to Hadamard matrices, finite geometries and experimental designs.

Text:

No prescribed text.

References:

Addition Theorems ... H. B. Mann (Interscience, 1965)
Cyclic Difference Sets ... L. D. Baumert (Springer, 1971)

RING THEORY — R. F. Berghout

This course deals with rings which in some respect resemble fields, or are related to fields. Such rings include division rings, simple rings, matrices over division rings and primitive rings. The study of such rings involves the Jacobson-Wedderburn-Artin structure theory. Rings may also be related to fields via their rings of fractions, as the integers are related to the rationals. Such rings include, successively, integral domains, prime rings and semi-prime rings. These are studied under the Goldie theory. Considerable use will be made of modules and module-theoretic versions of the main structure theorems will be presented.

Pre-requisite: Topic X.

Text:

Vorlesungen über artinsche Ringe ... A. Kertész (Akadémiai Kiadó, 1968)
OR
Noncommutative Rings ... I. N. Herstein (Wiley, 1968)
OR both the following
Fields and Rings ... I. Kaplansky (Univ. of Chicago, 1969)
Topics in Ring Theory ... I. N. Herstein (Univ. of Chicago, 1969)
PART IV TOPICS

References:

The Theory of Rings .......... N. McCoy (Macmillan, 1965)
Rings & Radicals .......... N. Divinsky (Allen-Unwin, 1964)
Elementary Rings and Modules .......... I. T. Adamson (Oliver & Boyd, 1970)

STOCHASTIC MODELS IN OPERATIONS RESEARCH — W. D. Wallis

This topic will examine a number of stochastic models which are of relevance to operations research. Topic I will be a pre-requisite and previous study of topics R and U an advantage. The syllabus will be selected from the following areas: queuing theory, dams and storage, renewal theory, inventory, simulation, quality control.

Text:
No prescribed text.

References:
Renewal Theory .......... D. R. Cox (Methuen, 1962)

MATHEMATICAL MODELS OF PHASE TRANSITIONS — A. J. Guttmann


Text:
No prescribed text.

References:

Statistical Physics, Phase Transitions and Superfluidity .......... M. Chretien, E. P. Gross & S. Deser (eds.) (Brandes Summer Institute, 1966)
On the Theory of Cooperative Phenomena in Crystals .......... C. Domb (Advances in Physics, 9, 149, 1960)

STOCHASTIC PROCESSES — R. G. Keats

This topic will cover the theory of stochastic processes and some of its applications. It will be assumed that students have studied Topic H and are studying or have studied Topics R and V. The topic will include the concepts of stationarity, covariance function, regular process, mean square continuity, differentiation, integration, ergodicity, spectrum, processes with uncorrelated or orthogonal increments, Wiener process, Poisson process. Applications to prediction and filtering will also be studied.

Text:
No prescribed text.

References:

Probability 3rd Ed. .......... M. Loève (Van Nostrand, 1963)
PART IV TOPICS

References (Cont.):

Theory of Stationary Random Functions ... A. M. Yaglom
(Prentice Hall, 1965)

Random Processes in Automatic
Control ... J. H. Laning & R. H. Battin
(McGraw-Hill, 1956)

Stochastic Processes ... M. S. Bartlett
(Cambridge Univ. Press, 1955)

Introduction to the Statistical Dynamics of
Automatic Control ... V. V. Solodovnikov
(Dover, 1960)

Statistical Analysis of Stationary Time
Series ... U. Grenander & M. Rosenblatt
(Wiley, 1957)

Time Series Analysis ... E. J. Hannan
(Methuen, 1960)

An Introduction to Probability Theory and
Its Applications Vols. I & II ... W. Feller
(Wiley, 1957 & 1966)

Introduction to the Theory of Random
Processes ... I. I. Gikhman & A. V. Skorokhod
(W. B. Saunders Co., 1969)
(translated by Scripta-technica)

VECTOR MEASURES—W. Ficker

This topic is an extension of topic V—Measure Theory and Integration. The set functions studied here are measures with values in vector spaces. The lectures will include problems concerning measures, extension of measures, measurable functions and integration.

Pre-requisite:
Topie V.

Text:
Vector Measures ... N. Dunceleanu
(Pergamon Press, 1967)

Reference:
Linear Operators Part I ... N. Dunford & J. T. Schwartz
(Inter science, 1958)

PART IV TOPICS

PERTURBATION THEORY — I. L. Rose


Text:
Perturbation Techniques in Mathematics, Physics and Engineering ... Richard Bellman
(Holt, Rinehart & Winston, 1966)

References:
Journal sources listed throughout the textbook.

VISCOS FLOW THEORY — W. T. F. Lau


Text: No prescribed text.

References:
An Introduction to Fluid Dynamics ... G. K. Batchelor
(Cambridge Univ. Press, 1967)

Fluid Mechanics ... L. D. Landau & E. M. Lifshitz
(Pergamon Press, 1959)

Research Frontiers in Fluid
Dynamics ... R. J. Seeger & G. Temple (eds.)
(Inter science, N.Y., 1965)

Visco Flow Theory Vols. I & II ... S. Pai
(Van Nostrand, 1956)

UNIVERSAL ALGEBRA—W. Brisley

A course of approximately twenty-seven lectures to afford students entry into the topic, formalising the concepts of $\Omega$-algebra, congruence, homomorphism, etc., in the general case, and presenting the appropriate theorems. As necessary, lattice-theory and set-theory will be investigated and $\Omega$-word algebras and attendant general theorems will be proved. Applications will be made to derive results in groups and rings, and also to link results from separate algebraic topics.

Text: No prescribed text.

References:
Universal Algebra ... P. M. Cohn
(Harper & Row, 1965)

Algebra ... Serge Lang
(Addison-Wesley, 1965)
COMBINATORIAL THEORY — Jennifer Wallis

Block designs; elementary theorems, the Bruck-Ryser-Chowla theorem; applications. Difference sets; finite fields; Singer’s theorem; the multiplier theorem; difference sets in general groups; some families of difference sets, orthogonal latin squares and orthogonal arrays; constructions for these and the disproof of the Euler conjecture. Hadamard matrices; Paley’s constructions and some more recent methods; applications. General constructions of block designs; Hanani’s theorems, triple systems; block designs with \( K > 3 \). Theorems on completion and embedding; Connor’s methods; rational completions; integral solutions.

Text: No prescribed text.

References:

Addition Theorems, The Additon Theorems of Group Theory & Number Theory

H. B. Mann

(Interscience, N.Y., 1965)

Combinatorial Identities

John Riordan

(Wiley, 1968)

Patterns & Configurations in Finite Spaces

S. Vajda

(Charles Griffin, 1967)

The Mathematics of Experimental Design. Incomplete Block Designs & Latin Squares

S. Vajda

(Charles Griffin, 1967)

An Introduction to Combinatorial Analysis

John Riordan

(Wiley, 1958)

Combinatorial Theory

M. Hall, Jr.

(Ginn Blaisdell, 1967)

Combinatorial Mathematics

H. J. Ryser

(Wiley, 1963)

A Survey of Matrix Theory and Matrix Inequalities

M. Marcus & H. Mine

(Allyn & Bacon, 1964)

List of Prime Numbers from 1 to 10,006,721

D. H. Lehmer

(Hafner, N.Y., 1956)

THEORY OF GROUPS — W. Brisley

A course on some important results in the theory of groups, comprising about twenty-seven lectures on the topics: Nilpotent and Soluble groups; Free groups; Group Extensions; Varieties of Groups (as equationally defined classes and as constructively defined classes); unsolved problems in Group Theory.

Prerequisite: Topic T.

Text: No prescribed text.

References:

The Theory of Groups

M. Hall Jr.

(Macmillan, 1962)

Group Theory

W. R. Scott

(Prentice-Hall, 1964)

The Theory of Groups Vols. I & II

A. G. Kurosh

(Chelsea, 1960)

(Translated and edited by K. A. Hirsch)

BANACH ALGEBRA — M. J. Hayes

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

Commutative Banach algebras; the Gelfand theory and the Gelfand representation theorem.

Weak topologies, the Banach-Alaoglu theorem, the Gelfand topology. Involutions in Banach algebras; hermitian involutions; the Gelfand-Naimark representation theorem for commutative \( B^0 \) algebras. Numerical range of an element in a normed algebra; relation of the numerical range to the spectrum; \( B^0 \) algebras are symmetric, discussion of the Gelfand-Naimark representation theorem for \( B^0 \) algebras.

Applications of Banach algebra theory.

Text: No prescribed text.

References:

Introduction to Topology and Modern Analysis

G. F. Simmons

(McGraw-Hill, 1963)

Functional Analysis

G. Bachman & L. Narici

(Academic Press, 1966)

Functional Analysis

A. Wilansky

(Blaisdell, 1964)

General Theory of Banach Algebras

C. E. Rickart

(Van Nostrand, 1960)

Numerical Ranges of Operators on Normed Spaces and Elements of Normed Algebras

F. F. Bonsall & J. Duncan

(Camb. Univ. Press, 1970)

Normed Rings

M. A. Naimark

(Noordhoff, 1959)

Commutative Normed Rings

I. M. Gelfand, D. A. Raikov & G. E. Shilov

(Chelsea, 1964)
PART IV TOPICS

COMPLEX VARIABLES — T. K. Sheng

Text:
*Complex Variables* — Robert B. Ash (Academic Press, 1971)

GRAPH THEORY — W. D. Wallis

Text:
*Graph Theory* — F. Harary (Addison-Wesley, 1969)

References:
*Graphs and Their Uses* — O. Ore (Random House, 1963)
*Theory of Graphs and Its Applications* — C. Berge (Methuen, 1962)
*Theory of Graphs* — D. König (Chelsea, 1970)

COMMUTATIVE ALGEBRA — R. F. Berghout
The main subject of this course is the notion of a prime ideal in a commutative ring and generalizations thereof. The treatment will involve localization, chain conditions, modules, exact sequences, tensor products, platitude, and the like as well as some more classical material such as primary decomposition.

Pre-requisite: Topic X.

Text:
*Introduction to Commutative Algebra* — M. F. Atiyah & I. G. MacDonald (Addison-Wesley, 1969)

References:
*Commutative Rings* — I. Kaplansky (Allyn & Bacon, 1970)
*A First Course in Rings and Ideals* — D. M. Burton (Addison-Wesley, 1970)
*Commutative Algebra* — J. T. Knight (Cambridge Univ. Press, 1971)

ANALYSIS OF TOPOLOGICAL AND LINEAR TOPOLOGICAL SPACE — J. R. Giles
A topological space is the most general mathematical structure for study by the analyst; the most useful class of topological spaces for study by the analyst is the class of linear topological spaces.

For both topological and linear topological spaces we discuss the generation of topologies, bases and subbases and for linear topological spaces locally convex topologies. For topological spaces we discuss continuity of mappings and for linear topological spaces the continuity of linear mappings. For both topological and linear topological spaces we treat product and quotient spaces. For topological spaces we treat the separation axioms and relate them to linear topological spaces. We examine questions of duality theory for linear topological spaces and the weak topologies. We deal with the different forms of compactness in topological spaces.

Text: No prescribed text.

References:
*General Topology* — J. L. Kelly (Van Nostrand, 1955)
*Linear Topological Spaces* — J. L. Kelly & I. Namioka (Van Nostrand, 1963)
*Functional Analysis* — A. Wilansky (Ginn Blaisdell, 1964)
*Topological Vector Spaces* — A. P. Robertson & W. J. Robertson (Cambridge Univ. Press, 1966)
GEOMETRIC PROBABILITY — R. J. Vaughan

The course will examine some properties of points and lines distributed in two-dimensional Euclidean space. The quadvariate normal distribution will be used to describe possible connections between two different sets of points on a plane. Shortest path curves will be examined when costs vary with both direction and position. Applications to traffic movement and urban geography will be emphasised. The course will rely heavily on continuous probability distributions and a knowledge of Topics C and H will be assumed.

Text: No prescribed text.

References:

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

DESIGN AND ANALYSIS OF EXPERIMENTS — Jennifer Wallis

The essential ideas of constructing experimental designs, estimation and testing hypotheses will be discussed. Various general procedures for computing analysis of variants will be described. The experimental designs to be introduced may include: randomized blocks, factorial designs, Latin-square designs, split-plots, balanced and partially balanced incomplete block designs and cyclic designs.

Text:

- Analysis and Design of Experiments — H. B. Mann (Dover, 1949)

References:

- Construction and Combinatorial Problems in Design of Experiments — D. Raghavarao (Wiley, 1971)
- Experimental Design — W. T. Federer (Macmillan, 1955)
- The Design and Analysis of Experiments — O. Kempthorne (Wiley, 1952)
- Planning of Experiments — D. R. Cox (Wiley, 1958)
- The Analysis of Variance — H. Scheffé (Wiley, 1959)

CHEMICAL RATE PROCESSES — D. L. S. McElwain

A review of statistical mechanics applied to gases. The dissociation of a diatomic gas will be studied in detail. The simple harmonic oscillator model of Montroll and Shuler, the Lighthill ideal dissociating gas and the classical oscillator of Keck and Carrier will be compared and the consequences of the models discussed. Also included will be an outline of the use of perturbation methods in the description of relaxation phenomena in gases and an introduction to the theory of laser action in gases.

Text: No prescribed text.

References:

- Dynamics of a Dissociating Gas — M. J. Lighthill (J. Fluid Mech., 2, 1, 1957)

DYNAMIC OCEANOGRAPHY — W. C. Summerfield

Structure and physical properties of the oceans. Kinematics; conservation laws; rotating frame of reference; coriolis acceleration. Dynamics: Boussinesq approximation; dimensionless parameters; turbulent flow; vorticity. Geostrophic motion; "thermal wind" equations; Ekman drift. Ocean circulation; Sverdrup relations; potential vorticity; theories of the large scale circulations. Upper layers of the sea; heat balance; momentum balance. Wave motions; surface waves; long-waves; planetary waves; specification.

Prerequisite:

It would be to the student's advantage to have studied Topic Q.

Text: No prescribed text.

References:

- An Introduction to Fluid Dynamics — G. K. Batchelor (Cambridge Univ. Press, 1967)
- An Introduction to Physical Oceanography — W. S. von Arx (Addison-Wesley, 1962)
- Dynamical Oceanography — J. Proudman (Methuen, 1963)


**PART IV TOPIC**

References (Cont.):

*Principles of Physical Oceanography* G. Neumann & W. J. Pierson  
(Prentice-Hall, 1966)

*The Dynamics of the Upper Ocean* O. M. Phillips  
(Cambridge Univ. Press, 1966)

*The Gulf Stream* H. Stommel  
(University California Press, 1966)

*The Oceans: Their Physics, Chemistry and General Biology* H. V. Sverdrup, M. W. Johnson & R. H. Fleming  
(Prentice-Hall, 1963)

*The Sea Vol. I* M. N. Hill (ed.)  
(Interscience, 1962)

*The Theory of Rotating Fluids* H. P. Greenspan  
(Cambridge Univ. Press, 1968)

*Wind-driven Ocean Circulation* A. R. Robinson (ed.)  
(Ginn Blaisdell, 1963)

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**THE BANACH FIXED POINT PRINCIPLE, ITS CONVERSES AND GENERALIZATIONS** — L. Janos

This topic will deal with some algebraic and topological aspects of the above principle and of the concept of contraction. Different ways of generalization of this concept to nonmetrizable spaces will be introduced. A representation theory of contractions by operators in Hilbert Spaces and Linear Topological Spaces will be given.

**Prerequisite:**

Basic knowledge in general topology.

**Text:**

No prescribed text.

**References:**

Several papers of L. Janos and papers of M. Edelstein, C. Bessaga and J. de Groot.

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**PART IV TOPIC**

**MATHEMATICAL MODELS IN COLLOID AND BIOPHYSICS** — E. R. Smith


**Text:** No prescribed text.

**References:**

*Special Functions of Mathematical Physics and Chemistry* I. N. Sneddon  
( Oliver & Boyd, 1966)

*Electrodynamics of Continuous Media and Statistical Physics* L. D. Landau & E. M. Lifschitz  
(Pergamon, 1967, 1969)

*Physical Chemistry* G. W. Castellan  
(Addison-Wesley, 1970)

*Metholds of Quantum Field Theory in Statistical Physics* A. A. Abrikosov, L. P. Gorkov & I. E. Dzyaloshinskii  
(Prentice-Hall, 1963)

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**RIGOROUS STATISTICAL MECHANICS** — E. R. Smith


**Text:**

*Statistical Mechanics* K. Huang  
(Wiley, 1963)

**References:**

*Mathematical Statistical Mechanics* C. J. Thompson  
(Macmillan, 1971)

*Lectures in Statistical Mechanics* G. E. Uhlenbeck & G. W. Ford  
(Amer. Math. Soc., 1963)

*Statistical Mechanics: Rigorous Results* D. Ruelle  
(Benjamin, 1969)

*Statistical Physics* G. H. Wannier  
(Wiley, 1966)
PART IV TOPIC

THE DEVELOPMENT OF ALGEBRA: AN ASPECT OF THE HISTORY OF MATHEMATICS — R. F. Berghout

The course will consist of about twenty-seven lectures and seminars, mainly the latter, and will deal with the following.

A brief outline of the emergence of algebra as an autonomous discipline in Greece (with emphasis on Diophantus and to a lesser extent Euclid), India (Brahmagupta and Bhaskara), and the Middle East and China. Pell's equation will be looked at in some depth, in the light of the work of Euler and Lagrange.

A study of the development of modern notation and other aspects of Renaissance algebra, based largely on selected source materials in translation.

The concern with uniqueness and existence problems and the growth of abstract algebra in the eighteenth and nineteenth centuries.

The notions of "structure" and of "structure-preserving maps", leading to Universal and Categorical Algebra.

Pre or Corequisite: Topic T or X.

Texts:

The Treasury of Mathematics Vols. I & II ... H. Midonick (Penguin, 1968)

A Source Book in Mathematics Vol. I ... D. E. Smith (Dover, 1959)

References:

Eléments d' Histoire des Mathématiques 2nd Ed. — N. Bourbaki (Herman, 1969)

A Source Book in Mathematics 1200-1800 ... D. Struik (Harvard Univ. Press, 1969)

History of Hindu Mathematics ... B. B. Dutta & A. N. Singh (Asia Publishing House)

The Development of Mathematics in China and Japan Y. Mikami (Chelsea, 1961)

Elements 3 Vols. ... Euclid (Dover, 1926)

Diophantus of Alexandria ... T. L. Heath (Dover, 1965)

Greek Mathematical Thought and the Origin of Algebra J. Klein (M. I. T. Press, 1968)

The Great Art ... G. Cardano (M. I. T. Press, 1969)

Die Genesis des abstrakten Gruppenbegriffes ... H. Wussing (V. E. B., 1969)

The Development of Mathematics ... E. T. Bell (McGraw-Hill, 1945)

Together with selections, where available, from the works of Descartes, Vieta, Cauchy, Euler, Lagrange, Gauss, Cayley, Galois, Kummer, Kronecker, Dedekind, Hermite, Wedderburn, etc.

SUMMARIES OF TOPICS, TEXT BOOKS AND REFERENCE BOOKS

SCHEDULE B

PART I TOPICS

CIVIL ENGINEERING IM

TOPIC. CE111 — STATICS — P. W. Kleeman

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

Text:

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

References:

Statics ..... J. L. Meriam (Wiley, 1966)

Mechanics for Engineers:


TOPIC. ME131 — DYNAMICS — K. L. Hitz

A Study of Force and Motion.

The forces involved in motion; gravity, dry friction, viscous friction, rolling friction. The "free body" and control volume techniques. Internal and external forces and equilibrium.

Newton's laws of motion applied to point masses, rigid bodies and connected bodies moving in straight line or curved paths, or in simple rotation. Reference frames and relative motion; inertial frames, accelerating frames and rotating frames, Coriolis acceleration with illustrations.

Momentum and impulse, both linear and angular, related to point masses and rigid bodies.

Energy and the conservation principle applied to mechanical work, strain energy, kinetic energy, potential energy and friction "losses", in the context of point masses and rigid bodies.

Text:

Force and Motion ..... A. K. Johnston & B. J. Hill (Univ. of Newcastle)

References:

Mechanics for Engineers:


**PART I TOPICS**

**TOPIC. CE231 — FLUID MECHANICS I — F. M. Henderson or ME251 — FLUID MECHANICS — A. K. Johnston**

Fluid properties and definitions. Fluid statics:— statics of moving systems, forces on surfaces, buoyant forces, stability of floating and submerged bodies. Fluid flow concepts:—

Types of flow, continuity equation, Euler’s equation of motion along a streamline. Bernoulli equation, energy equation. Linear momentum equation. The moment of momentum equation. Linear and angular momentum applications. Introduction to dimensional analysis. Viscous effects:— fluid resistance, laminar and turbulent flow, flow in pipes and conduits. Fluid measurement.

**Text:**

*Fluid Mechanics* 5th Ed.  
V. L. Streeter  
(McGraw-Hill, 1971)

**Reference:**

*Fluid Mechanics with Engineering Applications* 6th Ed.  
R. L. Daugherty & J. B. Franzini  
(McGraw-Hill, 1965)

**TOPIC. CE212 — MECHANICS OF SOLIDS I — P. W. Kleeman**

Uniaxial loading, states of stress and strain, stress and strain relationships; internal forces, internal stresses, deflexion of beams, torsion, buckling.

**Text:**

*Mechanics of Materials*  
F. R. Shanley  
(McGraw-Hill, 1967)

**PART II TOPICS**

**CIVIL ENGINEERING IIM**

**TOPIC. CE313A — STRUCTURAL ANALYSIS I — N. O. Betts**

Analysis component of CE313, viz.

Analysis of elastic statically determinate and indeterminate systems by classical methods; torsion.

**Text:**

*Elementary Structural Analysis*  
C. H. Norris & J. B. Wilbur  
(McGraw Hill, 1960)

**References:**

*Hyperstatic Structures Vols. I & II*  
J. A. L. Matheson  
(Butterworths, 1912)

*Structural Analysis*  
H. I. Laursen  
(McGraw-Hill, 1969)

**TOPIC. CE332 — FLUID MECHANICS II — W. G. Field**

Similitude; flow nets, boundary layers; closed conduit flow; pipe networks; unsteady flow; waterhammer, hydraulic machinery, open channel hydraulics, backwater curves.

**Texts:**

*Fluid Mechanics* 5th Ed.  
V. L. Streeter  
(McGraw-Hill, 1971)

*Open Channel Flow*  
F. M. Henderson  
(Collier Macmillan, 1966)

**References:**

*Engineering Hydraulics*  
H. Rouse  
(Wiley, 1958)

*Handbook of Fluid Dynamics*  
V. L. Streeter  
(McGraw-Hill, 1961)

*Handbook of Applied Hydraulics* 3rd Ed.  
C. V. Davis & K. E. Sorenson  
(McGraw-Hill, 1969)

*Applied Hydraulics in Engineering*  
H. M. Morris  
(Ronald Press, 1963)

*Applied Hydrodynamics*  
H. R. Vallentine  
(Butterworths, 1959)
PART II TOPICS

TOPIC. ME301—ENGINEERING COMPUTATIONS—
K. L. Hitz


Text:

Numerical Methods & Fortran Programming 
D. P. McCracken & W. S. Dorn
(Wiley International, 1964)

References:

A First Course in Numerical Analysis 
A. Ralston
(McGraw-Hill, 1965)

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

PART III TOPICS

ACCOUNTING III C

ACCOUNTING III A

EITHER

Selected contemporary problems in the theory and practice of financial accounting, company financial reporting and public practice including a study of current approaches to the formulation of accounting theory, governmental and institutional accounting.

References:

A Statement of Basic Accounting Theory 
American Accounting Assn. (Evanston, 1966)


Ethics and the Accountant M. Barradell (Gee, 1969)

Studies in Accounting

Theory 2nd Ed. W. T. Baxter & S. Davidson (eds.) (Sweet & Maxwell, 1962)

The Effectiveness of Accounting Information A. J. Briloff (Prager, 1967)

Contemporary Accounting and its Environment J. W. Buckley (Dickenson, 1969)


Accountants and the Law of Negligence R. W. V. Dickerson (Canadian Institute of Chartered Accountants, 1966)


References (Cont.):

Accounting Concepts of Profit ... S. Gilman
(Ronald)

Concepts of Depreciation ... L. Goldberg
(Law Book Co., 1960)

*An Inquiry into the Nature of Accounting ... L. Goldberg
(American Accounting Assn., 1965)

Accounting Theory ... E. S. Hendriksen
(Irwin, 1970)

Government Accounting in Australia ... W. R. C. Jay & R. L. Mathews
(Cheshire, 1967)

Law and Practice of Company Accounting in Australia 2nd Ed.
... T. R. Johnston, M. O. Jager & R. B. Taylor
(Butterworths, 1966)

Financial Accounting Theory Vol. II ... I. F. Keller & S. A. Zeff (eds.)
(McGraw-Hill, 1969)

*Public Financial Administration ... V. M. Levy
(Law Book Co.)

Structure of Accounting Theory ... A. C. Littleton
(American Accounting Assn., 1953)

Inflation and Company Finance 2nd Ed. ... R. L. Mathews & J. McB. Grant
(Law Book., 1962)

Accounting and Analytical Methods ... R. Mattessich
(Irwin, 1964)

Government Accounting 4th Ed. ... R. M. Mikesell & L. E. Hay
(Irwin, 1969)

Significant Accounting Essays ... M. Moontiz & A. C. Littleton
(Prentice-Hall, 1965)

Advanced Public Accounting Practice ... M. E. Murphy
(Irwin, 1966)

The Accountability and Audit of Governments E. L. Normanton
(Manchester Univ. Press, 1966)

Accounting Theory ... H. Norris
(Pitman, 1946)

An Introduction to Corporate Accounting Standards ... W. A. Paton & A. C. Littleton
(American Accounting Assn., 1965)

Local Government Accounting in Victoria 2nd Ed. D. M. Purdie
(Law Book Co., 1969)

Note — Essential books which students should possess are marked with an asterisk.

References (cont.):

Financial Statements: A Crusade for Current Values ... H. Ross
(Pitman, 1969)

A Theory of Accounting to Investors ... G. J. Staubus
(California Univ. Press, 1964)

The Search for Accounting Principles ... R. K. Storey
(A.I.C.P.A., 1964)

The Fund Theory of Accounting ... W. J. Vatter
(Chicago Univ. Press, 1951)

Accountants' Handbook 5th Ed. ... R. Wixen, W. G. Kell & N. M. Bedford (eds.)
(Ronald, 1970)

Financial Accounting Theory ... S. A. Zeff & T. F. Keller (eds.)
(McGraw-Hill, 1969)

ACCOUNTING IIIIB

Selected contemporary problems in the theory and practice of managerial accounting. Topics studied include the theories of behavioral budgeting, programme budgeting, break-even analysis, direct costing, transfer pricing, the impact of computers on management and general concepts of management accounting.

References:

Articles are selected from Abacus, The Accounting Review, Journal of Accounting Research, Journal of Business, etc. Text books should not be purchased until the course has commenced. The following list is of textbooks that are usually consulted.

Contemporary Problems in Cost Accounting ... H. R. Anton & P. A. Firmin
(Houghton Mifflin, 1966)

Topics in Cost Accounting and Decisions ... H. Bierman
(McGraw-Hill, 1963)

Managerial Cost Accounting ... H. Bierman & T. R. Dyckman
(Collier-Macmillan, 1971)

The Firm: Micro-Economic Planning and Action ... N. W. Chamberlain
(McGraw-Hill, 1962)

Case Problems in Management Accounting ... W. C. Greene
(Holt, Rinehart & Winston, 1964)

The Game of Budget Control ... G. H. Hofstede
(Associated Book Publishers, 1967)

Management Accounting: An Historical Perspective ... R. H. Parker
(Macmillan, 1969)
PART III TOPICS

References (cont.)

Studies in Cost Analysis 2nd Ed. .......... D. Solomons (ed.)
(Sweet & Maxwell, 1968)

Budget Control and Cost Behaviour .......... A. C. Stedry
(Prentice-Hall — Ford Foundation Series, 1961)

Readings in Cost Accounting Budgeting & Control 3rd Ed. .......... W. E. Thomas (ed.)
(South-Western, 1968)

ECONOMICS II

TOPIC. GROWTH AND DEVELOPMENT — N. Dickinson/ R. McStocker

The first two terms of this course deal with the dynamics of fluctuations and growth in the framework of an advanced economy. A critical appraisal is undertaken of leading contributions in this field. Topics such as the production function, technical progress and various models of growth are dealt with in detail.

The third term will be devoted to an examination of some problems of economic growth in developing countries. This part of the course will involve a discussion of some simple models of economic development and will continue with reference to some case studies from countries in Asia.

References:

A reading list will be distributed.

TOPIC. ECONOMETRICS I — R. McShane/G. Keating

A knowledge of matrix algebra, and of the mathematical statistics dealt with in Statistical Analysis I is recommended for students attempting this topic. This topic 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.

Texts:

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

AND

Intermediate Economic Statistics .......... K. A. Fox
(Wiley)

OR

Econometrics .......... R. J. Wonnacott & T. H. Wonnacott
(Wiley)

References:

Econometric Theory .......... A. S. Goldberger
(Wiley)

Linear Algebra .......... G. Hadley
(Addison-Wesley)

PART III TOPICS

References (cont.)

Regression and Econometric Methods .......... D. S. Huang
(Wiley)

Elements of Econometrics .......... J. Kmenta
(Macmillan)

AND ONE OF EITHER

TOPIC. PUBLIC ECONOMICS — W. Sheehan/N. Dickinson

Public Economics is a study of government intervention in the economy through the budget. It is, therefore, concerned with taxes and with government expenditures. There is an analysis of the effects of various existing personal and business taxes in Australia on incentives to work, to consume, to save and to invest. There is also a discussion of other possible taxes, such as expenditure tax, a capital gains tax and a tax on value added.

The macro-economic aspects of the budget are examined. Topics covered include the relation of fiscal policy to other economic and social policies for growth and stability and applications of basic multiplier theory to budgetary measures. There is also a discussion of the problems of the national debt, of inter-governmental financial relationships and of the place of fiscal policy in socialist economies and in developing economies.

References:

The Theory of Taxation .......... C. M. Allan
(Penguin, 1971)

The Public Finances .......... J. M. Buchanan
(Irwin, 1970)

Public Finance .......... O. Eckstein
(Prentice-Hall, 1967)

Public Finance .......... R. W. Houghton (Ed.)
(Penguin, 1970)

Public Economics .......... L. Johansen
(North Holland, 1965)

Public Expenditure .......... J. Millward
(McGraw-Hill, 1971)

Fiscal Policy in Australia .......... J. W. Neveil
(Cheshire, 1970)

(Allen and Unwin, 1971)

Public Finance .......... C. S. Shoup
(Weidenfeld and Nicolson, 1969)

Public Microeconomics .......... N. M. Singer
(Little, Brown, 1972)

Public Enterprise .......... R. Turvey (Ed.)
(Penguin, 1968)
PART III TOPICS

OR

TOPIC. INTERNATIONAL ECONOMICS — P. Ip/J. Stanton

This topic begins with a study of the theories of international trade in its non-monetary aspects. From the traditional analysis the theory is extended to examine such problems as the effect of economic growth on trade and the role of international trade in economic development. The theory of restrictions on trade is discussed with particular emphasis on the role of tariffs and of customs unions. The theory then considers certain theoretical aspects of international capital movements and the implications of Australia’s capital inflow. It goes on to examine the present international monetary system and its reform. The final section reviews Australia’s changing pattern of foreign trade and payments and assesses relevant economic policies.

References:

International Trade, Readings .... J. Bhagwati (Ed.)
(Penguin Modern Economics)

Theoretical Issues in International
Economics M. O. Clement, R. L. Pfister and K. T. Rothwell
(London Constable)

Balance of Payments Policy .... B. J. Cohen
(Penguin Modern Economics)

International Finance .... R. N. Cooper (Ed.)
(Penguin Modern Economics)

International Trade: Theory and
Empirical Evidence .... H. R. Heller
(Prentice-Hall)

International Economics .... C. P. Kindleberger
(Irwin)

The International Economics of Development:
Theory and Policy .... G. M. Meier
(Harper International Editions)

International Trade and the Australian Economy .... R. H. Snape
(Longmans paperback)

The International Monetary Mechanism .... L. B. Yeager
(Holt, Rinehart and Winston paperback)

CHEMICAL ENGINEERING IIIC

TOPIC. STAGE TRANSFER PROCESSES — B. D. Henry

Equilibrium stage processes for leaching absorption, extraction and distillation; stage efficiencies. Graphical methods of analysis; algebraic formulation for linear systems.
PART III TOPICS

TOPIC. TRANSPORT THEORY II — I. McC. Stewart

Heat and mass transfer in unsteady state conditions, analytical and numerical analysis; approximate methods. Generalized transport theory for momentum, mass and heat transfer in laminar, turbulent and simple boundary layer conditions; correlations of transfer coefficients.

References:

TOPIC. REACTION ENGINEERING I — K. L. Smith


Text:
- Chemical Reaction Engineering ..... O. Levenspiel (Wiley, 1964)

References:
- Principles of Chemical Equilibrium ............ K. Denbigh (Cambridge Univ. Press, 1961)

TOPIC. CHEMICAL PROCESS CONTROL — W. G. Kirchner

Relationship between measurement and control information display; plant response; types of controllers; transfer functions; analogue computer.

Text:
- Introduction to Chemical Process Control .... D. D. Perlmutter (Wiley, 1965)

TOPIC. HEAT TRANSFER III — I. McC. Stewart


Text:

 References:

TOPIC. CE414A — STRUCTURAL ANALYSIS II — P. W. Kleeman

Analysis component of CE414, viz.
Elastic analysis, instability of frames. Introduction to matrix analysis; plastic analysis.

Texts:

References:
- Plastic Analysis and Design Vol. I Beams and Frames ........ C. E. Massonet & M. A. Save (Blaisdell, 1965)

TOPIC. CE324 — SOIL MECHANICS — R. J. Wilson

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

Text:

References:
- Problems in Engineering 
- The Measurement of Soil Properties in the 
  Triaxial Test .......... A. W. Bishop & D. J. Henkel (Edward Arnold, 1964)

Further references to Journals will be given in the lectures.
PART III TOPICS

TOPIC. CE415A — STRUCTURAL ANALYSIS — CONTINUA —  
P. W. Kleeman

Introduction to classical methods of solution of problems in elasticity  
and plate bending. Development of numerical methods for solving  
continuum problems using finite elements. Derivation of some stiffness matrices  
for simpler elements.

TOPIC. CE415B — STRUCTURAL ANALYSIS — PLASTICITY —  
P. W. Kleeman

The non-linear behaviour of beam columns. The stability of partially yielded frames from elastic-plastic analyses. Linear programming techniques in frame analysis and minimum weight design.

TOPIC. CE434A — FLUID MECHANICS — THEORETICAL HYDRODYNAMICS — F. M. Henderson

General treatment of stresses and rates of strain in a moving fluid, derivation of the Navier-Stokes equations, the vorticity equation; Kelvin's circulation theorem, the generation and diffusion of vorticity, with engineering applications. Irrotational flow theory in two and three dimensions, with engineering applications.

TOPIC. CE434B — FLUID MECHANICS — OPEN CHANNEL FLOW — F. M. Henderson

Numerical methods for the solution of unsteady non-uniform flow problems in irregular channels. The equations of unsteady flow, the method of characteristics, with engineering applications, e.g., the dam break problem. Theories of flood wave movement and techniques for its prediction. Sediment transport, river channel formation and stability.

Text:

Open Channel Flow —  
F. M. Henderson  
(Collier-Macmillan, 1966)

PART III TOPICS

COMMUNICATIONS AND AUTOMATIC CONTROL

TOPIC. EE341 — AUTOMATIC CONTROL (First half year) —  
T. E. Fortmann and K. L. Hitz

A topic of lectures, tutorials and practical work.


References:

Notes for a Second Course on Linear Systems — C. A. Desoer  
(Van Nostrand Reinhold, 1970)

Linear Control Systems — J. L. Melsa & D. Schultz  
(McGraw-Hill, 1969)

Fundamentals of Automatic Control — S. C. Gupta & L. Hasdorff  
(Wiley, 1970)

Modern Control Engineering — K. Ogata  
(Prentice-Hall, 1969)

Automatic Control Engineering 2nd Ed. — F. H. Raven  
(McGraw-Hill, 1968)

TOPIC. EE342 — AUTOMATIC CONTROL (Second half year) —  
T. E. Fortmann and K. L. Hitz


References:

As for EE341.

TOPIC. EE444 — COMMUNICATION SYSTEMS (First half year) —  
B. D. O. Anderson

This topic introduces the common forms of analog modulation, as well as pulse modulation systems including pulse code modulation. Performance in the presence of noise is considered.

Text:

(McGraw-Hill, 1971)
PART III TOPICS

TOPIC, EE442 — MODERN CONTROL. (Second half year) —
J. B. Moore

A topic of lectures, tutorial and laboratory work including computer analysis covering the general area of Optimal Control Theory and in particular Dynamic Programming, the Calculus of Variations and the Pontryagin's Minimum Principle and various iterative numerical techniques for finding optimal controls and trajectories.

Text:
Optimal Control Theory — D. R. Kirk
(Prentice-Hall, 1971)

Reference:
Optimum Systems Control — A. P. Sage
(Prentice-Hall, 1968)

MECHANICAL ENGINEERING III

TOPIC, ME361 — AUTOMATIC CONTROL I — K. L. Hitz & T. E. Fortmann

An introductory topic in linear control systems.


Description of components of servomechanisms and process control systems.

References:
Linear Control Systems — J. L. Melsa & D. G. Schultz
(McGraw-Hill, 1967)
Fundamentals of Automatic Control — S. C. Gupta & L. Hasdorff
(Wiley, 1970)
Notes for a Second Course in Linear Systems — C. A. Desoer
(Van Nostrand-Reinhold, 1970)
Automatic Control Engineering 2nd Ed. — F. H. Raven
(MacGraw-Hill, 1968)

TOPIC, ME401 — SYSTEMS ANALYSIS — A. J. Carmichael


TOPIC, ME402 — SYSTEMS PLANNING, ORGANIZATION AND CONTROL — A. J. Carmichael or G. D. Butler


Use of analogue and digital computers, data processing.

References:
Production Systems, Planning Analysis and Control — J. L. Riggs
(Wiley, 1970)
(Irwin-Dorsey, 1965)
A Mathematical Theory of Systems Engineering — A. Wayne-Weymore
(Wiley, 1967)
A Concept of Corporate Planning — R. L. Ackoff
(Wiley, 1970)

TOPIC, ME403 — RESOURCES PLANNING AND ALLOCATION — A. J. Carmichael/A. K. Johnston/G. D. Butler

Types of resources. Resources availability, approach and classification. Analysis and projection for world, national and corporate levels of operation. Tactical and strategic problems, conservation of resources.

Generation of resources. Capital and technological resources. The planning, organisation and control of resources, with particular emphasis on long-range planning. The need at levels for a resources policy. Optimal use of resources allocation. The importance of mineral resources to Australia. Prediction of resources.

Notions of corporate planning with special reference to the steel industry.
PART III TOPICS

References:

World Resources and Industries E. W. Zimmerman (N.Y. Harper, 1951)
Man, Mind and Land W. Firey (N.Y. Free Press, 1960)
World Prospects for Natural Resources J. L. Fisher & N. Potter (John Hopkins Press, 1964)
Minerals and Men J. McDevitt (John Hopkins Press, 1968)
Resources and Mass National Academy Science (Freeman, 1969)

TOPIC. ME404 — MATHEMATICAL PROGRAMMING — K. L. Hitz

Non-linear programming — calculus of variations, dynamic programming, principles of optimality, multidimensional processes, use of Lagrange multipliers, integer programming, successive approximation method, non-additive return functions, quadratic programming, geometric programming.

References:

Operations Research H. A. Taha (Macmillan, 1971)
Introduction to Dynamic Programming G. L. Namhauser (Wiley, 1966)

Non-Linear Programming H. P. Kunzi, W. Krelle & W. Oetlli (Ginn Blaisdell, 1966)

Non-Linear and Dynamic Programming G. Hadley (Addison-Wesley, 1964)

Mathematical Programming C. McMillan (Wiley, 1970)

TOPIC. ME434 — ADVANCED KINEMATICS AND DYNAMICS OF MACHINES — E. Betz

A topic of lectures and tutorials.

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

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

References:

Kinematics and Dynamics of Plane Motion J. Hirschhorn (McGraw-Hill, 1962)

TOPIC. ME446 — INTRODUCTION TO PLASTIC ANALYSIS — A. J. Carmichael or E. Betz

Plastic behaviour materials — idealizations.


Applications where there exists: (i) no elastic-plastic interface; (ii) an elastic-plastic interface.


References:

Plasticity R. Hill (Oxford, 1950)
Introduction to Plasticity W. Prager (Addison-Wesley, 1959)

TOPIC. ME448 — INTRODUCTION TO PHOTO-MECHANICS — A. J. Carmichael or E. Betz


Model analysis for two and three dimension problems which may involve static, dynamic or thermal loading conditions.

Calibration of material and solution of disc problem.

References:

Introduction to Photo-Mechanics A. J. Durelli & W. F. Riley (Prentice-Hall, 1965)
Experimental Stress Analysis J. W. Dally & W. F. Riley (McGraw-Hill, 1965)
TOPIC. ME449 — RELIABILITY ANALYSIS FOR MECHANICAL SYSTEMS — A. J. Chambers


References:


TOPIC. ME487 — OPERATIONS RESEARCH — PROBABILISTIC MODELS — G. D. Butler

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

References:


*Statistical Forecasting for Inventory Control* — R. G. Brown (McGraw-Hill, 1959)


*Analysis for Inventory Systems* — G. Hadley & T. M. Whitin (Prentice-Hall, 1963)

*Production-Inventory Systems* — E. S. Buffa (Wiley, 1968)

*Queueing Theory* — J. A. Panico (Prentice-Hall, 1969)


*Queues, Inventories & Maintenance* — P. M. Morse (Wiley, 1958)

PART III TOPICS

References (Cont.):

Case Analysis and Business Problem Solving  K. E. Schnelle
(McGraw-Hill, 1967)

(Wiley, 1963)

A Guide to Operational Research  E. Duckworth
(Methuen, 1965)

PHYSICS IIIA

A basic Physics subject organized under the following main topics:
1. Analytical mechanics, including the elements of Lagrangian and Hamiltonian mechanics.
2. Electromagnetic field theory, including guided waves and transmission lines.
3. Relativity, the special theory.
4. Quantum mechanics, including applications to atomic and nuclear systems.
5. Statistical mechanics, including principles and application.
6. Electronics, theory and applications.

References:

Electronic Devices and Circuits  J. Millman & C. Halkias
(McGraw-Hill, 1967)

Pulse, Digital and Switching Waveforms  J. Millman & H. Taub
(McGraw-Hill, 1965)

Introduction to Solid State Physics 4th Ed.  C. Kittell
(McGraw-Hill, 1965)

Fundamentals of Optics 3rd Ed.  F. A. Jenkins & H. E. White
(McGraw-Hill, 1957)

Classical Mechanics 2nd Ed.  J. W. Leech
(Methuen, 1965)

Fundamentals of Modern Physics  R. M. Eisberg
(Wiley, 1961)

Introduction to Modern Physics  F. K. Richtmeyer, E. H. Kennard & T. Lauritsen
(McGraw-Hill, 1969)

Introductory Quantum Mechanics  V. B. Rojansky
(Prentice-Hall, 1938)

Text book lists will be displayed on the Physics notice board towards the end of 1972 and lists will also be available from the Cashier. Students should retain all their Physics II texts.

PART III TOPICS

PSYCHOLOGY IIIIC — A. C. Hall

This subject will cover the topics factor analysis and personality assessment of Psychology IIIB but students will be expected to study them at a higher level of mathematical sophistication. Other topics will include the study of personality, cognition, perception and physiological psychology and students must select one or more additional topics from Psychology IIIA or Psychology IIIB in consultation with the Head of the Psychology Department to complete their lecture programme of an average of four hours per week. In addition to lectures, students will be required to complete an independent investigation in mathematical psychology under supervision and to complete the normal laboratory programme of Psychology IIIA.

Text:

No prescribed text.

References:

Modern Factor Analysis  H. H. Harman
(Univ. of Chicago Press, 1960)

Problems in Human Assessment  D. N. Jackson & S. Messick
(McGraw-Hill, 1967)

The Developmental Psychology of Jean Piaget  J. H. Flavell
(Van Nostrand, 1963)

Thinking: From Association to Gestalt  J. M. Mandler & G. Mandler
(Wiley, 1964)
SUMMARIES OF TOPICS, TEXT BOOKS AND REFERENCE BOOKS

SCHEDULE C

MATHEMATICS/PHYSICS IV

In addition to the experimental and thesis work for this subject, the student is required to complete selected topics from those offered for Mathematics IV and Physics IV. The thesis, topics to be studied and experimental work will be decided in consultation with the Heads of Departments of Mathematics and Physics.

MATHEMATICS/PSYCHOLOGY IV

In addition to the experimental and thesis work for this subject, the student is required to complete four Mathematics topics chosen from the Part IV Mathematics topics in Schedule A. Syllabuses for these topics appear on pages 99-116 of this handbook. An additional topic, Psychological Measurement, described below must also be studied.

TOPIC. PSYCHOLOGICAL MEASUREMENT — J. A. Keats

This seminar series involves one weekly meeting of approximately 1½ hours. The series is introduced by lectures on the logic of measurement and its application to psychological phenomena after which each student is required to present at least one paper on one of the more recently developed psychological scaling methods.

Text:
No prescribed text.

References:

Studies in Mathematical Psychology — R. C. Atkinson (ed.)
(Stanford Univ. Press, Cal., 1964)

Foundations of Science: The Philosophy of Theory and Experiment — N. R. Campbell
(Dover, N.Y., 1957)

A Theory of Data — Clyde H. Coombs
(John Wiley, 1964)

Statistical Theories of Mental Test Scores — F. M. Lord & M. R. Novick
(Addison-Wesley, 1968)

Logical Foundations of Psychological Measurement — S. Ross
(Aarhus Stiftsbogtrykkerie A-S, Denmark, 1964)

Theory and Methods of Scaling — W. S. Torgerson
(John Wiley, 1958)

A GUIDE TO STUDENTS ENROLLING IN THE FACULTY OF MATHEMATICS

1. Students received approval to enrol in the following non-mathematics subjects in 1972.

<table>
<thead>
<tr>
<th>PART I</th>
<th>PART II</th>
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<tbody>
<tr>
<td>Accounting I</td>
<td>Greek I</td>
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<tr>
<td>Chemistry I</td>
<td>History I</td>
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<tr>
<td>Classical Civilisation I</td>
<td>Philosophy I</td>
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<tr>
<td>English I</td>
<td>Physics IA</td>
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<td>French I</td>
<td>Psychology I</td>
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<tr>
<td>Geography I</td>
<td>Sanskrit I</td>
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<tr>
<td>Geology I</td>
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</table>

2. Students transferring to the Faculty of Mathematics in the past have been granted standing in the following non-mathematics subjects, completed while enrolled in other Faculties.

<table>
<thead>
<tr>
<th>PART I</th>
<th>PART II</th>
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<tbody>
<tr>
<td>Accounting I</td>
<td>Geology I</td>
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<td>Chemistry I</td>
<td>German I</td>
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<td>Economics I</td>
<td>History I</td>
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<td>Engineering I</td>
<td>Philosophy I</td>
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<td>English I</td>
<td>Physics IA</td>
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<td>French I</td>
<td>Psychology I</td>
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<td>Geography I</td>
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3. Enrolment in the following subjects is restricted as indicated below.

Accounting I — Students who include this subject in their course as a Part I subject are advised to discuss with the Dean the possibility of including Accounting II A or Accounting II B in their Part II subjects.

Economics II A — Students should study Economics II E and Money and Banking. They should also include the Part II Mathematics topic H, Probability and Statistics, in their course.

Economics II B — 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.

A student may not include both Engineering I and Civil Engineering IM in his course.

A student who passes both Economics II E and Economic History I may be credited with one Part I subject towards the degree of Bachelor of Mathematics.

4. Permission will normally be given for the inclusion in a student's course of subjects which are pre-requisites or co-requisites of subjects appearing in the schedules.
REQUIREMENTS FOR THE DIPLOMA IN
COMPUTER SCIENCE

1. In these requirements, unless the contrary intention appears, “the Faculty Board” means the Faculty Board of the Faculty of Mathematics and “the Board” means the Board of Studies established to supervise the course of the Diploma in Computer Science.

2. An applicant for registration as a candidate for the diploma shall:
   (i) have satisfied all the requirements for admission to a degree in the University of Newcastle, or
   (ii) have satisfied all the requirements for admission to a degree in another University approved for this purpose by the Board, or
   (iii) hold other qualifications approved for this purpose by the Senate on the recommendations of the Board and the Faculty Board.

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

4. An applicant for registration as a candidate for the diploma may be granted standing on conditions to be determined by the Board of Studies.

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

6. (a) Before enrolling in a subject, a candidate shall have passed in any pre-requisite subject or subjects specified in the Schedule of Subjects.
   (b) A candidate shall not enrol in a subject unless he is concurrently enrolled in, or has completed, any co-requisite subject or subjects specified, in the Schedule of Subjects.

7. The Board shall approve a programme of studies for each candidate. This programme may be varied only with the approval of the Board.

8. (a) A candidate may withdraw from a subject in which he has enrolled only by notifying the Secretary of the University in writing.
   (b) A candidate who withdraws from a subject in which he has enrolled shall be deemed to have failed unless he has obtained the written permission of the Dean of the Faculty of Mathematics to withdraw without penalty; the Dean shall consult with the Board before granting such permission.

9. *In order to qualify for the diploma, a candidate shall, in not less than two years of part-time or one year of full-time study, complete satisfactorily a course of studies, comprising 12 units of work chosen from the Schedule of Subjects appended to these requirements provided that the subjects passed:
   (a) shall include all of the subjects in Group I, unless, in order to satisfy provisions of sub-section (c) of this clause, the Board has prescribed for the candidate concerned an alternative subject or subjects for one or more of the subjects in this Group;
   (b) shall not include more than two subjects from Group III;
   (c) shall not include a subject which, in the opinion of the Board, substantially overlaps the content of a course completed or work presented for another degree or diploma; and
   (d) shall be those prescribed in the programme approved by the Board.

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

* Students enrolled in the course in 1972 may complete the course not later than the end of 1974 under the requirements existing in 1972.
SCHEDULE OF SUBJECTS FOR
THE DIPLOMA IN COMPUTER SCIENCE

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>UNITS</th>
<th>PRE-REQUISITE</th>
<th>CO-REQUISITE</th>
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<tbody>
<tr>
<td><strong>Group I — Core Subjects</strong></td>
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<tr>
<td>Programming and Algorithms</td>
<td>1</td>
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<tr>
<td>Data Structures and Programming</td>
<td>1</td>
<td>Programming &amp; Algorithms</td>
<td></td>
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<tr>
<td>EE461 — Computer Structure: Machine and Assembly Language</td>
<td>1</td>
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<td>EE462 — Logical Design &amp; Switching Theory</td>
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<tr>
<td>Numerical Analysis</td>
<td>1.5</td>
<td>Mathematics II Topic F</td>
<td>Programming &amp; Algorithms</td>
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<tr>
<td>Commercial Data Processing</td>
<td>1.5</td>
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<tr>
<td><strong>Group II — Electives</strong></td>
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<td>Subjects or part of</td>
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<td>subjects offered in</td>
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<td>other courses and</td>
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<td>deemed by the Board</td>
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<td>to computer scientists.</td>
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<td>subjects will be</td>
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<td>determined by the Board</td>
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<td>As specified in other courses.</td>
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<tr>
<td><strong>Group III — Other Subjects</strong></td>
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<td>Subjects approved by</td>
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<tr>
<td>Group I or Group II.</td>
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<td>As specified in other courses.</td>
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* This pre-requisite may be relaxed with the consent of the Dean.
** It is intended that eventually subjects will be listed under Group II.
GROUP I — CORE SUBJECTS

Texts:

The Art of Computer Programming
Vol. I: Fundamental Algorithms
Vol. II: Semi-numerical Algorithms
 Donald E. Knuth
(Addison-Wesley, 1968, 1969)

References:

Data Structures: Theory and Practice
 A. T. Bertziss
(Academic Press, 1971)

Computer Organization and Programming
 C. William Gear
(McGraw-Hill, 1969)

Programming Languages: History and Fundamentals
 Jean E. Sammet
(Prentice-Hall, 1969)

A View of Programming Languages
 B. A. Galler & A. J. Perlis
(Addison-Wesley, 1970)

COMPUTER STRUCTURE: MACHINE AND ASSEMBLY LANGUAGES (EE461)

Basic computer elements and peripherals, representation and organization of information, number systems and arithmetic, logical operations. Hardware components, processor structure, addressing modes and instruction set, machine-language programming, subroutines, traps and interrupts, use of the stack. Assembly: pseudo-ops, macros, recursion and re-entrancy, relocation, linking and loading. System software: assemblers, linkers, loaders, dumper, interpreters, simulators, compilers.

Lectures will be supplemented with practical assignments using the PDP-11 and ICL 1904a computers.

Pre-requisite: Mathematics I or consent of lecturer.

Text:

To be decided.

References:

Introduction to Computer Organization and Data Structures
 H. S. Stone
(McGraw-Hill, 1972)

Computer Organization and Programming
 C. W. Gear
(McGraw-Hill, 1969)

Systems Programming
 J. J. Donovan
(McGraw-Hill, 1972)

PDP-11 Handbook

GROUP I — CORE SUBJECTS

LOGICAL DESIGN AND SWITCHING THEORY (EE462)

(Second half year)

A course of lectures, tutorial, and practical work.

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

Pre-requisite: Mathematics I. Also EE461 is recommended but not mandatory.

Co-requisite: EE425 complements this course but is not mandatory.

Text:

Computer Logic Design
 M. M. Mano
(Prentice-Hall, 1972)

References:

Introduction to Switching Theory and Logical Design
 F. J. Hill & G. R. Peterson
(Wiley, 1968)

Digital Electronics with Engineering Applications
 T. P. Sifferlen & V. Vartanian
(Prentice-Hall, 1970)

Theory and Design of Digital Computers
 Douglas Lewis
(Nelson, 1972)

NUMERICAL ANALYSIS

Finite difference approximations to derivatives; Gauss' elimination method; iterative point methods — Jacobi and Gauss-Seidel; convergence, stability and systematic iterative methods. Method of characteristics; matrix inversion methods and linear algebra.


Text:

Algol Programming Manual
 International Computers Ltd.

References:

A First Course in Numerical Analysis
 A. Ralston
(McGraw-Hill, 1965)

Elementary Numerical Analysis
 S. D. Conte
(McGraw-Hill, 1965)
COMMERCIAL DATA PROCESSING

A course of two hours of lectures per week throughout the year.

Basic concepts of file handling and file maintenance, including file creation and processing.

Flow charting; file merging and updating of transactions; tape blocking and buffering. General run types including editing, searching and sorting. Direct access versus serial; random or sequential organisation. Recom programme techniques; verifying programme accuracy; table lookup; program documentation and use of test data.

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

References:


Cobol Simplified — M. V. Farina (Prentice-Hall, 1968)

1900 Series Cobol Manual — International Computers Ltd.


Cobol Programming — J. I. Watters (Heinemann, 1970)

GROUP II — ELECTIVES

OFFERED BY DEPARTMENT OF MATHEMATICS

Details of these subjects will be found where indicated below.

Mathematical Logic — Mathematics III Topic O, see page 91

Operations Research (Deterministic Models) — Mathematics III Topic U, see page 95

Information Theory — Mathematics III Topic Y, see page 97

Graph Theory — Mathematics IV, see p. 110

Stochastic Models in Operations Research — Mathematics IV, see p. 104

OFFERED BY DEPARTMENT OF ELECTRICAL ENGINEERING

COMPUTER-AIDED ANALYSIS OF POWER SYSTEMS (EE516)

(Not offered in 1973)

Application of digital computers to the analysis of power systems, with emphasis on loss and fault calculations, and optimization.

Text:


(McGraw-Hill, 1968)

COMPUTER OPERATING SYSTEMS (EE463)

(First half year)

Functions of an Operating System. Multiprogramming and multi-access systems. Input-output control, file management. Multiprocessor systems. The user interface.

Pre-requisite:

EE461 (may be co-requisite subject to consent of lecturer)

Text:

Computer Operating Systems — D. W. Barron

(Chapman & Hall, 1971)

Reference:

Systems Programming — J. J. Donovan

(McGraw-Hill, 1972)
COMPILERS, ASSEMBLERS AND INTERPRETERS (EE464)
(Second half year)


Pre-requisite:
EE461

Co-requisite:
Data Structures and Programming (Mathematics) or consent of lecturer

Text:
To be decided.

References:
- Introduction to Computer Organisation and Data Structures H. S. Stone (McGraw-Hill, 1972)

AUTOMATA AND COMPUTING MACHINES (EE566)
(Second half year)

This is a course of lectures and tutorial work giving an introduction to the theory of finite and infinite computation, and to logic machines.

Pre-requisite:
Mathematics I

References:
- Finite State Models for Logical Machines F. Hennie (John Wiley, 1968)
- Brains, Machines and Mathematics Michael Arbib (McGraw-Hill, 1964)
- Computation (Finite and Infinite Machines) M. Minsky (Prentice-Hall, 1967)

GROUP II ELECTIVES

PATTERN RECOGNITION (Not offered in 1973) (EE565)
A course of lectures and tutorial work, with some laboratory use of the computer in pattern recognising systems. Theory of trainable pattern-classifying systems; Fourier-optical methods. Machines that learn with and without a teacher. Current research results obtained in the department, will be included.

Pre-requisite:
Mathematics IIB

References:
- Pattern Recognition L. Uhr (Wiley, 1966)
- Decision-making Processes in Pattern Recognition G. Sebestyen (Macmillan, 1962)

OPTIMIZATION TECHNIQUES (Not offered in 1973) (EE443)
A course including lectures, tutorial and computer analysis. Mathematical background to optimization. Comparison of optimization methods; engineering applications—such as to problems of identification, control, pattern recognition and resource allocation.

References:
- Introduction to Optimization Techniques (Fundamentals and Applications of Nonlinear Programming) M. Aoki (Macmillan, N.Y., 1971)
- Optimization Theory with Applications D. Pierre (Wiley, 1969)

COMPUTER PROCESS CONTROL (Not offered in 1973) (EE567)
Modelling the automated process—physical and economic models. Optimization of both well defined and poorly defined processes. Computer simulation languages. Analog computation.

References:
- Computer Simulation for Engineers R. E. Stephenson (Harcourt, Brace & Jovanovich, 1971)
AUTOMATIC CONTROL (Also see ME361) (EE341)
(First half year)
A course of lectures, tutorial, and laboratory work.
Mathematical models of systems and components: linear differential
equations, block diagrams, Laplace transforms, state-space formulation.
Transient response: characteristic roots, transition matrix, system
stability. Forced response: transfer functions, impulse and step responses,
input-output stability, steady-state behaviour. Feedback and compensation:
effects of feedback on characteristic roots, root-locus technique, Nyquist
stability criteria, series and feed-back compensation.

Pre-requisite:
Mathematics IIB or consent of lecturer.

Texts:
To be decided.

References
Automatic Control Engineering ... ... Raven
(McGraw-Hill)
Linear Control Systems ... ... Melsa & Schultz
(McGraw-Hill)
Fundamentals of Automatic Control ... ... Gupta & Hasdorff
(Wiley)
Modern Control Engineering ... ... Ogata
(Prentice-Hall)
Notes for a Second Course in Linear Systems ... ... Desoer
(Van Nostrand Reinhold)

MODERN CONTROL (Linear Optimal Control Theory) (EE441)
(First half year)
The development of the linear optimal regulator theory via Hamilton-
Jacobi theory, its engineering properties and applications to related control
problems such as the tracking problem, the singular control problem, and
control problem with input disturbances; methods for solving suboptimal
systems: methods for solving Riccati equations.

Pre-requisite:
EE341 and EE342.

Texts:
Linear Optimal Control ... ... B. D. Anderson & J. B. Moore
(Prentice-Hall, 1971)

MODERN CONTROL
(Nonlinear Optimal Control Theory) (EE442)
(Second half year)
A course of lectures, tutorial and laboratory work, including computer
analysis covering the general area of Optimal Control Theory and in
particular Dynamic Programming, the Calculus of Variations and the
Pontryagin's Minimum Principle and various iterative numerical techniques
for finding optimal controls and trajectories.

Pre-requisite:
EE341 and EE342.

Texts:
Optimal Control Theory ... ... D. R. Kirk
(Prentice-Hall, 1971)

Reference:
Optimal Systems Control ... ... A. P. Sage
(Prentice-Hall, 1968)
GROUP II — ELECTIVES

OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

Details of these subjects will be found where indicated below.

Operations Research — Deterministic Models — (ME 487), see p. 136
Operations Research — Probabilistic Models — (ME 488), see p. 137
Operations Research — Applications in Industry — (ME 489), see p. 137
Mathematical Programming — (ME 404), see p. 134

OFFERED BY DEPARTMENT OF COMMERCE

SYSTEMS ANALYSIS AND DESIGN

A course of two hours of lectures per week throughout the year.

Basic approach to planning for a computer; systems concepts and theory. Pre-installation planning; documenting current applications; design of new applications; conversion problems and implementation; programme development; testing of programmes; programme documentation.

Case studies will be used extensively through the course.

References:

Practical Systems Analysis .... A. Chandor, J. Graham & R. Williams (Rupert, Hart & Davis, 1969)


Basic Training in Systems Analysis .... A. Daniels & D. Yeates (Pitman, 1969)

Management Systems


Systems Analysis: A Diagnostic Approach .... Van Court Hare (Harcourt, Brace & World, 1967)


Computer Usage/Applications .... E. A. Weiss (McGraw-Hill, 1970)

GROUP III SUBJECTS

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

OFFERED BY DEPARTMENT OF MATHEMATICS

Details of these subjects will be found where indicated below.

Probability and Statistics — Mathematics III Topic R, see p. 93
Asymptotic Methods in Analysis — Mathematics IV, see p. 102
Topics in Finite Mathematics — Mathematics IV, see p. 100
Random and Restricted Walks — Mathematics IV, see p. 101
Signal Detection — Mathematics IV, see p. 99
Stochastic Processes — Mathematics IV, see p. 105
Combinatorial Configurations — Mathematics IV, see p. 108

OFFERED BY THE DEPARTMENT OF COMMERCE

Details of the following will be found in the Economic and Commerce Faculty Handbook.

Principles of Management

OFFERED BY DEPARTMENT OF ELECTRICAL ENGINEERING

Details of the following will be found in the Engineering Faculty Handbook.

EE321-322-323L — Electronics
EE421-423L — Electronics
EE444-445 — Communication Systems

OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

Details of the following will be found in the Engineering Faculty Handbook.

ME449 — Reliability Analysis for Mechanical Systems.

OFFERED BY DEPARTMENT OF PHYSICS

PHYSICS IIIA (ELECTRONICS)

A course comprising 20 lectures and 20 hours of laboratory work covering the following topics: review of the physics of semiconductors; P N junction and junction transistor operation and characteristics; transistor small signal parameters; amplifier design; transistor switching characteristics; pulse and logic circuits; operation of special semiconductor devices.

Pre-requisite:

Physics I
REQUIREMENTS FOR THE DEGREE OF
MASTER OF MATHEMATICS

1. An application to register as a candidate for the degree of Master of Mathematics shall be made on the prescribed form which shall be lodged with the Secretary at least one full calendar month before the commencement of the term in which the candidate desires to register.

2. A person may register for the degree of Master of Mathematics if—
   (a) he is a graduate or graduand of the University of Newcastle or other approved University with Honours in the subject to be studied for that degree; or
   (b) he is a graduate or graduand of the University of Newcastle or other approved University; or
   (c) in exceptional cases he produces evidence of such academic and professional attainments as may be approved by the Senate, on the recommendation of the Faculty Board.

3. In the case of applicants desiring to register under provision 2(b), and (c), the Faculty Board may require the candidates to carry out such work and sit for such examinations as the Board may determine before registration as a candidate for the degree of Master of Mathematics is confirmed.

4. In every case, before permitting an applicant to register as a candidate, the Faculty Board shall be satisfied that adequate supervision and facilities are available.

5. An applicant approved by the Faculty Board shall register in one of the following categories:—
   (i) Student in full-time attendance at the University.
   (ii) Student in part-time attendance at the University.

6. (i) Every candidate for the degree shall be required to submit a thesis embodying the results of an investigation or design, to take such examination and to perform such other work as may be prescribed by the Faculty Board. The candidate may submit also for examination any work he has published, whether or not such work is related to the thesis.

   (ii) The investigation or design and other work as provided in paragraph 6(i) shall be conducted under the direction of a supervisor appointed by the Faculty Board or under such conditions as the Faculty Board may determine.

   (iii) A part-time candidate shall, except in special circumstances—
      i. conduct the major proportion of the research or design work in the University; and
      ii. take part in research seminars within the Department in which he is working.

(iv) Every candidate shall submit annually a report on his work to his supervisor for transmission to the Higher Degree Committee.

(v) Every candidate shall submit three copies of the thesis as provided under paragraph 6(i). All copies of the thesis shall be in double-spaced typescript, shall include a summary of approximately 200 words, and a certificate signed by the candidate to the effect that the work has not been submitted for a higher degree to any other University or institution. The ORIGINAL copy of the thesis for deposit in the Library shall be prepared and bound in a form approved by the University. The other two copies of the thesis shall be bound in such manner as allows their transmission to the examiners without possibility of their disarrangement.

(vi) It shall be understood that the University retains the three copies of the thesis and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act (1968) the University may issue the thesis in whole or in part in photostat or microfilm or other copying medium.

7. No candidate shall be considered for the award of the degree until the lapse of six complete terms from the date from which the registration becomes effective, save that in the case of a candidate who has obtained the degree of Bachelor with Honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, this period may, with the approval of the Faculty Board, be reduced by up to three terms.

8. For each candidate there shall be two examiners appointed by the Senate, one of whom shall be an external examiner.

9. A candidate who fails to satisfy the examiners may be permitted to resubmit his thesis in an amended form. Such a resubmission must take place within twelve months from the date on which the candidate is advised of the result of the first examination. No further resubmission shall be permitted.

* A separate sheet on the preparation and binding of higher degree thesis is available on application.
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Senate to a candidate who has satisfied the following requirements.

2. A candidate for registration for the degree of Doctor of Philosophy shall:
   (i) have satisfied all of the requirements for admission to the degree of master or the degree of bachelor with first or second class honours in the University of Newcastle or a degree from another University recognised by the Senate as having equivalent standing; or
   (ii) have satisfied all of the requirements for admission to the degree of bachelor with third class honours or without honours in the University of Newcastle or a degree from another University recognised by the Senate as having equivalent standing, and have achieved by subsequent work and study a standard recognised by the Senate as equivalent to at least second class honours; or
   (iii) in exceptional cases submit such other evidence of general and professional qualifications as may be approved by the Senate.

3. The Senate may require a candidate, before he is permitted to register, to undergo such examination or carry out such work as it may prescribe.

4. A candidate for registration for a course of study leading to the degree of Ph.D. shall:
   (i) apply on the prescribed form at least one calendar month before the commencement of the term in which he desires to register; and
   (ii) submit with his application a certificate from the Head of the Department in which he proposes to study stating that the candidate is a fit person to undertake a course of study or research leading to the Ph.D. degree and that the Department is willing to undertake the responsibility of supervising the work of the candidate.

5. Before being admitted to candidature, an applicant shall satisfy the Senate that he can devote sufficient time to his advanced study and research.

6. Subsequent to registration, the candidate shall pursue a course of advanced study and research for at least nine academic terms, save that any candidate who before registration was engaged upon research to the satisfaction of the Senate, may be exempted from three academic terms.

7. A candidate shall present himself for examination not later than fifteen academic terms from the date of his registration, unless special permission for an extension of time be granted by the Senate.

8. The course, other than field work, must be carried out in a Department of the University, under the direction of a supervisor appointed by the Senate, or under such conditions as the Senate may determine, save that a candidate may be granted special permission by the Senate to spend a period of not more than three academic terms in research at another institution approved by the Senate.

9. Not later than three academic terms after registration the candidate shall submit the subject of his thesis for approval by the Senate. After the subject has been approved it may not be changed except with the permission of the Senate.

10. A candidate may be required to attend a formal course of study appropriate to his work.

11. On completing his course of study every candidate shall submit a thesis which complies with the following requirements:
   (i) The greater proportion of the work described must have been completed subsequent to registration for the Ph.D. degree.
   (ii) It must be a distinct contribution to the knowledge of the subject.
   (iii) It must be written in English or in a language approved by the Senate and reach a satisfactory standard of literary presentation.

12. The thesis shall consist of the candidate's own account of his research. In special cases work done conjointly with other persons may be accepted provided the Senate is satisfied on the candidate's part in the joint research.

13. Every candidate shall be required to submit with his thesis a short abstract of the thesis comprising not more than 300 words.

14. A candidate may not submit as the main content of his thesis any work or material which he has previously submitted for a University degree or other similar award.

15. The candidate shall give in writing three months' notice of his intention to submit his thesis and such notice shall be accompanied by the appropriate fee.

16. Four copies of the thesis shall be submitted together with a certificate from the supervisor that the candidate has completed the course of study prescribed in his case and that the thesis is fit for examination.

17. The thesis shall be in double-spaced typescript. The original copy for deposit in the Library shall be prepared and bound in a form approved by the University. The other three copies shall be bound in such manner as allows their transmission to the examiners without possibility of disarrangement.
18. It shall be understood that the University retains four copies of the thesis and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act (1968) the University may issue the thesis in whole or in part in photostat or microfilm or other copying medium.

19. The candidate may also submit as separate supporting documents any work he has published, whether or not it bears on the subject of the thesis.

20. The Senate shall appoint three examiners of whom at least two shall not be members of the teaching staff of the University.

21. The examiners may require the candidate to answer, viva voce or in writing, any questions concerning the subject of his thesis or work.

22. The result of the examination shall be in accordance with the decision of a majority of the examiners.

23. A candidate permitted to re-submit his thesis for examination shall do so within a period of twelve months from the date on which he is advised of the result of the first examination.

**Requirements for the Degree of Doctor of Science**

1. The degree of Doctor of Science may be awarded by the Council, on the recommendation of the Senate, for an original contribution or contributions of distinguished merit adding to the knowledge or understanding of any branch of learning with which the Faculty is concerned.

2. An applicant for registration for the degree of Doctor of Science shall hold a degree of the University of Newcastle or a degree from another University recognised by the Senate as being equivalent or shall have been admitted to the status of such a degree.

3. The degree shall be awarded on published work although additional unpublished work may also be considered.

4. Every candidate in submitting his published work and such unpublished work as he deems appropriate shall submit a short discourse describing the research embodied in his submission. The discourse shall make clear the extent of originality and the candidate’s part in any collaborative work.

5. An applicant for registration for the degree shall submit in writing to the Secretary a statement of his academic qualifications together with:—

   (a) four copies of the work, published or unpublished, which he desires to submit; and

   (b) a Statutory Declaration indicating those sections of the work, if any, which have been previously submitted for a degree or diploma in any other University.

6. The Senate shall appoint three examiners of whom at least two shall not be members of the teaching staff of the University.

7. The examiners may require the candidate to answer, viva voce or in writing, any questions concerning his work.

8. The result of the examination shall be in accordance with the decision of a majority of the examiners.

* In these requirements, the term “published work” shall mean printed in a periodical or as a pamphlet or as a book readily available to the public. The examiners are given discretion to disregard any of the work submitted if, in their opinion, the work has not been so available for criticism.
ALGEBRA — Mr. R. F. Berghout is pursuing some topics in ring theory, making use of the theory of radicals, and is also engaged in the extension of this theory to additive categories.

Associate Professor W. Brisley is working on some problems occurring in the laws defining certain varieties of groups, the subsequent lattice of sub-varieties of given varieties, and the location of generating critical groups for varieties of groups.

BASIC BIOLOGICAL FORCES — Dr. E. R. Smith is studying the role of van der Waals and related forces in the stabilization of biological objects and colloids. He is also interested in the stability of the myosin lattice in striated muscle.

CHEMICAL KINETICS — Dr. D. L. S. McElwain is working on the mathematical modelling of nonequilibrium phenomena in gases, using the Master Equation approach. A stochastic theory of the dissociation of diatomic gases and exchange reactions is being investigated.

COMBINATORIAL THEORY AND OPERATIONS RESEARCH —

Dr. Jennifer Wallis has been working on Hadamard matrices and other specialised matrices used by experimental research workers, electrical engineers and by scientists using artificial satellites. She is also working on computing techniques in combinatorial problems, on problems involving rostering and scheduling, and cyclotomy.

Dr. W. D. Wallis is carrying out research in the classification of graphs by their automorphism groups and on graph factorization. He is also working on rostering and scheduling problems.

DIFFERENTIAL EQUATIONS — Dr. J. G. Couper has been working on the geometric theory of autonomous systems of ordinary differential equations.

Dr. L. Janos is working in transformation theory of second order differential equations of the form $y'' + q(x)y = 0$ and its connection with fixed point theory.

DYNAMIC OCEANOGRAPHY — Dr. W. C. Summerfield is working on the interactions of the various oceanic motions with continental boundaries. In particular, he is examining the resonance properties of the continental shelf region.

ENVIRONMENTAL STUDIES — Professor H. M. Lieberstein is considering a range of problems including estuary models.

FLUID DYNAMICS — Dr. W. T. F. Liu is concerned with flow problems involving free boundaries.

FUNCTIONAL ANALYSIS — Dr. J. R. Giles is involved in determining properties of Banach spaces which can be derived from relations between the points of the space and their support functionals. In particular, he is examining differentiability properties of the norm. He is also working on the development of the theory of algebra and numerical range to locally multiplicatively convex topological algebras.

Dr. W. Ficker and Mr. C. J. Ashman are working in measure theory, particularly, in some problems on classes of null sets.

GENERAL TOPOLOGY — Dr. L. Janos is working in dimension theory on problems of metric characterization of zero-dimensionality.

GEOMETRY — Dr. P. K. Smrz is working on application of the theory of continuous groups and fibre bundles to studies of the mathematical properties of space-time continuum, especially in relation to its spinor structure.

INFORMATION THEORY — Professor R. G. Keats is continuing to work in co-operation with research scientists at the Weapons Research Establishment who are active in the study of signal processing. This work, which is supported by a grant from the Department of Supply, involves the study of non-linear systems with stochastic inputs.

MATHEMATICAL PHYSIOLOGY — Professor H. M. Lieberstein is continuing his work on a mathematical model of electrically active cells and is investigating the advantages of the coiled cochlea in therian animals, the latter being an advanced vibration problem.

NUMBER THEORY — Dr. T. K. Sheng studies the structure of humanly manageable numbers.

Dr. Jennifer Wallis is studying difference sets and their application in combinatorial theory and operations research.

NUMERICAL ANALYSIS AND COMPUTING — Dr. A. J. Guttmann is interested in methods of function approximation, particularly from the viewpoint of using a linear differential equation representation.

Professor H. M. Lieberstein is studying the use of sequences in the solution of stationary boundary-value problems to approximate the steady-state solution of time-dependent problems without specification of initial values.

Associate Professor I. L. Rose is investigating problems in numerical analysis and mathematical aspects of porous conduits.

PARTIAL DIFFERENTIAL EQUATIONS — Professor H. M. Lieberstein is studying the weakening of the sense of uniqueness for boundary value problems so that physical phenomena are better posed.
STATISTICAL MECHANICS — Dr. A. J. Guttmann is working on the theory of equilibrium critical phenomena. He is particularly interested in the analysis of power series expansions which are frequently used to study systems exhibiting phase transitions.

Dr. E. R. Smith is working on the theory of nonhomogeneous systems and the theory of liquid crystals.

Dr. W. P. Wood is investigating the dynamical behaviour of long chain molecules in solution.

STATISTICS — Dr. W. D. Wallis is working on the theory and application of Room square designs.

TRANSPORTATION PROBLEMS — Dr. R. J. Vaughan is continuing his work in the application of mathematics to traffic engineering, accidents — in particular, traffic accidents — transportation planning, urban geography, industrial and production problems.