GENERAL SECTION

CONSULT THE CALENDAR FOR:

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

PREFACE

May I first welcome all those students who have enrolled, or are contemplating enrolling, in this new Faculty of Mathematics. I assure you that the staff of the Faculty will always be ready to help with your proposed course and to discuss other academic matters with you.

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

Although Faculties of Mathematics are not uncommon overseas, the Faculty of Mathematics at the University of Newcastle is the first in Australia.

In constituting this Faculty the Council of the University recognised the central role of mathematics in most Universities, and especially in Newcastle.

The Senate, before recommending the proposal to Council, had considered very carefully two crucial questions:

1. how best can the needs of students requiring studies in mathematics, supplementary and complementary to their principal subject of study, be met?
2. how best can the needs of students reading mathematics as their major discipline, be met?

Senate concluded that the broad applicability and servicing aspects of mathematics constituted the strongest argument for the location of mathematics in an independent faculty. Such a faculty would be able to arrange appropriate joint degree courses emphasising these areas of application. The needs of the student specialising in mathematics would also be best met by an independent faculty.

This handbook details the manner in which the Faculty of Mathematics proposes to implement the wishes of Council and Senate.

The needs of students whose interests lie in the application of mathematics to other fields will be met by the provision of combined degrees, not only with physical sciences but also with a variety of other disciplines.

The application of mathematics to physical problems has, of course, been well established for centuries, but mathematics is now used in a large number of other endeavours, and this number is rapidly increasing. This wide spectrum of applications is reflected in the membership of the Faculty Board on which almost all departments of the University are represented.

The needs of students who wish to specialise in mathematics are to be met not only by the provision of topics in the conventional disciplines of pure mathematics, applied mathematics and statistics, but also by the provision of topics in computing science, operations research and other aspects of modern applied mathematics. It is confidently expected that the number of topics offered will increase as the University expands. Summaries of all topics offered in 1971 appear in this handbook.

Finally, may I encourage you to take an active part in other facets of University life. You should find there is time available for these general activities without their interfering with your studies.

R. G. KEATS
Dean
Faculty of Mathematics
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PRINCIPAL DATES 1971

JANUARY

1 Friday Public Holiday — New Year's Day
15 Friday Last day for lodgement of Re-Enrolment Applications — Old Students
18 Monday Deferred Examinations begin
25 Monday Last day for lodgement of Enrolment Applications — New Students
30 Saturday Last Day of Deferred Examinations

FEBRUARY

1 Monday Public Holiday — Australia Day
23 Tuesday Last day for payment of Annual General Services Fee and First Term Fees

MARCH

1 Monday FIRST TERM commences
19 Friday Graduation Day

APRIL

9 Friday to Easter Recess
13 Tuesday Anzac Day

MAY

15 Saturday FIRST TERM ends
PRINCIPAL DATES

JUNE

7 Monday SECOND TERM begins
14 Monday Public Holiday — Queen's Birthday
18 Friday Last day for payment of Second Term Fees
     Last day for acceptance of applications for examinations.

AUGUST

14 Saturday SECOND TERM ends

SEPTEMBER

6 Monday THIRD TERM begins
17 Friday Last day for payment of Third Term Fees

OCTOBER

4 Monday Public Holiday — Six Hour Day
29 Friday Third Term Classes Cease

NOVEMBER

6 Saturday THIRD TERM ends
     Annual Examinations begin
27 Saturday Annual Examinations end

1972

FEBRUARY

28 Monday FIRST TERM begins

FACULTY OF MATHEMATICS

Dean
Professor R. G. Keats

Sub-Dean
Associate Professor I. L. Rose

MATHEMATICS

Professor
R. G. Keats, B.Sc., Ph.D.(Adel.), F.A.S.A.

Associate Professor
I. L. Rose, B.E.(Syd.), Ph.D.(N.S.W.)

Senior Lecturers
W. Brisley, B.Sc.(Syd.), M.Sc.(N.S.W.), Ph.D., Dip.Ed.(N.E.)
W. Ficker, Prom.Mat., C.Sc., RNDr(Comenius)
I. R. Giles, B.A.(Syd.), Ph.D.; Dip.Ed.(Syd.)
J. A. Lambert, B.Sc.(Syd.), M.Sc.(N.S.W.)
W. T. F. Lau, M.E.(N.S.W.), Ph.D.(Syd.), M.A.I.A.A.
W. D. Wallis, B.Sc., Ph.D.(Syd.)

Lecturers
R. F. Berghout, M.Sc.(Syd.)
J. G. Couper, B.Sc., Ph.D.(N.E.)
M. J. Hayes, B.A.(Cantab.)
T. K. Sheng, B.A.(Marian Coll.), B.Sc.(Malaya & Lond.), Ph.D.(Malaya)
Jennifer Wallis, B.Sc.(N.S.W.), M.Sc., Ph.D.(La Trobe)

Senior Tutors
C. J. Ashman, B.A., Litt.B.(N.E.)
G. W. Southern, B.A.(N.S.W.)

Tutors
Winifred Frost, B.A.
J. W. Lloyd, M.Sc.,
G. S. Martin, B.A.(N.S.W.)
E. V. Petersons, B.Sc.(Syd.)

Secretary
Miss K. Wood

Stenographer
Mrs. R. Mills

Assistant
B. J. Stokes, B.Sc.
ADMINISTRATIVE STAFF

Vice-Chancellor and Principal

Vice-Principal and Deputy Vice-Chancellor
Professor B. Newton-John, M.A.(Cantab.)

Deputy Vice-Chancellor
Professor J. A. Allen, M.Sc.(Qld.), Ph.D.(Bristol), F.R.A.C.I.

Personal Assistant to Vice-Chancellor
A. Nell Emanuel, B.A.(N.S.W.)

BURSAR'S DIVISION

Bursar
L. W. Harris, A.A.S.A., A.C.A.A., A.B.I.A.

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

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

Assistant Bursar — Staff
R. J. Goodbody

SECRETARY'S DIVISION

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

Student Administration
J. D. Todd, B.Com., A.A.S.A.
P. H. Beckett, B.A.(Syd.)

Examinations
Glennie Jones, B.A.(N.S.W.)

Faculty Secretariat
J. S. Boydell, B.A.(Cantab.)
T. G. Chapman, B.A.(Syd.)
D. L. Farmer, B.Sc., Dip.Ed.(Syd.)

Publications and Publicity
J. W. Armstrong
E. Joan Bale, B.A.(N.S.W.)

Statistics and Systems
T. R. Rodgers, B.A.

PLANNER'S DIVISION

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

Assistant Planner
A.A.I.L.A.

Assistant Staff Architects
W. J. Crook, B.Arch.(N.S.W.), A.R.A.I.A.
A. Lee, A.S.T.C.

Staff Engineer
ADMINISTRATIVE STAFF

STUDENT COUNSELLING UNIT

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

Student Counsellor
B. E. Hazell, M.A.(Syd.)

Assistant Student Counsellor

APPOINTMENTS OFFICE

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

COMPUTER CENTRE

Director

Programmers
I. R. Beaman, B.Sc.(N.S.W.), Dip.Ind.Eng.
J. Carpenter, B.E.(Melb.)

THE LIBRARY STAFF

University Librarian
E. Flowers, M.A.(Syd.), A.L.A.A.

Assistant University Librarian (Technical Services)
M. Elizabeth Guilford, B.A.(N.E.), A.L.A.A.

Assistant University Librarian (Reader Services)
Joan E. Murray, B.A.(N.E.), A.L.A.A.

Acquisitions Librarian
Barbara R. Cook, B.A.; Dip.Lib.(N.S.W.)

Serials Librarian
B. Mitcheson, B.A., A.L.A.A.

Assistant Librarians
E. Elizabeth Cook, B.A.(Syd.), A.L.A.A.

Graduate Library Staff
Patricia E. T. Alexander, B.A.; Dip.Lib.(N.S.W.)
G. R. Baxter, B.A.
Janet May Brice, B.A.(N.S.W.)
L. Faidiga, B.A.
Anna M. Geyl, B.Sc.
Helen Hart, B.A.
Jane M. Kandiah, B.A.
Winifred Murdoch, B.Sc.(N.E.)
Mary E. Rabbitt, B.A.(N.S.W.)
I. Walsh, B.A.(W.Ont.)
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 3095 in 1970.

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 will be given on the Shortland Campus in 1971.

The University is governed by a Council of twenty-three members of whom one, the Chancellor, acts as chairman. The Council comprises representatives of the University staff, Convocation, the undergraduates, 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 principal academic body in the University is the Senate comprising the Vice-Chancellor, Professors, a representative of each of the Faculty Boards and certain other ex officio members. Teaching and research in each Faculty are supervised by a Faculty Board consisting principally of the permanent academic staff of the Departments in the Faculty.
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>English</th>
<th>Greek</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<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</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 a 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 con­
cerned, 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.

PRE-REQUISITES

Although pre- requisites 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 1 — Second level Short Course Mathematics. English 1 — Second level English. French 1 — Second level French.</td>
</tr>
<tr>
<td>ECONOMICS AND COMMERCE</td>
<td>There is no compulsory pre-requisite for admission but students entering the Faculty are advised to have passed mathematics at the N.S.W. Higher School Certificate examination at least at the second level short course standard or to have achieved an equivalent standard in mathematics.</td>
</tr>
<tr>
<td>MATHEMATICS</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>SCIENCE</td>
<td>Second level Short Course Mathematics and Science.</td>
</tr>
</tbody>
</table>
PROCEDURES

ENROLMENT

All documents relating to enrolment are obtainable from the Student Records Office, Room G.63, Building “A” Shortland site.

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

All intending students in the 1971 academic year will be required to lodge an “Application for Admission” with the Student Records Office before 5.00 p.m. on Monday, 25 January, 1971.

Students proposing to attempt the University of Sydney Matriculation Examination in February 1971 should lodge an “Application for Admission” as set out above. Details of the subjects and levels proposed to be offered for examination should be indicated on the application.

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.

PERSONS RE-ENROLLING IN UNDERGRADUATE COURSES

Undergraduates re-enrolling will be required to complete an enrolment form and lodge it with the Student Records Office on or before Friday, 15 January, 1971.

Students awaiting deferred or special examination results must lodge their enrolment form within one week of the publication of the 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 his term address.

CANDIDATES FOR POSTGRADUATE DIPLOMA COURSES

DIPLOMA IN APPLIED PSYCHOLOGY

Intending candidates will be required to complete an Application Form to Register as a candidate for the Postgraduate Diploma in Applied Psychology and lodge it with the Student Records Office on or before Monday, 18 January, 1971.

Each student whose undergraduate studies were undertaken at another University will be required to submit a full transcript of his academic record.

All candidates will be required to attend the University for interview before a decision is made on their Applications for Registration.

All candidates will be advised by letter of the outcome of their applications and those approved for registration will be sent an enrolment form and instructions on how to complete enrolment.

DIPLOMA IN BUSINESS STUDIES

Intending candidates who have completed all the requirements for admission to the degree of Bachelor of Commerce or other degree of the University of Newcastle, or who are graduates of another university, university college or college of advanced education, should complete a Postgraduate enrolment form and lodge it with the Student Records Office on or before Monday, 18 January, 1971.

All other candidates will be required to complete an application to register as a candidate for a Postgraduate Diploma Course and lodge it with the Student Records Office as soon as possible but in any case not later than Monday, 18 January, 1971.

DIPLOMA IN EDUCATION

Intending candidates who have completed all of the requirements for admission to the degree of Bachelor of Arts or Bachelor of Science or Bachelor of Commerce in the University of Newcastle should complete a Postgraduate Diploma enrolment form and lodge it with the Student Records Office on or before Monday, 18 January, 1971.

All other candidates will be required to complete an Application to Register as a candidate for a Postgraduate Diploma course and lodge it with the Student Records Office as soon as possible but in any case not later than Monday, 18 January, 1971.
PROCEDURES

Notices will be displayed on the University Notice Boards giving information as to where and when prospective candidates will be interviewed concerning their studies.

DIPLOMA IN INDUSTRIAL ENGINEERING

Intending candidates will be required to complete an Application Form to Register as a candidate for the Postgraduate Diploma course in Industrial Engineering and lodge it with the Students Records Office on or before Monday, 18 January, 1971.

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

CANDIDATES FOR THE DEGREE OF MASTER OR DOCTOR OF PHILOSOPHY

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 University Cashier together with the appropriate fees on or before Tuesday, 23 February, 1971.

Candidates Registering for the First Time

These persons should complete an "Application for Registration as a Candidate for a Higher Degree" and lodge it with the Student Records Office.

NON-ACCEPTANCE

The student whose enrolment is not accepted will be notified in writing.

LATE ENROLMENTS

(i) Students who are unable to lodge their Application Form or Enrolment Form by the prescribed date, shall make written application to The Secretary for an extension of time. This application must be received by The Secretary on or before Monday, 25 January, 1971 in the case of new students, or Friday, 15 January, 1971 in the case of students re-enrolling, otherwise the University reserves the right not to accept the student's application or enrolment.

(ii) No enrolments will be accepted after 31 March of each academic year without the approval of The Secretary which shall be given only in exceptional circumstances.

(iii) Deferred Examinations

A student who has taken a deferred examination or special examination will be required to lodge an Enrolment Form with the Student Records Office within one week from the day of publication of the examination results.

"SHOW CAUSE" STUDENTS

Notices will be displayed throughout the University during Third Term 1970 indicating procedures to be followed by students who wish to "Show Cause" after failure at the annual examinations.

A letter will be sent to all students who "Show Cause". Those whose re-enrolment is approved will also be sent an enrolment form and details of procedure for student to complete enrolment.

STUDENTS WISHING TO RE-ENROLL AFTER A PERIOD OF EXCLUSION

Students wishing to Re-enrol after a period of exclusion should make an appointment to interview the Dean of the Faculty concerned before Friday, 15 January 1971 and present his case for re-enrolment.

UNIVERSITY SKILLS ASSESSMENT

All new first year students will be required to attend the University for a full day to be notified in the week 22 to 26 February, 1971 for University Skills Assessment.

ENROLMENT IN CORRECT SUBJECTS

Considerable inconvenience is caused to the University and to the student if he reads a subject in which he has not enrolled. It is essential for the student to determine before submitting his Enrolment Form, the subjects he will read for the year.

WITHDRAWAL FROM THE COURSE REGARDED AS FAILURE

Approval to withdraw from a course 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
PROCEDURES

sitting for the examination is regarded as not passing the examination (unless withdrawal has been approved).

A student is required to notify The Secretary of the University in writing of his withdrawal within seven (7) days of the date of withdrawal. 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.

(a) Faculties of Arts, and Economics and Commerce
   Second Friday in Second Term
(b) Faculties of Applied Science, Architecture, Engineering, Mathematics, and Science
   Sixth Monday in Second Term

AMENDMENTS

The following matters are regarded as amendments to course programmes and are required to be documented:

(a) to withdraw completely from a course
(b) to withdraw from a subject or subjects
(c) to substitute one subject for another
(d) to add a subject to existing programme
(e) to transfer from F/T to P/T within degree course
(f) to transfer from P/T to F/T within degree course
(g) to transfer from one degree course to another
(h) to transfer from a degree course in one Faculty to a degree course in another Faculty
(i) if the variation sought is not listed above, please indicate briefly nature of change sought.

NOTES

The student is liable for fees up to the date on which his application to withdraw is received by the University.

When requesting exemption in subject unit(s) or substituting unit(s) within a subject, no Variation Application is required. BUT the Head of the Department concerned must be formally notified in writing.

HOW TO DOCUMENT WITHDRAWALS AND AMENDMENTS

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

It is essential that these variations be completed before 31 March 1971. 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 Application Form.

Variation Application Forms (pink) are available from the Student Records Office.

CHANGE OF ADDRESS

Students are responsible for notifying the Student Records 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 Records Office of a change of address.

The Transport Authorities may challenge a student whose address on his identity token is incorrect.

IDENTITY TOKENS

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 token which will be given to him.

The student should present his fee receipt to the Student Records Office on or after Monday, 8 March, 1971 and he will be given an identity token for 1971.

Students re-enrolling are permitted to use their 1970 identity tokens up to Friday, 5 March, 1971.

Loss of Identity Token

If a student loses his identity token he should pay to the University Cashier, the sum of 50 cents, and present the receipt to the Student Records Office for the purpose of obtaining a replacement token. A delay of approximately ten days is involved in this procedure.
PROCEEDURES

Return of Identity Token

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

Non-Degree Students and Identity Token

Each non-degree student, who does not elect to pay the General Service Fee, will be issued with an identity token appropriately embossed. 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 Records Office, Building “A”, Shortland Site.

The Student’s Identity Token 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 between 18 and 30 years of age 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.

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 class 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) at the rear of the Main Lecture Theatre.
FEES

GENERAL INFORMATION

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

COMPLETION OF ENROLMENT

Enrolment is completed by the payment of fees. Fees should be paid on or before Tuesday, 23 February, 1971. After that, a late fee will apply (see below). Fees will not be accepted after 31 March unless The Secretary's approval to enrol is obtained in writing. This will only be given in exceptional circumstances.

Payment of fees by mail is encouraged. Money Orders should be made payable at the Newcastle University Post Office, 2308. Fees should be paid to the Cashier on the first floor of Building “A” Shortland site. The Cashier's office is open at the following times:

Monday to Friday 9.00 a.m. to 11.00 a.m.
1.00 p.m. to 4.30 p.m.

During enrolment periods the Cashier's hours are extended and details are published in the press and on University Noticeboards.

PAYMENT OF FEES BY TERM

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 on or before Tuesday, 23 February, 1971.

Students paying fees under this arrangement will receive accounts for Second and Third Term fees prior to the commencement of these terms. These fees must be paid within the first two weeks of each term, otherwise late fees will apply.

EXTENSION OF TIME IN WHICH TO PAY FEES

Students who are unable to pay fees by the prescribed date may apply in person to the Vice-Principal for an extension of time to pay fees; special forms are available for this purpose. Applications must state fully the reasons why fees cannot be paid and must be lodged before Wednesday, 19 February, 1971.

FEES

SCHOLARSHIP HOLDERS AND SPONSORED STUDENTS

Students are required to submit authorised enrolment forms together with vouchers or other documentary evidence that fees are covered by a scholarship or will be paid by a sponsor, where this type of financial assistance is received. Where such documentary evidence is not available, students are expected to make payment by the due date to avoid late fees and apply for a refund of fees when the authority required is available.

DATES FOR PAYMENT OF FEES IN 1971

<table>
<thead>
<tr>
<th></th>
<th>Fees payable before or on</th>
<th>$6.00 payable on and after</th>
<th>$10.00 payable on and after</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST TERM</td>
<td>Tuesday February 23</td>
<td>Wednesday February 24</td>
<td>Thursday April 1</td>
</tr>
<tr>
<td>SECOND TERM</td>
<td>Friday June 18</td>
<td>Monday June 21</td>
<td>Monday July 5</td>
</tr>
<tr>
<td>THIRD TERM</td>
<td>Friday September 17</td>
<td>Monday September 20</td>
<td>Monday October 4</td>
</tr>
</tbody>
</table>

* Refer page 31 for other Late Fees.

FAILURE TO PAY FEES

Any student who is indebted to the University and who fails to make a satisfactory settlement of his indebtedness upon receipt of due notice ceases to be entitled to membership and privileges of the University. Such a student is not permitted to register for a further term, to attend classes or examinations, or to be granted any official credentials. The student is not eligible to attend the annual examinations in any subject where any portion of his Course Fees for the year is outstanding by the end of the third week of third term. In very special cases the Vice-Principal may grant exemption from this disqualification upon receipt of a written statement setting out all relevant facts.

FEE ADJUSTMENTS

Should an application to withdraw from a course or a subject be approved, an adjustment of course fees may be made, based on the date the application is received by the University; *fees accrue up to that date.*
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 notifies the termination of 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 notifies termination of a course after the end of the fifth week of term, no refund will be made.

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

The University Administration does not refund any portion of the General Services Fee. However, students withdrawing from courses may enquire of the Union, Sports' Union and Students' Association regarding refund possibilities.

DESIGNATION OF STUDENTS

FULL-TIME STUDENTS

A Full-Time Student is a student who enrols 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.

PART-TIME STUDENTS

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

NON-DEGREE STUDENTS

A Non-Degree Student is a student who is permitted to read 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 reading one subject.

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 University of Newcastle Union for the first time, are required to pay an entrance fee of $12.00.

This fee must be paid by the prescribed time in First Term.

(b) Non-Degree Student

Payment of the General Services Fee by a non-degree student is optional.

A student cannot elect to pay portion of this fee.

UNDERGRADUATE COURSE FEES

<table>
<thead>
<tr>
<th>FEES</th>
<th>Full-Time</th>
<th>Part-Time</th>
<th>Non-Degree Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts, Mathematics, Economics and Commerce</td>
<td>$330 per annum</td>
<td>$198 per annum</td>
<td>$108 per annum</td>
</tr>
<tr>
<td>All other Faculties</td>
<td>$396 per annum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

POSTGRADUATE DIPLOMA COURSE FEES

<table>
<thead>
<tr>
<th>FEES</th>
<th>Full-time</th>
<th>Part-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>$330 per annum</td>
<td>$198 per annum</td>
<td></td>
</tr>
</tbody>
</table>

LATE FEES

Late payment fee

(a) Payable if fees due are not paid within stipulated times approved by the Vice-Chancellor

(b) Plus a further penalty (of $4) if the fees are not paid within an extended time approved by the Vice-Chancellor

(1) Late Re-enrolment fee where a continuing student fails to lodge an enrolment form by the date approved by the Vice-Chancellor

(2) Where a student who has been granted an extension of time in which to pay fees does not do so by the prescribed time, late fees in accordance with (a) and (b) above shall be payable.

(3) When an application to sit for examination is accepted after closing date
OTHER FEES
(1) Deferred examinations, per subject .................. 4
(2) Examination under special supervision, per paper .... 8
(3) Review of examination results, per subject ............ 6
(4) Statement of matriculation status ..................... 6
(5) Laboratory Kits: (per kit) ............................. 8

FEES FOR DEGREE OF MASTER
(a) Research and Thesis
   Registration Fee ....................................... 5
   Course & Supervision Fee (full-time) ......... 138 p.a.
   Course & Supervision Fee (part-time) ....... 93 p.a.
   Final Examination & Graduation Fee .......... 36

(b) Course Work and Dissertation or Formal Study Courses
    (Master of Eng. Sc.)
   Registration Fee ....................................... 5
   Course & Supervision Fee (full-time) ......... 330 p.a.
   Course & Supervision Fee (part-time) ....... 198 p.a.
   Final Examination & Graduation Fee .......... 36

FEES FOR THE DEGREE
DOCTOR OF PHILOSOPHY
Qualifying Examination Fee (if applicable) 6 ........... 15
Registration Fee ....................................... 5
Course & Supervision Fee (full-time) ............. 138 p.a.
Course & Supervision Fee (part-time) ........... 84 p.a.
Final Examination & Graduation Fee ............ 51

6Payable when an examination is prescribed for the assessment of a student prior to registration as a higher degree candidate.

RESUBMISSION OF 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 new appropriate course and supervision fee will be payable on a term basis.

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.

A candidate may not lodge his thesis for examination if fees for the current term have not been paid.

Where a candidate withdraws 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 31). 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 enrols 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.

Re-submission of 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.
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 for which he is reading.

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 (B.01) Shortland Site for the specific purpose of displaying examination timetables and notices concerning all 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.

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.

OWNERSHIP OF STUDENT'S 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 Token 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 token.

The student should present his fee receipt to the Student Records Office on or after Monday, 8 March, 1971 and he will be given an identity token for 1971.

Loss of Identity Token

If a student loses his identity token, he should pay to the University Cashier, the sum of 50c., and present the receipt to the Student Records Office for the purpose of obtaining a replacement token. A delay of approximately ten days is involved in this procedure.

Return of Identity Token

Each student, who during the academic year withdraws completely from his course, will be required to hand his Identity Token to the Student Records Office before leaving the University.
CHANGE OF ADDRESS

Students are responsible for notifying Student Records 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 Student Records Office of a change of address. The Transport Authorities may challenge a student whose address on his identity token is incorrect.

GENERAL CONDUCT

Acceptance as a member of the University implies an undertaking on the part of the student to observe the by-laws and other requirements of the University.

Students are expected to conduct themselves at all times in a seemly fashion. Smoking is not permitted during lectures, in examination rooms or in the University Library. Gambling is forbidden.

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

PARKING OF CARS

On the Tighe's Hill Site the authorities of the Newcastle Technical College are responsible for traffic control and parking, and their regulations, traffic signs, etc., must be obeyed.

At Shortland, all vehicles must be parked in a car park.

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, 18 June, 1971.

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 the examination. 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 $4.00. 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 if any change in address from that given on the Application for Admission to Examinations.

EXAMINATION RESULTS

The official examination results will be posted on the notice board at the top of the main staircase. It is planned to advise each student 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 $6.00 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 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 to the University 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 if the candidate does not pass therein 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 to resolve a doubt. 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

To assist those students who may be unsuited to university study or whose circumstances jeopardise success at study and to deal with those students whose lack of success has a detrimental effect on the work of the course, 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.
ACADEMIC PROGRESS REQUIREMENTS

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 initiate action should he wish to re-enrol. He must interview the Dean of his Faculty in accordance with the time-table announced towards the end of the academic year.

THE LIBRARY

The Library, totalling approximately 170,000 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 are:

<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></td>
<td>(long vacation excepted)</td>
</tr>
<tr>
<td>Saturday</td>
<td>9.00 a.m. to 5.00 p.m.</td>
</tr>
<tr>
<td></td>
<td>(all vacations and holiday weekends excepted)</td>
</tr>
<tr>
<td>Sunday</td>
<td>1.00 p.m. to 5.00 p.m.</td>
</tr>
<tr>
<td></td>
<td>(all vacations and holiday weekends excepted)</td>
</tr>
<tr>
<td>Long vacation:</td>
<td></td>
</tr>
<tr>
<td>Monday, Wednesday, Friday</td>
<td>9.00 a.m. to 5.00 p.m.</td>
</tr>
<tr>
<td>Tuesday and Thursday</td>
<td>9.00 a.m. to 7.00 p.m.</td>
</tr>
</tbody>
</table>

*The Library is closed on public holidays.*
STUDENT COUNSELLING UNIT

The Student Counsellors assist students—past, present and future—in a wide variety of matters. Most students, whatever their academic level, at one time or another need help in dealing with difficulties which arise during the course of their University lives.

A student should not feel that he or she must have a major problem before consulting a Counsellor. Many worries take only a few minutes to clear up, and frequently the Counsellor's function is simply to direct a bewildered student to the right source of information.

Students who are worried about inadequate study methods, personal difficulties, choice of courses or career planning are invited to arrange an appointment with a Student Counsellor.

The S.C.U. is divided into three major divisions, although there is inevitably, overlap between the sections. These are Personal Counselling, Study Skills Training and Research. Apart from individual counselling, courses in an increasing number of areas are run for groups of students.

In 1968 an Appointment Service was established within the S.C.U. and students are invited to register; Students in their final year may expect to receive all available advance information about career opportunities, and all students may register for part-time, casual or vacation employment. Students in the first group will be interviewed and may seek Vocational Guidance if they so desire.

Student Counselling is by now a thoroughly established and widely accepted part of University life throughout Australia, and at this University, approximately one-third of all students utilise it.

STUDY AT THE UNIVERSITY LEVEL

The S.C.U. produced a brief but comprehensive book on this subject in 1967, and this can be obtained at the Bookshop for 40 cents. Although it was produced specifically for the students of Newcastle 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.
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 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 A. J. A. Scott, B.A.(Melb.), Th.L.,
83 Queen's Road,
NEW LAMBERT. Tel. 57 1875

Baptist — The Reverend J. A. Blankley,
42 Kahibah Road,
HIGHFIELDS. Tel. 57 0231

Methodist — The Reverend W. D. Adams, B.A.(Syd.),
B.D.(Melb.)
23 William Street,
HAMILTON. Tel. 614040

Presbyterian — The Reverend H. V. Barratt, B.A.(Syd.),
St. Phillip's Manse,
NEWCASTLE. Tel. 2 2379

Roman Catholic — The Reverend Father L. A. Larkin, B.A.(Syd.),
B.Ed.(Melb.), S.T.B.(Baltimore),
M.A.C.E.,
Catholic Presbytery,
SHORTLAND. Tel. 51 1094

STUDENT LOAN FUND

The Council of the University has established a Student Loan Fund which is managed by a committee under the chairmanship of the Vice-Principal.

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.

OVERSEAS STUDENTS

Overseas students who wish to obtain any information or help are invited to see the Overseas Students' Adviser in the Student Counselling Unit.
UNIVERSITY ORGANISATIONS

THE UNIVERSITY OF NEWCASTLE STUDENTS ASSOCIATION

Included in the General Services Fee of the University is an amount payable to the Students’ Association, a body to which all students of the University belong. The Students’ Association is governed by the Students’ Representative Council (SRC), which is elected each year in September to take office in the following April. The functions of the Students’ Association are many and varied.

The SRC acts as the main liaison body between the student body and the University authorities. Complaints and requests from students may be handled by the Education and Welfare Committee, or by the SRC as a whole when brought to its attention by one of the Faculty or General Representatives. The Education and Welfare Committees are the part of the SRC most students come in contact with. The education side attempts to study the local and national needs of education and to bring these to the attention of the public and the government.

One of the major ways in which the income of the SRC is spent is in grants to affiliated clubs and societies (which include cultural, social, political and religious societies). To this end the Vice-President is the Clubs’ and Societies’ Liaison Officer, and, with his assistant and the Clubs’ and Societies’ Committee, gives such help to these societies as they may seek from time to time.

The SRC is also responsible for publishing the student newspaper “Opus”, the literary magazine “Nimrod” and the Orientation Handbook, which may be seen around the campus at the time of their publication. A weekly “Bulletin” is published to publicise activities of the SRC, the Union and affiliated clubs and societies.

Each year the SRC organises, with assistance from the University and the Union, Orientation Week and other activities designed to help new students adjust to university life. Early in July Autonomy Day is also organised by the SRC — of this nothing need be said than that it is the equivalent of Commem, Foundation Day, or similar activities at other universities.

As the Students’ Association is a constituent member of the National Union of Australian University 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 inter- varsity 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”.

President — Russell R. Schulz
Secretary — Tony Laffan
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, the Sports Union and the Students' Counsellor are contained in the basement of 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.

President — Mr. K. J. Moss, B.E.
Secretary Manager — Mr. W. V. Bridgwater

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:—

ACCOMMODATION

(a) 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.

SPORT

The Amenities Officer, 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.

INSURANCE

The Amenities section on behalf of the Sports Union is responsible for the operation of the Personal Accident Insurance Scheme.
THE UNIVERSITY OF NEWCASTLE
SPORTS UNION

The Sports Union is a student organisation responsible for promotion and control of sporting activities within the University. All students are automatically members of the Sports Union. There are twenty-four affiliated clubs: Athletics, Australian Rules, Badminton, Men's Basketball, Women's Basketball, Cricket, Fencing, Golf, Men's and Women's Hockey, Mountaineering, Men's and Women's Rowing, Rugby Union and Rugby League, Ski-ing, Soccer, Softball, Squash, Surfing, Swimming, Scuba, Table Tennis, Tennis, 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 Amenities office is in the temporary building adjacent to the main University building, and the Sports Union office is on the lower floor of the University Union, next to the SRC office.

President — Professor R. G. Tanner, M.A.(Melb. and Cantab.)
Secretary — Mr. J. A. Fuller, B.A.
Amenities Officer — Mr. H. Bradford

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 N.S.W. Regiment. The current strength of the Company is 150 and is rising.

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 ten days in May
(c) Two weekend bivouacs a year
(d) Parades on Friday nights of two and a half hours duration
(e) Four weekend day parades

The training programme is designed to fit in with vacations, examinations, and deferred examinations and there is practically no commitment in the 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, New Guinea or Vietnam.
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. F. O'Toole
Full-time Staff — WO2 M. Durie
S/Sgt. P. Toohey
CONVOCATION

Convocation consists of persons of or above the age of twenty-one years who are: members or former members of the University Council; graduates of the University or graduates of the University of New England or the University of New South Wales who spent at least three years as students at the Newcastle University College; full-time members of the academic staff and graduate permanent members of the administrative, library and technical staff; and graduates of other Universities, either resident in the Hunter Valley or North Coast areas or approved by Council, who have been admitted as members of Convocation by Council after payment of the fee prescribed by Council.

At least two meetings are held each year, an Annual Meeting during First Term and an ordinary meeting in Third Term.

Convocation elects a Chairman who is called the Warden of Convocation and whose term of office is two years, and a Standing Committee of Convocation consisting of the Warden and twelve other members.

This body, which has the right to discuss and to pronounce an opinion on any matter relating to the University and to communicate directly with either the Council or the Senate, provides a means whereby graduates can remain active in university affairs. Five of the members of the Council are elected by the members of Convocation.

OFFICE BEARERS
Warden — Mr. J. P. Talty, B.D.S.(Syd.)
Secretary — Miss E. M. Kane, B.Com.(N.S.W.)

FACULTY OF MATHEMATICS

CLASSIFICATION OF STUDENTS IN COURSES

CLASSIFICATIONS

1. (i) Full-time students are classified by year (Roman numerals).
   (ii) Part-time students are classified by stage.

2. In the Faculties of Arts, Mathematics, and Science, classification depends on the number of subjects passed.

3. (i) In all other Faculties, classification is determined by enrolment in classifying subject, i.e. by a major subject in a course.
   (ii) If a student enrols in more than one classifying subject, then the year or stage of the lower classifying subject applies.
   (iii) If the student enrols in no classifying subject, then he is classified in the year or stage of the highest classifying subject he has passed.

4. FACULTIES OF ARTS, MATHEMATICS, AND SCIENCE
Students are classified according to the number of subjects passed, i.e.

Full-time
A student stays in Year I until he has passed 3 subjects (Science 4 subjects).
A student stays in Year II until he has passed 4-6 subjects (Science 5-6 subjects).
A student stays in Year III until he has passed 7-9 subjects.
A student is in Year IV when taking Honours.

Part-time
A student stays in Stage I until he has passed 2 subjects.
A student stays in Stage 2 until he has passed 3-4 subjects.
A student stays in Stage 3 until he has passed 5-6 subjects.
A student stays in Stage 4 until he has passed 7-8 subjects.
A student stays in Stage 5 until he has passed 9 subjects.
A student is in Stage 6 when doing Honours.
REQUIREMENTS FOR THE DEGREE OF
BACHELOR OF MATHEMATICS

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. Prerequisites and Corequisites

No candidate may enrol in a subject unless he has satisfied the prerequisites and corequisites 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.

THE HONOURS 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 IIB 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.

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.

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**DEGREE OF BACHELOR OF MATHEMATICS**

**SCHEDULE A — MATHEMATICS SUBJECTS**

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>REMARKS INCLUDING PRE-REQUISITES AND COREQUISITES</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><strong>PART II</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics II A</td>
<td>Prerequisite: Mathematics I</td>
</tr>
<tr>
<td>Mathematics II B</td>
<td>Prerequisite: Mathematics I. This subject is offered to part-time students in 2 parts each of three terms duration.</td>
</tr>
<tr>
<td>Mathematics II C</td>
<td>Prerequisite: Mathematics I; pre- or corequisite: Mathematics II A.</td>
</tr>
<tr>
<td><strong>PART III</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics III A</td>
<td>Prerequisite: Mathematics III A and Mathematics II B.</td>
</tr>
<tr>
<td>Mathematics III B</td>
<td>Pre- or corequisite: Mathematics III A</td>
</tr>
<tr>
<td><strong>PART IV</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IV</td>
<td>Prerequisite: Mathematics III A and Mathematics II B.</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>Physics III A</td>
<td>Prerequisite: Physics II</td>
</tr>
<tr>
<td>Economics III C</td>
<td>Prerequisite: Economics III A</td>
</tr>
<tr>
<td>Psychology III C</td>
<td>Prerequisite: Psychology III A</td>
</tr>
<tr>
<td>Communications and Automatic Control</td>
<td>Prerequisite: Physics I, Mathematics III A and Mathematics III C</td>
</tr>
</tbody>
</table>
DEPARTMENT OF MATHEMATICS

DESCRIPTION OF SUBJECTS

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 pages 66-67 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 prerequisite for entry to each Part II subject given by the Department; in addition some topics will require other topics as a corequisite or prerequisite as shown. Summaries of these topics, text books and reference books appear on pages 68-73 of this handbook.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Corequisite or Prerequisite Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Analysis of metric spaces</td>
</tr>
<tr>
<td>B</td>
<td>Complex analysis</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</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</td>
</tr>
<tr>
<td>H</td>
<td>Probability and statistics</td>
</tr>
<tr>
<td>I</td>
<td>Topic in statistics, e.g. time series</td>
</tr>
<tr>
<td>J</td>
<td>Topic in Applied mathematics, e.g. dynamics</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</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, J, 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 corequisite or prerequisite 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.
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.

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 IIIC is a prerequisite for entry to Mathematics IIIA. Students taking Mathematics IIB are required to study Mathematics IIIA as a corequisite. 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 prerequisites as shown. Summaries of these topics, text books and reference books appear on pages 74-82 of this handbook.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisite</th>
<th>Corequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>General tensors</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Variational methods</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Mathematical logic</td>
<td>F</td>
</tr>
<tr>
<td>P</td>
<td>Differential and integral equations</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Fluid dynamics</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Probability and statistics</td>
<td>H</td>
</tr>
<tr>
<td>S</td>
<td>Geometry</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>Group theory</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>Topic in operations research</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Measure theory and integration</td>
<td>A</td>
</tr>
<tr>
<td>W</td>
<td>Topology</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Galois theory</td>
<td>L</td>
</tr>
<tr>
<td>Y</td>
<td>Topic in applied probability, e.g. information theory</td>
<td>H</td>
</tr>
<tr>
<td>Z</td>
<td>Numerical analysis</td>
<td>F</td>
</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 IIIB
A subject of four lectures and two tutorial hours per week for three terms comprising four topics chosen from the fourteen listed above.

NOTE
In order to pass both Mathematics IIIA and Mathematics IIIB, 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.

TRANSITION ARRANGEMENTS
A student who has passed Pure Mathematics II A, Pure Mathematics II B, Applied Mathematics II A or Applied Mathematics II B may with the permission of the Head of Department be admitted to Mathematics IIIA.

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

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 III A or Pure Mathematics III B, 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 III A or Applied Mathematics III B, 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 1971 appear on pages 83-91 of this handbook.
SUMMARIES OF TOPICS, TEXT BOOKS AND REFERENCE BOOKS

MATHEMATICS I

TOPIC. AN — REAL ANALYSIS — M. J. Hayes


Texts:
Calculus Vol. 1 2nd Edition T. Apostol
OR (Ginn Blaisdell, 1967)
Calculus and Linear Algebra H. S. Wilf
(Harcourt Brace & World Inc., 1966)

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

TOPIC. AL — ALGEBRA — W. D. Wallis

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

Texts:
Calculus Vol. 1 2nd Edition T. Apostol
OR (Ginn Blaisdell, 1967)
Calculus and Linear Algebra H. S. Wilf
(Harcourt Brace & World Inc., 1966)

References:
Linear Algebra S. Lipschutz
(Schaum, 1968)
Group Theory B. Baumslag & B. Chandler
(Schaum, 1968)
Linear Algebra D. Zelinsky
(Academic Press, 1968)
Introduction to Algebra S. Perlis
(Blaisdell, 1966)
Introduction to Modern Algebra N. McCoy
(Allyn & Bacon, 1968)

MATHEMATICS I

TOPIC. CA — CALCULUS — R. F. Berghout


Texts:
Calculus Vol. 1 2nd Edition T. Apostol
OR (Ginn Blaisdell, 1967)
Calculus and Linear Algebra H. S. Wilf
(Harcourt Brace & World Inc., 1966)

References:
Calculus and Analytic Geometry J. R. Britton, R. B. Kriegh
& L. W. Rutland
(Freeman, 1966)
First Year Calculus E. Hille & S. Salas
(Ginn Blaisdell, 1968)
(International Textbook Series)

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

An introduction to computer programming in Fortran; elementary numerical analysis. The writing of successful programmes is a required part of this topic.

Text:
No textbook is prescribed. An outline of Fortran as implemented on the ICL 1900 Series computers will be made available.

References:
Introduction to Numerical Analysis K. E. Fröberg
(Addison-Wesley, 1965)
Numerical Methods for Scientists and Engineers R. W. Hamming
(McGraw-Hill, 1962)
Numerical Analysis F. Scheid
(Schaum, 1968)
1900 Series Fortran (Technical Publication 4088) International Computers Ltd.
PART II TOPICS

TOPIC. A — ANALYSIS OF METRIC SPACES — M. J. Hayes

Real numbers as a complete ordered field, density of rationals. Metric spaces, continuity, uniform continuity. Compactness, connectedness, completeness. Applications to the differential and integral calculus of functions of one real variable. Uniform convergence, and application to differentiation, integration of sequences and series.

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

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

TOPIC. B — COMPLEX ANALYSIS — T. K. Sheng


Texts:
Theory and Problems of Complex Variables .... Murray R. Spiegel
(Schaum, 1964)

Elements of Complex Analysis ................. J. Duncan
(N.Y. Wiley, 1968)

TOPIC. C — CALCULUS AND VECTOR CALCULUS —
R. F. Berghout


Texts:
OR
Advanced Calculus ................................ W. Kaplan
(Addison-Wesley, 1969)

References:
Linear Algebra and Multivariate
Calculus ........................................ G. F. Feeman & N. R. Grabois
(McGraw-Hill, 1970)

Advanced Calculus .............................. H. K. Nickerson, D. C. Spencer
& N. E. Steenrod
(Van Nostrand, 1959)

TOPIC. D — LINEAR ALGEBRA — Jennifer Wallis

Linear spaces, subspaces, span sum of subspaces, linear independence, 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 ........................................ S. Lipschutz
(Schaum, 1968)

References:
Linear Equations and Matrices ............ J. B. Johnstone, G. B. Price
& F. S. Van Vleck
(Addison-Wesley, 1966)

A Survey of Matrix Theory and Matrix
Inequalities ........................................ M. Marcus & H. Minc
(Allyn & Bacon, Boston, 1964)

TOPIC. E — DIFFERENTIAL EQUATIONS AND INTEGRAL
TRANSFORMS — T. K. Sheng


Text:
Elementary Differential Equations and Boundary Value
Problems (Chapters 3, 4, 5, 6, 7, 9) ........ W. E. Boyce &
R. C. DiPrima
(N.Y. Wiley, 1969)
PART II TOPICS

TOPIC, F — NUMERICAL ANALYSIS AND COMPUTING —

Jennifer Wallis


Texts:

Numerical Methods 2 Vols. .... B. Noble (Oliver & Boyd, Edinburgh, 1964)


References:

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

Elementary Numerical Analysis ..... S. P. Conte (McGraw-Hill, 1965)

TOPIC, G — FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS — W. Ficker


Texts:

A First Course in Partial Differential Equations H. F. Weinberger AND

Fourier Series ..... I. N. Sneddon (Blaisdell, 1965)

Reference:

Advanced Calculus .... W. Kaplan (Addison-Wesley, 1965)

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. Tchebichev 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-square, $S^2$ $T$ and $F$ with applications.

Text:


References:

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


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

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

PART II TOPICS

TOPIC. I — TOPIC IN STATISTICS, e.g. TIME SERIES —
W. Feller


Text:

Finite Markov Chains         J. G. Kemeny & J. L. Snell
(Van Nostrand, 1969)

References:

(N.Y. Wiley, 1968)

Finite Mathematical Structures         J. G. Kemeny, H. Mirkil,
J. L. Snell & G. L. Thompson
(Prentice-Hall, 1959)

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

DYNAMICS — J. A. Lambert

This topic provides an introduction to the aims and methods of applied mathematics. Applied mathematics is concerned with the development of mathematical models for various aspects of the physical world. The particular example chosen for this topic is Newtonian mechanics of a particle and of a rigid body. The motion of a particle in one, two and three dimensional Cartesian space under the influence of various types of force will be studied, in particular, uniform force fields and central forces. This is followed by examination of systems of particles, especially the two-dimensional motion of rigid bodies.

Text:

Theoretical Mechanics          Murray R. Spiegel
(Schaum, 1967)

References:

Classical Mechanics        H. Goldstein
(Addison-Wesley, 1950)

Classical Mechanics         D. E. Rutherford
(Addison-Wesley, 1950, 2nd Ed.)

Mechanics                  K. R. Symon
(Addison-Wesley, 1960, 3rd Ed.)

Principles of Mechanics     J. L. Synge & B. A. Griffith
(McGraw-Hill, 1959, 3rd Ed.)
PART III TOPICS

TOPIC M — GENERAL TENSORS — I. L. Rose

Reference systems — dual basis systems. Fundamental tensors $g^{ \alpha \beta}$ and $g_{\alpha \beta}$ and derivatives. Two-dimensional curved surface — Christoffel symbols covariant differentiation — intrinsic differentiation. Special results — orthogonal curvilinear co-ordinates. Riemannian geometry — Riemann-Christoffel tensor. Curvature tensor — geodesics. Differential geometry — helix — surfaces — First Fundamental Form — Second Fundamental Form — curves on surface — principal directions. Codazzi and Gauss equations — total curvature.

Text:

Tensor Calculus
J. Abram
(Butterworths, 1965)

References:

Elements of Tensor Calculus
A. Lichnerowitz
(Methuen, 1962)

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

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

TOPIC N — VARIATIONAL METHODS — I. L. Rose


Text:

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. D. Wallis

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. Certain of the following topics will be discussed briefly: axiomatic arithmetic and Gödel's theorem; geometry: set theory: modal calculi.

Text:

First Order Mathematical Logic
A. Margaris
(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— W. T. F. Lau

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
AND
Linear Integral Equations
W. V. Lovitt
(Freeman, San. Fran., 1968)
(N.Y., Dover, 1950)
PART III TOPICS

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

Introduction: basic equations; potential flow. Two-dimensional motion 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: Joukowski’s transformation; the theorem of Kuti and Joukowski; the Schwarz-Christoffel transformation. Aximetrical motions: Stokes’ stream function; motions involving sources; sinks and doublets.

Texts:

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

Theoretical Hydrodynamics L. M. Milne-Thomson

TOPIC R — PROBABILITY AND STATISTICS — J. A. Lambert

This topic consolidates and extends the study of probability and statistics made in topic H. Items studied include convolutions of random variables, sampling distributions associated with the normal (Gaussian) distribution, point and interval estimation. A study will also be made of some aspects of statistical inference employing the Neyman-Pearson lemma, likelihood ratio tests, Bayesian prior distributions, and the likelihood function. Further items to be examined include regression and analysis of variance.

Text:

Introduction to
Mathematical Statistics R. V. Hogg & A. T. Craig
(Prentice-Hall, 1965)

References:

Mathematical Methods of Statistics H. Cramer
(Princeton, 1946)

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
(Hafner, 1968)

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

Introduction to the Theory of Statistics
2nd Ed. A. M. Mood & F. A. Greybill
(McGraw-Hill, 1963)

Introduction to Probability and
Mathematical Statistics H. G. Tucker
(Academic Press, 1967)

Mathematical Statistics 2nd Ed. S. S. Wilks
(Wiley, 1962)

TOPIC S — GEOMETRY — I. L. Rose


Text:

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

TOPIC T — GROUP THEORY — M. J. Hayes

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-Holder theorem, soluble and nilpotent groups.

Texts:

The Theory of Groups I. D. MacDonald
(Oxford Uni. Press, 1968)

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

Reference:

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

TOPIC III -- OPERATIONS RESEARCH -- W. D. Wallis

The course will introduce certain of the areas of Operations Research and related mathematics. The syllabus will include: two-person zero-sum games; linear programming and the Hitchcock problem; graphs, the travelling salesman problem and nim-type games; networks and flows; queueing theory.

Text:

To be decided.

References:

Programming, Games and Transportation Networks -- C. Berge & A. Ghouila-Houri (Methuen, 1965)
Combinatorial Theory -- M. Hall Jr. (Blaisdell, 1967)
A Guide to Operational Research -- E. Duckworth (Methuen, 1965)
Methods and Models of Operations Research -- A. Kaufmann (Prentice Hall, 1963)
Queues, Inventories and Maintenance -- P. M. Morse (Wiley, 1958)
Monte Carlo Methods -- J. Hammersley & D. Handscomb (Methuen, 1964)
Elementary Mathematical Programming -- R. W. Metzger (Wiley, 1958)
Mathematical Programming -- S. Vajda (Addison-Wesley, 1961)

PART III TOPICS

References (Cont.):

Games and Decisions -- R. D. Luce & H. Raiffa (Wiley, 1957)
Integer Programming and Network Flows -- T. C. Hu (Addison-Wesley, 1969)
Applications of Undergraduate Mathematics in Engineering -- B. Noble (M.A.A. Macmillan, N.Y., 1967)
Great Ideas of Operations Research -- Jagjit Singh (Dover, 1968)

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

Sets and classes of sets, rings, algebras, \( \sigma \)-rings, \( \sigma \)-algebras, monotone classes, generated rings and \( \sigma \)-rings. Measures and outer measures, measures on rings, outer measures, measurable sets, extension of measures, Lebesgue measure, Lebesgue-Stieltjes measure. Measurable functions, combinations of measurable functions, sequences of measurable functions, convergence of measurable functions. Integration, integrable simple functions, sequences of integrable simple functions, integrable functions, Lebesgue and Lebesgue-Stieltjes integral. If time permits, general set functions, Hahn and Jordan decompositions, absolute continuity and the Radon-Nikodym theorem.

Texts:

The Elements of Integration -- R. G. Bartle (N.Y., Wiley, 1966)
A First Course in Integration -- E. Asplund & L. Bungart (Holt, Rinehart & Winston, 1966)

References:

Measure Theory -- P. R. Halmos (Van Nostrand, 1950)
Measure Theory and Integration -- S. K. Berberian (Macmillan, 1955)
PART III TOPICS

TOPIC W — TOPOLOGY — M. J. Hayes


Texts:

Reference:
General Topology ..................................... J. L. Kelley (Van Nostrand, 1955)

TOPIC X — GALOIS THEORY — R. F. Berghout


Text:
Topics in Algebra ..................................... I. N. Herstein (Blaisdell, N.Y., 1965)

References:
Fields and Rings ..................................... I. Kaplansky (Univ. of Chicago, 1969)
Galois Theory ......................................... E. Artin (Univ. of Notre Dame Press, 1944)
A Survey of Modern Algebra ....................... G. D. Birkhoff & S. MacLane (MacMillan, 1953)
Introduction to Field Theory ...................... I. T. Adamson (Oliver & Boyd, 1964)
Structures of Algebra ................................ S. Lang (Addison Wesley, 1967)
Fundamentals of Galois Theory ..................... M. Postnikov (P. Noordhoff, Groningen, Netherlands, 1962)
Oeuvres Mathématiques ............................. E. Galois (Gauthiers-Villars, 1951)

TOPIC W — INFORMATION THEORY — R. G. Keats

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 \( H \) 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.

Texts:

References:
Information Theory & Reliable Communication R. G. Gallagher (Wiley, 1968)
Recent Results in Information Theory .............. S. Kots (Methuen, London, 1966)
Mathematical Foundations of Information Theory A. I. Khinchin (Dover, 1957)
TOPIC: Z — NUMERICAL ANALYSIS AND COMPUTING —

Jennifer Wallis


Texts:

- Numerical Methods 2 Vols. B. Noble
  (Oliver & Boyd, Edinburgh, 1964)

References:

- A First Course in Numerical Analysis A. Ralston
  (McGraw-Hill, 1965)
- Elementary Numerical Analysis S. P. Conte
  (McGraw-Hill, 1965)

FLUID DYNAMICS — W. T. F. Lau

Introduction: basic equations; specifying equations; thermodynamic relations; the tangent gas approximation of Karman, Tsien and Chaplygin; derived equations; vortex theory of Helmholtz and Kelvin; compressible potential motions; hodograph representation. Theory of characteristics: general theory; two-dimensional flow theory. One-dimensional flow: unsteady flow of an ideal fluid; simple waves. Plane steady potential flow: hodograph method: simple waves.

Text:

- Mathematical Theory of Compressible Fluid Flow R. V. Mises
  (Academic Press, 1958)

References:

- High-Speed Aerodynamics (Compressible Flow) E. Carafoli
  (Pergamon Press, 1957)
- Supersonic Flow and Shock Waves R. Courant & K. O. Friedrichs
  (Interscience, 1948)
- Modern Developments in Fluid Dynamics; High Speed Flow 2 Vols. L. Howarth (Ed.)
  (Oxford University Press, 1953)
- Elements of Gas dynamics H. W. Liepmann & A. Roshko
  (John Wiley, 1957)
- Gas Dynamics (English version by G. Kuerti) K. Oswatitsch
  (Academic Press, 1957)
- The Dynamics and Thermodynamics of Compressible Fluid Flow 2 Vols. A. H. Shapiro
  (Ronald Press, 1953)

(Other references can be found in the text book).

ANALYSIS OF NORMED LINEAR SPACES — J. R. Giles

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; weak topologies; Banach-Alaoglu theorem. Category and Baire's theorem; the open mapping; closed graph and uniform boundedness theorems. Conjugate mappings; adjoint and self-adjoint operators in Hilbert space. The numerical range and the spectrum of an operator in Hilbert space. Projection, normal and unitary operators in Hilbert space. Complete orthonormal sets in Hilbert space. Introduction to Banach algebra.

Text:

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

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

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

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

**Elements of the Theory of Functions and Functional Analysis**
A. N. Kolmogorov & S. V. Fomin
(Graylock Press, Rochester, N.Y., 1957)

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

**Linear Operators**
N. Dunford & J. T. Schwarz
(Interscience, London-N.Y., 1958)

**Foundations of Modern Analysis**
J. Dieudonné

**COMBINATORIAL THEORY—Jennifer Wallis**

- Partitions; symmetric functions; Hammond operators; magic squares.
- 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; construction 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.

**PART IV TOPICS**

**References (Cont.):**

- **An Introduction to Combinatorial Analysis**
  John Riordan
  (Wiley, 1958)

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

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

- **A Survey of Matrix Theory and Matrix Inequalities**
  M. Marcus & H. Minc
  (Allyn & Bacon, Boston, 1964)

- **List of Prime Numbers from 1 to 10,006,721**
  D. H. Lehmer

**GRAPH THEORY—W. D. Wallis**

- Basic definitions such as graph, subgraph, multigraph, connectivity, colouring, duality in graphs. Cutpoints, bridges and blocks. Connectivity, Menger's theorem. Traversability; generalised Königsberg bridge problem and its dual. Planarity, Kuratowski's theorem. Colouring; the four-colour conjecture and related theorems; uniquely colourable graphs.

**Text:**

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

**References:**

- **Topics on Tournaments**
  J. W. Moon
  (Holt, Rinehart, Winston, 1968)

- **A Seminar on Graph Theory**
  F. Harary (Ed.)
  (Holt, Rinehart, Winston, 1967)

- **Graphs and Their Uses**
  O. Ore
  (Random House, 1963)

- **Theory of Graphs**
  O. Ore
  (Amer. Math. Soc., 1967)

- **Structural Models**
  F. Harary, R. Z. Norman & D. Cartwright
  (Wiley, 1965)

- **The Connectivity of Graphs**
  W. T. Tutte
  (Toronto U.P., 1967)

- **The Four-Colour Problem**
  O. Ore
  (Academic Press, 1967)

- **Theory of Graphs and Its Applications**
  C. Berge
  (Methuen, 1962)

- **The Mathematics of Experimental Design. Incomplete Block Designs & Latin Squares**
  S. Vajda
  (Charles Griffin, 1967)

- **Patterns & Configurations in Finite Spaces**
  S. Vajda
  (Charles Griffin & Co., 1967)

- **An Introduction to Combinatorial Analysis**
  John Riordan
  (Wiley, N.Y., 1958)

- **Finite Graphs and Networks**
  R. G. Busacker & T. Saaty
  (McGraw-Hill, 1965)
PROBABILITY — J. A. Lambert

In this topic, probability will be examined as an example of measure; particular attention will be given to conditional expectation and the Radon-Nikodym theorem. Some special distributions (in particular the uniform and exponential) and convolutions of these will be studied. A study will be made of some stochastic processes, in particular birth and death processes in discrete and continuous time.

Text:

Introduction to Probability Theory and Its Applications W. Feller

References:

Elements of the Theory of Markov Processes and Their Applications A. T. Bharucha-Reid
(McGraw-Hill, 1960)

A Course in Probability Theory K. L. Chung
(Harcourt, Brace and World, 1968)

The Theory of Branching Processes T. E. Harris
(Prentice-Hall, 1964)

A First Course in Stochastic Processes S. Karlin
(Academic Press, 1966)

Introduction to Measure and Probability J. F. C. Kingman & S. J. Taylor
(Cambridge U.P., 1966)

Stochastic Processes E. Parzen
(Holden-Day, 1962)

Stochastic Processes L. Takacs
(Methuen, 1960)

RING THEORY — R. F. Berghout


Text:

No prescribed text.

References:

Non-Commutative Rings I. N. Herstein
(Wiley, 1968)

Fields & Rings I. Kaplansky
(University of Chicago, 1969)

The Theory of Rings N. McCoy
(Macmillan, 1965)

Rings & Radicals N. Divinsky
(Allen-Unwin, 1964)

A Radical Approach to Algebra M. Gray
(Addison-Wesley, 1970)

NUMBER THEORY — T. K. Sheng


Text:

No prescribed text.

References:

Elementary Number Theory Underwood Dudley
(Freeman, 1969)

An Introduction to the Theory of Numbers G. H. Hardy & E. M. Wright
(Oxford, 1965)

Introduction to Number Theory T. Nagell
(Uppsala, 1951)

An Introduction to The Theory of Numbers Ivan Niven
(John Wiley, 1968)

An Introduction to the Geometry of Numbers J. W. S. Cassels
(Springer-Verlag, 1959)

Journal of Number Theory Academic Press
(Vol. I No. 1, January, 1969, etc.)
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 H 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:
Detection Theory J. Selin (Princeton University Press, 1965)
Introduction to Statistical Communication Theory J. B. Thomas (Wiley, 1969)
An Introduction to the Principles of Communication Theory J. C. Hancock (McGraw-Hill, N.Y., 1961)
Selected Papers on Noise and Stochastic Processes N. Wax (Ed.) (Dover, N.Y., 1954)

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:
Stochastic Processes J. L. Doob (Wiley, N.Y., 1953)
PART IV TOPICS

References (Cont.):

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

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

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

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

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

An Introduction to Probability Theory and its Applications
W. Feller

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

THEORY OF GROUPS — W. Brisley

A course on the modern 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.

Text:
To be decided.

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)

CATEGORY THEORY — W. Brisley

An introductory course of approximately twenty-seven lectures, dealing with the concepts and results involved in: categories, functors, products and co-products, natural transformations, adjoint functors, tensor products, representable functors, and the "Adjoint Functor Theorem". (Realisations will be taken from the categories of groups and of rings and modules.)

Text:
To be decided.

References:
Theory of Categories
B. Mitchell
(Academic Press, 1965)

Abelian Categories
P. Freyd
(Harper & Row, 1964)

UNIVERSAL ALGEBRA — W. Brisley

A course of approximately twenty-seven lectures to afford students entry into the topic, formalising the concepts of $*$-algebra, congruence, homomorphism, etc., in the general case, and presenting the appropriate theorems. As necessary, lattice-theory and set-theory will be investigated and *-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:
To be decided.

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

Algebra
Serge Lang
(Addison-Wesley, 1965)

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.

Corequisite:
4th year course in combinatorial theory.

Text:
To be decided.

References:
Addition Theorems
H. B. Mann
(Interscience, 1965)

Combinatorial Mathematics
H. J. Ryser
(Wiley, New York)
(Math. Association of America, 1963)
PART III SUBJECTS — SCHEDULE B

COMMUNICATIONS AND AUTOMATIC CONTROL

EE341 AUTOMATIC CONTROL (first half year) —
T. E. Fortmann

A course of lectures, tutorials, and practical work.


Text:
To be decided.

References:
- Modern Control Engineering — K. Ogata (Prentice-Hall, 1969)

EE342 AUTOMATIC CONTROL AND LINEAR SYSTEMS THEORY (second half year) — T. E. Fortmann

A continuation of EE341 consisting of lectures and tutorials.


Text:
To be decided.

References:
- Modern Control Engineering — K. Ogata (Prentice-Hall, 1969)

EE444 COMMUNICATIONS SYSTEMS (first half year) —
J. B. Moore

EE445 STATISTICAL COMMUNICATIONS (second half year) —
J. B. Moore

A course of lectures and tutorials.

Models of communications systems; problems of detection, estimation, and modulation. Theory of random signals and noise; generalized harmonic analysis of time functions, correlation functions, power spectra. Optimal filtering, prediction, and smoothing; Wiener filter, Kalman-Bucy filter.

Text:

References:

ECONOMICS IIIC

FLUCTUATIONS AND GROWTH — I. Fairbairn/I. Holmes

This course analyses the problem of economic fluctuations and growth. The various tools and concepts employed in such analysis are first treated; and this is followed by an examination of the theories of Harrod, Hicks, Duesenberry, amongst others. Particular emphasis is given to the application of these theories to the problems of a growing economy. The course ends with an examination of economic development in selected countries in the Pacific area, the Middle East and Europe.

References:
- The Trade Cycle — R. C. O. Matthews (Nisbet, 1959)
- Economics for Development — S. Enke (Prentice-Hall, 1963)
ECONOMETRICS — R. McShane

A knowledge of calculus and of statistics covering at least those topics in the Commerce Statistics course is a prerequisite for reading Econometrics. The content includes elementary matrix algebra, elementary mathematical statistics, the two variable linear model and extensions of it, the major problems in linear estimation, and an introduction to simultaneous estimation.

Texts:

Econometric Methods — J. Johnston
Intermediate Economic Statistics — K. A. Fox
An Introduction to Econometrics — L. R. Klein

References:

Mathematics for Economists — T. Yamane
Econometric Theory — A. S. Goldberger
Statistical Methods of Econometrics — E. Malinvaud
Linear Algebra — G. Hadley
Introduction to the Theory of Statistics — A. M. Mood & F. A. Graybill

AND ONE OF EITHER

PUBLIC ECONOMICS — W. Sheehan/J. Stanford

Public economics is a study of Government intervention in the economy through the budget. It is concerned, therefore, with taxes and with government expenditure. The analysis of the effects of such personal taxes as a poll tax, income tax and wealth tax on savings, consumption and work effort is followed by an analysis of business taxes such as company tax and sales tax. There is a discussion of other possible taxes, notably an expenditure tax, a capital gains tax and a tax on value added.

The relation between the budget and the level of employment is then examined. Topics covered include the multiplier impact of the balanced budget, the use of taxation and government expenditure to achieve stability and the notion of capacity to pay taxes. There is also an examination of the problems of the national debt, of inter-governmental financial relationships, and of the place of fiscal policy in economic development.

References:

Public Finance — O. Eckstein
Government Finance: Economics of the Public Sector — J. F. Due
Public Finance — A. P. Prest
Public Investment in Australia — R. L. Mathews
Public Finance and the Budgetary Policy — A. R. Williams
The Theory of Public Finance — R. A. Musgrave

INTERNATIONAL ECONOMICS — P. Sherwood/R. Smith

This course 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. This is followed by analysis of balance of payments problems and of various policies of adjustment, such as internal deflation, devaluation and direct controls. The course 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 Economics — C. P. Kindleberger
Introduction to International Economics — D. A. Snider
International Trade and the Australian Economy — R. H. Snape
International Monetary Relations — D. A. Snider
International Trade; Theory and Empirical Evidence — H. R. Heller
The International Economics of Development — G. M. Meier
PHYSICS IIIA

A basic Physics subject organized under the following main headings:

- Analytical mechanics, including the elements of Lagrangian and Hamiltonian mechanics.
- Electromagnetic field theory, including guided waves and transmission lines.
- Relativity, the special theory.
- Quantum mechanics, including applications to atomic and nuclear systems.
- Statistical mechanics, including principles and application.
- 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 — C. Kittell
(Wiley, 3rd Ed. 1966)

Fundamentals of Optics — F. A. Jenkins & H. E. White
(McGraw-Hill, 3rd Ed. 1957)

Classical Mechanics — J. W. Leech
(Methuen, 2nd Ed. 1965)

Fundamentals of Modern Physics — R. M. Eisberg
(Wiley, 1961)

(McGraw-Hill, 1969)

Introductory Quantum Mechanics — V. B. Rojansky
(Prentice-Hall, 1938)

Details of any other required texts will be displayed in the Physics Department towards the end of 1970. Students should retain all of their Physics II texts.

PSYCHOLOGY III C — A. C. HALL

This subject will cover the topics factor analysis and personality assessment of Psychology III B 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 verbal learning and students must select one or more additional topics from Psychology III A or Psychology III B 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 III A.

Text:

No prescribed text.

References:

Modern Factor Analysis — H. H. Harman
(University of Chicago Press, Chicago, 1960)

Problems in Human Assessment — D. N. Jackson & S. Messick
(McGraw-Hill, N.Y., 1967)

The Developmental Psychology of Jean Piaget — J. H. Flavell
(Van Nostrand, N.Y., 1963)

Thinking: From Association to Gestalt — J. M. Mandler & G. Mandler
(Wiley, N.Y., 1964)

The Genesis of Language — F. Smith & G. A. Miller

Biological Foundations of Language — E. H. Lenneberg
(Wiley, N.Y., 1967)

Varieties of Perceptual Learning — W. Epstein
(McGraw-Hill, N.Y., 1967)

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 rearrangement.

(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 (1912-1950) 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.
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.

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 (1912-1950) 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.

**Research in the Department of Mathematics — 1971**

**Algebra** — Mr. R. F. Berghou 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.

Dr. W. Brisley is working on some problems occurring in the laws defining certain varieties of groups, the subsequent lattice of subvarieties of given varieties, and the location of generating critical groups for varieties of groups.

Dr. W. D. Wallis is working in the field of linear representation of finite groups.

**Combinatorial Theory and Operations Research** — Dr. W. D. Wallis is interested in strongly regular graphs and the relation between Latin squares and block designs.

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.

**Differential Equations** — Dr. J. G. Couper has been working on the geometric theory of autonomous systems of ordinary differential equations. He is now on two years leave of absence for National Service.

**Fluid Dynamics** — Dr. W. T. F. Lau is concerned with flow problems involving free boundaries.

Mr. E. V. Petersons is working on the theory of a hydrofoil in a finite depth.

**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.

Dr. W. Ficker and Mr. C. J. Ashman are working in measure theory, particularly, in some problems on classes of null sets.

Mr. J. W. Lloyd is working on problems connected with a generalisation of measure theory.

**Information Theory** — Professor R. G. Kents 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.

Mr. J. A. Lambert is undertaking studies in pattern recognition; this work is also supported by the grant from the Department of Supply.

**Number Theory** — Dr. T. K. Sheng is investigating the distribution of rational points on the real line. He has obtained a partial result.

Jennifer Wallis is studying difference sets and her research here is of interest in that it may lead to new results in combinatorial theory and operations research.

**Numerical Analysis and Computing** — Professor I. L. Rose is investigating problems in numerical analysis and mathematical aspects of porous conduits.

**Statistics** — Dr. W. D. Wallis is working on the theory and application of Latin square designs.
FACULTY OF MATHEMATICS

TIMETABLE 1971

ROOM CODE: First letter denotes location

A — CLASS ROOMS IN THE ARTS/ADMINISTRATION BUILDING
B — MAIN LECTURE THEATRE
C — CLASS ROOMS IN THE GEOLOGY BUILDING
D — CLASS ROOM IN THE PHYSICS BUILDING
E — CLASS ROOMS IN THE ENGINEERING BUILDING
G — CLASS ROOMS IN THE CHEMISTRY BUILDING
H — SCIENCE LECTURE THEATRE

Second symbol denotes level

G — GROUND FLOOR  LG — LOWER GROUND FLOOR
1 — FIRST FLOOR  - — NOT APPLICABLE
2 — SECOND FLOOR

MA Thu. 9 H-01 or Tues. 7 B-01
Wed. 9 H-01 or Tues. 8 B-01
Fri. 9, 10 B-01 or Fri. 6, 7 B-01

Two tutorial hours to be arranged.

PART II MATHEMATICS TOPICS

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<tr>
<th>Topic</th>
<th>Lecture</th>
<th>Tutorial</th>
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<td>A</td>
<td>Thurs. 9 AG25 or Thurs. 6 AG25</td>
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<td>B</td>
<td>Thurs. 10 AG24 or Thurs. 8 AG25</td>
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<td>C</td>
<td>Wed. 9 B-01 or Wed. 6 AG25</td>
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<td>D</td>
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<td>E</td>
<td>Mon. 11 AG24 or Mon. 7 AG24</td>
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<td>Thurs. 11 AG25 or Thurs. 5 AG24</td>
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<td>J</td>
<td>Tues. 12 AG25 or Tues. 5 AG25</td>
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<td>K</td>
<td>Mon. 2 AG25 or Mon. 6 AG09</td>
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<td>L</td>
<td>Mon. 3 AG25 or Mon. 7 AG09</td>
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PART III MATHEMATICS TOPICS

Topic M
Lecture Tues. 2 AG24
Tutorial Tues. 4 AG24

Topic N
Lecture Tues. 3 AG24
Tutorial Tues. 4 AG24

Topic O
Lecture Tues. 9 AG24 or Tues. 6 ALG29
Tutorial Tues. 12 AG24 or Tues. 8 ALG29

Topic P
Lecture Mon. 3 AG24
Tutorial Mon. 4 AG24

Topic Q
Lecture Tues. 10 AG24 or Tues. 7 ALG29
Tutorial Tues. 12 AG24 or Tues. 8 ALG29

Topic R
Lecture Wed. 10 AG24 or Wed. 5 ALG29
Tutorial Wed. 12 AG24 or Wed. 7 ALG29

Topic S
Lecture Mon. 2 AG24
Tutorial Fri. 11 AG24

Topic T
Lecture Fri. 9 AG24
Tutorial Mon. 4 AG24

Topic U
Lecture Wed. 11 AG24 or Wed. 6 ALG29
Tutorial Wed. 12 AG24 or Wed. 7 ALG29

Topic V
Lecture Thurs. 2 AG24 or Thurs. 7 AG09
Tutorial Thurs. 4 AG24 or Thurs. 8 AG09

Topic X
Lecture Thurs. 3 AG24
Tutorial Thurs. 4 AG24

Topic W
Lecture Thurs. 10 AG24 or Thurs. 6 AG09
Tutorial Thurs. 11 AG24 or Thurs. 8 AG09

Topic Y
Lecture Thurs. 9 AG24
Tutorial Thurs. 11 AG24

Topic Z
Lecture Fri. 10 AG24
Tutorial Fri. 11 AG24

PART IV MATHEMATICS TOPICS

Preliminary meetings will be held in the first week of first term to arrange times and places for these topics. All intending students are advised to attend these preliminary lectures which will be announced on the departmental notice board.

SCHEDULE B SUBJECTS

COMMUNICATIONS AND AUTOMATIC CONTROL

EE 444 Communications Systems Lecture Tues. 4.15 - 5.45 E101
and EE 445 Statistical Communications Lecture Thurs. 4.15 - 5.45 E101

EE 341 and Automatic Control Lecture Mon. 5.30 - 7.00 E101
EE 342

PSYCHOLOGY III C

Cognition Lecture Mon. 11 ALG16 or Mon. 7 CG04
Mon. 2 ALG16 or Mon. 8 CG04
Term 3 only

Factor Analysis Lecture Fri. 2 AG25 or Fri. 7 AG25

Perception Lecture Thurs. 12 ALG46 or Thurs. 7 A127
Term 1 only

Personality Assessment Lecture Fri. 12 AG09 or Fri. 6 AG09
Term 3 only

Personality Theory Lecture Thurs. 12 A127 or Thurs. 7 A127
Terms 2 and 3 only

Verbal Learning Lecture Mon. 11 ALG16 or Mon. 7 CG04
Term 2 only

Plus additional lecture and laboratory hours to be decided in consultation with the Head of the Department of Psychology.

PHYSICS III A

Lectures Tues. 9, 10 DG08
Thurs. 9, 10 DG08
Laboratory Tues. 1 — 5 D101
Thurs. 1 — 5 D101

ECONOMICS III C

Econometrics Lecture Thurs. 10, 11 A117 or Tues. 6 A110
Fluctuations Fluctuations & Growth Lecture Fri. 10, 11 AG25 or Wed. 8, 9 A127
and Growth International Economics Lecture Fri. 3, 4 AG25 or Fri. 6, 7 AG25
Public Economics Lecture Tues. 10, 4 AG25 or Tues. 7, 8 A127

A student must study Econometrics, Fluctuations and Growth, and either International Economics or Public Economics.

N.B. There are some timetable clashes between Part III topics and Schedule B subjects. It may be possible to resolve some of these clashes during the first week of the first term.