FACULTY OF BIOLOGICAL SCIENCES AND FACULTY OF SCIENCE

COMBINED 1973 HANDBOOK

THE UNIVERSITY OF NEW SOUTH WALES

80 CENTS

COMBINED
FACULTY OF BIOLOGICAL SCIENCES AND FACULTY OF SCIENCE

1973 HANDBOOK

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University of New South Wales—Faculty of Science (aae)

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INTRODUCTION

The Science Course is offered in a unit system in all three years of the pass degree. In this system, the traditional subjects, such as Mathematics, are broken up into smaller units: first year subjects into two units, second year subjects into three units and third years subjects into four units.

First year subjects, which count as two units, differ from those of later years in that they must be taken as a whole. In other words one unit cannot be taken without the other. All students in the Science Course must enrol in Mathematics I, which is offered in three versions each of which counts as two units: Mathematics I, Higher Mathematics I and Mathematics IT. One only is required, but care must be taken in making the choice. Care must also be taken in choosing between Physics I, Higher Physics I and Physics IC. In general, Mathematics IT and Physics IC considerably limit the choice of units in following years.

Students proceeding to a degree in Science will be associated principally with schools within the Faculties of Biological Sciences and Science. However, in accordance with the regulations, students may elect to take subjects from schools in other faculties.

Some schools do not offer a full range of level III units in the evening. Students in the part-time course are urged to take note of these Schools, since a science major involving any of them will only be possible for day-time attendances. The Schools concerned are marked below with ‡.

Students seeking advice should contact the representative of the relevant School. A list appears below:

Faculty of Applied Science

‡School of Applied Geology .... Mr. G. J. Baldwin

Faculty of Arts

School of Geography*	Professor J. A. Mabbutt
School of Philosophy**	Professor C. L. Hamblyn

Faculty of Biological Sciences

General and Human Biology* (prerequisite for all other units in this Faculty excepting Psychology)	Dr. Eleanor Russell
School of Applied Psychology	Mr. P. J. Cleary (Science Course) Mrs. N. Binks (Applied Psychology)
‡School of Biochemistry†	Dr. P. J. Schofield
‡School of Biological Technology	Professor B. J. Ralph
‡School of Botany†	Dr. M. M. Hindmarsh
‡School of Microbiology†	Dr. A. J. Wicken
‡School of Zoology†	Mrs. Patricia Dixon

Faculty of Engineering

School of Mechanical and Industrial Engineering (Engineering I*)	Mr. D. J. S. Mudge
School of Electrical Engineering (Computer Science†)	Mr. K. A. Robinson

Faculty of Medicine

‡School of Anatomy†	Assoc. Prof. B. R. A. O'Brien
‡School of Human Genetics	Mr. A. E. Stark
‡School of Physiology†	Dr. D. G. Garlick

Faculty of Science

School of Applied Physics and Optometry	Professor C. J. Milner (Applied Physics) Associate Professor J. Lederer (Optometry)
School of Chemistry	Mr. W. J. Dunstan
‡School of Mathematics	Associate Professor W. E. Smith
School of Physics	Dr. R. E. Lishmund

In addition to the Science subjects, all undergraduates in Science are required to pass in three subjects in General Studies. A wide choice is available and students should consult the Department of General Studies handbook which is provided free of charge.

Students who wish to be admitted with advanced standing should obtain the necessary forms from the Admissions Office. Copies of recommended courses may be obtained from the Faculty Office (Room 57, Main Building).

C.J.Q.
N.C.S.

* First year level only
** First and Second year levels only
† Second and Third year levels only
‡ Schools which do not offer a full range of level III units in the evening

CALENDAR OF DATES FOR 1973

Session 1: March 5 to May 12
May Recess May 13 to May 20
May 21 to June 16
Midyear Recess June 17 to July 22

Session 2: July 23 to August 11
August Recess August 12 to August 26
August 27 to November 10

JANUARY

Friday 12	Last date for application for review of results of annual examinations
Monday 15	Last day for acceptance of applications for admission to university degrees and diplomas
Friday 19	Last day for application for deferred examinations
	Last day for acceptance of applications to enrol by new students and students repeating first year
Monday 29	Australia Day—Public Holiday
Tuesday 30	Deferred examinations begin

FEBRUARY

Saturday 10	Deferred examinations end
Monday 19	Enrolment period begins for new students and students repeating first year
Monday 26	Enrolment period begins for students re-enrolling (second and later years)

MARCH

Friday 2	Last date for application for review of deferred examination results
Monday 5	**Session 1 commences**
Friday 16	Last day for acceptance of enrolments by new students (late fee payable)
Monday 19	Faculty of Biological Sciences meeting, 2 p.m.
Tuesday 27	Faculty of Science meeting, 2 p.m.
	Last day for changes in course programmes
Friday 30	Last day for acceptance of enrolments by students re-enrolling (late fee payable)

APRIL

Friday 6	Last day for discontinuation without failure of subjects which extend over the first session only

APRIL

Thursday 19	Last day for acceptance of corrected enrolment details forms
Friday 20 to Monday 23	Easter
Wednesday 25	Anzac Day—Public Holiday

MAY

Monday 7	Provisional timetable for June/July examinations published
Sunday 13	May Recess begins
Sunday 20	May Recess ends
	Last date for discontinuation without failure of subjects which extend over the academic year

JUNE

Monday 4	Faculty of Biological Sciences meeting, 2 p.m.
Tuesday 5	Timetable for June/July examinations published
Monday 11	Queen's Birthday—Public Holiday
Tuesday 12	Faculty of Science meeting, 2 p.m.
Saturday 16	**Session 1 ends**
Sunday 17	Midyear Recess begins
Tuesday 19	Midyear examinations begin
Saturday 30	Last day for acceptance of applications for re-admission after exclusion under rules governing re-enrolment

JULY

Tuesday 3	Midyear examinations end
Sunday 22	Midyear Recess ends
Monday 23	**Session 2 commences**

AUGUST

Thursday 2	Foundation Day
Monday 6	Faculty of Biological Sciences meeting, 2 p.m.
Thursday 9	Faculty of Science meeting, 2 p.m.
Sunday 12	August Recess begins
Wednesday 22	Last day for acceptance of corrected enrolment details forms
Friday 24	Last date for discontinuation without failure of subjects which extend over the second session only
Sunday 26	August Recess ends

SEPTEMBER

Monday 10	Provisional timetable for annual examinations published

OCTOBER

Monday 1	Eight Hour Day—Public Holiday
Monday 8	Faculty of Biological Sciences meeting, 2 p.m.

OCTOBER

Thursday 18	Faculty of Science meeting, 2 p.m.
Tuesday 30	Timetable for annual examinations published

NOVEMBER

Saturday 10	**Session 2 ends**
Tuesday 13	Annual examinations begin

DECEMBER

Tuesday 4	Annual examinations end
Tuesday 25	Christmas Day—Public Holiday
Wednesday 26	Boxing Day—Public Holiday

1974

Session 1: March 4 to May 19
May Recess: May 20 to May 26
May 27 to June 16
Midyear Recess: June 17 to July 21

Session 2: July 22 to August 25
August Recess: August 26 to September 1
September 2 to November 3
Study Recess: November 4 to November 10

JANUARY

Friday 11	Last date for application for review of results of annual examinations
Monday 14	Timetable for deferred examinations published
	Last date for application for admission to university degrees and diplomas
Friday 18	Last date for application for deferred examinations
Tuesday 29 to Saturday 9	Deferred examinations

FEBRUARY

Monday 18	Enrolment period begins for new students and students repeating first year
Monday 25	Enrolment period begins for students re-enrolling (second and later years)
	Results of deferred examinations available

THE ACADEMIC YEAR

The academic year is divided into two sessions, each containing 14 weeks for teaching. There is a recess of five weeks between the two sessions. In addition there are short recesses within the sessions—one week within Session 1 and two weeks within Session 2.

The first session commences on the first Monday of March.

FACULTY OF BIOLOGICAL SCIENCES

Dean—Professor B. J. F. Ralph
Chairman—Professor E. O. P. Thompson
Administrative Assistant—P. J. MacGinley

SCHOOL OF BIOCHEMISTRY

Professor of Biochemistry and Head of School
E. O. P. Thompson, MSc DipEd *Syd.*, PhD *Camb.*, ARACI

Associate Professors
J. B. Adams, MSc *Syd.*, PhD *N.S.W.*, ARACI
C. A. Marsh, BSc *Lond.*, PhD *Aberd.*, ARCS
K. G. Rienits, MSc *Syd.*, PhD *Birm.*
J. F. Williams, MSc PhD *N.S.W.*, ASTC, FRACI

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Mary M. Hindmarsh, BSc PhD *Syd.*

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Professor of Microbiology
J. M. Vincent, DScAgr *Syd.*, DipBact *Lond.*, FAIAS

Associate Professor of Bacteriology
D. D. Smith, MD ChB *Glas.*, MPCA, MCPath (seconded from School of Pathology)

Associate Professors of Microbiology
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A. J. Wicken, BSc PhD *Cape T.*, MA *Camb.*, FNZIC, ARIC

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Professor of Applied Psychology
A. G. Hammer, MA *Syd.*

Associate Professor
R. T. Martin, BA DipPubAdmin *Syd.*, MBPsychoanalSoc

Executive Assistant to Head of School
A. K. Olley, BA *Syd.*

SCHOOL OF ZOOLOGY

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Associate Professor
A. K. O'Gower, MSc PhD *Syd.*

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Chairman—Professor R. M. Golding

Dean's Representative—Associate Professor N. C. Stephenson, MSc *Syd.*, PhD DSc *N.S.W.*, FRACI

Graduate Assistant—Mrs. Emma S. Rossi, BA *Syd.*

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Associate Professor (Applied Physics)
D. H. Morton, MA *Oxon.*, FInstP, FAIP

Associate Professors (Optometry)
G. Amigo, BSc(OptSc) PhD *N.S.W.*, ASTC, FIO, FAAO
J. Lederer, BSc *Syd.*, MSc *N.S.W.*, ASTC, FIO

SCHOOL OF CHEMISTRY

Professor of Analytical Chemistry and Head of School
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G. W. K. Cavill, MSc *Syd.*, PhD DSc *Liv.*, FRIC, FRACI

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R. M. Golding, MSc *Auck.*, PhD *Camb.*, FNZIC, MInstP

Professor and Head of Department of Inorganic Chemistry*
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E. R. Cole, MSc *Syd.*, PhD *N.S.W.*, FRACI, FAIFST
R. A. Eade, MSc *Syd.*, PhD *Liv.*, FRACI
J. L. Garnett, MSc *N.S.W.*, PhD *Chic.*, ASTC, ARACI
D. P. Graddon, MSc PhD *Manc.*, FRIC
C. M. Harris, PhD DSc *N.S.W.*, ASTC, FRACI

* In the field of inorganic chemistry

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Administrative Officer
R. Sutton, MVO, AFAIM

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Professor of Applied Mathematics
V. T. Buchwald, BSc *Manc.*, MSc PhD *Lond.*

Professor of Applied Mathematics
J. M. Blatt, BA *Cinc.*, PhD *Corn.* and *Prin.*, FAA, FAPS

Professors of Pure Mathematics
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G. Szekeres, DiplChemEng *Bud.*, FAA

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J. B. Douglas, MA BSc DipEd *Melb.*

Associate Professor (Pure Mathematics)
J. L. Griffith, BA MSc DipEd *Syd.*

Associate Professor (Applied Mathematics)
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S. J. Prokhovnik, BA MSc *Melb.*

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Associate Professor A. H. Low, MSc DipEd *Syd.*, PhD *N.S.W.*

Administrative Assistant
Mrs. Pamela Monk, BSc *N.E.*

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Professor of Experimental Physics
H. J. Goldsmid, BSc PhD DSc *Lond.*, FInstP, FAIP

Professor of Experimental Physics
Vacant

Associate Professors
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J. C. Kelly, BSc *Syd.*, PhD *R'dg.*, FInstP, AAIP
J. F. McConnell, MSc *Syd.*, PhD *N.S.W.*, MInstP, AAIP
L. G. Parry, BSc DipEd *Syd.*, MSc PhD *N.S.W.*, AInstP, AAIP

Director of First Year Studies
J. E. Giutronich, BSc *Syd.*, PhD *N.S.W.*, AAIP

Executive Assistant to Head of School
R. E. Lishmund, BSc PhD *St. And.*, MInstP, AAIP

Administrative Officer
C. C. Rosario

ADMISSIONS AND ENROLMENT PROCEDURE

ADMISSIONS OFFICE

The Admissions Office which is located in the Chancellery on the upper campus provides intending students (both local and overseas) with information regarding courses, admission requirements, scholarships and enrolment. Office hours are from 9.00 a.m. to 1.00 p.m. and 2.00 p.m. to 5.00 p.m. Monday to Friday and an evening service is provided during the enrolment period.

Applications for special admission, admission with advanced standing and from persons relying for admission on overseas qualifications are processed by the Admissions Office. The Office also receives applications from students who wish to transfer from one course to another, resume their studies after an absence of twelve months or more, or seek any concession in relation to a course in which they are enrolled. It is essential that the closing dates for lodgment of applications are adhered to, and, for further details the sections on "Rules Relating to Students" and "Enrolment Procedure for Undergraduate Courses" should be consulted.

Applications for admission to undergraduate courses from students who do not satisfy the requirements for admission (see section on "Requirements for Admission"), from students seeking admission with advanced standing, and from students who have had a record of failure at another university, are referred by the Admissions Office to the Admissions Committee of the Professorial Board.

Students seeking to register as higher degree candidates should discuss their proposals initially with the Head of the School in which they wish to register. An application is then lodged on a standard form and the Admissions Office, after obtaining a recommendation from the Head of the School, refers the application to the appropriate Faculty or Board of Studies Higher Degree Committee.

ADMISSIONS PROCEDURE

Details of the procedure to be followed by students seeking entry to first year courses at the University may be obtained from the Admissions Office or the Metropolitan Universities Admissions Centre.

Persons seeking entry to first year courses in one or more of the three Universities in the Sydney Metropolitan Area (Macquarie University, The University of New South Wales and the University of Sydney) are required to lodge a single application form with the Metropolitan Universities Admissions Centre, Third Floor, 13-15 Wentworth Avenue (near Liverpool Street), Sydney. Postal address: P.O. Box 7049, G.P.O., Sydney 2001. Telephone: 26 6301. On the application form, provision is made for applicants to indicate preferences for courses available in any of the three Universities. Students are notified individually of the result of their applications and provided with information regarding the procedures to be followed in order to accept the offer of a place at this University and complete their enrolment at the Enrolment Bureau, Unisearch House, 221 Anzac Parade, Kensington.

ENROLMENT PROCEDURE FOR UNDERGRADUATE COURSES

In 1973, it will be necessary for the University to impose quotas in each Faculty and Board of Studies.

The enrolment procedure for the different classes of undergraduate students is as follows:

First Enrolments

(a) New South Wales residents already qualified for admission and persons who are applying for enrolment on the basis of qualifications gained or about to be gained outside New South Wales must lodge an application for enrolment with the Metropolitan Universities Admissions Centre, 13-15 Wentworth Avenue, Sydney (P.O. Box 7049, G.P.O., Sydney 2001) by 27th October, 1972.

(b) New South Wales residents qualifying for admission by the 1972 New South Wales Higher School Certificate Examination or the 1973 Sydney University Matriculation Examination and those who have attended a University in New South Wales in 1972 must apply for enrolment to the Metropolitan Universities

Admissions Centre, 13-15 Wentworth Avenue, Sydney (P.O. Box 7049, G.P.O., Sydney 2001) by 19th January, 1973.

Students whose applications for enrolment are accepted will be required to complete their enrolment at a specified appointment time before the start of Session 1. Fees must be paid on the day of the appointment. However, in special circumstances and provided class places are still available, students may be allowed to complete their enrolment after the prescribed week subject to the payment of a late fee.

Application forms for enrolment and details of the application procedures may be obtained on application to the Registrar, P.O. Box 1, Kensington 2033.

Failure in First Year

First year students who failed all subjects at the 1972 Annual Examinations and who were not granted any deferred examinations will NOT follow the above procedure. They are required to "show cause" why they should be allowed to continue in the course, and should await instructions in writing from the Registrar as to the procedure.

Later Year Enrolments

All students enrolling other than for the first time and not included above must attend at the time and place during Enrolment Week as set out in the booklet published each year on enrolment procedures. Enrolment forms for these students will be prepared and available at the enrolment centre.

All full-time and part-time students in the Pure and Applied Chemistry course are required to complete an enrolment form in the last fortnight of Session 2. The forms may be obtained from the office of the School of Chemistry (Mr. A. Funnell). An appointment will then be made to complete enrolment in accordance with the special arrangements made by the school. These arrangements are also published in the booklet on enrolment procedures.

A late fee of $10 will be incurred by students failing to enrol during Enrolment Week.

Miscellaneous Subjects
(students not proceeding to a degree or diploma)

Students may be accepted for enrolment in miscellaneous subjects provided the University considers that the subject/s will

be of benefit to the student and there is accommodation available. Only in exceptional circumstances will subjects taken in this way count towards a degree or diploma.

Students seeking to enrol in miscellaneous subjects should obtain a letter of approval from the Head of the appropriate School or his representative permitting them to enrol in the subject concerned. The letter should be given to the enrolling officer at the time of enrolment. **Where a student is under exclusion he may not be enrolled in any miscellaneous subjects unless given approval by the Professorial Board.**

Unless otherwise instructed, students who have obtained permission to enrol should attend the appropriate enrolment centre (see next pages) on Friday 2nd March 2.00 p.m. to 4.30 p.m.
6.00 p.m. to 7.30 p.m.

Preliminary Enrolment

Science Course

Before the end of Session 2, each student must obtain his or her personal enrolment form (form UE3 for full-time students, form UE4 for part-time students) and 1973 programme form (form SC73) plus instruction forms from the Faculty of Science Office, Room 57, Main Building.

After notification of the annual examination results, the student should complete form SC73 and lodge it, together with re-enrolment form filled in as far as possible, at the Science Faculty office not later than 19th January, 1973. Students whose programme forms and re-enrolment forms are not received by 19th January, 1973, must re-enrol at a late re-enrolment session and pay the prescribed late fee.

Pure and Applied Chemistry Course

Before proceeding on vacation students are required to attend the Office of the School to complete the necessary preliminary enrolment procedures.

BSc (Psychology Course)

Each student must obtain his or her personal enrolment form UE3 or UE4 and Personal Programme FORM AP/RE from the School of Psychology. The forms are available from 16th October, 1972. After notification of the annual examination results the student should indicate the subjects already completed and the proposed programme for 1973 on FORM AP/RE and forward this, together with his enrolment form (completed except for the entry of subjects) to reach the Enrolment Officer, School of Psychology, not later than Friday, 19th January, 1973.

Enrolment Timetable

Science Course

After fulfilling preliminary enrolment requirements, students should complete their re-enrolment at *Unisearch House* in accordance with the following timetable:

Full-time Course	
Year 2 & Year 1 Repeats	
	Wednesday 28th February
Surnames A to G	9.30 a.m. to 12.30 p.m.
Surnames H to M	2.00 p.m. to 5.00 p.m.
	Thursday 1st March
Surnames N to R	9.30 a.m. to 12.30 p.m.
Surnames S to Z	2.00 p.m. to 5.00 p.m.
Year 3	
Surnames A to J	Monday 26th February 2.00 p.m. to 5.00 p.m.
	Tuesday 27th February
Surnames K to R	9.30 a.m. to 12.30 p.m.
Surnames S to Z	2.00 p.m. to 5.00 p.m.
Year 4	
All students	Friday 2nd March 9.30 a.m. to 12.30 p.m. 2.00 p.m. to 4.30 p.m.
New Students with Advanced Standing	Friday 2nd March 9.30 a.m. to 12.30 p.m. 2.00 p.m. to 5.00 p.m.
Part-time Course	
Stage 2 & Stage 1 Repeats	Monday 26th February 6.00 p.m. to 8.00 p.m.
Stage 3 and Stage 4 Students	Tuesday 27th February 6.00 p.m. to 8.00 p.m.
Stage 5 & Later Stages	Wednesday 28th February 6.00 p.m. to 8.00 p.m.
New Students with Advanced Standing	Thursday 1st March 6.00 p.m. to 8.00 p.m.

Pure and Applied Chemistry Course

Students in the course are required to attend *Unisearch House* in accordance with the following timetable:

a. Full-time Course	
Year 2 & Year 1 repeats	Monday 26th February 1.30 p.m. to 5.00 p.m.
Year 3	Wednesday 28th February 9.00 a.m. to 12.30 p.m.
Year 4	Friday 2nd March 9.00 a.m. to 12.30 p.m.
b. Part-time Course	
Stage 1 repeats & Stages 2 and 3	Tuesday 27th February 2.00 p.m. to 5.00 p.m. 6.00 p.m. to 8.00 p.m.
Stage 4	Wednesday 28th February 2.00 p.m. to 5.00 p.m.
Stages 5, 6 & later	Tuesday 27th February 2.00 p.m. to 5.00 p.m. 6.00 p.m. to 8.00 p.m.
c. New Students with Advanced Standing	Wednesday 28th February 2.00 p.m. to 5.00 p.m.

Optometry Course

All students including those wishing to enrol in miscellaneous subjects conducted by the Department of Optometry are required to attend *Unisearch House, 221 Anzac Parade (across from Main Campus)*

All Re-enrolling, Miscellaneous, Higher Degree Students, and New Students with Advanced Standing	Thursday 1st March 2.00 p.m. to 5.00 p.m.

Enrolment Centre

Science Pure and Applied Chemistry Optometry	Unisearch House 221 Anzac Parade (across from Main Campus)

School of Psychology

BSc(Psychology) students must attend for re-enrolment at the *School of Psychology, Anzac Parade*, as follows:

Full-time Students	
Year 2 and Year 1 repeats	Tuesday 27th February 10.00 a.m. to 12 noon
Years 3 and 4	Tuesday 27th February 2.00 p.m. to 4.00 p.m.
Part-time Students All Stages	Wednesday 28th February 6.00 p.m. to 7.30 p.m.

Students who are unable to attend personally should send a representative at the specified time with a letter of authority to collect their form for them.

Students who fail to do this or fail to attend personally will be required to attend one of the late enrolment periods.

Students who have completed the final examinations but have a thesis still outstanding are required to enrol for the period necessary to complete the thesis and to pay the requisite fees.

Course details must be completed during the prescribed Enrolment Week. For details of fee requirements, including late fee provisions, see under Fees.

Final Dates for Completion of Enrolment

No enrolments will be accepted from *new students* after the end of the second week of Session 1 (16th March, 1973) except with the express approval of the Registrar and the Head of the School concerned; no *later year enrolments* will be accepted after 31st March without the express approval of the Registrar which will be given in exceptional circumstances only.

UNIVERSITY UNION CARD

All students other than miscellaneous students are issued with a University Union membership card. This card must be carried during attendance at the University and shown on request.

The number appearing on the front of the card above the student's name is the student registration number used in the University's records. This number should be quoted in all correspondence.

The card must be presented when borrowing from the University libraries, when applying for travel concessions and when notifying a change of address. It must also be presented when paying fees

on re-enrolment each year when it will be made valid for the year and returned. Failure to present the card could result in some inconvenience in completing re-enrolment.

A student who loses a Union card must notify the University Union as soon as possible.

New students will be issued with University Union cards at the University Union Enquiry Desk as soon as practicable after payment of fees. In the meantime, fees receipt form should be carried during attendance at the University and shown on request. A period of at least three weeks should be allowed to elapse after payment of fees before making application for the card. Cards will not be posted under any circumstances.

REQUIREMENTS FOR ADMISSION

A person who seeks to become a candidate for any degree of Bachelor of the University must first have qualified for matriculation and have satisfied the requirements for admission to the particular Faculty, Course or Subject* chosen.

In addition to complying with these conditions, candidates must be selected before being permitted to enrol in a course. In 1973, it will be necessary for the University to limit the number of students enrolling in all undergraduate courses.

Special Assistance for Aboriginal Students

The University may admit suitably qualified persons of Aboriginal descent outside of any quota restrictions.

Upon receipt of an application under this provision, the University will assess the applicant's potential to cope with University studies, and will make Student Counsellors available to discuss the choice of a course and subsequent career opportunities.

All enquiries relating to this scheme should be directed to the Registrar.

Matriculated Student

A candidate who has satisfied the conditions for matriculation and for admission to a course of study shall be classed as a "matriculated student" of the University, after enrolment.

A person who has satisfactorily met the conditions for admission may be provided with a statement to that effect on the payment of the prescribed fee.

SECTION A

General Matriculation and Admission Requirements

1. A candidate may qualify for matriculation by attaining in recognised matriculation subjects at one New South Wales

* Students who have gained a 2S level pass in Mathematics and/or Science, while being admitted, may have difficulties in their chemistry, physics and mathematics studies and are strongly advised to attend the bridging courses in these subjects.

Higher School Certificate Examination or at one University of Sydney Matriculation Examination a level of performance determined by the Professorial Board from time to time.

2. The level of performance required to qualify for matriculation shall be

(a) passes in at least five recognised matriculation subjects, one of which shall be English and three of which shall be at Level 2 or higher;

and

(b) the attainment of an aggregate of marks, as specified by the Professorial Board, in not more than five recognized matriculation subjects, such marks being co-ordinated in a manner approved by the Board.

3. The following subjects, and such other subjects as may be approved by the Professorial Board from time to time, shall be recognized matriculation subjects:—

English	Greek	Chinese
Mathematics	Latin	Japanese
Science	French	Hebrew
Agriculture	German	Dutch
Modern History	Italian	Art
Ancient History	Bahasa Indonesia	Music
Geography	Spanish	Industrial Arts
Economics	Russian	

4. A candidate who has qualified to matriculate in accordance with the provisions of Clauses 1, 2 and 3 may be admitted to a particular Faculty, course or subject provided that:—

(a) his qualification includes a pass at the level indicated in the subject or subjects specified in Schedule A as Faculty, course or subject prerequisites;

or

(b) the requirements regarding these particular Faculty, course or subject prerequisites, as specified in Schedule A, have been met at a separate Higher School Certificate or University of Sydney Matriculation Examination.

5. Notwithstanding any of the provisions of Clauses 1 to 4, the Professorial Board may grant matriculation status to any candidate at the Higher School Certificate or University of Sydney Matriculation Examination who has reached an acceptable standard and may admit him to any Faculty, course or subject.

NOTE

1. For the purposes of clause 2 (a), Mathematics and Science BOTH PASSED at first level or second level full course shall together count as three subjects.
2. For the purposes of clause 2 (b), Mathematics and Science TAKEN either singly or together at first level or second level full course shall each count as one and one half subjects.

SCHEDULE A

FACULTY OR COURSE	FACULTY OR COURSE PREREQUISITES
Applied Science (excl. Applied Geography and Wool and Pastoral Sciences courses) Biological Sciences Engineering Industrial Arts Course Medicine Military Studies (Engineering course and Applied Science course) Science Bachelor of Science (Education)	(a) Science at Level 2S or higher AND (b) either Mathematics at Level 2F or higher OR Mathematics at Level 2S, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board.
Architecture Applied Geography and Wool and Pastoral Sciences courses (Faculty of Applied Science)	(a) Science at Level 2S or higher AND (b) Mathematics at Level 2S or higher
Arts Social Work Degree Course	English at Level 2 or higher
Commerce	(a) Mathematics at Level 2S or higher AND (b) either English at Level 2 or higher OR English at Level 3, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board.
Law Combined Jurisprudence/Law Combined Arts/Law Combined Commerce/Law	Nil Nil As for Arts As for Commerce
Military Studies (Arts Course)	English at Level 2 or higher; OR English at Level 3, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board, and provided that a candidate so qualified shall not enrol in a course of English literature.

SUBJECT	SUBJECT PREREQUISITES
1.011—Higher Physics I 1.001—Physics I 1.041—Physics IC	As for Faculty of Science
2.001—Chemistry I 17.001—General and Human Biology 25.001—Geology I 25.111—Geoscience I	Science at Level 2S or higher
10.011—Higher Mathematics I	Mathematics at Level 2F or higher
10.001—Mathematics I	Either Mathematics at Level 2F or higher OR Mathematics at Level 2S, provided that the candidate's performance in the subject and his general level of attainment are at standards acceptable to the Professorial Board.
10.021—Mathematics IT	Mathematics at Level 2S or higher
15.102—Economics II	As for Faculty of Commerce
50.111—English I 51.111—History IA 51.121—History IB	English at Level 2 or higher
56.111—French I	French at Level 2 or higher
59.111—Russian I	Russian at Level 2 or higher
64.111—German I	German at Level 2 or higher
65.111—Spanish I	Spanish at Level 2 or higher
59.001—Russian IZ 64.001—German IZ 65.001—Spanish IZ	A foreign language, other than that in which enrolment is sought, at Level 2 or higher

SECTION B

Supplementary Provisions for Matriculation

Notwithstanding the provisions of Section A above, candidates may be accepted as "matriculated students" of the University under the conditions which are listed in the University Calendar.

UNDERGRADUATE COURSE FEES*

COURSE FEES

Fees for Undergraduate Courses

Where course fees are assessed on the basis of session hours of attendance the hours for each subject for purposes of fee assessment shall be those prescribed in the Calendar, irrespective of any variation from the prescribed hours which may be necessary in conducting the subject.

For the purpose of fee determination for courses in the Faculty of Science assessment is on a session basis. There are two sessions in each year. A full-time course fee will be charged for any session where more than 15 hours' per week instruction, etc., is involved.

(i) Full-time Course Fee (more than 15 hours' attendance per week)—$270 per session.

(ii) Part-time Course Fee (over 6 hours' and up to 15 hours' attendance per week)—$135 per session.

(iii) Part-time Course Fee (6 hours' or less attendance per week)—$67.50 per session.

(iv) Course Continuation Fee—a fee of $39 per annum (no session payment) is payable by:—

Category (a) Students who have once been enrolled for a thesis and have only that requirement outstanding; OR

Category (b) Students given special permission to take annual examinations without attendance at the University. (Students in this category are not required to pay the subscriptions to the University Union, the Students' Union, the Sports Association and the Library Fee.)

Miscellaneous Subjects

Undergraduate subjects taken as "miscellaneous subjects" (i.e., not for a degree or diploma) or to qualify for registration as a candidate for a higher degree are assessed on an hourly basis in accordance with the schedule above.

*** Fees quoted are current at time of publication and may be altered by Council without notice.**

Students given approval to enrol in a miscellaneous subject or subjects in addition to being enrolled in a course are assessed according to the total hours of attendance as if the additional subject formed part of the course.

OTHER FEES

In addition to the course fees set out above all registered undergraduates will be required to pay—

Matriculation Fee—$11—payable at the beginning of first year.
Library Fee—annual fee—$20.
University Union*—entrance fee—$20.

Student Activities Fees

University Union*—$30—annual subscription.
Sports Association*—$4—annual subscription.
Students' Union*—$7—annual subscription.
Miscellaneous—$17—annual fee.

Graduation Fee—$11—payable at the completion of the course.

Depending on the course being taken, students may also be required to pay—

Psychology Kit Hiring Charge—$2 per kit. Additional payment for breakages and losses in excess of $1.

Biochemistry Kit Hiring Charge—$4 per kit. Additional charge for breakages and losses in excess of $1 may be required.

Chemistry Kit Hiring Charge—$4 per kit. Additional charge for breakages and losses in excess of $1 may be required.

Excursion Fee—$2 per subject (plant morphology, plant taxonomy, environmental botany).

SPECIAL EXAMINATION FEES

Deferred examination—$8 for each subject.

Examinations conducted under special circumstances—$11 for each subject.

Review of examination result—$11 for each subject.

*** Life members of these bodies are exempt from the appropriate fee or fees.**

LATE FEES

Session 1—First Enrolments

Fees paid on the late enrolment session and before the commencement of Session 1	$10
Fees paid during the first and second weeks of Session 1	$20
Fees paid after the commencement of the third week of Session 1 with the express approval of the Registrar and Head of the School concerned	$40

Session 1—Re-Enrolments

Failure to attend enrolment centre during enrolment week	$10
Fees paid after the commencement of the third week of Session 1 to 31st March	$20
Fees paid after 31st March where accepted with the express approval of the Registrar	$40

Session 2—All Enrolments

Fees paid in third and fourth weeks of Session 2	$20
Fees paid thereafter	$40
Late lodgement of corrected enrolment details forms (late applications will be accepted for three weeks only after the prescribed dates)	$8

WITHDRAWAL FROM COURSE

1. Students withdrawing from a course are required to notify the Registrar in writing. Fees for the course accrue until a written notification is received.

2. Where notice of withdrawal from a course is received by the Registrar before the first day of Session 1 a refund of all fees paid other than the matriculation fee will be made.

3. Where a student terminates for acceptable reasons a course of study within 30 days of the commencement of Session 1 a refund of fees paid, less a sum of $39, may be made in respect of all fees except the University Union entrance and membership fees, the University of New South Wales Students' Union fee and the University of New South Wales Sports Association fee, in regard to which fees refunds may be made as shown hereunder.

4. Where a student terminates for acceptable reasons a course of study: (1) after the lapse of 30 days and before the lapse of half Session 1, one half of each of the course fee, the library fee and the miscellaneous student activities fee may be refunded; (2) before the lapse of half Session 2, one half of the session's course fee may be refunded.

5. Where a student terminates a course of study after half a session has elapsed, no refund may be made in respect of that session's fees.

6. No portion of the matriculation fee is refundable on withdrawal.

7. On notice of withdrawal a partial refund of the University Union Entrance Fee is made on the following basis: any person who has paid the entrance fee in any year and who withdraws from membership of the University Union after the commencement of Session 1 in the same year, or who does not renew his membership in the immediately succeeding year may on written application to the Warden receive a refund of half the entrance fee paid.

8. On notice of withdrawal a partial refund of the Student Activities Fees is made on the following basis:

University Union—$7.50 in respect of each half session.

University of New South Wales Students' Union—where notice is given prior to the end of the fifth week of Session 1, $3.50, thereafter no refund.

University of New South Wales Sports Association—where notice is given prior to 30th April a full refund is made, thereafter no refund.

9. Where initial registration is made at commencement of Session 2 in any year and the student subsequently withdraws, a refund of fees based on the above rules may be made.

PAYMENT OF FEES

Completion of Enrolment

All students are required to attend the appropriate enrolment centre during the prescribed enrolment period* for authorisation of course programme. Failure to do so will incur a late fee of $10.

* The enrolment periods for Sydney students are prescribed annually in the leaflet on enrolment procedures.

First year students (including students repeating first year) must complete enrolment (including fee payment) before they are issued with class timetables or permitted to attend classes. A first year student who has been offered a place in a course to which entry is restricted and fails to complete enrolment (including fee payment) at the appointed time may lose the place allocated.

Fees should be paid during the prescribed enrolment period but will be accepted during the first two weeks of Session 1. (For late fees see above.) No student is regarded as having completed an enrolment until fees have been paid. Fees will not be accepted (i.e., enrolment cannot be completed) from new students after the end of the second week of Session 1 (i.e., 16th March, 1973), and after 31st March from students who are re-enrolling, except with the express approval of the Registrar, which will be given in exceptional circumstances only.

Payment of Fees by Session

Students who are unable to pay their fees by the year may pay by the session, in which case they are required to pay the first session's course fees and other fees for the year, within the first two weeks of Session 1. Students paying under this arrangement will receive accounts from the University for Session 2 fees. These fees must be paid within the first two weeks of Session 2.

Assisted Students

Scholarship holders or Sponsored Students who have not received an enrolment voucher or appropriate letter of authority from their sponsor at the time when they are enrolling should complete their enrolment paying their own fees. A refund of fees will be made when the enrolment voucher or letter of authority is subsequently lodged with the Cashier.

Extension of Time

Any student who is unable to pay fees by the due date may apply in writing to the Deputy Registrar (Student Services) for an extension of time. Such application must give year or stage, whether full-time or part-time, and the course in which the applicant wishes to enrol, state clearly and fully the reasons why payment cannot be made and the extension sought, and must be lodged before the date on which a late fee becomes payable. Normally the maximum extension of time for the payment of fees is until 31st March for fees due in Session 1 and for one month from the date on which a late fee becomes payable in Session 2.

Where an extension of time is granted to a first year student in Session 1, such student may only attend classes on the written authority of the Registrar, but such authority will not normally be given in relation to any course where enrolments are restricted.

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 session, to attend classes or examinations, or to be granted any official credentials.

No student is eligible to attend the annual examinations in any subject where any portion of his course fees for the year is outstanding after the end of the fourth week of Session 2 (17th August, 1973).

In very special cases the Registrar may grant exemption from the disqualification referred to in the two preceding paragraphs upon receipt of a written statement setting out all relevant circumstances.

Cashier's Hours

The cashier's office is open for the payment of fees from 9.30 a.m. to 1.00 p.m., and from 2.00 p.m. to 4.30 p.m. Monday to Friday. It is open for additional periods during the first four weeks of Session 1 and three weeks of Session 2. Students are advised to consult noticeboards for details.

RULES RELATING TO STUDENTS

GENERAL CONDUCT

Acceptance as a member of the University implies an undertaking on the part of the student to observe the regulations, by-laws and other requirements of the University, in accordance with the declaration signed at the time of the enrolment.

In addition, 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 also 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 or any breach of regulations occurring in the University.

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 Registrar.

In the case of illness or of absence for some other unavoidable cause a student may be excused by the Registrar from non-attendance at classes for a period of not more than one month, or on the recommendation of the Dean of the appropriate Faculty for any longer period.

Applications to the Registrar for exemption from re-attendance at classes, either for lectures or practical work, may only be granted on the recommendation of the Head of the appropriate School. The granting of an exemption from attendance does not carry with it exemption from payment of fees.

Application forms for exemption from lectures are available at the Admissions Office and should be lodged there (with a medical certificate where applicable). If session examinations have been missed this fact should be noted in the application.

Where a student has failed a subject at the annual examinations in any year and re-enrols in the same course in the following year, he must include in his programme of studies for that year the subject in which he has failed. This requirement will not be applicable if the subject is not offered the following year; is not a compulsory component of a particular course; or if there is some other cause, which is acceptable to the Professorial Board, for not immediately repeating the failed subject.

Where a student has attended less than eighty per cent of the possible classes, he may be refused permission to sit for the examination in that subject.

INDEBTEDNESS TO THE UNIVERSITY

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 session, to attend classes or examinations, or to be granted any official credentials.

In very special cases the Registrar may grant exemption from the disqualification referred to in the preceding paragraph upon receipt of a written statement setting out all relevant circumstances.

COURSE TRANSFERS

Students wishing to transfer from one course to another must apply on an application form obtainable from the Admissions Office, Chancellery, by Friday, 21st January. As quotas will operate on entry to all Faculties and the Board of Vocational Studies, failure to apply by 21st January, 1972 will probably result in the application for transfer being unsuccessful.

Students whose applications to transfer are successful are required to comply with the enrolment procedures for the year/stage of the new course in which they expect to enrol. Unless otherwise instructed they must present the letter granting approval of the transfer to the enrolling officer.

Students who have not received advice regarding their application to transfer before the date on which they are required to enrol should check with the Admissions Office.

Students should also advise the Enrolling Officer of the School in which they are enrolled of their intention to transfer.

ADMISSION WITH ADVANCED STANDING

Any person who makes application to register as a candidate for any degree or other award granted by the University may be admitted to the course of study leading to such degree or award with such standing on the basis of previous attainments as may be determined by the Professorial Board.

Students should consult the University Calendar for complete details regarding "Admission with Advanced Standing".

CHANGES IN COURSE PROGRAMMES AND WITHDRAWAL FROM SUBJECTS

Students seeking approval to substitute one subject for another, add one or more subjects to their programme or discontinue part or all of their programme must make application to the Registrar through the Head of the School responsible for the course on forms available from School offices. The Registrar will inform students of the decision. Application to enrol in additional subjects must be submitted by 31st March.

Approval of withdrawal from subjects is not automatic, each application being determined after considering the circumstances advanced as justifying withdrawal.

It is emphasized that:

1. Withdrawal from a subject, tuition in which extends over the academic year, at any time after the May recess;
2. withdrawal from a subject, tuition in which extends over only one session, at any time after one month from the commencement of the subject; or
3. failure to sit for the examinations in any subject in which the student has enrolled,

shall be regarded as failure to satisfy the examiners in the subject, unless written approval to withdraw without failure has been obtained from the Registrar.

STUDENT RECORDS

All students will receive enrolment details forms by 4th April and 7th August. It is not necessary to return the forms unless any information recorded thereon is incorrect. Amended forms must be returned to the Examinations and Student Records Section by 19th April and 22nd August respectively. Amendments notified

after the closing date will not be accepted unless exceptional circumstances exist and approval is obtained from the Registrar. Where a late amendment is accepted, a late fee of $8 will be payable. Amended forms returned to the Registrar will be acknowledged in writing within fourteen days.

RESUMPTION OF COURSES

Students wishing to resume their studies after an absence of twelve months or more are required to apply to the Admissions Office for permission to re-enrol by 19th January, 1973. Students re-enrolling in this way will normally be required to satisfy conditions pertaining to the course at the time of re-enrolment. This condition applies also to students who have been re-admitted to a course after exclusion under the rules restricting students re-enrolling.

ANNUAL EXAMINATIONS

Most annual examinations are held in November-December and examinations in many subjects are also held during the mid-year recess. Timetables indicating the dates and times of examinations and notices of the location of examinations are posted on the central notice boards in the Wallace Wurth Medical School, Biological Sciences Building, the Chancellery, Central Lecture Theatre Block, Dalton (Chemistry) School, Main Building (Mining and Physics), outside the Science Theatre and in the Western Grounds Area.

Misreading of the timetable is not an acceptable excuse for failure to attend an examination.

A student suffering from a physical disability which puts him at a disadvantage in written examinations should apply to the Registrar in writing, as early as possible, for special provisions to be made for him to take examinations. The request should be supported by medical or other evidence.

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

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

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

(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 of commencement of the examination.

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

(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 examinations.

(i) All answers must be in English unless otherwise directed. Foreign students who have the written approval of the Officer-in-Charge of Examinations may use standard translation dictionaries.

(j) A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination, to immediate expulsion from the examination room and to such further penalty as may be determined in accordance with the By-laws.

A student who through serious illness or other cause outside his control is unable to attend an examination is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar not later than seven days after the date of the examination, and may be required to submit to medical examination.

A student who attempts an examination yet claims that his performance is prejudiced by sickness on the day of the examination, must notify the Registrar or Examination Supervisor, before, during or immediately after the examination and may be required to submit to medical examination.

A student who believes that his performance at an examination has been affected by serious illness during the year or by other cause outside his control, and who desires these circumstances to be taken into consideration in determining his standing is required to bring the evidence (supported by medical certificates or other

evidence) to the notice of the Registrar not later than seven days after the date of the examination.

In the assessment of a student's progress, consideration is given to work in laboratory and class exercises and to any term or other tests given throughout the year, as well as to the results of written examinations.

Examination results are posted to the term addresses of students and it is therefore essential that any change of address be advised to the Examination and Student Records Section. Results are also posted on School notice boards. No examination results will be given by telephone.

Examination results may be reviewed for a fee of $9.00 a subject, which is refundable in the event of an error being discovered. Such a review will consist primarily in ensuring that all questions attempted by candidates have been marked and that the total of all marks awarded are correct. Applications for review must be submitted on the appropriate form to the Examinations and Student Records Section, together with the necessary fee by the date indicated on the notification of results.

Examination Results

Graded Passes

Passes will be graded as follows:

High Distinction (indicates a quite superior performance).

Distinction (indicates a superior performance).

Credit (indicates a good, but not superior performance).

Pass (indicates the achievement of an acceptable minimum level of competence in relation to the course objectives).

Pass Conceded

A pass conceded may be granted to students where the mark in the subject is slightly below the required standard and whose overall performance warrants it.

Terminating Pass

A terminating pass may be granted where the mark for the subject is below the required standard. A terminating pass will not permit a student to progress further in the subject or to enrol in any other subject for which a pass in the subject is a co-requisite or prerequisite. A student granted a terminating pass may attempt a deferred examination, if available, to improve his performance, but if the student fails the deferred examination, the terminating pass will stand.

DEFERRED EXAMINATIONS

Deferred examinations may be granted in the following cases:—

(i) When a student through illness or some other acceptable circumstance has been prevented from taking the annual examination or has been placed at a serious disadvantage during the annual examinations. Applications for deferred examination in this category must be lodged with the Registrar with appropriate evidence of the circumstances (e.g., medical certificate) not later than seven days after the examination concerned. All such applications shall be reported to the Head of the School responsible for the subject. Before a deferred examination is granted on medical grounds, regard shall be paid to the student's class and assignment work in the subject, to his general performance in the year, and to the significance of the annual examination in compiling the composite mark.

(ii) To help resolve a doubt as to whether a student has reached the required standard in a subject.

(iii) To allow a student by further study to reach the required standard in a subject. The granting of a deferred examination in such cases will be based on the general quality of the student's performance.

(iv) Where a student's standing at the annual examinations is such that his progression or graduation could depend on his failure in one subject only, then his position in that subject shall be again reviewed with a view to determining whether a deferred examination may be granted notwithstanding his failure otherwise to qualify for such concession.

Deferred examinations must be taken at the centre in which the student is enrolled, unless he has been sent on compulsory industrial training to remote country centres or interstate. An application to take an examination away from the centre in which enrolled must be lodged with the Registrar immediately examination results are received. Normally, the student will be directed to the nearest University for the conduct of the deferred examination.

A student eligible to sit for a deferred examination must lodge with the Accountant an application accompanied by the fee of $8 per subject, by the date indicated on the notification of results.

APPLICATION FOR ADMISSION TO DEGREE OR DIPLOMA

Applications for admission to a degree or diploma of the University must be made on the appropriate form by 15th January. Applicants should ensure that they have completed all requirements for the degree or diploma, including industrial training where necessary.

RESTRICTION UPON STUDENTS RE-ENROLLING

The University Council has adopted the following rules governing re-enrolment with the object of requiring students with a record of failure to show cause why they should be allowed to re-enrol and retain valuable class places. These rules apply retrospectively from 1st January, 1971.

1. (i) 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 in the annual examination counts, for the purpose of this regulation, as one failure). Where such subject is prescribed as a part of the student's course he shall be required to show cause why he should be allowed to continue the course.

   Notwithstanding the provisions of Clause 1(i)

   (ii) A student enrolled in the first year or first stage of any course who has failed in more than half the programme in which he is enrolled for that year or stage shall be required to show cause why he should be allowed to continue in the course.

   (iii) A student enrolled in the first year of the Medical course who has failed in more than one subject of that year shall be required to show cause why he should be allowed to continue in the Medical course.

   (iv) The provisions of sections (ii) and (iii) of this rule shall be deemed to apply to any student on transfer from another course or institution whose programme of studies in the first year of enrolment immediately following transfer is comprised of subjects so chosen that half or more of such subjects are listed in the University Calendar as first year subjects.

2. Notwithstanding the provisions of Clause 1, a student shall be required to show cause why he should be allowed to continue a course which he will not be able to complete in the time set down in the following schedule:—

Number of years in course	*Total time allowed from first enrolment to completion (years)*
3	5
4	6
5	8
6	9
7	11
8	12

3. No full-time student shall, without showing cause, be permitted to continue a course unless all subjects of the first year of his course are completed by the end of his second year of attendance. No student in the Faculty of Arts shall, without showing cause, be permitted to continue a course unless he completes four subjects by the end of his second year of attendance. No full-time student in the Bachelor of Social Work course shall without showing cause be permitted to continue with the course unless he completes the equivalent of four full subjects by the end of his second year of attendance.

No part-time student in a course in which progression is by stage shall without showing cause be permitted to continue a course in which he will not be able to complete all subjects of the first two stages by the end of his fourth year of attendance and all subjects of the third year and fourth stages of his course by the end of his seventh year of attendance.

No part-time student in the Science course shall without showing cause be permitted to continue a course in which he will not be able to complete level one Mathematics and six other level one units by the end of his fourth year of attendance and fourteen units inclusive of at least three at level two of his course by the end of his seventh year of attendance.

No student in the Faculty of Medicine shall, without showing cause, be permitted to continue with the medical course unless he completes the second year of the course by the end of his third year of attendance,

and the third year of the course by the end of his fourth year of attendance.

4. A student who has a record of failure in a course at another University shall be required to show cause why he should be admitted to this University. A student admitted to a course at this University following a record of failure at another University shall be required to show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations in his first year of attendance at this University.

5. Any student excluded under any of the Clauses 1-3 may apply for re-admission after two academic years and such application shall be considered in the light of any evidence submitted by him.

6. A student wishing "to show cause" under these provisions shall do so in writing to the Registrar. Any such application shall be considered by a committee, hereinafter referred to as the Re-enrolment Committee appointed by the Professorial Board, which shall determine whether the cause shown is adequate to justify his being permitted to continue his course or re-enrol as the case may be.

7. The Vice-Chancellor may on the recommendation of the Re-enrolment Committee exclude from attendance in a course or courses any student who has been excluded from attendance in any other course under the rules governing re-enrolment and whose record at the University demonstrates, in the opinion of the Re-enrolment Committee and the Vice-Chancellor, the the student's lack of fitness to pursue the course nominated.

8. A student who has failed, under the provisions of Clause 6 of these rules, to show cause acceptable to the Re-enrolment Committee why he should be permitted to continue in his course, and who has subsequently been permitted to re-enrol in that course or to transfer to another course, shall also be required to

show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations immediately following the first year of resumption or transfer of enrolment as the case may be.

9. Any student who is excluded from attendance in any course or subject under the provisions of these rules may appeal to an Appeal Committee constituted by Council for this purpose. The decision of the Appeal Committee shall be final.

10. The notification to any student of a decision by the Re-enrolment Committee to exclude the student from attendance in any course or subject shall indicate that the student may appeal against the decision to an Appeal Committee. In lodging such appeal the student shall ensure that a complete statement is furnished of all grounds on which the appeal is based and shall indicate whether or not the student wishes to appear in person before the Appeal Committee.

In considering an appeal the Appeal Committee, on the basis of the student's academic record and the stated grounds of appeal, shall decide:

(i) whether there are grounds which justify the Committee seeing the student in person, or

(ii) whether there is sufficient information available to the Committee to allow decision without seeing the student in person

and so proceed to determine the application accordingly.

RE-ADMISSION AFTER EXCLUSION

Applications for re-admission must be made on the standard form and lodged with the Registrar not later than 30th June of the year prior to that for which re-admission is sought. An application should include evidence of appropriate study in the subjects (or equivalents) on account of which the applicant was excluded. In addition, evidence that the circumstances which were deemed to operate against satisfactory performance at the time of exclusion are no longer operative or are reduced in intensity, should be furnished. An applicant may be required to take the annual

examinations in the relevant subjects as qualifying examinations in which case re-admission does not imply exemption from the subject. Late applications cannot be considered where, in the opinion of the University, insufficient time will be available for the student to prepare himself for any qualifying examinations which may be required.

It should be noted that a person under exclusion may not be enrolled in miscellaneous subjects unless he has received the approval of the Professorial Board on the recommendation of the Admissions Committee.

Persons who intend applying for re-admission to the University at a future date may seek advice as to ways in which they may enhance their prospects of qualifying for re-admission. Enquiries should be made on a form obtainable from the Examinations Branch, and lodged with the Registrar.

OWNERSHIP OF STUDENTS' WORK

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.

CHANGE OF ADDRESS

Students are requested to notify the Student Records Section of the Registrar's Division of any change in their address, as soon as possible. Failure to do this could lead to important correspondence not reaching students. The University cannot accept responsibility if official communications fail to reach students who have not notified their change of address. A Change of Address Advice form is available at Faculty and School offices and at the Enquiry Counters on the Ground Floor of the Chancellery Building.

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.

LOST PROPERTY

All enquiries concerning lost property should be made to the Superintendent on Extension 2503 or to the Lost Property Office at the Union.

PARKING WITHIN THE UNIVERSITY GROUNDS

Because of the limited amount of parking space available, only the following categories of students may apply for a permit; motor cycle owners (annual fee $3.90); higher degree students (limited issue, annual fee $7.80); postgraduate, and senior undergraduate students who have completed three years of a full-time or part-time course (annual fee $3.90). A permit will allow access to the campus between 5 p.m. and 11 p.m. on weekdays and during library hours on Saturdays, Sundays and public holidays. Enquiries should be made to the Property Section, Room 240, The Chancellery Building, or phone 663 0351, extension 2920. It should be noted that increasing demand for parking space may require the imposition of further restrictions.

APPLICATION OF RULES

General

Any student who requires information on the application of these rules or any service which the University offers may make inquiries from the Admissions Office, the Student Counselling Centre or the Registrar.

Appeals

Section 5(c) of Chapter III of the By-laws provides that "Any person affected by a decision of any member of the Professorial Board (other than the Vice-Chancellor) in respect of breach of discipline or misconduct may appeal to the Vice-Chancellor, and in the case of disciplinary action by the Vice-Chancellor, whether on appeal or otherwise, to the Council".

STUDENT SERVICES

THE LIBRARY

The University library is on the upper campus and adjacent to the Chancellery, and the Arts and Commerce Buildings. The Bio-Medical Library is in the Biological Sciences Building with a branch at Prince Henry Hospital ('Phone: 661 0111). The Law Library is temporarily housed on the 4th Floor of the Science Building on the upper campus.

The Library's Undergraduate Collection covers the teaching and research interests of the Faculty, and students are expected to read widely and critically from it.

It is recommended that students attend the "Introduction to the Library" which is held at advertised times during Orientation Week and the first week of Session 1. The "Introduction" uses audio-visual aids to describe the physical layout of the undergraduate library and the services available to readers.

Copies of the booklet, *Guide to the Library*, are available on request.

Students who are interested in a subject approach to information may attend a course which outlines methods of searching for information in libraries. This course runs for eight hours over a period of one week.

Individual assistance for readers with specific library problems is provided by the *Reader Assistance Unit* which is located in the foyer.

Staff and students must use a machine readable identification card to borrow from the main University Library. Personal identification is required in the other libraries listed. For students a current union card is acceptable. Staff must apply to the Library for a library card.

THE UNIVERSITY UNION

The University Union, housed in the circular building and joined by a courtyard to an adjacent rectangular building, is located near the entrance to the Kensington campus from Anzac

Parade. The third building in the Union complex was completed in 1971. Membership of the Union is compulsory for all registered students of the University and is also open to all members of staff and graduates of the University.

The full range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre, cloak room, banking and hairdressing facilities, showers, a women's lounge, common, games, reading, meeting, music, practice, craft and dark rooms. Photocopying, sign printing and stencil cutting services are also available.

The Union also sponsors and conducts courses in many facets of the arts including weaving, photography, creative dance and yoga.

STUDENT ACCOMMODATION

The Kensington Colleges

Accommodation for students is provided within the group of The Kensington Colleges which comprise Basser College, Goldstein College and Philip Baxter College. The group houses 450 men and women students, as well as staff members. Tutors in residence provide tutorial assistance in a wide range of subjects.

Board and residence fees, which are payable on a session basis, amount to $308 per session. Intending students should apply in writing to the Master, Box 24, Post Office, Kensington, N.S.W. 2033, from whom further information is available.

International House

International House accommodates over 110 students of whom half are Australian; the remaining half is made up of students from some 20 different countries. First-year students who have come to the University straight from school are not eligible for residence because preference is given to mature undergraduates and postgraduate students. Fees are $23.50 per week.

Students should apply as soon as possible if they wish to reside at International House at a later date. They should write to the Warden, International House, P.O. Box 88, Kensington, N.S.W. 2033 for information.

New College

This Church of England College is the first of the independent Colleges on the Campus of the University. There are no religious tests, and accommodation is available for 210 men in single study-bedrooms. Fees are $25 per week.

Enquiries should be addressed to the Master, New College, Anzac Parade, Kensington, N.S.W. 2033.

Warrane College

This College, an affiliated Roman Catholic residential college, was completed in 1970, and provides accommodation for 200 students and fourteen resident tutors.

Basic fees are $24 per week for board and residence, payable on a session basis, and a registration fee of $20. Intending students should write to The Master, Warrane College, Box 123, P.O. Kensington, N.S.W. 2033.

The Jewish College

The Jewish College will provide accommodation for 86 men and women students when it is ready for occupation in 1973. The basic fee for residents will be $28 a week. Non-resident membership will be available to students who wish to avail themselves of the Kosher dining room and tutorial facilities.

Applications for residence and further information should be addressed to The Master, The Jewish College, The University of New South Wales, Box 1, P.O. Kensington, N.S.W. 2033.

Other Accommodation

Students requiring other than Residential College accommodation may make personal application to the Housing Officer (Ext. 3260) at the Student Amenities Unit. Current lists are kept of accommodation available at recognized boarding houses, private homes, and in serviced and unserviced apartments.

STUDENT AMENITIES UNIT

The Amenities Unit is concerned with student welfare and its activities are associated with sport and recreation, travel and student accommodation. It works in close liaison with the Sports Association, assisting the various clubs, and administers sporting facilities for both grade and social competitions. The Unit also has the added responsibility of the Physical Education and Research Centre where attractive recreational programmes for students and staff are provided. Concessional application forms for all types of travel may also be obtained at the Enquiry Desk in the Chancellery or at the Student Amenities Unit. A Housing Officer is also available to assist students with any off-campus accommodation problems.

Location: The Student Amenities Unit is located in Hut B at the foot of Basser Steps.

Phone: 663 0351, Extension 2235 Sports Association; 3271 Physical Education and Recreation Centre; 3261 Travel; and 3260 Accommodation.

STUDENT EMPLOYMENT UNIT

The Student Employment Unit offers assistance with career employment for final year students and graduates of the University. This service includes the mailing of regular job vacancy notices to registered students and a campus interview programme for final year students. Careers advice and assistance is also available to undergraduates. Assistance is offered in finding vacation employment which gives either course related experience or industrial training experience where this is a course requirement. Information and advice regarding cadetships, undergraduate and postgraduate scholarships is also available.

The Service is located in the Chancellery on the ground floor. Telephone: 663 0351 ext. 3259 for employment and careers advice, or 663 0351 ext. 2086 for cadetships and industrial training information.

CHAPLAINCY SERVICE

This service is provided for the benefit of students and staff by five Christian Churches and by the Jewish congregation. Chaplains are in attendance at the University at regular times. A Chapel is also available for use by all denominations.

The University Chapel and full-time chaplains are located in Hut F near the Chemistry Building. They may be contacted by phone at the following extensions: Anglican, 2684; Jewish, 3273; Roman Catholic, 2379; Churches of Christ, Methodist and Seventh Day Adventist, 2683.

STUDENT HEALTH UNIT

A student health and first aid centre, staffed by two qualified medical practitioners and a nursing sister, is provided by the University. This medical service, although therapeutic, is not intended to replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected, the student is referred to a private practitioner or to an appropriate hospital for specialist opinion and/or treatment. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.

The service is available to all enrolled students by appointment, free of charge between 9 a.m. and 5 p.m. Mondays to Fridays, and additionally to part-time students from 6 p.m. to 8 p.m. on Tuesdays and Thursdays during session. For staff members, immunizations are available, and first-aid service in the case of injury or illness on the campus.

The centre is located in Hut E on the northern side of the campus in College Road.

Appointments may be made by calling at the centre or by telephoning extension 2679 or 3275 during the above hours.

STUDENT COUNSELLING AND RESEARCH UNIT

The Student Counselling and Research Unit offers a free, confidential counselling service to help students, individually or in groups, to deal with problems, and to make plans and decisions associated with their personal, academic, and vocational progress.

Interviews, and group programmes, are available between 9 a.m. and 8 p.m. each week-day. Appointments may be made at the Unit, which is located at the foot of Basser Steps, or by ringing 663 0351, extensions 2600-2605 between 9 a.m. and 5 p.m.

FINANCIAL ASSISTANCE TO STUDENTS

The Students' Union and the University have co-operated to provide assistance to students who are in financial difficulties which are considered likely to prejudice their progress with their studies.

Three main forms of assistance are available:

1. Deferment of Payment of Fees

Deferments may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the deferment is requested prior to the due date for fee payments.

In exceptional circumstances the University may consider granting deferments for up to twelve months or even longer. In cases where payment is deferred to 31st December, examination results will not be published or made available until such time as the outstanding fees are paid. Where deferments are granted to a date beyond 31st December, the University may require the student to enter into a formal agreement to repay the fees.

2. Short Term Cash Loans

Donations from the Students' Union, the University Union and other sources have made funds available for urgent cash loans not exceeding $100.00. These loans are normally repayable within one month.

3. Long Term Cash Loans

An amount of up to $300.00 is available from this fund, repayable usually after twelve months or within twelve months of graduation or upon withdrawal from the course. This scheme is funded jointly by the University and the Students' Union. Students are required to enter into a formal agreement with the University to repay such a loan.

In all cases assistance is limited to students with reasonable academic records and whose financial circumstances warrant loans.

Applications may be made personally to the Deputy Registrar (Student Services).

FINANCIAL ASSISTANCE TO ABORIGINAL STUDENTS

Financial assistance is available from a number of sources to help Aboriginal students. Apart from Open Entrance Commonwealth University Scholarships, there is also a Commonwealth Aboriginal Study Grant Scheme. Furthermore, the University may assist Aboriginal students with some essential living expenses or the waiving of course fees in exceptional circumstances.

All enquiries relating to this scheme should be directed to The Deputy Registrar (Student Services).

UNIVERSITY CO-OPERATIVE BOOKSHOP LTD.

Membership is open to all students, on payment of a fee of $5, refundable when membership is terminated. Members receive an annual rebate on purchases of books.

STUDENT ACTIVITIES

THE STUDENTS' UNION

The Students' Union was formed in 1952 as an organization, duly recognised by the University Council, to represent the student body and to provide a central organization for the administration of student activities. In the words of its constitution, "The Union is formed for the purpose of advancing the interests of University men and women, facilitating their general scientific and technical education, and fostering a University spirit among them."

The Union affords a recognised means of communication between the student body and the University authorities, and represents its members in all matters affecting their interests. It aims to promote the cultural, educational and recreational life of the University and to encourage a permanent interest among graduates in the life and progress of the University.

Membership of the Union is compulsory for all registered students of the University and is open to graduates of the University and to members of its academic staff. The annual subscription is $7.

The Union is governed by a Council consisting of student representatives from the various faculties of the University, representatives of Life Members, overseas students, and of the University and the Sports Association. The Council is elected annually.

THE SPORTS ASSOCIATION

The Sports Association is a student organization within the University, and it caters for a variety of competitive sports for both men and women.

In December 1952 the University Council approved the establishment of the Sports Association which consisted of five clubs. As the University has grown, the Association has expanded, and today includes over thirty clubs.

The controlling body of the Association is the General Committee which consists of a President, Secretary, Treasurer, eight Vice-Presidents and two delegates from each of the affiliated clubs.

Membership of the Association is compulsory for all registered students, and the annual subscription is $4.

PHYSICAL EDUCATION AND RECREATION CENTRE

The Physical Education and Recreation Centre consists of eight squash courts and a main building. The latter has a large gymnasium and ancillary practice rooms for fencing, table tennis, judo and weightlifting. The Supervisor of Physical Recreation is responsible for this Centre and provides a recreational programme for both students and staff. Those who desire to participate in the recreational programmes should contact the Supervisor on Extension 3271.

STUDENT CLUBS AND SOCIETIES

Students have the opportunity of joining a wide range of clubs and societies. Affiliated with the Students' Union are the School and Faculty associations, and the numerous religious, social and cultural clubs. There are also many sporting clubs (33) affiliated with the Sports Association.

Clubs and societies seeking to use the name of the University in their title, or seeking University recognition, must submit their constitutions either to the Students' Union or the Sports Association if they wish to be affiliated with either of these bodies, or to the Registrar for approval by the University Council.

THE UNIVERSITY REGIMENT

Enquiries should be made to the Adjutant at the Regimental Depot in Day Avenue just west of Anzac Parade.

THE N.S.W. UNIVERSITY SQUADRON

Enquiries should be made to the Commanding Officer at Squadron Headquaters at the corner of City and Darlington Streets, Darlington 2008.

ROYAL AUSTRALIAN NAVY

Enquiries should be made to the Royal Australian Naval Liaison Officer, Professor J. S. Ratcliffe, Commander, R.A.N.V.R., at the School of Chemical Engineering. Phone 663 0351, ext. 2406.

SCHOLARSHIPS, BURSARIES, CADETSHIPS AND PRIZES

SCHOLARSHIPS

Students undertaking courses in the Faculty of Science are eligible to apply for the following scholarships. Not all scholarships are offered each year. During the first week of January prospective applicants should enquire from the Student Employment and Scholarships Unit which scholarships are available.

Except where otherwise specified, applications on the forms obtainable from the Admissions Office ('phone: 663 0351, ext. 2485) must be lodged with the Registrar, the University of New South Wales, P.O. Box 1, Kensington 2033, within seven days of the publication of the award of Commonwealth University Undergraduate Scholarships. A separate application must be lodged for each category of scholarship.

In addition to those scholarships made available by the University and other bodies as set out below, cadetships or traineeships are offered by the Commonwealth Service, the New South Wales Public Service Board, the Department of Railways and a number of private industrial organizations. Cadets generally have their University fees paid by the employer, and are employed at cadet rates of pay during their course.

University Undergraduate Scholarships

The University annually awards up to fifteen scholarships tenable in degree courses to students who have matriculated at the Higher School Certificate Examination; ten scholarships to students who have completed certificate courses (Department of Technical Education); ten scholarships to students who have completed Trade Courses (Department of Technical Education); and ten scholarships to part-time students who have taken the Diploma Entrance course of the Department of Technical Education. The scholarships are tenable in any faculty and exempt the holder from payment of course fees during the currency of the scholarship. Scholarships will be awarded in order of merit on the Higher School Certificate Examination results. They may be held only by persons who do not hold another award and whose parents are permanent residents of Australia.

Commonwealth University Scholarships

There are three types of scholarships, which are available for both Pass and Honours courses: (a) Open Entrance Scholarships; (b) Later Year Scholarships; (c) Mature Age Scholarships. Benefits include payment of tuition fees, examination fees, matriculation fees, degree fees, and other compulsory fees. Full-time students may also apply for a living allowance, which is subject to a means test.

The closing date for applications for Commonwealth University Scholarships is 30th September of the year immediately preceding the year for which the scholarship is desired. Applications for renewal of scholarship must be made before 31st October each year. Further information, application forms and the Commonwealth Scholarship Handbook may be obtained from the Department of Education and Science, La Salle Building, 70 Castlereagh Street, Sydney 2000, or Box 3987, G.P.O. Sydney 2001. Phone 2 0323.

Scholarships in Optometry

The Australian Optometrical Association (New South Wales Division) and Gibb & Beeman (Spectacle Makers) Pty. Ltd., offer annually one scholarship each to the value of $500 per annum. These scholarships are available to students who desire to enrol in the full-time degree course in Optometry leading to the degree of Bachelor of Optometry at the University of New South Wales.

The Australian Optometrical Association offers annually a scholarship open to any student enrolling in the first or second year of the full-time degree course in Optometry, and provides him benefits of $250 p.a. if enrolled in Year 1 and $500 p.a. if enrolled in subsequent years. If his home address is more than 50 miles away from the University he receives an additional allowance of up to $150 p.a. and his first class return surface travel ticket to his home each year.

Applicant's parents must be ordinarily permanent residents of Australia.

Further details are available in the University Calendar.

Application for these scholarships, on the prescribed form shall be lodged with the Registrar within seven (7) days of the publication of the award of Commonwealth University Undergraduate Scholarships.

The Fell Scholarship (University Residential Colleges)

The Fell Scholarship is available to any undergraduate who is or will be in residence at one of the Colleges under the administration of Kensington Colleges Ltd. during the year of the award. The annual value of the Scholarship is $100. It may be held concurrently with Commonwealth and other scholarships.

In awarding the scholarship the academic merit and financial need of the applicant will be taken into consideration.

Applications must be made on the appropriate form and lodged with the Master, Kensington Colleges Ltd., Box 24, P.O., Kensington 2033 (telephone 663 0651).

BURSARIES

Bursaries Awarded by the Bursary Endowment Board

A number of Bursaries tenable at the University are awarded to candidates of merit at the Higher School Certificate Examination whose family income falls within certain limits prescribed by the Bursary Endowment Board.

Applications should be made to the Secretary, Bursary Endowment Board, Box 7077, G.P.O., Sydney 2001.

CADETSHIPS

Sponsored Students

Many private industrial and commercial organisations sponsor students in Science courses. The conditions under which students are sponsored vary from company to company, but in general the company meets all compulsory fees. Industrial training is generally undertaken with the sponsoring company.

Students are advised to consult the Admissions Office or the Student Counselling Unit at Kensington for further details concerning scholarships and cadetships and for information concerning companies sponsoring students.

PRIZES

School/Department	*Donor/Name of Prize*	*Value* $	*Awarded for*
General	Sydney Technical College Union Award	50.00	Leadership in the development of student affairs and academic proficiency throughout the course.
	University of New South Wales Alumni Association	Statuette	Achievement for community benefit—students in their final or graduating year.
School of Botany	E. O. Tout Memorial	21.00	Best aggregate any five units offered by School of Botany.
School of Chemistry	Abbott Laboratories Pty. Ltd.	40.00	2.622 Organic Chemistry II.
	Australian Chemical Holdings Ltd.	21.00	Organic Chemistry.
	Australian Glass Manufacturers Co.	30.00	Subject selected by Head of School.
	Borden Chemical Co. (Aust.) Pty. Ltd.	50.00	Subject selected by Head of School.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	C.S.R. Chemicals Ltd.	100.00	Chemistry Honours.
	Inglis Hudson Bequest	6.00	2.611 Organic Chemistry I.
	Merck, Sharp & Dohme (Aust.) Pty. Ltd.	52.50 52.50	Chemistry—Level 2 Units Science Course. Chemistry—Level 3 Units Science Course.
	The Nestlé Co. (Aust.) Ltd.	10.50	Subject selected by Head of School.

PRIZES (continued)

School/Department	*Donor/Name of Prize*	*Value* $	*Awarded for*
School of Chemistry (cont.)	Parke Pope	10.50	Subject selected by Head of School.
	V. S. Rawson	10.50	Subject selected by Head of School.
	Science Association	(i) 10.50 (ii) 10.50	Subject selected by Head of School. Subject selected by Head of School.
	Tooheys Ltd.	10.00	Subject selected by Head of School.
	Tooth & Co. Ltd.	10.00	Subject selected by Head of School.
	Univeler Aust. Pty. Ltd.	21.00	Physical Chemistry.
	George Wright	10.50	2.001 Chemistry I—Full-time students only.
School of Mathematics	School of Mathematics	25.00	Higher Mathematics I.
		25.00	Higher Pure Mathematics II.
		25.00	Higher Applied Mathematics II.
		25.00	Higher Pure Mathematics III.
		25.00	Higher Applied Mathematics III.
	The Broken Hill Proprietary Co. Ltd.	50.00	Higher Theory of Statistics II.
	The W.D. & H.O. Wills (Aust.) Ltd. Prize	50.00	Higher Theory of Statistics III.
	I.C.I. Australia Ltd.	50.00	Theory of Statistics IV.
	Statistical Society of Australia (New South Wales Branch)	20.00	General proficiency—Theory of Statistics subjects.

Department of Optometry	Australian Optometrical Association	30.00	Subject selected by Head of School.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	Arthur Cocks & Co. Ltd.	10.50	Subject selected by Head of School.
	International Optical Corporation Ltd.	21.00	Subject selected by Head of School.
		21.00	Subject selected by Head of School.
	Martin Wells Pty. Ltd.	30.00	Subject selected by Head of School.
		50.00	Subject selected by Head of School.
		30.00	Subject selected by Head of School.
	G. Nissel & Co. Aust. Pty. Ltd.	150.00	31.813 and 31.841 Optometry III—best student in Contact Lenses section.
	Optical Products Pty. Ltd.	21.00	Subject selected by Head of School.
	Opticians and Optometrists' Association of N.S.W.	25.00	Subject selected by Head of School.
School of Physics	Head of School's Prize in Physics	20.00	Area selected by Head of School.
	Physics Staff	60.00	Physics III.
	Physics IV Prize	40.00	Physics IV.
	School Prize for Physics II	40.00	Physics II.
School of Psychology	Australian Psychological Society	30.00	A Year IV Psychology subject selected by Head of School.

UNDERGRADUATE COURSES

There are two types of courses available within the Faculties of Science and Biological Sciences. The first is the Science Course, which allows a student to select sequences from a variety of the sciences. The second type of course is of a more specialized nature. Such courses are offered in Pure and Applied Chemistry, Optometry and Psychology. Details of each of these courses are given below.

SCIENCE COURSE

The Science Course is administered by the Dean of the Faculty of Science through his nominated representative on behalf of the Schools within the Faculty of Biological Sciences and the Faculty of Science, as well as the Schools of Applied Geology, Physiology and Anatomy, and the Department of Electronic Computation (School of Electrical Engineering).

The pass degree (Bachelor of Science) is based on a unit structure. A unit in experimental subjects comprises 90 hours of lectures, tutorials and laboratory work, and in theoretical subjects comprises an equivalent loading of lectures and tutorials. A unit may be of 14 or 28 weeks' duration.

The unit structure has been chosen to allow flexibility in the choice of a course of study and the regulations have been framed so that a student may choose a pattern suitable for:—

(1) a general scientific education.
(2) the training of science teachers.
(3) professional training in a specific discipline.
(4) professional training in interdisciplinary areas.

Units are grouped according to levels. Level I subjects are all double units. Level II units normally follow after level I prerequisites. Level III units in most cases follow after level II prerequisites.

The requirements of a pass degree may be met by completing units in accordance with the regulations set out below and which

constitute a major in one of the disciplines of the Schools of the Faculties of Science and Biological Sciences, or the Schools of Applied Geology (Faculty of Applied Science), Physiology or Anatomy (Faculty of Medicine). Some units may also be included from Schools in the Faculties of Arts and Engineering. A major normally includes four level III units chosen from those offered by a particular School.

All students are required to complete three General Studies subjects. Patterns and outlines of these subjects are listed in the Department of General Studies Handbook, which is available free of cost.

The minimum time required to complete a pass degree is three years' full-time study or an equivalent period part-time. Some subject groupings cannot, however, be completed in the minimum time due to timetable difficulties.

A student may be admitted, subject to meeting conditions defined in the regulations, to an honours course which involves an extra year of full-time study or two years of part-time study. Those intending to seek admission to an honours year should consult the Head of the appropriate school on completion of the first year subjects.

Any arrangement of units to be studied must be approved by the Dean of the Faculty of Science. Advice on recommended course patterns may be obtained from the Education Officer of the School in which a student intends to major.

REGULATIONS GOVERNING THE SCIENCE COURSE

1. Definitions

The Science course is administered by the Dean of the Faculty of Science through his nominated representative.

The pass degree is based on a unit structure. A unit may be of 14 or 28 weeks' duration, and units are grouped according to levels. Level I subjects are all double units, level II units normally follow after level I prerequisites and level III units, in most cases, follow after level II prerequisites. A major sequence normally includes four level III units chosen from those offered by a particular school, although a number of schools offer more than four such units.

A prerequisite unit is one which must be completed prior to enrolment in the unit for which it is prescribed. A co-requisite unit is one which must either be completed successfully before or be studied concurrently with the unit for which it is prescribed. An excluded unit is one which cannot be counted together with the unit which excludes it towards the degree qualification. In exceptional circumstances, on the recommendation of the head of the appropriate school, the Dean of the Faculty of Science may waive or vary a particular prerequisite or co-requisite.

CARE SHOULD BE TAKEN IN THE CHOICE OF UNITS TO ENSURE THAT THE PATTERN COMPLIES WITH THE REGULATIONS SET OUT IN SECTION 3(a). CERTAIN COMBINATIONS OF UNITS CANNOT BE COMPLETED IN THE MINIMUM TIME DUE TO THE RESTRICTIONS OF TIMETABLES. COPIES OF TYPICAL COURSE PATTERNS ARE AVAILABLE FROM THE FACULTY OFFICE.

2. Regulations governing the Science course

(a) *Requirements for a pass degree*

In order to qualify for admission to the degree of Bachelor of Science under these regulations a candidate shall attend classes and satisfy the examiners in Science units and General Studies subjects chosen as follows—

(i) At least 23 Science units shall be included from the list set out in section 3(a) and three General Studies subjects from the list in section 3(b).

(ii) The 23 Science units shall comply with the prerequisites, co-requisites and exclusion conditions set out in section 3(a) and also shall conform to the following restrictions:

not less than 8 units, nor more than 10 units may be from level I;

not less than 4 units may be from level III, and these four shall be chosen from related disciplines.

(iii) One of 10.001 Mathematics I, *OR*
10.011 Higher Mathematics I, *OR*
10.021 Mathematics IT
shall be included.

(iv) In addition to the specific prerequisites listed in Clause 3(a), additional general prerequisites are required by some schools as a preliminary to certain advanced level units. These units, which are scheduled below, should be taken in the first year of enrolment together with compulsory mathematics. Eight units are normally taken in first year.

School of Chemistry	1.001, 1.011 or 1.041 Physics.
School of Applied Geology	1.001, 1.011 or 1.041 Physics and 2.001 Chemistry.

School of Biochemistry School of Botany School of Microbiology School of Zoology	2.001 Chemistry. 17.001 General and Human Biology; plus one other subject. *Note:* In making their choice students should consider carefully, in their first year, the requirements of level II and level III units.
School of Anatomy	17.001 General and Human Biology.
School of Physiology	2.001 Chemistry and 17.001 General and Human Biology.

(v) Only one from each of the following subjects/ units may be included:

(a) 12.001 Psychology or 26.121 Psychology.

(b) 52.111 Philosophy or 26.521 Philosophy.

(c) Any unit listed in Section 3(a) or the equivalent unit offered at Wollongong University College which contains similar syllabus material.

(vi) A full-time student is required to complete the appropriate level I Mathematics and six other approved level I units in the first two years of attendance or else show cause to the satisfaction of the Professorial Board why he should be allowed to re-enrol. The remaining units of the course may be completed in any order consistent with the requirements concerning prerequisite and co-requisite units as set out in Clause 3(a).

(vii) *The proposed course must be approved by the Dean of the Faculty of Science or his representative at enrolment.* In special circumstances, the Dean may grant a student permission to defer enrolment in certain level I units until the second year of the course. Where any alteration in the course approved at enrolment is desired, the student must obtain the approval of the Dean or his representative for the new course.

(b) *Requirements for an honours degree*

(i) In order to qualify for admission to the honours degree of Bachelor of Science a candidate shall:

1. Satisfy the requirements for a pass degree but without proceeding to graduation;
2. Undertake an extra year of full-time or two extra years of part-time study.

(ii) Admission to an honours course is granted by the Head of School. Students wishing to proceed to an honours degree must apply to the Head of the appropriate school on completion of pass degree requirements.

(iii) A suitably qualified candidate may be admitted to an honours course in one of the following:

Anatomy	Geology
Applied Mathematics	Microbiology
Applied Physics	Physics
Biochemistry	Physiology
Biological Technology	Psychology†
Botany	Pure Mathematics
Chemistry	Theory of Statistics
Computer Science	Zoology
Entomology	

(iv) To qualify for admission to an honours course, a student must have completed successfully 8 level III units in the pass degree course* except that in special cases the Head of the appropriate school may approve entry without such a qualification.

(v) Further to requirements listed in paragraph 2(b) (iv), to qualify for entry into an honours year a student must have completed any special units at required grades as determined by the Head of the School, prior to admission to the Honours year.

* For the honours course in Applied Physics the corresponding normal requirement is both (a) at least six level III units to be completed and (b) at least eight units at levels II and III to be completed at Credit grade or better or in the respective Higher version.

† The Honours subject is 12.014 Psychology IV.

In order to ascertain any such special conditions, a student contemplating honours is advised to consult the Head of School at the end of the first year of study.

(vi) Upon admission to the honours course a student must attend lectures, read and engage in laboratory work as required by the Head of School.

3. Schedule of Units

(a) *Science units*

These are listed under the Schools which provide the instruction and are divided into levels. Students must observe the prerequisites and co-requisites. Some Schools offer higher units to which special prerequisites apply and which are designed to lead to honours. Students contemplating honours studies must ensure that they have selected appropriate units. Some units are terminating so that students taking these may not qualify to continue studies in that School. When selecting terminating units students must ensure that a choice of a major sequence is still available. Note that many units are of half year duration so that it is necessary to choose units which give a balanced programme of study over the year.

The Dean of the Faculty has the power to vary in exceptional cases the prerequisites and/or co-requisites set down below on the recommendation of the Head of the appropriate school.

See following pages B8-B27.

(b) *General Studies*

Turn to page B28.

FACULTY OF SCIENCE

SCHOOL OF PHYSICS

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites‡	Co-requisites‡	Excluded
1.001	Physics I	I	2	Full yr.	6	Sc. Faculty Ent.		
1.011	Higher Physics I	IH	2	Full yr.	6	Sc. Faculty Ent.		
1.041	Physics IC*	I	2	Full yr.	6	Sc. Faculty Ent.		
	PHYSICS LEVEL II							
1.112A	Electromagnetism	II	1	Session 2	6	1.001, 10.001 1.001, 10.001	10.211A	1.122A
1.112B	Modern Physics	II	1	Session 1	6		10.211A	1.122B, 1.212C
1.112C	Waves in Continuous Media and Thermodynamics	II	1	Full yr.	2	1.001, 10.001	10.211A	1.122C
1.212T	Physics IIT (any two of 1.212A, 1.212B, 1.212C, 1.212D)	II	1	Full yr.	3	1.001 *or* 1.011 *or* 1.031 *or* 1.041, *or* 1.051 *or* 1.061; 10.001 *or* 10.011 *or* 10.021		1.112B (excluded by 1.212C only)
	HIGHER PHYSICS LEVEL II							
1.122A	Electromagnetism	IIH	1	Session 2	6	1.011, 10.001	10.211A	1.112A
1.122B	Quantum Physics	IIH	1	Session 1	6	1.011, 10.001	10.211A	1.112B
1.122C	Thermodynamics and Mechanics	IIH	1	Full yr.	2	1.011, 10.001	10.211A	1.112C

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites‡	Co-requisites‡	Excluded
	PHYSICS LEVEL III							
1.113A	Wave Mechanics and Spectroscopy	III	1	Session 1	6	1.112B, 1.112C 10.211A		1.123A and 1.123D 2.023A and 10.222F
1.113B	Electromagnetic Fields and Physical Optics	III	1	Session 2	6	1.112A, 10.211A		10.212C and 10.222C
1.113C	Statistical Mechanics and Solid State	III	1	Session 1	6	1.112B and 1.112C	1.113A	1.123B and 1.123C
1.113D	Astrophysics and Nuclear Physics	III	1	Session 2	6	1.112B	1.113A§ or 10.222F	1.123C
	HIGHER PHYSICS LEVEL III							
1.123A	Quantum Mechanics	IIIH	1	Session 1	6	1.122B, 1.122C, 1.122A, 10.211A, 10.111A, 10.111B		1.113A, 2.023A 10.222F
1.123B	Electromagnetic Theory and Statistical Mechanics	IIIH	1	Session 1	6	1.122C, 1.122A 10.211A		1.113C, 10.212C, 10.222C
1.123C	Solid State and Nuclear Physics	IIIH	1	Session 2	6	1.122B, 10.211A	1.113A or 1.123A or 10.222F	1.113C and 1.113D
1.123D	Atomic Physics and Spectroscopy	IIIH	1	Session 2	6	1.122B, 1.122A 10.211A	1.123A or 10.222F	1.113A

SCHOOL OF PHYSICS (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites‡	Co-requisites‡	Excluded
	PHYSICS LEVEL III SUPPLEMENTARY UNITS							
1.133A	Electronics	III**	1	Session 1	6	1.001 or 1.011	1.112B or 1.122B	
1.143A	Biophysics	III	1	Session 1	5	1.112C		
1.143B	Solid State Devices and Electronics	III	1	Session 2	6	1.112A, 1.112B, 1.133A		
1.143C	Magnetism	III	1	Session 2	5	1.112A, 1.112B 10.211A		
1.143D	Conceptual Framework of Physics	III	1	Session 2	5	1.112C† 1.112A, 1.112B		
1.143E	Electrical and Optical Properties of Solids	III	1	Session 2	5		1.113C	1.123D
1.153A	Hydrodynamics and Magnetohydrodynamics	IIIH	1	Full yr.	4	1.122A, 1.122C 10.211A, 10.111A 10.111B		
1.153B	Relativity and Electromagnetism	IIIH	1	Full yr.	4	1.122A and 1.122C 10.211A, 10.111A 10.111B		10.212C and 10.222C

* Available for students who intend to study Physics for only one year.
Progression to Physics level II units is normally by way of 1.001 or 1.011.

† This unit may be a co-requisite in special cases.

‡ Students should note the additional mathematics prerequisite to units of Higher Physics III. Where a unit is specified at level II as a prerequisite or co-requisite the level IIH unit may be substituted.
Students must apply to the Head of School for admission to Physics honours and they must have completed at least Physics units 1.123A, 1.123B, 1.123C and 1.123D.

** This unit may be taken in second year of the course provided prerequisites have been completed.

§ This co-requisite may be waived under certain circumstances subject to the approval of the School of Physics.

SCHOOL OF CHEMISTRY

No.	Name	Level	Unit Value	When Offered	Hours p.w	Prerequisites	Co-requisites	Excluded
2.001	Chemistry I	I	2	Full yr.	6	H.S.C. Science 2S		
2.002A‡	Physical Chemistry	II	1	Half yr.	6	2.001 and 10.001 *or* 10.011 *or* 10.021 and 1.001 *or* 1.011 *or* 1.041 *or* 1.031 *or* 1.061		
2.002B‡	Organic Chemistry	II	1	Half yr.	6	2.001 and 10.001 *or* 10.011 *or* 10.021		
2.002C‡	Inorganic Chemistry	II	1	Half yr.	6	2.001 and 10.001 *or* 10.011 *or* 10.021		
2.003A	Physical Chemistry	III	1	Half yr.	6	2.002A		2.013A, 2.023A
2.003B	Organic Chemistry	III	1	Half yr.	6	2.002B		
2.003C	Inorganic Chemistry	III	1	Half yr.	6	2.002C		
2.003D	Analytical Chemistry	III	1	Half yr.	6	2.002A, 2.002C		
2.003E	Nuclear and Radiation Chemistry	III	1	Half yr.	6	2.002A*, 2.002C*		
2.013A	Theoretical Chemistry	III	1	Half yr.	6	2.002A, and 10.031 *or* 10.211A		2.003A, 2.023A
2.023A§	Chemical Physics	III	1	Full yr.	3	10.211A (or equiv.) and 2.002A *or* 1.112B		1.113A, 1.123A 2.013A, 2.003A
2.033A**	Macromolecules	III	1	Half yr.	6	2.002A and 2.002B		

* If taken as one unit independently, prerequisites may be waived subject to the approval of Head of School.

‡ All three level II units must be taken by students majoring in Chemistry.

§ This is a unit which may be taken in conjunction with units of Applied Mathematics or Physics. It cannot be included as a Chemistry level III unit.

** Entry to this course requires permission from the Head of School.

SCHOOL OF MATHEMATICS

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded*
				MATHEMATICS				
10.001	Mathematics I	I	2	Full yr.	6			
10.011	Higher Mathematics I	IH	2	Full yr.	6			
10.021	Mathematics IT	IT	2	Full yr.	6			
10.031	Mathematics	II	1	Full yr.	2	10.001 *or* 10.011 *or* 10.021 Credit		‡
10.032	Mathematics	III	1	Full yr.	2	10.031		§
				PURE MATHEMATICS				
	Pure Mathematics Level II							
10.111A	Linear Algebra	II	1	Full yr.	2	10.001 *or* 10.011		10.121A
10.111B	Analysis	II	1	Full yr.	2	10.001 *or* 10.011		10.121B
10.111C	Algebra and Geometry	II	1	Full yr.	2	10.001 *or* 10.011	10.111A, 10.111B, 10.211A	10.121A
	Higher Pure Mathematics Level II†							
10.121A	Algebra	IIH	1	Full yr.	2½	10.011		10.111A
10.121B	Real and Complex Analysis	IIH	1	Full yr.	2½	10.011		10.111B
10.121C¶	Number Theory and Geometry	IIH	1	Full yr.	2½	10.011	10.121A, 10.121B, 10.221A *or* 10.211A	
	Pure Mathematics Level III							
10.112A	Number Theory and Algebra	III	1	Full yr.	2	10.111A	10.111C	10.121A, 10.121C
10.112B	Real Analysis	III	1	Full yr.	2	10.111B		10.121B
10.112C	Differential Geometry	III	1	Full yr.	2	10.111A, 10.211A, 10.111B		10.122C
10.112D	Topology and Set Theory	III	1	Full yr.	2	10.001 *or* 10.011	10.111A, 10.111B, 10.211A	
10.112E	Complex Analysis and Differential Equations	III	1	Full yr.	2	10.111B, 10.211A		

SCHOOL OF MATHEMATICS (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
	Higher Pure Mathematics Level III**							
10.122A	Algebra	IIIH	1	Full yr.	2½	10.121A		10.112A
10.122C	Differential Geometry and Complex Variable Theory	IIIH	1	Full yr.	2½	10.121A, B & 10.211A	10.121D	10.112C
10.122D	Number Theory and Logic	IIIH	1	Full yr.	2½	10.121A	10.122A	10.112D
10.122F	Functional Analysis	IIIH	1	Full yr.	2½	10.121B, 10.211A	10.121D	

* If a unit in this column is counted the corresponding unit in the first column may not be counted.

† 1. Admission to Higher Pure Mathematics II normally requires completion of 10.011 Higher Mathematics I; students who gain a superior pass in 10.001 Mathematics I may, subject to the approval of the Head of the School of Mathematics, be permitted to proceed to Higher Pure Mathematics II units.
2. Students majoring in Physics who wish to take Higher Pure Mathematics II should attempt 10.121A, 10.121B and either 10.221A or 10.211A.
3. Students aiming at Honours in Pure Mathematics must take 10.121A, B and C and either 10.221A or 10.211A.

‡ Mathematics 10.031 is included for students desiring to attempt only one level II Mathematics unit If other level II units in Pure Mathematics, Applied Mathematics are taken, 10.031 Mathematics will not be counted.

§ Mathematics 10.032 is included for students desiring to attempt only one level III Mathematics unit. If other level III units in Pure Mathematics, Applied Mathematics are taken, 10.032 Mathematics will not be counted.

¶ In special circumstances 10.121C may be completed as a level III unit for students proceeding to honours in mathematics.

** Students wishing to attempt Level IIIH units should consult with the School of Mathematics prior to enrolment. Pre- and co-requisites may be varied in special circumstances with the permission of the Head of the School.

Students will not normally be permitted to attempt a level III Pure Mathematics unit unless they have completed at least one level II unit from 10.111A, 10.111B and 10.211A and are concurrently attempting the remaining units of these three units.

APPLIED MATHEMATICS

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
	Applied Mathematics Level II							
10.211A	Mathematical Methods	II	1	Full yr.	2	10.001		10.221A
10.211B	Analytical Dynamics	II	1	Full yr.	4	10.001, 1.001		10.221B
10.211C	Hydrodynamics	II	1	Full yr.	4	10.001, 1.001		10.221C
	Higher Applied Mathematics Level II							
10.221A	Mathematical Methods	IIH	1	Full yr.	2½	10.011†		10.211A

SCHOOL OF MATHEMATICS (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
10.221B	Analytical Dynamics	IIH	1	Full yr.	2	10.011†, 1.011†		10.211B
10.221C	Hydrodynamics	IIH	1	Full yr.	2	10.011†, 1.011†		10.211C
	Applied Mathematics Level III							
10.212A	Numerical Analysis	III	1	Full yr.	1½	10.111A, 10.211A		10.222A
10.212B	Continuum Mechanics	III	1	Full yr.	1½	10.111A, 10.111B & 10.211A, B, C		10.222B
10.212D	Mathematical Methods	III	1	Full yr.	1½	10.211A, 10.111A, 10.111B		10.032, 10.222D; 10.222E
10.212L	Optimization Techniques	III	1	Full yr.	1½	10.111A, 10.111B, 10.211A		
	Higher Applied Mathematics Level III							
10.222A	Numerical Analysis	IIIH	1	Full yr.	1½	10.111A (or better)		10.212A
10.222B	Continuum Mechanics	IIIH	1	Full yr.	2	10.111A, B, 10.221A, B, C		10.212B
10.222C	Maxwell's Equations and Special Relativity	IIIH	1	Full yr.	2	10.221A, 10.121B‡, 1.001		1.113B 1.123B, 1.153B
10.222D§	Complex Variables and Integral Transforms	IIIH	1	Full yr.	2	10.221A, 10.121A 10.121B‡		10.212D
10.222E§	Boundary Value Problems and Special Functions	IIIH	1	Full yr.	2	10.121A, 10.121B, 10.221A‡		10.212D
10.222F	Quantum Mechanics	IIIH	1	Full yr.	2	10.221A, 10.121A, 10.121B‡	10.222D or E	1.113A, 1.123A

† A student who gains a superior pass in 10.001 Mathematics I and/or 1.001 Physics I may apply to proceed to Higher Applied Mathematics units.
‡ 10.111A, B and 10.211A with a sufficiently good pass may be substituted as a prerequisite in place of 10.121A, B and 10.221A.
§ Units 10.222D, 10.222E will be offered in alternate years.

SCHOOL OF MATHEMATICS (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites (all units named except as governed by *or*)	Co-requisites	Excluded
				STATISTICS				
10.311	**Theory of Statistics Level II** Probability and Random Variables Sampling Distributions and Estimation Tests of Hypotheses and Regression	II	3	Full yr.	7	10.001 *or* 10.011 *or* 10.021 Cr		10.321
10.321	**Higher Theory of Statistics Level II** Probability and Random Variables Sampling Distributions and Estimation Tests of Hypotheses and Regression	IIH	3	Full yr.	8	10.001 *or* 10.011		10.311
10.331	**Statistics SS**	II	1	Full yr.	2	10.001 *or* 10.011 *or* 10.021 Cr		10.311, 10.321
	Theory of Statistics Level III							
10.312A	Stochastic Processes and Applications Statistics	III	1	Session 2	4	10.311 *or* 10.321 *or* 10.331; 10.111A or 10.121A; 10.111B *or* 10.121B; 10.211A *or* 10.221A		10.322A
10.312B	Experimental Design Applications and Sampling	III	1	Session 1	4	10.311 *or* 10.321 *or* 10.331 (normally Cr.)	10.211A *or* 10.221A	10.322B
10.312C	Experimental Design (Theory) and Project	III	1	Session 1	4	10.311 *or* 10.321; 10.111A *or* 10.121A; 10.111B *or* 10.121B; 10.211A *or* 10.221A	10.312B *or* 10.322B*	10.322C
10.312D	Contingency Tables and Probability Theory	III	1	Session 2	4	10.311 *or* 10.321; 10.111A *or* 10.121A; 10.111B *or* 10.121B; 10.211A *or* 10.221A		10.322D

SCHOOL OF MATHEMATICS (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites (all units named except as governed by *or*)	Co-requisites	Excluded
	STATISTICS (Continued)							
	Higher Theory of Statistics Level III							
10.322A	Stochastic Processes and Applications	IIIH	1	Session 2	4½			10.312A
10.322B	Experimental Design Applications	IIIH	1	Session 1	4½	10.321; 10.111A *or* 10.121A;		10.312B
10.322C	Experimental Design (Theory) and Project	IIIH	1	Session 1	4½	10.111B *or* 10.121B; 10.211A *or* 10.221A	10.322B*	10.312C
10.322D	Contingency Tables, Probability Theory	IIIH	1	Session 2	4½		10.211A *or* 10.221A	10.312D

* Any two level III Pure Mathematics or Applied Mathematics units.

SCHOOL OF APPLIED PHYSICS AND OPTOMETRY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
31.113A	Physics of Materials	III	1	Session 1 *and* Full yr.	6 3	1.112B *or* 1.122B *and* 2.001 *or* 2.011		
31.113B	Physics of Measurements	III	1	Full yr.	3	1.112B *or* 1.122B		
31.113C	Applications of Radiation	III	1	Session 2	6	1.112B *or* 1.122B		

FACULTY OF BIOLOGICAL SCIENCES

SCHOOL OF PSYCHOLOGY*

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Excluded
12.001	Psychology I	I	2	Full yr.	5	Sc. Faculty Entrance	
12.152	Research Methods II	II	1	Full yr.	3	12.001	
12.252	Learning II	II	½	Half yr.	3	12.001	
12.302	Personality II	II	½	Half yr.	3	12.001	
12.322	Motivation II	II	½	Half yr.	3	12.001	
12.372	Psychological Assessment II	II	½	Half yr.	3	12.001	
12.412	Physiological Psychology II	II	½	Half yr.	3	12.001	12.402
12.452	Human Information Processing II	II	½	Half yr.	3	12.001	
12.472	Perception II	II	½	Half yr.	3	12.001	
12.502	Social Psychology II	II	½	Half yr.	3	12.001	
12.552	Developmental Psychology II	II	½	Half yr.	3	12.001	
12.602	Abnormal Psychology II	II	½	Half yr.	3	12.001	
12.153	Research Methods IIIA	III	1	Half yr.	6	12.152	
12.163	Research Methods IIIB	III	1	Half yr.	6	12.153	

SCHOOL OF PSYCHOLOGY* (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Excluded
12.173	Psychological Issues	III	1	Half yr.	6	12.001	
12.253	Learning IIIA	III	1	Half yr.	6	12.001	
12.263	Learning IIIB	III	1	Not offered in 1973	6	12.253	
12.303	Personality IIIA	III	1	Half yr.	6	12.001	
12.313	Personality IIIB	III	1	Half yr.	6	12.001	
12.323	Motivation IIIA	III	1	Half yr.	6	12.001	
12.373	Psychological Assessment (Testing) III	III	1	Half yr.	6	12.372	12.042
12.383	Psychological Assessment (Psychometric Theory) IIIB	III	1	Half yr.	6	12.372	
12.413	Physiological Psychology IIIA	III	1	Half yr.	6	12.001	12.402
12.423	Physiological Psychology IIIB	III	1	Not offered in 1973	6	12.412	
12.453	Human Information Processing IIIA	III	1	Half yr.	6	12.001	
12.463	Human Information Processing IIIB	III	1	Not offered in 1973	6	12.452	
12.473	Perception IIIA	III	1	Half yr	6	12.001	

SCHOOL OF PSYCHOLOGY* (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Excluded
12.483	Perception IIIB	III	1	Half yr	6	12.472 *or* 12.473	
12.503	Social Psychology IIIA	III	1	Half yr	6	12.001	
12.513	Social Psychology IIIB	III	1	Not offered in 1973	6	12.502	
12.553	Developmental Psychology IIIA	III	1	Half yr.	6	12.001	
12.563	Developmental Psychology IIIB	III	1	Not offered in 1973	6	12.552	
12.603	Abnormal Psychology IIIA	III	1	Half yr.	6	12.001	
12.613	Abnormal Psychology IIIB	III	1	Not offered in 1973	6	12.602	
12.623	Guidance & Counselling III	III	1	Half yr.	6	12.372 *or* 12.373	
12.653	Industrial Psychology III	III	1	Half yr.	6	12.001	
12.703	Psychological Techniques III	III	1	Half yr.	6	12.001	12.042
12.713	Behavioural Control and Modification	III	1	Half yr.	6	12.001	

* (a) In any year some level II and level III units will be mutually exclusive. Details of these exclusions and of advisable sequences will be announced before the end of the preceding academic year so that students are fully informed prior to their lodging of pre-enrolment forms and their finalising of enrolment. All students proposing to undertake level II and level III units should consult with the School's Science Course advisers before completing enrolment.

(b) Not all courses will be offered each year.

GENERAL AND HUMAN BIOLOGY

No.	Name	Level	Unit Value	Period	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
17.001	General and Human Biology	I	2	Full yr.		6	Sc. Faculty Entrance	2.001 10.001 *or* 10.011 *or* 10.021; if level II or level III Biology Units in the Faculty of Biological Sciences are to be taken subsequently.	

SCHOOL OF BIOCHEMISTRY‡

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites**	Co-requisites
41.101A	Chemistry of Biologically Important Molecules	II	1	Session 1	6	**For any level II unit:** 17.001† and 2.001†	41.101B*
41.101B	Metabolism	II	1	Session 1	6		41.101A
41.101C	Control Mechanisms	II	1	Session 2	6	both 41.101A and 41.101B	
41.102A	Biochemistry of Macromolecules and Cell Biochemistry	III	2	Session 1	12	**For any level III unit:** 41.101A, 41.101B and 41.101C and two level II Chemistry units, including 2.002B and preferably 2.002A as the second Chemistry unit.	
41.102B	Metabolic Pathways and Control Mechanisms	III	2	Session 2	12		

* 41.101A may be taken as a single unit under special circumstances and at the discretion of the Head of School.

** In exceptional circumstances a student may apply to the Head of School for variation of the prerequisite.

† Terminating pass not acceptable.

‡ Third level units available only during the daytime.

SCHOOL OF BIOLOGICAL TECHNOLOGY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites*	Co-requisites
42.102	Fermentation Technology	III	1	Session 2	6	44.102A and/or 44.102B	

* In exceptional circumstances a student may apply to the Head of School for variation of the prerequisite.

SCHOOL OF BOTANY†

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites
43.101A	Genetics and Biometry	II	1	Session 1	6	17.001
43.101B	Plant Evolution and Ecology	II	1	Session 2	6	17.001
43.101C	Plant Physiology	II	1	Session 2	6	17.001; 2.001 *or* 1.001** *or* 1.031** *or* 1.041**
43.102A	Advanced Genetics	III*	1	Session 2	6	43.101A
43.102B	Plant Taxonomy	III*	1	Session 1	6	43.101B; 43.101A pre- or co-requisite
43.102C	Plant Physiology & Biochemistry	III*	1	Session 1	6	41.101A; 41.101B; 43.101C
43.102D	Mycology	III*	1	Session 2	6	17.001
43.102E	Environmental Botany	III*	1	Session 1	6	17.001; 1.001** *or* 1.031** *or* 1.041**
43.102F	Plant Pathology	III*	1	Session 1	6	17.001

NOTE: Students taking four or more units in the School of Botany must take Genetics and Biometry 43/45.101A and at least two level II units in Biochemistry, or Chemistry, or Physics, or Mathematics.

† Third level courses conducted by the School of Botany are available only during the daytime to part-time students enrolling for the first time in 1973.

* These units may be taken in *either* second *or* third year of the Science course provided that prerequisites have been completed.

** This unit may be taken as a co-requisite in some circumstances.

SCHOOL OF MICROBIOLOGY†

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites*	Co-requisites
44.101	Introductory Microbiology	II	1	Session 2	6	17.001	
44.111	Microbiology**	II	1	Full yr.	3		
44.102A	Basic General Microbiology: Nature of Microorganisms	III	1	Session 1	6	44.101, 43.101A, 41.101A and 41.101B	
44.102B	Basic General Microbiology: Microbial Physiology and Ecology	III	1	Session 1	6		
44.102C	Higher Microorganisms	III	1	Session 2	6		
44.102D	General Applied Microbiology	III	1	Session 2	6	44.102A, 44.102B	
44.102E	Medical Microbiology	III	1	Session 2	6	44.102A, 44.102B	
44.102F	Immunology	III	1	Session 2	6	17.001, 41.101A, 41.101B	

† Third level units available only during the daytime.

* In exceptional circumstances a student may apply to the Head of School for variation of the prerequisite.

** For students not intending to major in Microbiology and not taking level II Biochemistry. This unit is not acceptable as a prerequisite for level III Microbiology, except on the recommendation of the Head of School.

SCHOOL OF ZOOLOGY†

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
45.101A	Genetics and Biometry (see Botany)	II	1	Session 1	6	17.001 2.001 *or* 2.011 10.001 *or* 10.011 *or* 10.021	
45.101B	Invertebrate Zoology	II	1	Session 2	6		
45.101C	Vertebrate Zoology	II	1	Session 2	6		

SCHOOL OF ZOOLOGY† (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
45.101D	Field Ecology	II	1	Session 2	6*	17.001 plus three other first year science subjects		
45.102A	Marine Ecology	III	1	Session 1	6	43.101A	45.101B *or* 45.101C	
45.102B	Animal Behaviour	III	1	Session 1	6	45.101A		
45.102C	Comparative and Environmental Physiology	III	1	Session 2	6	41.101A & B; 1.001 *or* 1.011 *or* 1.041	45.101C	
45.102D‡	Comparative Reproductive Physiology	III	1	Session 2	6	41.101A & B and 45.101C		70.012E
45.102E	Invertebrate Physiology**	III	1	Session 1	6	As for 45.101B		
45.102F	Invertebrate Behaviour	III	1	Session 2	6			
45.201A	Insect Structure and Classification	III	1	Session 1	6	45.101A & 45.101B		
45.201B	Insect Physiology	III	1	Session 1	6	45.201A		
45.201C	Applied Entomology	III	1	Session 2	6	45.201B		
45.201D	Project	III	1	Session 2	6	45.201B		

NOTE: Students taking four or more units in the School of Zoology must take Genetics and Biometry 43/45.101A and at least two level II units of Biochemistry, or Chemistry, or Physics or Mathematics, or Geology.

* This unit includes a two-week camp in November/December.

† Third level courses conducted by the School of Zoology are available only during the daytime to part-time students enrolling for the first time in 1973.

‡ May not be counted towards a degree which includes 70.012E Comparative Embryology.

** Not available in 1973.

FACULTY OF APPLIED SCIENCE

SCHOOL OF APPLIED GEOLOGY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
25.111*	Geoscience I	I	2	Full yr.	6	Sc. Faculty Ent.	2.001
25.112A**	Geoscience IIA	II	2	Full yr.	6	25.111 2.001	
25.112B**	Geoscience IIB	II	1	Full yr.	3	25.111 2.001	
25.113A***	Geoscience IIIA	III	2	Full yr.	6	25.112A and 25.112B	
25.113B***	Geoscience IIIB	III	2	Full yr.	6	25.112A and 25.112B	

* Three field tutorials, up to five days in all, are an essential part of the course. Attendance is compulsory.
** Field work: approximately seven days will be spent on field tutorials throughout the year. Attendance is compulsory.
*** Field work is an essential part of the course and consists of approximately ten days of field tutorials. Attendance is compulsory.

SCHOOL OF GEOGRAPHY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
27.031	Geography IS	I	2	Full yr.	6	Sc. Faculty Ent.		
27.103*	Climatology	II	1	Session 2	5½	1.041 *and* 27.031		
27.203*	Biogeography	II	1	Session 1	5½	27.031		
27.413*	Geomorphology	II	1	Session 1	5½	27.031 *or* 25.111 *or* 25.001		

SCHOOL OF GEOGRAPHY (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
27.423*	Pedology	II	1	Session 2	5½	2.001 *and* 27.031 *or* 25.111 *or* 25.001	

* Field work (to be arranged by the School of Geography) is a compulsory component of each unit.

FACULTY OF ARTS

SCHOOL OF PHILOSOPHY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
52.111	Philosophy I	I	2	Full yr.	4	Sc. Faculty Ent.	
52.112	Philosophy II	II	3	Full yr.	4	52.111	
52.122	Philosophy II (Honours)	IIH	3	Full yr.	5	52.111	

FACULTY OF ENGINEERING

SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
5.001	Engineering	I	2	Full yr.	6	Sc. Faculty Ent.	

SCHOOL OF ELECTRICAL ENGINEERING

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
6.601A	Introduction to Computing	II	1	Session 1	5	10.001	
6.601B	Assembler Programming & Non-numeric Computing	II	1	Session 2	5	10.001	6.601A
6.602A	Computer Systems I	III	1	Session 1	5	6.601B	
6.602B	Computer Systems II	III	1	Session 2	5		6.602A
6.602C	Computer Applications	III	1	Session 1	5	6.601A	
6.602D	Programming Languages	III	1	Session 2	5	6.601A	

FACULTY OF MEDICINE

SCHOOL OF ANATOMY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
70.011A	Mammalian Histology	II	1	Session 1	6	17.001	
70.011B	Mammalian Embryology	II	1	Session 2	6	17.001	
70.011C	Systematic Anatomy I	II	1	Full yr.	3	17.001, 70.011A*	
70.012A	Systematic Anatomy II	III	1	Full yr.	3	70.011A*, 70.011C*	
70.012B	Systematic Anatomy III	III	1	Full yr.	3	70.011A*, 70.011C*	
70.012C	Systematic Anatomy IV	III	1	Full yr.	3	70.011A*, 70.011C*	
70.012D	Comparative Histology	III	1	Session 1	6	70.011A	

* In some circumstances this subject may be taken as a co-requisite rather than a prerequisite.

SCHOOL OF HUMAN GENETICS

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
78.201	Population Genetics Theory	III	1	Session 2	5	43.101A/45.101A, 10.001 *or* 10.011	43.102A

SCHOOL OF PHYSIOLOGY AND PHARMACOLOGY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
73.011A	Principles of Physiology	II	2	Full yr.	6	2.001 10.001 *or* 10.011 *or* 10.021 17.001	
73.012	Physiology II	III	4	Full yr.	13	73.011A; 41.101 (A + B + C)	45.101A

NOTE: The above represent the normal prerequisites for the courses in Physiology, but the Head of School may recommend that students with a good academic record be granted exemption from them.

(b) *General Studies*

Students shall select *three* general studies subjects (see General Studies handbook); in addition, honours students shall be required to complete an Advanced General Studies Elective.

4. Pattern of Studies

In general, a student should select a course which is adequately distributed over the six half years of study. Typical course patterns are available from the Faculty Office.

A suggested pattern of study is:—

First year: The appropriate two units of level I Mathematics and six other level I units including those essential to the intended major sequence of units.

Second year: One general studies elective and eight units from level II or six units from level II and two from level I.

Third year: Two general studies electives and at least four level III units. The other units could be level II or III.

Fourth year: For an honours degree, an advanced general studies elective and such requirements as specified by the Head of the appropriate School.

5. Part-time Study

A student must select the units and general studies electives in accordance with these regulations save that Clause 2a(vi) is modified so that he must complete level I Mathematics and 6 other level I units in the first four years of enrolment or else show cause to the satisfaction of the Professorial Board why he should be allowed to re-enrol.

RULES GOVERNING ADMISSION TO THE SCIENCE DEGREE COURSE WITH ADVANCED STANDING FOR THE PURPOSE OF OBTAINING A DOUBLE DEGREE

1. Undergraduates* of the University of New South Wales who have satisfied the examiners in at least the first two years of a degree course extending over four or more years and approved by the Faculty of Science for the purpose of double degrees, may

*In Rule 1, the word "undergraduates" includes graduands, i.e., a person may be admitted under these rules if he has met all requirements for a first degree which has not yet been conferred on him, and his admission under these rules shall be no bar to the subsequent award for the first degree.

be admitted to the Science degree course with advanced standing. Such undergraduates' performance shall have been of a high standard and their admission shall be subject to the approval of the Dean of the Faculty of Science.

2. Students so admitted who have satisfied the examiners in General Studies subjects and/or Science course units shall be given advanced standing in such General Studies subjects and no more than 14 such Science course Units.

3. Students so admitted may be granted exemption from two other level II Science Units on the basis of other subjects completed by them.

4. In order to qualify for the award of the degree of B.Sc., students so admitted with advanced standing shall be required to complete the appropriate General Studies subjects and no less than four units of either level II or level III and four other level III units in accordance with the Science course regulations.

The units submitted for the Bachelor's degree under these regulations must include at least four level III units chosen from related disciplines in accordance with the Science course regulations. One of Mathematics 10.021 or 10.001 or 10.011 must be included in the course.

RULES GOVERNING ADMISSION TO THE SCIENCE DEGREE COURSE WITH ADVANCED STANDING

1. Graduates of the University of New South Wales may be admitted to the Science degree course with exemption in all General Studies subjects completed by them and in no more than twelve Science course units completed by them.

2. Undergraduates of the University of New South Wales who transfer from another course to the Science degree course, may be admitted to the Science degree course with exemption in all General Studies subjects completed by them and in all Science course units completed by them. Further, where an undergraduate has completed a subject which contains the syllabus material of a Science course unit (or units) the Dean, with the agreement of the Head of the School offering the Science course unit (or units) may allow the unit (or units) so covered to be counted to a Bachelor of Science degree.

An undergraduate transferring to the Science course must take Mathematics 10.021 or 10.001 or 10.011 during his first year of enrolment in the course unless one of them has previously been completed.

3. Graduates or undergraduates of other universities or of other approved tertiary institutions may be admitted to the Science degree course with advanced standing.

4. Students admitted under Rule 3 who have satisfied the examiners in units of the same title or subject matter as Science course subjects in this University may, subject to the approval of the appropriate Heads of School, be granted exemption in no more than eleven Science course units but not including level III Science course units.

5. Notwithstanding the provisions of Rules 1, 2, 3 and 4, Faculty may determine a special programme to be completed by a student who wishes to be granted advanced standing for an honours degree of Bachelor of Science in this University.

PURE AND APPLIED CHEMISTRY COURSE

This course also leads to the Bachelor of Science degree, but provides a study in depth of one field only. It may be taken either as a full-time or part-time course.

Full-time Course

This course may be taken at pass or honours standard. The pass course requires full-time attendance at the University for three years. An additional year is required for the honours course.

First year is similar to Year I of Chemistry in the Science course. In the second year a core of chemistry subjects, similar in content to chemistry units in the science course, but treated in greater depth and with extended practical work, is supplemented by science units offered by the Faculties of Science, Applied Science and Biological Sciences. It will be possible to choose between a wide range of such units, which may include a further first year subject if desired. The most widely chosen electives are some combination of mathematics units or a group of biological science units, such as the level II Biochemistry units in the Science course. It is possible that some elective units at this level may be offered by the School of Chemistry in later years.

The first half of third year will consist of a further development of the core course in four chemistry subjects. At this stage the student will have studied chemistry to an extent comparable to the student who graduates from the Science course with a major in chemistry, *but* the Pure and Applied Chemistry student *will have studied at rather greater depth.* In the second half of the third year, students in the Pure and Applied Chemistry course will select *three* advanced elective subjects. While most of the electives available are provided by the School of Chemistry, the needs of students who see their future in the less technical areas of industry will be met by the provision of electives with an applied bias.

Third year electives are normally of 112 hours, equivalent to eight hours per week for the half year. They are arranged in four groups, corresponding to areas of scientific interest. Not more than two electives may be chosen from one group; at least one must be chosen from electives offered by the School of Chemistry and any pre- or co-requisites must be observed.

Group 1.	Physical and theoretical chemistry, chemical physics, mathematics and statistics.	2.333, 2.303
Group 2.	Organic chemistry, biochemistry	2.633
Group 3.	Inorganic, analytical, nuclear and radiation chemistry	2.433, 2.533 2.811
Group 4.	Applied chemistry, interdisciplinary	2.513, 2.711 2.911

Electives offered by School of Chemistry		*Prerequisites*
2.333	Physical Chemistry	2.322* or 2.303*
2.303	Theoretical Chemistry	2.302* or 2.322*
2.433	Inorganic Chemistry	2.422*
2.533	Analytical Chemistry	2.522*
2.513	Analytical Biochemistry	2.522*
2.633	Organic Chemistry	2.622*
2.711	Solid State Chemistry	2.311, 2.411
2.811	Nuclear and Radiation Chemistry	2.411
2.911	Applied Chemistry	2.311, 2.411, 2.511 *and* 2.611

* May be taken as co-requisites if necessary.

391. PURE AND APPLIED CHEMISTRY
FULL-TIME COURSE

		Hours per week for 2 sessions		
		Lec.	Lab. Tut.	Total
YEAR 1				
1.011 / 1.001 / 1.041	Higher Physics I *or* Physics I *or* Physics IC	3	3	
2.001	Chemistry I	2	4	
10.011 / 10.001 / 10.021	Higher Mathematics I *or* Mathematics I *or* Mathematics IT	4	2	
Plus one of—				
5.001 / 17.001 / 25.111	Engineering I / General and Human Biology / Geoscience I	3	3	
27.031	Geography IS	2	4	
		12	12	
			or	
		11	13	
YEAR 2				
2.311	Physical Chemistry	1½	3	4½
2.411	Inorganic Chemistry	1	2	3
2.511	Analytical Chemistry	1	3	4
2.611	Organic Chemistry	1½	3	4½
	Science Electives*			9
	General Studies Elective			1½
				26½

* Recommended elective subjects in Second Year. Pre- and co-requisites for these subjects are shown under the Science course and must be observed.

MATHEMATICS

10.031	Mathematics	2
10.311T	Statistics	2
10.911	Mathematics II	6

PHYSICS

1.212	Physics IIT	3

BIOLOGICAL SCIENCES

17.001	General and Human Biology	6
41.101A	Chemistry of Biologically Important Molecules	6*
41.101B	Metabolism	6*
41.101C	Biochemical Control	6*
44.101A	Introductory Microbiology	3
73.011A	Principles of Physiology	6

* One session only.

GEOLOGY

25.111	Geoscience I	6
25.112A	Geoscience IIA	6
25.112B	Geoscience IIB	3

YEAR 3		Hours per week for 2 sessions Lec.	Lab. Tut.	Total
2.322	Physical Chemistry*	1	2	3
2.422	Inorganic Chemistry	1	2	3
2.522	Analytical Chemistry	1	2	3
2.622	Organic Chemistry	1	2	3
	Advanced Elective Subjects†			12
	Two General Studies Electives			3
				27

* Alternatively 2.013A Theoretical Chemistry (1, ½, 1½).

† Three to be selected from the following list in accordance with the groupings and other requirements detailed earlier:

		Lec./Tut.	Lab.
2.333	Physical Chemistry	2	2
2.303	Theoretical Chemistry	2	2
2.433	Inorganic Chemistry	1	3
2.533	Analytical Chemistry	1	3
2.513	Analytical Biochemistry	1	3
2.633	Organic Chemistry	1½	2½
2.711	Solid State Chemistry	1	3
2.811	Nuclear and Radiation Chemistry	1	3
2.911	Applied Chemistry	2	2

YEAR 4 — HONOURS

Consult School for details.

Part-time Course

The part-time course in Pure and Applied Chemistry is equivalent to the full-time course and extends over six part-time years, leading to the degree of Bachelor of Science. Honours may be awarded on the completion of an additional year of full-time study or, in special circumstances, an additional two years of part-time study.

The part-time course has been designed for students employed in the chemical industry but employment in this industry is not obligatory for entrance to the course.

This course allows a student to choose electives from other faculties such as Commerce or Applied Science. Areas such as industrial chemistry, management and technical services can thus be covered by those students who feel that their vocational interests lie in one particular region.

391. PURE AND APPLIED CHEMISTRY
PART-TIME COURSE

STAGES 1 AND 2

Two of the following subjects will be taken in the first year and the other two in the second year (as directed).

		Hours per week for 2 sessions	
		Lec.	Lab. Tut.
1.011	Higher Physics I *or*		
1.001	Physics I *or*	3	3
1.041	Physics IC		
2.001	Chemistry I	2	4

		Hours per week for 2 sessions	
		Lec.	Lab. Tut.
10.001	Mathematics I *or*		
10.021	Mathematics IT	4	2
Plus one of—			
5.001	Engineering I		
17.001	General and Human Biology	3	3
25.111	Geoscience I*		
27.031	Geography IS	2	4
		12	12
		or	
		11	13

* Three field excursions, up to five days in all, are an essential part of the course.

		Hours per week for 2 sessions		
STAGE 3		Lec.	Lab. Tut.	Total
2.311	Physical Chemistry	1½	3	4½
2.411	Inorganic Chemistry	1	2	3
	Science Electives*			6
				13½

* See footnote under Second Year Full-time Course.

STAGE 4				
2.511	Analytical Chemistry	1	3	4
2.611	Organic Chemistry	1½	3	4½
	Science Elective*			3
	General Studies Elective			1½
				13

* See footnote under Second Year Full-time Course.

		Hours per week for 2 sessions		
		Lec.	Tut. Lab.	Total
STAGE 5				
2.322	Physical Chemistry*	1	2	3
2.422	Inorganic Chemistry	1	2	3
2.522	Analytical Chemistry	1	2	3
2.622	Organic Chemistry	1	2	3
	General Studies Elective			1½
				13½

* Alternatively 2.013A Theoretical Chemistry (1, ½, 1½).

STAGE 6	
Advanced Elective Subjects**	12
General Studies Elective	1½
	13½

** Three to be selected. See list and regulations under Third Year Full-time course.

Honours

The requirements for admission to the honours course are the same as for the full-time honours course. A student wishing to do honours on a part-time basis may complete the honours year over two part-time years. Students are, however, advised to make every effort to do the honours year full time.

OPTOMETRY COURSE

The Department of Optometry provides a four year full-time course in Optometry leading to the degree of Bachelor of Optometry, which may be awarded at the pass or honours level. The first year of the course involves a study in the fundamental sciences of physics, chemistry, mathematics and general and human biology. Students who have completed the first year of a science course including physics, chemistry, mathematics and general and human biology or zoology at any Australian university are qualified for admission to the second year of the course. Second, third and fourth years are devoted to professional training in optometry including clinical optometry in the final year.

395. OPTOMETRY—FULL-TIME COURSE

Bachelor of Optometry

		Hours per week for 2 sessions	
		Lec.	Lab. Tut.
YEAR 1			
1.041	Physics IC	3	3
2.001	Chemistry I	2	4
10.001 10.011 10.021	Mathematics I *or* Higher Mathematics I *or* Mathematics IT	4	2
17.001	General and Human Biology	3	3
		12	12
YEAR 2			
31.811	Optometry I	4	4
31.821	Special Anatomy and Physiology	3	3
73.011A	Principles of Physiology	3	3
	General Studies Elective	1	½
		11	10½
YEAR 3			
12.001	Psychology I	3	2
31.812	Optometry II	8	7
31.831	Diseases of the Eye	2	1
	Two General Studies Electives	2	1
		15	11

YEAR 4		Hours per week for 2 sessions Lec.	Lab. Tut.
12.741	Psychology	2	0
31.813	Optometry III	6	0
31.841	Clinical Optometry*	1	14
74.001	Indication for Medical Referral†	1	0
	Advanced General Studies Elective	1	½
		11	14½

* Lectures cease after first 9 weeks.
† Lectures commence after first 9 weeks.

CONDITIONS FOR THE AWARD OF THE DOUBLE DEGREE OF BSc, BOptom IN THE FACULTY OF SCIENCE

1. Undergraduates* of the University of New South Wales who have satisfied the examiners in at least the first two years of the Optometry degree course may be admitted to the Science degree course with advanced standing for the purpose of qualifying for the double degree of BSc, BOptom. Such undergraduates' performance shall have been of a high standard and their admission shall be subject to the approval of the Dean of the Faculty of Science.

2. In order to qualify for the award of the degree of BSc, students so admitted shall be required to complete the appropriate general studies subjects and no less than four units of either level II or level III and four other level III units, in accordance with the Science Course regulations.

   The units submitted for the Bachelor's degree under these regulations must include at least four level III units chosen from related disciplines in accordance with the Science course regulations.

3. In order to qualify for the award of the degree of BOptom, students so admitted shall complete the requirements of the Optometry degree course.

*In Rule 1, the word "undergraduates" includes graduands, i.e., a person may be admitted under these rules if he has met all requirements for a first degree which has not yet been conferred on him, and his admission under these rules shall be no bar to the subsequent award of the first degree.

BACHELOR OF SCIENCE IN PSYCHOLOGY COURSE

The four year course in Psychology, which leads to the degree of Bachelor of Science, is designed to meet the requirements of students who intend to become professional psychologists, as either practitioners or research workers. It provides extensive study of psychological theory and practice, supported by an appropriate selection of other subjects.

The course is available on a full-time basis only.* Entry into the course is subject to a quota which is determined from time to time.

In the fourth year, students undertake a programme of study which includes courses selected from the School's advanced electives. Electives are offered in the major areas of general psychology and in a number of applied fields, e.g. clinical, industrial, human factors, and educational. In addition, the student must complete a research thesis or project.

Details of qualifications for admission to the Psychology BSc Course, the course requirements for Pass and Honours at graduation and rules governing admission with Advanced Standing are given below. Hours of attendance for the main subjects available in the course are shown in the Schedule of Course Subjects, followed by some recommended course patterns.

RULES GOVERNING THE PSYCHOLOGY BSc COURSE

I. Applicants for admission to the Course must be matriculated to this University; and also have either satisfied the entrance requirements for the Faculty of Science or, alternatively, have passed Mathematics I or General and Human Biology.

II. (A) In order to qualify for admission to the degree of BSc in Psychology under these regulations a candidate must attend classes and satisfy the examiners in the following subjects:—

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* Any student who enrolled in the former BSc in Applied Psychology Course prior to 1973 on a part-time basis may continue enrolling on that basis, provided that the course of study is completed within the minimum time plus two years.

1. *Each of:*—

12.001 Psychology I
12.042 Psychology IIA
and
A total value of 11 units of Psychology (Level II and III)

(In special cases, the Head of the School of Psychology or his representative may approve of the substitution of any other appropriate course or equivalent units).

and
12.004 Psychology IV.

2. *Five other subjects* (or their equivalent in units) selected to meet the following requirements:

(a) that they shall include *at least* one of:
(i) 10.011 Higher Mathematics I, *or*
10.001 Mathematics I, *or*
10.021 Mathematics IT
or
(ii) 17.001 General and Human Biology.
[They may include both (i) and (ii).]

(b) that they shall include *at least* one of:
53.111 Sociology I
15.101 Economics I
54.111 Political Science I
52.111 Philosophy I
or with the approval of the Head of the School of Psychology, one other Arts I subject or two General Studies electives.

(c) that they shall include at least one subject which together with the subject meeting the requirements of (a) or (b) immediately above constitutes a recognized sequence of two courses.

Recognized sequences are:
(i) 10.001 Mathematics I, followed by three Mathematics Level II units, or by 10.311 Theory of Statistics II.

(ii) 17.001 General and Human Biology, followed by 12.402 Physiological Psychology, or by the equivalent of one subject chosen from the following units according to the regulations of the Faculty of Biological Sciences:

41.101A Chemistry of Biologically Important Molecules
41.101B Metabolism
(41.101A and 41.101B must be taken together, and count as two units)
41.101C Biochemical Control
45.101A Genetics and Biometry
45.101C Vertebrate Zoology
73.011A Principles of Physiology I (equivalent to 2 units)

(iii) 53.111 Sociology I, followed by 53.112 Sociology II
15.101 Economics I, followed by 15.102 Economics II
54.111 Political Science I, followed by 54.112 Political Science II
52.111 Philosophy I, followed by 52.112 Philosophy II.

(B) The proposed course must be approved by the Head of the School of Psychology or his representative prior to or during enrolment. The courses must be chosen in such a way as will fit in with the timetable.

(C) Progression in the Course shall be by subjects, and the subjects in the Course may be completed in any order consistent with the requirements concerning prerequisites and co-requisites for the subjects chosen.

III. *Prerequisites and Co-requisites*

Before enrolling in any course (or equivalent units of a subject) the student shall have attended the classes and shall have satisfied the examiners in all relevant prerequisite subjects.

The student should refer to the appropriate Faculty Handbook or to the Calendar for a statement of subject prerequisites and/or co-requisites.

IV. The award of BSc in Psychology at graduation shall be at either Pass level or with Honours after a minimum of four years of full-time study.

RULES GOVERNING ADMISSION TO THE PSYCHOLOGY BSc COURSE WITH ADVANCED STANDING

1. Graduates of the University of New South Wales may be admitted to the Psychology BSc degree course with exemptions from no more than five subjects or their unit equivalents completed by them. No more than two Psychology subjects may be included in the subjects exempted.
2. Undergraduates of the University of New South Wales who transfer from another course to the Psychology BSc course may be admitted to the Psychology BSc course with exemption in no more than seven Psychology BSc course subjects or their unit equivalents.
3. Graduates or undergraduates of other universities may be admitted to the Psychology BSc course with advanced standing.
4. Students admitted under Rule 3 who have satisfied the examiners in subjects of the same title or subject matter as those permissible in the Psychology BSc course may, subject to the approval of the appropriate Heads of School, be granted exemption in no more than five subjects, of which no more than two may be Psychology subjects.

RECOMMENDED PSYCHOLOGY BSc COURSE PATTERNS

The course requirements have been so designed that they allow for:

(a) a solid core of psychology to equip the psychologist-in-training with psychological theory, skill in experimentation and psychological techniques by way of the equivalent of 6 compulsory psychology subjects [although the student may choose from a number of level II, III and IV units];

(b) some supporting studies in mathematics and/or biology, of which a minimum of one course is compulsory;

(c) some supporting studies in the social sciences, of which a minimum of one course is compulsory; and

(d) the special needs, interests and academic or vocational background of the individual student to be considered when the balance of the five supporting subjects (or their equivalents in units) is selected in consultation with the Head of School or his representative.

For this reason, no course patterns are prescribed. The patterns to be completed by students who are admitted with advanced standing will take into account the subjects credited.

Students commencing university studies for the first time will arrange their patterns of supporting subjects in consultation with the Head of the School or his representative before completing enrolment. For such full-time students, some examples of patterns, based on supporting subject variants, are suggested below:

		Year I	Year II	Year III	Year IV
COMPULSORY PSYCHOLOGY SUBJECTS FOR ALL COURSES		12.001	3 Psychology units value 12.042	8 Psychology units value	12.004
MAIN SUPPORTING SUBJECT: Pure Mathematics	(2 Yrs.)	10.001 Social Science Subject I Any approved level I Subject	{10.111A, 10.111B *and* 10.111C *or* 10.211A	An approved level I or II Subject (or equiv. units)	
	(3 Yrs.)	10.001 A Social Science Subject I Any approved level I Subject	10.111A unit 10.111B unit 10.111C unit 10.211A unit	10.112A unit 10.112B unit 10.112E unit	
Statistics	(2 Yrs.)	10.001 A Social Science Subject I Any approved level I Subject	10.311	An approved level I or II Subject (or equiv. units)	
	(3 Yrs.)	10.001 A Social Science Subject I Any approved level I Subject	10.311 10.211A unit 10.112B unit	10.321B unit 10.312C unit	

		Year I	Year II	Year III	Year IV
Biochemistry		17.001 2.001 10.001 *or* 10.021	41.101A 41.101B 41.101C	A Social Science Subject I	
Zoology	(2 Yrs.)	17.001 2.001 10.001 *or* 10.021	45.101A unit 45.101C unit A Social Science Subject I		
Physiology	(2 Yrs.)	17.001 A Social Science Subject I Any approved level I Subject	73.011A Any approved level I or II Subject (or equiv. units)		
	(2 Yrs.)	17.001 2.001 10.001 *or* 10.011 *or* 10.021	73.011A 10.311T *or* A Pure Maths II Unit	A Social Science Subject I	
Social Science Subject	(2 Yrs.)	A Social Science Subject (A) I 10.011 *or* 10.021 *or* 17.001 Any approved level I Subject	Social Science Subject (A) II An approved level I or II Subject (or equivalent units)		

	Year I	Year II	Year III	Year IV
(3 Yrs.)	A Social Science Subject (A) I 10.011 *or* 10.021 *or* 17.001 Any approved level I Subject	Social Science Subject (A) II	Social Science Subject (A) III	
General	Social Science Subject (A) I 17.001 10.001 *or* 10.021	12.402	Social Science Subject (A) II *or* Social Science Subject B (I) *or* Any approved level I or II Subject	

SCHEDULE: MAIN PSYCHOLOGY BSc COURSE SUBJECTS

	No.	Subject or Unit	Level	Hours p.w.	When Offered	Prerequisites	Co-requisites
PSYCHOLOGY	12.001	Psychology I	I	5	Full yr.		
	12.042	Psychology IIA*	II	6	Full yr.	12.001	12.012
	12.004	Psychology IV	IV	15	Full yr.	All other Course requirements	
	12.402	Physiological Psychology	II	4	Full yr.	12.001, 17.001	
	12.042**	11 Psychology units	II & III				
MATHEMATICS §	10.001	Mathematics I	I	6	Full yr.		
	10.011	Higher Mathematics I	I	6	Full yr.		
	10.021	Mathematics IT	I	6	Full yr.		
	10.911	Mathematics II	II	6	Full yr.	10.001 *or* 10.011	
	10.311	Theory of Statistics II	II	7	Full yr.	10.001 *or* 10.011 *or* 10.021 cr.	
	10.321	Higher Theory of Statistics II	II	8	Full yr.	10.001 *or* 10.011	
GENERAL AND HUMAN BIOLOGY	17.001	General and Human Biology	I	6	Full yr.		
BIOCHEMISTRY UNITS §	41.101A	Chemistry of Biologically Important Molecules	II	6	Session 1	17.001	41.101B
	41.101B	Metabolism	II	6	Session 1	2.001	41.101A
	41.101C	Biochemical Control	II	6	Session 2	10.001 *or* 10.011 *or* 10.021	41.101A 41.101B

	No.	Subject or Unit	Level	Hours p.w.	When Offered	Prerequisites	Co-requisites
ZOOLOGY UNITS §	45.101A	Genetics and Biometry	II	6	Session 1	17.001	
	45.101C	Vertebrates	II	6	Session 2	2.001 10.001 *or* 10.011 *or* 10.021	
PHYSIOLOGY UNITS §	73.011A	Principles of Physiology (Equiv. Unit Value = 2)	II	6	Full yr.	17.001 2.001 10.001 *or* 10.011 *or* 10.021	
ECONOMICS	15.101	Economics I	I	3	Full yr.		
	15.102	Economics II	II	4	Full yr.	15.101	
PHILOSOPHY	52.111	Philosophy I	I	4	Full yr.		
	52.112	Philosophy II	II	5	Full yr.	52.111	
SOCIOLOGY	53.111	Sociology I	I	4	Full yr.		
	53.112	Sociology II	II	4½	Full yr.	53.111	
POLITICAL SCIENCE	54.111	Political Science I	I	3½	Full yr.		
	54.112	Political Science II	II	3½	Full yr.	54.111	

* Day-time attendance for tutorials and practical work, including visits to institutions, etc., is required.

** For details of level II and level III units, including pre- and co-requisites, refer to Science Course details under Faculty of Science.

§ For details of level II and level III units, including pre- and co-requisites, refer to Science course details under Faculty of Science. If units are taken, three level II units are equivalent to one level II subjects; four level III units are equivalent to one level III subject.

POSTGRADUATE COURSES

On completion of a first degree course (BSc) the student may wish to proceed to a higher degree. This usually entails two or three years' research under direction. A limited number of Scholarships are available at this and other Universities, and these are competitive.

The regulations governing higher degrees are to be found in the University Calendar. A candidate thinking of undertaking such a course should first discuss the matter with the Head of the School in which he wishes to study.

A course in Food and Drug Analysis is offered by the School of Chemistry on a part-time basis over two years and leads to a diploma (DipFDA). The course is designed to provide systematic training at an advanced level for chemists who wish to extend their acquaintance with analytical techniques, and is thus suitable for those who wish to practise as public analysts. The School also offers a formal graduate course for the degree of Master of Chemistry (MChem) in Analytical Chemistry, on a full-time basis for one year, which runs full-time in 1973, but will not operate in 1974. The programme may also be extended in the future to part-time students. For full details see Calendar.

The School of Psychology offers a postgraduate formal course leading to the award of Master of Psychology (MPsychol). It is available to selected graduates with Honours in Psychology and provides professional training in either Experimental Clinical Psychology or Psychodynamic Clinical Psychology.

The School of Biological Technology, conjointly with the School of Chemical Engineering, offers a course in biochemical engineering which leads to the award of a postgraduate diploma (DipBiochemEng). The course may be completed in one year of full-time study or part-time over two years and is intended for graduates in chemical engineering, chemistry, biological sciences and agriculture.

The School of Mathematics offers a postgraduate course which covers a wide range of statistical theory and practice. It leads to

the award of the degree of Master of Statistics (MStats), and is available on a two-year full-time basis or on a four-year part-time basis.

The course provides advanced training for practising statisticians, and is available to graduates with a pass degree in statistics or an honours degree in a related field (commonly mathematics) with supporting study in statistics. Honours graduates in statistics may be exempted from a maximum of half the course.

The School of Physics offers a postgraduate course, with an emphasis on Solid State Physics, which leads to the award of MPhysics. The course may be completed in one year of full-time study or two years of part-time study.

A formal graduate course for the degree of Master of Optometry (MOptom) is given by the School of Applied Physics and Optometry. For details see page B55.

SUBJECT INFORMATION AND TEXTBOOK LISTS

The following pages list details of textbooks, subject descriptions, etc. Reference books are not included here but the reference lists will be made available by the various schools. Information concerning general studies subjects is contained in the Handbook of the Board of General Studies which is available free of charge.

SCHOOL OF ANATOMY

The School of Anatomy offers three Level II units and four Level III units for Science students. Level II units comprise Mammalian Histology, Mammalian Embryology and Systematic Anatomy I (cardio-pulmonary). The Level III units are Systematic Anatomy II (locomotion), Systematic Anatomy III (alimentary and urogenital), Systematic Anatomy IV (neuro-endocrine) and Comparative Histology. Students who major in Anatomy and who attain an adequate standard may proceed to a BSc degree with honours. Each Anatomy unit is offered once during the year as a day course only.

For details of level, unit value, when offered, hours per week, pre-requisites and co-requisites, see page B26.

70.011A Mammalian Histology

Cell form and tissue structure. Cell structure and function. Cell function and evolution. Epithelial cells and tissue. Connective tissues and connective tissue cells. Muscle cell and muscle tissue. Nerve cell and nervous tissue. Cellular interrelations. Structure of organs and organ systems. Skin and derivatives. Development and structure of teeth. Circulatory System. Oral cavity. Alimentary canal and associated glands. Respiratory system. Urinary system. Eye, ear. Reproductive system.

TEXTBOOK

Bloom, W. & Fawcett, D. W. *A Textbook of Histology*. 9th ed. Saunders, 1968.

70.011B Mammalian Embryology

History of embryology and its development as a science. The mammalian reproductive system. Gametogenesis. Fertilisation and cleavage. Development and implantation of blastocyst. Development of embryonic disc, embryonic membranes, placenta. Comparative mammalian placentation. Human embryogenesis. Development of human foetus. Characteristics of external form. Teratology. Human organology. Comparative mammalian development. Biochemistry and embryogenesis.

TEXTBOOK

Arey, L. B. *Developmental Anatomy*. 7th ed. Saunders, 1965.

70.011C Systematic Anatomy I

Introduction to terms and concepts in systematic anatomy. Introduction to nervous system. Nerves of the thorax. Walls of the thorax. Thoracic movement. Circulation. Pericardium and heart. Blood vessels. Vascular distribution. Vascular anastomoses. The lymphatic system. Spleen and thymus. Skull, nasal cavity and sinuses. Larynx. Speech. Trachea and bronchi. Pleura and lungs. Living and radiological anatomy of air passages and thorax. Biomechanics of respiration.

TEXTBOOK

Gardner, E., Gray, D. J. & O'Rahilly, R. *Anatomy*. 3rd ed. Saunders, 1969.

70.012A Systematic Anatomy II

Bone, cartilage and joints. Fascia and muscle. Bones, muscles and joints of limbs, trunk, head and neck. Course and distribution of peripheral nerve trunks. Vascular arrangements of the limbs. Biomechanics of movement, posture and locomotion. The hand as an organ. Living and radiological anatomy of trunk and limbs.

TEXTBOOK

Gardner, E., Gray, D. J., & O'Rahilly, R. *Anatomy*. 3rd ed. Saunders, 1969.

70.012B Systematic Anatomy III

Mouth and salivary glands. Pharynx. Oesophagus. Abdomino-pelvic cavity. Peritoneum. Stomach, intestine, liver, pancreas. Kidney, ureter, bladder, urethra. Male and female reproductive organs. Innervation, blood supply and lymph drainage of gastro-intestinal and urogenital systems. Living and radiological anatomy of alimentary and urogenital organs.

TEXTBOOK

Gardner, E., Gray, D. J., & O'Rahilly, R. *Anatomy*. 3rd ed. Saunders, 1969.

70.012C Systematic Anatomy IV

The neurons, neuronal satellite cells. Functional anatomy of the central nervous system. Blood supply of central nervous system. Organs of special sense. Endocrine glands. Principles of peripheral nerve distribution.

TEXTBOOKS

Barr, M. L. *The Human Nervous System.* Harper & Row, 1972.

Bowsher, D. *Introduction to the Anatomy and Physiology of the Nervous System.* Blackwell, 1967.

Gardner, E., Gray, D. J., & O'Rahilly, R. *Anatomy.* 3rd ed. Saunders, 1969.

70.012D Comparative Histology

Comparative cellular and intracellular structure and function. Comparative tissue structure and function. Vertebrate and invertebrate cells and tissues. Detailed comparative study of skin and derivatives. Bone and skeletal structure. Haemopoietic tissues. Cells of circulating blood and tissue fluids. Blood vascular system. Muscle. Nervous tissue and sense organs. Alimentary system and associated glands. Excretory system. Genital and reproductive tissue.

TEXTBOOK

Bloom, W. & Fawcett, D. W. *A Textbook of Histology.* 9th ed. Saunders, 1968.

SCHOOL OF APPLIED PHYSICS AND OPTOMETRY

DEPARTMENT OF APPLIED PHYSICS

There are significant and increasing numbers of opportunities for employment of physicists along with other technologists in the research-and-development laboratories and other departments of Australian industrial firms. The kind of work done by industrial physicists is described as applied physics; and the Department of Applied Physics in this University has been set up to bring together industrial scientists and students and staff of the University.

The Department currently offers three level III units in the Science Course (31.113A, B and C)†. While these are intended as part of preparation for applied physics honours study, they are equally suitable for science students, whether majoring in physics or not, who have an interest in the application of physics in technology and have completed the prerequisite units (1.112B *or* 1.122B; *and* 2.001 for 31.113A).

Undergraduates who are majoring in Physics in the Science Course and whose interest is in applying their subject are offered the opportunity to achieve a BSc with Honours in Applied Physics on the basis of the fourth-year course which the Department conducts.

In accordance with Science Course regulations, suitably-qualified students may apply to the Head of the School for admission to the Honours year on completing pass degree requirements. Suitable qualifications include, besides the major in Physics, completion of the majority of a range of Science Course subjects and units which give appropriate support to applied physics study. A recommended pass degree programme is:

Year 1	1.001 (or 1.011)	Physics I	(2 units each)
	2.001	Chemistry I	
	5.001	Engineering I	
	10.001 (or 10.011)	Mathematics I	
Year 2	1.112 (or 1.122)	Physics II (units A, B & C)	
	10.111 (or 10.121)	Pure Mathematics II (units A & B)	
	10.211 (or 10.221)	Applied Mathematics II (unit A)	
	2 further units from the "Preferred List" below		
Year 3	1.113 (or 1.123)	Physics III (units A, B, C and D)	
	At least 2 of		
	31.113	Applied Physics III (units A, B & C)	
	Further units from the "Preferred List" on next page, to comprise a total of 8 units for the year.		

"Preferred List" of Science Course units

Level I*	17.001	General and Human Biology	(2 units each)
	12.001	Psychology I	
	25.001	Geology I	
Level II	1.212T	Physics (including "A" option — Geometrical Optics)	(1 unit each)
	2.002	Chemistry II (units A, B & C)	
	6.601A	Introduction to Computing	
	10.311T	Statistics	
Level III	1.143	Physics III (units A, B, C & E)	
	31.113	Applied Physics III (unit A, B or C)	

Completion of a 24-unit pass degree programme (as indicated), and a majority of graded passes in the Level II and Level III units, is normally required for admission to the Honours year.

The honours course comprises lectures, laboratory studies, and project work in areas of the application of physics to practical objectives, some of which areas may be chosen by the student from a number of electives. Also included is "Introduction to Industrial Practice" in which aspects of the work of scientists in industry will be critically studied in depth. In this course, and in other parts of the honours year work, the Department is assured of the support of a staff of visiting lecturers from industry.

Graduates with honours in applied physics, or in physics, may register as research students in the Department working for the MSc or the PhD degree. Research work in the Department is directed towards practical objectives. Students working part-time or externally in appropriate fields for the MSc are welcome and given full encouragement.

Graduates not holding an appropriate honours degree either must present evidence of research ability, or must complete a qualifying course prescribed by the Department, before being accepted as higher-degree research students.

Students coming from outside the Science Course should note the "Rules governing Admission to the Science Degree Course with Advanced Standing" and in particular Rule 5, which relates to admission for the purpose of obtaining an honours degree. The "special programme" which Faculty would be recommended to prescribe, in the case of a pass graduate or graduand with a major in physics, would normally comprise one year of preparatory studies followed by the normal applied physics honours year. Depending on circumstances, the preparatory work might be accomplished by one year's full-time study, or might involve more than one year if part-time.

31.113A Physics of Materials I

A study of the physical properties of all types of materials in relation to structure.

TEXTBOOK

Van Vlack, L. H. *Materials Science for Engineers.* Addison-Wesley, 1970.

* The Science Course Regulations (see 2(a)(ii)) require that not less than 8 nor more than 10 units be from level I.

REFERENCE BOOKS

Adamson, A. W. *Physical Chemistry of Surfaces.* Interscience.
American Society of Metals. *Metal Surfaces.* ASM.
Andrews, E. H. *Fracture in Polymers.* Oliver & Boyd.
Bacon, G. E. *X-ray & Neutron Diffraction.* Pergamon.
Bowden, F. P. & Tabor, D. *Friction and Lubrication of Solids.* O.U.P., 1964.
Cottrell, A. H. *The Mechanical Properties of Matter.* Wiley.
Dekker, A. J. *Solid State Physics.* Macmillan.
Di Benedetto, A. T. *The Structure and Properties of Materials.* McGraw-Hill.
Ferry, J. D. *Viscoelastic Properties of Polymers.* Wiley.
Hall, I. H. *Deformation of Solids.* Nelson.
Holister, G. S. & Thomas, C. *Fibre-Reinforced Materials.* Elsevier, 1966.
Hughel, T. J. *Liquids: Structures, Properties, Solid Interactions.* Elsevier.
Hutchinson, T. S. & Baird, D. C. *The Physics of Engineering Solids.* Wiley.
Kelly, A. *Strong Solids.* O.U.P.
Meares, P. *Polymers: Structure and Bulk Properties.* Van Nostrand.
Patrick, R. L. *Adhesion and Adhesives.* Arnold.
Ritchie, P. D., ed. *The Physics of Plastics.* Iliffe.
Schmid, E. & Boas, W. *Plasticity of Crystals.* Chapman & Hall.
Scientific American. *Materials.* Freeman.
Stanworth, J. E. *Physical Properties of Glass.* O.U.P.
Tabor, D. *Gases, Liquids & Solids.* Penguin.
Treloar, L. R. G. *The Physics of Rubber Elasticity.* O.U.P.
Woods, H. J. *Physics of Fibres.* Institute of Physics.
Wulff, J. et al. *The Structure and Properties of Materials,* 4 vols., Wiley, 1965.

31.113B Physics of Measurement

The general principles of measuring physical quantities and analysing measurements. Techniques of measurement, their scope and limitations.

TEXTBOOK

Cook, N. H., & Rabinowicz, E. *Physical Measurement and Analysis.* Addison-Wesley, 1963.

REFERENCE BOOKS

Blatt, J. M. *Introduction to FORTRAN IV Programming,* Goodyear, 1971.
Brookes, A. M. P. *Basic Instrumentation for Engineers and Physicists,* Pergamon, 1968.
Braddick, H. J. J. *The Physics of Experimental Method,* Chapman & Hall, 1956.
Brophy, J. J. *Basic Electronics for Scientists,* McGraw-Hill, 1966.
Brownlee, K. A. *Industrial Experimentation,* Chemical Publishing Co., 1953.
Cooper, B. E. *Statistics for Experimentalists,* Pergamon, 1969.
Cross, A. W. *Experimental Microwaves.* Sanders Electronics, Stevenage, 1970.
Norton, H. N. *Handbook of Transducers for Electronic Measuring Systems.* Prentice-Hall, 1969.
Rowe, J. *An Introduction to Digital Electronics.* Electronics Australia, 1970.
Sears, F. W. *Optics.* Addison-Wesley, 1956.
Standards Association of Australia. *Australian Standard 1000-1970, The International System (SI) Units and their Application.* S.A.A., Sydney, 1970.
Whittaker, E. & Robinson, G. *The Calculus of Observations.* Blackie, 1952.

31.113C Applications of Radiation

Long-wave to short-wave electromagnetic radiation; some uses of electron beams and other radiations.

TEXTBOOK
No set text.

REFERENCE BOOKS
Belk, J. A. & Davis, A. L. *Electron Microscopy and Microanalysis of Metals.* Elsevier, 1968.
Birchon, D. *Optical Microscope Techniques.* Newnes, 1961.
Brown, J. G. *X-rays and their Applications.* Iliffe, 1966.
Grivet, P. *Electron Optics.* Pergamon, 1965.
Hackforth, H. L. *Infra-Red Radiation.* McGraw-Hill, 1960.
Harrison, G. R. et al, *Practical Spectroscopy.* Blackie, 1949.
Lipson, S. G. & Lipson, H. *Optical Physics.* C.U.P., 1969.
McDowell, C. A. *Mass Spectrometry.* McGraw-Hill.
Sears, F. W. *Optics.* Addison-Wesley, 1956.
Stephens, R. W. B. & Bate, A. E. *Acoustics and Vibrational Physics.* Arnold, 1966.

Part of each unit will comprise relevant laboratory work and other exercises. In these, students will be to a significant extent associated with the current programme of research work of the Department.

DEPARTMENT OF OPTOMETRY

The following courses are offered by the Department.

(a) A four-year full-time course leading to the degree of Bachelor of Optometry at either pass or honours level. This degree (BOptom) fulfils the requirements defined in the N.S.W. Optometrists (Amendment Act, 1963), and is the only course of professional training for Optometrists given in this State. Full details of the course appear earlier in this handbook.

(b) An extended undergraduate course leading to the double degree BSc/BOptom.

(c) A formal graduate course for the degree of Master of Optometry (MOptom). This course involves the study of three elective postgraduate subjects and advanced clinical optometry, together with the preparation of a thesis on an assigned project. It may be completed in one year of full-time study, or in the case of practising optometrists, in two or three years of part-time study.

(d) Facilities for individual research are available and students who are considered as eligible may enrol with the university as candidates for the degrees of Master of Science or Doctor of Philosophy.

Further information on the foregoing may be obtained from the brochures issued by the Department of Optometry.

31.811 Optometry I

Geometrical and Physical Optics—Extension of Physics I content on the nature of light, reflection, refraction, thin lenses, optical instrument, dispersion and colour.

Lens systems and thick lenses, Interference, Diffraction, Polarisation, Photometry.

Mechanical Optics and Optical Dispensing—The manufacture and properties of spectacle lens materials. The optical properties of spherical, cylindrical, sphero-cylindrical, and prismatic spectacle lenses. Bifocal and multifocal lenses. Protective lenses. Frame measurements. Optical dispensing. Magnifying spectacles, and magnifying glasses. Lens aberrations and spectacle lens design. Lens measuring and lens testing instruments.

Physiological Optics—Optical system of the eye; the retinal image, visual acuity. Refraction of the eye; hyperopia, myopia, astigmatism, aphakia. Presbyopia. Anisometropia. The schematic eye. Theory of subjective refraction. Aberrations of the eye. Entopic phenomena. Accommodation and convergence. Binocular vision, stereoscopy.

TEXTBOOKS

Bennett, A. G. *Ophthalmic Lenses.* Hatton.
Emsley, H. H., *Visual Optics.* Vols. I & II. Hatton.
Fincham, W. H. A. *Optics.* Hatton.

REFERENCE BOOKS

Andrews, C. H. *Optics of the Electromagnetic Spectrum.* Prentice-Hall.
Curry, C. *Wave Optics.* Arnold.
Emsley, H. H. *Aberrations of Thin Lenses.* Hatton.
Helmholtz, H. *Physiological Optics.* Dover.
Jenkins, F. A. & White, H. E. *Fundamentals of Optics.* McGraw-Hill.
Morgan, J. *Introduction to Geometrical and Physical Optics.* McGraw-Hill.
Rossi, B. *Optics.* Addison-Wesley.
Sears, F. W. *Optics.* Addison-Wesley.
Smith, F. G. & Thomson, J. H. *Optics.* Wiley.

31.812 Optometry II

External and Internal Examination of the Eye—Case history and symptoms. Signs of local and/or general disease. Examination methods and instruments. Optometrical photography. Facial measurements and frame fitting.

Examination of Visual Functions—Theory and practice of perimetry. Criteria of norms. Interpretation of field defects. Evaluation of light and colour sense.

Refraction—Theory and practice of keratometry, objective and subjective refraction, prescribing special visual aids. Theory of design and construction of apparatus.

Orthoptics and Pleoptics—Assessment of binocular sensory and motor functions. Diagnosis and treatment of anomalies. Instrumentation.

Reading Deficiency—The reading process and its anomalies. Remedial training. Instrumentation.

Lighting—Elements of illumination engineering. Assessment of visibility. Sight conservation.

TEXTBOOKS

Aust, W. *The Conservative Management of Squint.* Karger.
Bier, N. *Correction of Sub-Normal Vision.* 2nd ed. Butterworth.
Harrington, D. O. *The Visual Fields.* Mosby.
Sasieni, L. S. *The Principles and Practice of Optical Dispensing and Fitting.* Hammond.

REFERENCE BOOKS

Berens, C. & Zuckerman, J. *Diagnostic Examination of the Eye.* Lippincott.
Berliner, S. *Biomicroscopy of the Eye.* Hoeber.
Davson, H. *The Eye.* Vols. 3 & 4. Academic.
Doggart, J. H. *Ocular Signs in Slit Lamp Microscopy.* Kimpton.
Dowaliby, M. *Modern Eyewear—Fashion and Cosmetic Dispensing.* Professional Press.
Duke-Elder, S. *The Practice of Refraction.* Churchill.
Duke-Elder, S. *Textbook of Ophthalmology.* Kimpton.
Giles, G. H. *The Practice of Orthoptics.* Hammond.
Giles, G. H. *The Principles and Practice of Refraction.* Hammond.
Hartridge, H. *Recent Advances in the Physiology of Vision.* Churchill.
Lyle, K. & Jackson, S. *Orthoptics.* Lewis.
Ogle, K. N. *Researches in Binocular Vision.* Saunders.
Shapero, M., Cline, D. & Hofstetter, H. W. *Dictionary of Visual Science.* Chilton.
Schonell, F. J. *Backwardness in the Basic Subjects.* Oliver & Boyd.
Smith, W. *Clinical Orthoptic Procedure.* Mosby.
Spache, G. D. *Towards Better Reading.* Garrard.
Tait, E. F. *Textbook of Refraction.* Saunders.
Traquair, H. M. *An Introduction to Clinical Perimetry.* Kimpton.
Wolff, M. D. & Wolff, J. A. *Remedial Reading.* McGraw-Hill.

31.813 Optometry III

Industrial Optometry—Job analysis and standardization of visual requirements. Occupational visual aids. Vision screening. Industrial hazards and industrial eye protection.

Contact Lenses—Theory and practice of prescribing haptic and corneal lenses. Instruments.

Theory of Spectacle Lenses and Optical Instruments—Advanced geometrical optics and spectacle lens design. Aberrations and their control. The elements of macroscopic and microscopic systems.

Advanced Visual Physiology and Physiological Optics—Recent advances in anatomy and physiology. An introduction to electro-physiology. Aetiology of refractive errors. Theories of colour perception and its anomalies. Evaluation of diagnostic tests. Theories of space perception. Distortion of stereoscopic space. Stereoptics.

Comparative Ophthalmology and Ocular Evolution—The anatomy and physiology of invertebrate and vertebrate visual organs. Evolution of binocular vision.

History of Optics—Discussion of the development of optics, ophthalmology and optometry against the background of a short history of science. Optometrical and interprofessional ethics.

TEXTBOOKS

Bennett, A. G. *Optics of Contact Lenses.* Association of Dispensing Opticians, U.K.
Burnham, R. W., Hanes, R. M. & Bartleson, C. J. *Color: A Guide to Basic Facts and Concepts.* Wiley.
Mandel, R. B. *Contact Lens Practice: Basic and Advanced.* Thomas.

REFERENCE BOOKS

Brandt, F. H. *The Psychology of Seeing.* Philosophical Library.
Brindley, G. S. *Physiology of the Retina and the Visual Pathway.* Arnold.
Conrady, A. E. *Applied Optics and Optical Design.* Dover.
Corson, R. *Fashion in Eyeglasses.* Owen.

Davson, H. *The Eye.* Vols. 1 & 4. Academic.
Duke-Elder, S. *System of Ophthalmology.* Vol. 1. Kimpton.
Duke-Elder, S. & Perkins, E. S. *Transparency of the Cornea.* Blackwell.
Emsley, H. H. *Aberrations of Thin Lenses.* Hatton.
Gibson, J. J. *Perception of the Visual World.* Houghton-Mifflin.
Graham, C. H. *Vision and Visual Perception.* Wiley.
Grosvenor, T. P. *Contact Lens Theory and Practice.* Professional Press.
Hartridge, H. *Recent Advances in the Physiology of Vision.* Churchill.
Haynes, P. L. *Encyclopaedia of Contact Lens Practice.* International Optics.
Hirsch, M. J. & Wick, R. W. *Vision of the Ageing Patient.* Hammond.
Hofstetter, H. W. *Industrial Vision.* Chilton.
Holmes, C. *Guide to Occupational and other Visual Needs.* Silverlake.
Ittelson, W. H. *The Ames Demonstrations in Perception.* Princeton.
Johnson, B. K. *Optics and Optical Instruments.* Hatton.
Le Grand, Y. *Light, Colour and Vision.* Chapman & Hall.
Martin, L. C. *Technical Optics.* Pitman.
Mazow, B. *Synopsis of Corneal Contact Lens Fitting for Optometrists.* Burgess.
Murray, H. D. *Colour in Theory and Practice.* Chapman & Hall.
Ogle, K. N. *Researches in Binocular Vision.* Saunders.
Optical Society of America. *The Science of Color.* Crowell.
Polyak, S. *The Vertebrate Visual System.* Chicago U.P.
Prince, J. H. *Comparative Anatomy of the Eye.* Thomas.
Prince, J. H. *Ocular Prosthesis.* Livingstone.
Sorsby, A. *A Short History of Ophthalmology.* Staples.
Thomas, C. I. *The Cornea.* Thomas.
Thomas, P. F. *Conoid Contact Lenses.* Corneal Lens Corporation, Sydney.
Wright, W. D. *Researches in Normal and Defective Colour Vision.* Kimpton.
Wright, W. D. *The Measurement of Colour.* Hilger.
Wyszecki, G. & Stiles, W. S. *Color Science.* Wiley.

31.821 Special Anatomy and Physiology

Histology, Anatomy, and Embryology of the Eye and Associated Structures—Anatomy and histology of the eyeball, ocular adnexae, bony orbit, visual nervous pathways and visual cortex. The blood vessels, muscles, and nerves of the orbit and associated structures. The motor and sensory pathways associated with the visual apparatus. Elementary embryology and the detailed development of the eye and adnexae. Developmental defects of the eye and adnexae.

Physiology of the Eye and Vision—Physiology of the eyelids and lacrimal apparatus, cornea, aqueous humour and intra-ocular pressure, iris and pupil, lens and accommodation, retina and photo-chemistry of vision. Sensory responses to occular stimulation, luminosity curve, flicker, after-images, and contrast phenomena. Visual acuity. Light- and dark-adaptation, photopic and scotopic vision. Colour vision and colour blindness. Eye movements, binocular vision, and stereopsis. Theories of vision, visual perception.

TEXTBOOKS

Moses, R. A. *Adler's Physiology of the Eye.* Mosby.
Wolff, E. *The Anatomy of the Eye and Orbit.* Lewis.

REFERENCE BOOKS

Davson, H. *The Eye.* Vols. 1, 2 & 3. Academic.
Duke-Elder, S. *System of Ophthalmology.* Vols. 2, 3 & 4. Kimpton.
Keeney, A. H. *Chronology of Ophthalmic Development.* Thomas.

Mann, I. *The Development of the Human Eye.* C.U.P.
Mann, I. *Developmental Abnormalities of the Eye.* C.U.P.
Polyak, S. L. *The Retina.* Chicago U.P.
Rushton, W. A. H. *Visual Pigments in Man.* Liverpool U.P.
Spooner, J. D. *Ocular Anatomy.* Hatton.

31.831 Diseases of the Eye

Introductory Bacteriology and Pathology—Pathogenic organisms, infection, immunity, allergic manifestations. Antiseptics and germicides, antibiotics. Pathological tissue changes; cysts, neoplasms. Diseases of the blood, arteries, veins, heart, lungs, and kidneys. Venereal diseases. Diseases of the nervous system.

The Aetiology, Pathology, Diagnosis and Prognosis of Diseases of the Eye and Adnexae—Diseases of the eyelids, lacrimal apparatus, orbit, conjunctiva, cornea, sclera, uveal tract, lens, vitreous, retina, and optic nerve. Glaucoma. Ocular injuries. Sympathetic ophthalmia. Disease resulting from blood-borne infection. Disturbances of vision of central origin. Disturbances of ocular motility. Developmental abnormalities.

The Ocular Manifestation of Systemic Diseases—Ocular manifestations of: tuberculosis, syphilis, disorders of metabolism, dental sepsis, diseases of the kidneys, cardiovascular system, blood, endocrine system, central nervous system, phakomatoses and hereditary syndromes.

TEXTBOOKS

Lyle, T. K. & Cross, A. G. *May & Worth's Manual of Diseases of the Eye.* Bailliere.
Passmore, R. & Robson, J. S. eds. *A Companion to Medical Studies.* Vol. 2. Blackwell.
Perkins, E. S. & Hansell, P. *An Atlas of Diseases of the Eye.* Churchill.

REFERENCE BOOKS

Ballantyne, A. J. & Michaelson, I. C. *Textbook of the Fundus of the Eye.* Livingstone.
Doggart, J. H. *Ocular Signs in Slit-Lamp Microscopy.* Kimpton.
Doggart, J. H. *Ophthalmic Medicine.* Kimpton.
Duke-Elder, S. *Textbook of Ophthalmology.* Kimpton.
Larsen, H. W. *Atlas of the Fundus of the Eye.* Munsgaard.

SCHOOL OF BIOCHEMISTRY

Biochemistry involves a study of the chemistry of living organisms, and it is a subject where those interested in biology and those interested in chemistry work together to increase our understanding of life.

Some of the most spectacular achievements of recent times have been in the unravelling of the chemistry and function of very large molecules, macromolecules, of proteins, nucleic acids and polysaccharides which occur in living organisms. This has resulted in a better understanding of the transmission of hereditary information and the adaptation of organisms to the environment by mutations and natural selection.

Major areas of interest in Biochemistry at the present time involve a study of the chemistry of these large molecules involved in body processes such as growth, movement and reproduction. The formation and breakdown of these large molecules is known as metabolism and necessarily includes the chemical processes, involving both large and small molecules present in foodstuffs, which provide the necessary energy and the simple molecules or monomers that are then used in biosynthesis of these larger molecules which constitute the organism.

Basic to any understanding of the reactions of living organisms is the process of promoting chemical reactions under physiological conditions, that is, at low temperatures. A considerable emphasis is placed on understanding the hundreds of different types of enzymes, large protein molecules, each specifically designed for promoting one particular chemical reaction, the speed with which they function and the factors which control their operation.

The integration and control of biochemical reactions involves the study of hormones, or chemical messengers, that are synthesised in certain glands and exert their effects on cells, often situated in distant parts of the body, after being transported in the circulating blood or other vascular fluid.

A knowledge of Biochemistry is essential in maintaining the health of living organisms and is vital to the study of Medicine. There is an overlap with other biological sciences so that Biochemistry is a co-requisite or prerequisite for study in the disciplines of Biological Technology, Botany, Microbiology, Physiology and Zoology. Biochemistry on the other hand draws particularly on a background of Biology and Chemistry and some knowledge of Mathematics and Physics.

There are excellent prospects for advanced training at honours level, involving an additional year's training, mainly in research, and for graduate research work for the Master of Science degree or for the Doctorate in Philosophy.

Biochemistry plays a role in so many facets of human activity that for students majoring in Biochemistry there are good employment opportunities in educational institutions, in many research areas, e.g., in Universities, C.S.I.R.O., Public Health and hospital organizations, and in industries concerned with food, pharmaceuticals and agriculture.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page B20.

41.101A Chemistry of Biologically Important Molecules

The chemical properties of amino acids, peptides and proteins, carbohydrates, nucleic acids and lipids and the biological roles of these compounds. The nature and function of enzymes. Practical work to illustrate the lecture course.

TEXTBOOKS

Barker, R. *Organic Chemistry of Biological Compounds.* Prentice-Hall, 1971.

Montgomery, R. & Swenson, C. A. *Quantitative Problems in the Biological Sciences.* Freeman, 1969.

White, A., Handler, R. & Smith, E. L. *Principles of Biochemistry.* 4th ed. McGraw-Hill, 1968.

REFERENCE BOOKS

Loewy, A. G. & Siekevitz, P. *Cell Structure and Function.* 2nd ed. Holt, Rinehart & Winston, 1969.

41.101B Metabolism

The intermediary metabolism of carbohydrates, lipids and nitrogenous compounds. The molecular mechanism of gene expression and protein synthesis. Practical work to illustrate the lecture course.

TEXTBOOKS

As for 41.101A.

41.101C Control Mechanisms

The relation between structure and function of enzymes, hormones, vitamins and membranes. Photosynthesis. Metabolic networks and control mechanisms. Practical work to illustrate the lecture course.

TEXTBOOKS

As for 41.101A.

41.102A Biochemistry of Macromolecules and Cell Biochemistry

Polysaccharides and glycoproteins including bacterial cell walls. Chemistry and biology of polynucleotides. Methods of amino acid and nucleic acid sequence analysis. Protein structure and synthesis. Active centres of some proteins. Sub-unit organization of proteins. Cellular degradation. Practical work to illustrate the lecture course and to provide experience in modern biochemical techniques.

TEXTBOOKS

Barker, R. *Organic Chemistry of Biological Compounds.* Prentice-Hall, 1971.

Frieden, E. & Lipner, H. *Biochemical Endocrinology of the Vertebrates.* Prentice-Hall, 1971.

Kerridge, D. & Tipton, K. *Biochemical Reasoning.* Benjamin, 1972.

The Molecular Basis of Life. An Introduction to Molecular Biology. Readings from Scientific American. Freeman, 1968.

White, A., Handler, R. & Smith, E. L. *Principles of Biochemistry.* 4th ed. McGraw-Hill, 1968.

Wold, F. *Macromolecules: Structure and Function.* Prentice-Hall, 1971.

REFERENCE BOOKS

Bernhard, S. *The Structure and Function of Enzymes.* Benjamin, 1968.
Mahler, H. R. & Cordes, E. H. *Biological Chemistry.* 2nd ed. Harper & Row, 1971.
Watson, J. W. *The Molecular Biology of the Gene.* 2nd ed. Benjamin, 1970.

41.102B Metabolic Pathways and Control Mechanisms

Haemoproteins, and electron transport, photosynthesis, photophosphorylation and oxidative phosphorylation. The nature and function of coenzymes. Interrelationships in mammalian intermediary metabolism. Biochemical control mechanisms including hormones and allosteric interactions. Enzyme kinetics. Practical work to illustrate the lecture course and to provide experience in modern biochemical techniques.

TEXTBOOKS

As for 41.102A above.

41.121 Biochemistry

Physical and chemical properties and functional roles of the principal biological constituents of man. Enzymology, energetics, metabolism of principal cell constituents in the organs and tissues of man, multicellular organisation, metabolic and hormonal regulation and whole body metabolism. The biochemistry of body fluids and specialized tissues. Energy storage in man, whole body metabolic economy and nutrition. Practical work to illustrate the lecture course.

TEXTBOOKS

Frieden, E. & Lipner, H. *Biochemical Endocrinology of the Vertebrates.* Prentice-Hall, 1971.
McGilvery, R. W. *Biochemistry: A Functional Approach.* Saunders, 1970.
Montgomery, R. & Swenson, C. A. *Quantitative Problems in the Biochemical Sciences,* Freeman, 1969.
White, A., Handler, R. & Smith, E. L. *Principles of Biochemistry.* 4th ed. McGraw-Hill, 1968.

REFERENCE BOOKS

Bartley, W., Birt, L. M. & Banks, P. *The Biochemistry of the Tissues.* Wiley, 1968.
Christensen, H. N. *pH and Dissociation: A programmed text.* 2nd ed. Saunders, 1964.
Loewy, A. G. & Siekevitz, P. *Cell Structure and Function.* 2nd ed. Holt, Rinehart & Winston, 1969.

SCHOOL OF BIOLOGICAL TECHNOLOGY

The School is primarily concerned with the development of multi-disciplinary approaches to basic and applied problems in biochemistry and microbiology, and in particular those problems which arise from or have relevance to the various biological technologies in industry, agriculture and medicine. The well-established methodologies of biochemistry and medicine can be strengthened and diversified by the newer mathematical techniques, and can be used most effectively in conjunction with the rigorous quantitative methods common in the physical sciences and in engineering.

Currently, the School has a major interest in microbial processes and in their extension and development in new areas, such as the extraction of metals from their ores, the utilization of natural gas and petroleum products, the enzymatic catalysis of chemical reactions, and the conversion to useful products of waste materials. Basic studies on continuous cultivation processes and upon the growth kinetics and regulatory mechanisms of micro-organisms have been in progress for some years. Most of the activities of the School are collaborative with other schools and departments of the University in particular, the Schools of Chemistry, Chemical Engineering and Metallurgy. The present staff of the School is much concerned to maintain adequate communication with relevant industries.

The School offers one Level III subject, Fermentation Technology, as an option to students undertaking a major sequence in Microbiology in the Science Course (the subject is also available to students in the Food Technology course).

An honours year programme in the fourth year of the Science course can be undertaken in the School by students who have reached a satisfactory standard in biochemical or microbiological subjects in the third year of the course; an honours year scholarship of $1,000, funded by industry, is competitively available. A graduate diploma course in Biochemical Engineering is offered in collaboration with the School of Chemical Engineering and is open to graduates in relevant disciplines. The course is of one year's duration full-time or two years' duration part-time; both programmes are currently available. Registration for the degrees of Master of Science or of Doctor of Philosophy is open to honours graduates in relevant disciplines or to those graduates who have completed the preliminary or qualifying programmes available in the School. In addition to Commonwealth and University Postgraduate Scholarships, financial support for higher degree studies is available from time to time from industrial sources.

The School is not interested in producing narrow specialists, but in the training of graduates who, by participation in formal courses and research programmes of a collaborative kind, are equipped to identify and solve a wide range of problems, and are experienced in the multi-disciplinary approach and appreciative of its potentialities.

42.102 Fermentation Technology

An introduction to the basic factors involved in the operation of microbial processes on an industrial scale, including: The selection, maintenance and improvement of micro-organisms; the influence of physical and chemical factors on the microbial environment; the control of environmental factors; the effects of operational patterns in batch and continuous flow cultivation; the harvesting, purification and standardisation of products; process optimisation; disposal of waste materials; an examination of selected microbial processes for chemical, pharmaceutical and food production, against the basic characteristics of large-scale fermentation processes practical exercises, including the operation of various types of fermenters, to illustrate the principal aspects of the lecture course.

TEXTBOOKS

Aiba, S., Humphrey, A. E. & Millis, N. F. *Biochemical Engineering.* 2nd ed. Tokyo U.P., 1973.

Casida, L. E. Jr. *Industrial Microbiology.* Wiley, 1968.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page B21.

42.103 Biological Technology (Honours)

Advanced formal training in selected areas of biochemistry and/or microbiology and participation in one of the school's research projects.

SCHOOL OF BOTANY

Botany is concerned with all aspects of the structure and function of plants and the relation of plants to the environment. Knowledge gained by investigations in these fields is important in agriculture, forestry and conservation, as well as in understanding the fundamental properties of biological material.

The major aspects of the subject which are taught in undergraduate courses in the School are Plant Genetics, Plant Physiology and Biochemistry, Plant Morphology, Ecology, Environmental Botany, Mycology and Plant Pathology. Any of these courses are usually combined with appropriate subjects in Biochemistry, Microbiology and Zoology. By this means, students may complete their studies with a broad spread over a number of biological disciplines, or may concentrate more in botanical aspects, with other subsidiary supporting subjects.

Fourth year Honours courses are provided for students wishing to specialise in a particular branch of Botany.

Research facilities are available within the School of postgraduate study leading to a degree of Master of Science or Doctor of Philosophy.

Careers for graduates in Botany include teaching, at secondary or tertiary level, scientific and technological work in food and drug industries, and investigational, research or extension work in the science and agriculture laboratories of State or Commonwealth organizations.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page B21.

43.101A/45.101A Genetics and Biometry

Analysis of the mitotic cycle; replication of DNA and its organization in the chromosomes; linkage, non-meiotic recombination; mutation, structural changes, polyploidy, aneuploidy; population genetics; cytoplasmic inheritance; episomes; gene structure and function. An introduction to statistical methods and their application to biological data, including an introduction to analysis of variance and experimental design.

TEXTBOOKS

Clarke, M. C. *Statistics and Experimental Design.* Arnold, 1969.
Rohlf, F. T. & Sokal, R. *Statistical Tables.* Freeman, 1969.
Srb, A. M., Owen, R. D. & Edgar, R. S. *General Genetics.* 2nd ed. Freeman, 1965.

This unit is offered jointly by the Schools of Botany and Zoology.

43.101B Plant Evolution and Ecology

A study of the evolution of vegetative form and structure of vascular plants; an examination of their organization into terrestrial communities; identification, evolution and distribution of elements of the Australian flora. Students are required to attend excursions as arranged during the course.

TEXTBOOKS

Beadle, N. C. W., Evans, O. D., & Carolin, R. C. *Handbook of the Vascular Plants of the Sydney District and Blue Mountains.* Authors, Armidale, 1962.

Billings, W. D. *Plants and the Ecosystem.* Macmillan, 1964.

Esau, K. *Anatomy of Seed Plants.* Wiley, 1960.

43.101C Plant Physiology

A general introduction to the physiology of the whole plant including a consideration of photosynthesis, inorganic nutrition, transport, translocation, physiology of growth and development, and plant growth substances and their application in agriculture.

TEXTBOOKS

Galston, A. W. & Davies, P. J. *Control Mechanisms in Plant Development.* Prentice-Hall, 1970.

Richardson, M. *Translocation in Plants.* Arnold, 1968.

Sutcliffe, J. *Plants and Water.* Arnold, 1968.

Whittingham, C. P. *Photosynthesis.* O.U.P., 1971.

43.102A Advanced Genetics

Human genetics including chromosome analysis, genetics of haemoglobin variation and drug response. Twin studies. Serum and enzyme polymorphisms. DNA studies including polarity and transcription concepts. Hypothesis of genetic recombination. Evolutionary genetics. Allelic complementation and fine structure. Polyploid cytogenetics, particularly wheat cytogenetics. Genetics of pathogenicity. Quantitative genetics. Heritability estimates and selection. Students are required to attend to long-term experiments outside formal class time.

43.102B Plant Taxonomy

Considers the assessment analysis and presentation of data for classifying plants both at the specific and supra-specific level. Students are required to attend some weekend day field trips.

TEXTBOOKS

Beadle, N. C. W., Evans, O. D. & Carolin, R. C. *Handbook of the Vascular Plants of the Sydney District and Blue Mountains.* Authors, Armidale, 1962.

Sporne, K. R. *The Morphology of the Gymnosperms.* Hutchinson, 1967.

Cronquist, A. *The Evolution and Classification of Flowering Plants.* Nelson, 1968.

43.102C Plant Physiology and Biochemistry

Includes the pathway of carbon in leaves, lipid metabolism, hormone physiology and the cell wall. Modifications may include items of current interest in plant physiology. Projects are related to the above topics or to research in progress within the School, and may require attendance outside the hours set down in the timetable.

43.102D Mycology

General structure and ultrastructure of the fungal cell. Morphology of members of the major taxonomic groups. Spore liberation, dispersal, deposition and germination. Cytology, genetics and patterns of life cycles. Growth and differentiation of hyphae and fruit bodies. Response to nutritional and environmental conditions for growth and reproduction. Transport processes, metabolism and metabolic products. Ecological considerations of fungi in specialised habitats.

TEXTBOOKS

Alexopoulos, C. J. *Introductory Mycology*. Wiley, 1962.
Burnett, J. H. *Fundementals of Mycology*. Arnold, 1968.

43.102E Environmental Botany

An introduction to the soil and atmospheric environment in which terrestrial plants exist and a study of the behaviour and response of the flowering plant to its environment, both in nature and agriculture.

Students must attend two Saturday field trips.

43.102F Plant Pathology

History of plant pathology; pathogenic organisms; symptoms of disease. Specific diseases caused by fungi, nematodes, bacteria and viruses. Host-pathogen relationships including stages of infection, evolution of host-pathogen relationships, adaptation for successful parasitism, resistance mechanisms and genetics of resistance. Control of diseases by the use of fungicides, nematocides, crop rotation and breeding for resistance.

TEXTBOOKS

Alexopoulos, C. J. *Introductory Mycology*. Wiley, 1962.
Walker, J. C. *Plant Pathology*. 3rd ed. McGraw-Hill, 1968.

SCHOOL OF CHEMISTRY

Chemistry is the science of materials, their properties and their transformations. As such, it is both an experimental and a theoretical science. Chemistry provides a common language for the experimental sciences, comparable with the language of quantitative scientific thought provided by mathematics, and is central among them, lying between physics on the one hand, and biology on the other. The interdependence of chemistry and other sciences is exemplified in the fields of biochemistry, chemical physics, geochemistry and chemical engineering. Additional to its intrinsic value, chemistry provides the basis of modern technology, through its contributions to medicine, industry and agriculture.

Career opportunities in chemistry are available for graduates in chemical industry, particularly in the research and development, control and management sections. Opportunities are also available in the universities and tertiary institutes, and in secondary teaching. Further opportunities are provided within Commonwealth and State departments, and within research organizations including the CSIRO and the AAEC.

Chemistry forms a part of many undergraduate courses offered, for example, Chemistry in the Science course, and Pure and Applied Chemistry. Additionally, there are courses within the Faculty of Applied Science, such as Industrial Chemistry, Ceramic Engineering, Food Technology, Chemical Engineering, Textile Technology and Metallurgy, which are predominantly concerned with technological aspects of chemistry.

The School of Chemistry provides two main undergraduate courses, namely (1) **Pure and Applied Chemistry,** and (2) **Chemistry (as a co-major) in the Science Course.** Both courses lead to the BSc degree.

A study of **Chemistry (as a co-major) in the Science course** involves a study of two branches of science to an advanced level. For example, a combination of level III Chemistry with level III Mathematics will provide a useful basis for later specialization in X-ray crystallography or theoretical chemistry; a combination of level III Chemistry with level III Geology will be of assistance to those who later wish to specialize in geochemistry. Another possibility is to combine level III Chemistry with level III Biochemistry units. These courses are suitable for those who wish to acquire advanced knowledge of two fields of study, or of interdisciplinary subjects. The Science course, as an alternative to the BSc(Ed) course, is also suitable for those planning to teach Chemistry at the secondary level. On a full-time basis, the Science course may be taken in three years (pass) or four years (with honours). On a part-time basis, however, the Science course may, according to the choice of subjects, require seven years (pass).

The aim of the **Pure and Applied Chemistry** course is to provide both depth and choice of subject matter at pass and honours level, to meet the needs of students who will become professional chemists. The course consists of a study of the fundamental principles of chemistry and of electives which deal with topics in contemporary fields of chemistry. It may be taken either full-time (three years for pass, four years for honours) or part-time (six years for pass, eight years for honours). No industrial training is required, though it is customary for students taking the part-time course to find employment in some branch of the chemical industry.

The role of basic scientific research in the creation of modern industrial society is widely accepted. The usual introduction to research in chemistry is provided by the honours degree (in either the Science course, or the Pure and Applied Chemistry course), which may be followed by a higher research degree in Chemistry (e.g., MSc, PhD). These degrees are aimed at those whose interests are in research and/or teaching. Alternatively, postgraduate training in chemistry is provided through formal Diploma or Master's courses (e.g. the Diploma in Food and Drug Analysis, and the MChem in Analytical Chemistry).

REQUIREMENTS FOR HONOURS IN CHEMISTRY

Students desiring admission to the honours course must apply in writing to the Head of the School not later than 30th November of the year in which the third year of the full-time (or equivalent stage of the part-time) course is completed.

The requirement for admission to the honours course is a sufficiently meritorious record in the work of the pass degree.

The major part of the work for honours will consist of a research project on which a written thesis is submitted. There is also some formal course work. Attendance will be required at such lectures and seminars as the Head of the School directs. Honours will not be awarded in any particular branch of the subject, but in chemistry as a whole.

For admission to the honours chemistry course in Science, the applicant must complete at least eight level III units, of which at least four must be in Chemistry. Students who, at the beginning of their third year are already interested in taking honours in chemistry, are advised to seek guidance from the School about the most appropriate subject to accompany the level III Chemistry units.

Prospective Honours students in the Pure and Applied Chemistry course should seek guidance before choosing their final year elective subjects.

2.001 Chemistry I

Classification of matter and theories of the structure of matter. Atomic structure, the periodic table and chemical behaviour. Chemical bonds and molecular structure. Equilibrium and change in chemical systems. The structure, nomenclature and properties of organic compounds. Reactions of organic compounds.

TEXTBOOKS

Ander, P. & Sonnessa, A. J. *Principles of Chemistry*. Collier Macmillan, 1966.

Aylward, G. H. & Findlay, T. J. V. *SI Chemical Data*. Wiley, 1971

Barrow, G. M., Kenney, M. E., Lassila, J. D., Litle, R. L. & Thompson, W. E. *Understanding Chemistry*. Benjamin, N.Y., 1969.

Chemistry I Laboratory Manual. Univ. of N.S.W., 1971.

Hart, H. & Schuetz, R. D. *Organic Chemistry*. Houghton Mifflin, 1972.

Schaum Outline Series. *Theory and Problems of College Chemistry*. SI (Metric) ed. McGraw-Hill.

Turk, A., Meislich, H., Brescia, F. & Arents, J. *Introduction to Chemistry*. Academic Press, 1968.

REFERENCE BOOKS

Brown, G. I. *A New Guide to Modern Valency Theory*. Longmans, 1967.
Eastwood, F. W., Swan, J. M. & Yonatt, J. B. *Organic Chemistry. A First University Course in Twelve Programs*. Science Press, 1967.
Gray, H. B. & Haight, G. P. *Basic Principles of Chemistry*. Benjamin, 1967.
Pauling, L. *College Chemistry*. 3rd ed. Freeman, 1964.
Runquist, O., Cresswell, C. J. & Head, J. T. *Chemical Principles. A Programmed Text*. Burgess Pub. Co., 1968.
Sisler, H. H., Van der Werf, C. A. & Davidson, A. W. *College Chemistry*. 3rd ed. Collier-Macmillan, 1967.
Vogel, A. I. *Macro and Semimicro Qualitative Analysis*. 4th ed. Longmans, 1954.

2.002A Chemistry II (Physical Chemistry)

Quantum mechanics; molecular energy and thermodynamics; chemical application of thermodynamics; surface and colloid chemistry.

TEXTBOOKS

Aylward, G. H. & Findlay, T. J. V. *SI Chemical Data*. Wiley, Sydney, 1971.
Barrow, G. M. *Physical Chemistry*. 2nd ed. McGraw-Hill, 1966.
Shaw, D. J. *Introduction to Colloid and Surface Chemistry*. 2nd ed. Butterworth, 1970.

REFERENCE BOOKS

Alexander, A. E. & Johnson, P. *Colloid Science*. O.U.P., 1950.
Barrow, G. M. *Structure of Molecules*. Benjamin, 1963.
Daniels, F. et al. *Experimental Physical Chemistry*. 7th ed. McGraw-Hill, 1970.
Daniels, F. & Alberty, R. A. *Physical Chemistry*. 3rd ed. Wiley, 1966.
Glasstone, S. *Textbook of Physical Chemistry*. 2nd ed. Van Nostrand, 1948.
Moore, W. J. *Physical Chemistry*. 4th ed. Longmans, 1963.
Shoemaker, D. P. & Garland, C. W. *Experiments in Physical Chemistry*. 2nd ed. McGraw-Hill, 1967.

2.002B Chemistry II (Organic Chemistry)

Chemistry of the more important functional groups: aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, halides, alcohols, phenols, aldehydes, ketones, ethers, carboxylic acids and their derivatives, nitro compounds, amines and sulphonic acids.

TEXTBOOKS

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*. 3rd ed. Int. Stud. Ed. Allyn & Bacon, 1973.
2. One of the following:
Cheronis, N. D. & Entrikin, J. B. *Identification of Organic Compounds*. Wiley International Edition.
Shriner, R. L., Fuson, R. C. & Curtin, D. Y. *Systematic Identification of Organic Compounds*. 5th ed. Wiley, 1964.
Vogel, A. I. *Elementary Practical Organic Chemistry*. Pt. II. Qualitative Organic Analysis. Longmans, 1957.

2.002C Chemistry II (Inorganic/Analytical Chemistry)

Chemistry of non-metals; chemistry of typical metals; transition metals, lanthanides and actinides; introduction to nuclear chemistry. Quantitative inorganic analysis.

TEXTBOOKS

Fischer, R. B. & Peters, D. G. *Quantitative Chemical Analysis.* Saunders, 1968.
Jolly, W. L. *The Chemistry of the Non-Metals.* Prentice-Hall, 1966.
Quagliano, J. V. & Vallarino, L. M. *Coordination Chemistry.* Heath & Co., Lexington, 1969.

REFERENCE BOOKS

Basolo, F. & Johnson, R. *Coordination Chemistry.* Benjamin, 1964.
Carswell, D. J. *Introduction to Nuclear Chemistry.* Elsevier, 1967.
Cotton, F. A. & Wilkinson, G. *Advanced Inorganic Chemistry.* 2nd ed. Wiley, 1966.

2.003A Chemistry III (Physical Chemistry)

Physico-chemical aspects of spectroscopy—quantum mechanical approach; electronic and vibrational spectra; nuclear magnetic resonance and electron spin resonance spectroscopy. Chemical kinetics—transition state theory; theories of uni-molecular reactions; chemistry of excited species.

TEXTBOOKS

Barrow, G. M. *Physical Chemistry.* 2nd ed. McGraw-Hill, 1966.
Daniels, F. et al. *Experimental Physical Chemistry.* 6th or 7th ed. McGraw-Hill, 1962 or 1970.
Dixon, R. N. *Spectroscopy and Structure.* Methuen, 1965.
Laidler, K. J. *Chemical Kinetics.* 2nd ed. McGraw-Hill, 1965.

REFERENCE BOOKS

Amdur, I. & Hammes, G. G. *Chemical Kinetics.* McGraw-Hill, 1966.
Benson, S. W. *Thermochemical Kinetics.* Wiley, 1968.
Calvert, J. G. & Pitts, J. N. *Photochemistry.* Wiley, 1966.
Carrington, A. & McLachlan, A. D. *Introduction to Magnetic Resonance.* Harper & Row, 1967.
Gardiner, W. C. *Rates and Mechanisms of Chemical Reactions.* Benjamin, 1969.
Glasstone, S., Laidler, K. J. & Eyring, H. *Theory of Rate Processes.* McGraw-Hill, 1941.
Golding, R. M. *Applied Wave Mechanics.* Van Nostrand, 1969.
King, G. W. *Spectroscopy and Molecular Structure.* Holt, Rinehart & Winston, 1964.
Shoemaker, D. P. & Garland, C. W. *Experiments in Physical Chemistry.* 2nd ed. McGraw-Hill, 1967.

2.003B Chemistry III (Organic Chemistry)

Stereochemistry of acyclic systems. *Alicyclic Chemistry*: the synthesis and properties of monocyclic systems, conformational aspects of cyclohexane and related systems, rearrangement reactions, and the chemistry of fused and bridged polycyclic compounds. *Heterocyclic Chemistry*: the chemistry of pyridine, quinoline, isoquinoline, and benzopyran and its derivatives; the chemistry of pyrrole, furan, and thiophene and their benzo derivatives; the chemistry of pyrimidine, imidazole and pyrazole.

TEXTBOOKS

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*. 3rd ed. Int. Stud. Ed. Allyn & Bacon, 1973.

or

Roberts, J. D. & Caserio, M. C. *Basic Principles of Organic Chemistry*. Benjamin, 1964.

2. Tedder, J. M., Nechvatal, A., Murray, A. W. & Carnduff, J. *Basic Organic Chemistry*. Pt. 3. Wiley, 1970.

3. One of the following:
   Cheronis, N. D. & Entrikin, J. B. *Identification of Organic Compounds*. International Edition. Wiley.
   Shriner, R. L., Fuson, R. C. & Curtin, D. Y. *Systematic Identification of Organic Compounds*. 5th ed. Wiley, 1964.
   Vogel, A. I. *Elementary Practical Organic Chemistry*. Pt. II. Qualitative Organic Analysis. Longmans, 1957.

REFERENCE BOOKS

Acheson, R. M. *An Introduction to the Chemistry of Heterocyclic Compounds*. 2nd ed. Wiley Int. Ed., 1967.
Eliel, E. L. *Stereochemistry of Carbon Compounds*. McGraw-Hill, 1962.
Eliel, E. L., Allinger, N. L., Angyal, S. J. & Morrison, G. A. *Conformational Analysis*. Interscience, 1965.
Gould, E. S. *Mechanism and Structure in Organic Chemistry*. Holt, Rinehart & Winston, 1959.
Hallas, G. *Organic Stereochemistry*. McGraw-Hill, 1965.
March, J. *Advanced Organic Chemistry: Reactions, Mechanisms and Structure*. McGraw-Hill, 1968.
Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*. 3rd. ed. Longmans, 1971.
Whitham, G. H. *Alicyclic Chemistry*. Oldbourne.

2.003C Chemistry III (Inorganic Chemistry)

Molecular structure determination, with particular reference to complex salts, optical activity, crystal structure, systematic chemistry of the lanthanides and transition elements, further chemistry of nitrogen, sulphur and the halogens.

TEXTBOOKS

Cotton, F. A. & Wilkinson, G. *Advanced Inorganic Chemistry*. 2nd ed. Wiley, 1966.
Vogel, A. I. *A Textbook of Macro & Semi-micro Qualitative Inorganic Analysis*. Longmans.

REFERENCE BOOKS

Bailar, J. C. *Chemistry of the Coordination Compounds*. Reinhold, 1960.
Barnard, A. K. *Theoretical Basis of Inorganic Chemistry*. McGraw-Hill, 1965.
Dwyer, F. P. & Mellor, D. P. *Chelating Agents and Metal Chelates*. Academic, 1964.
Lewis, J. & Wilkins, R. *Modern Coordination Chemistry*. Interscience, 1959.
Pauling, L. *Nature of the Chemical Bond*. 3rd. ed. Cornell, 1960.
Sienko, M. J. & Plane, R. A. *Physical Inorganic Chemistry*. Benjamin, 1965.
Wells, A. F. *Structural Inorganic Chemistry*. 3rd ed. O.U.P., 1962.

2.003D Chemistry III (Analytical Chemistry)

Ionic equilibria in solution; advanced qualitative analysis; advanced electrochemical analysis; advanced spectrophotometry; separations and preconcentrations.

TEXTBOOKS

Eckschlager, K., Chalmers, R. A. trans. ed. *Errors and Measurement in Chemical Analysis.* Van Nostrand, 1969.

Ewing, G. W. *Instrumental Methods of Chemical Analysis.* McGraw-Hill, 1969.

Fischer, R. B. & Peters, D. G. *Quantitative Chemical Analysis.* Saunders, 1968.

Stock, R. & Rice, C. B. F. *Chromatographic Methods.* 2nd ed. Chapman Hall, 1967.

2.003E Chemistry III (Nuclear and Radiation Chemistry)

Nuclear structure, reactions, transformations; radioactive properties and measurements, radiations, isotopes, radio-chemical techniques.

TEXTBOOKS

Carswell, D. J. *Introduction to Nuclear Chemistry.* Elsevier, 1967.

or

Friedlander, G., Kennedy, J. & Miller, J. M. *Nuclear and Radiochemistry.* 2nd ed. Wiley, 1964.

or

Harvey, B. *Introduction to Nuclear Physics and Chemistry.* Prentice Hall, 1962.

REFERENCE BOOKS

Ausloos, P. *Fundamental Processes in Radiation Chemistry.* Interscience, 1968.

Denaro, A. R. & Jayson, G. G. *Fundamentals of Radiation Chemistry.* Butterworths, 1972.

Farley, S. *Elements of Pulse Circuits.* Methuen, 1955.

Haissinsky, M. *Nuclear Chemistry and its Applications.* Tuck, D. C., trans. Masson, 1957.

Sharpe, J. *Nuclear Radiation Detectors.* Methuen, 1964.

Spinks, J. W. T. & Woods, R. J. *An Introduction to Radiation Chemistry.* Wiley, 1964.

Taylor, D. *The Measurement of Radioisotopes.* Methuen, 1959.

2.013A Theoretical Chemistry

A fundamental approach to wave mechanics—operators; solving the Schrödinger wave equation; variation and perturbation methods; many-electron problem; vector coupling; allowed transitions. Chemical kinetics—transition state theory; theories of unimolecular reactions; chemistry of excited species.

TEXTBOOKS

Daniels, F. et al. *Experimental Physical Chemistry.* 7th ed. McGraw-Hill, 1970.

Golding, R. M. *Applied Wave Mechanics.* Van Nostrand, 1969.

Laidler, K. J. *Chemical Kinetics.* 2nd ed. McGraw-Hill, 1965.

REFERENCE BOOKS

Amdur, I. & Hammes, G. G. *Chemical Kinetics.* McGraw-Hill, 1966.
Calvert, J. G. & Pitts, J. N. *Photochemistry.* Wiley, 1966.
Gardiner, W. C. *Rates and mechanisms of Chemical Reactions.* Benjamin, 1969.
Glasstone, S., Laidler, K. J. & Eyring, H. *Theory of Rate Processes.* McGraw-Hill, 1941.
Shoemaker, D. P. & Garland, C. W. *Experiments in Physical Chemistry.* 2nd ed. McGraw-Hill, 1967.

2.023A Chemical Physics

Wave mechanics—linear operators: Schrödinger wave equation, applications, methods of solution; variation principle; linear combinations; perturbation theory. The many-electron problem—central field method; electron spin; Fermi-Dirac statistics; angular momentum operators; Coulomb repulsion two-electron operator; spin-orbit coupling; Russell-Saunders and jj coupling; Zeeman effect; vector coupling and Wigner coefficients; allowed transitions. Group theory—symmetry operations; matrix representation; irreducible representation; characters of a group; non-rigid molecules; antisymmetry operations.

TEXTBOOK

Golding, R. M. *Applied Wave Mechanics.* Van Nostrand, 1969.

2.004 Chemistry IV (Science Honours)

Advanced lectures and research project.

2.022 Chemistry II(M)

Units 2.002A (Physical Chemistry) and 2.002C (Inorganic Chemistry) of 2.002 Chemistry II (Science).

2.033A Macromolecules

Structural classes. Macromolecules in solution; determination of molecular size, conformation. Macromolecules in the solid state; methods of investigation.

TEXTBOOK

No set text.

REFERENCE BOOKS

Flory, P. J. *Principles of Polymer Chemistry.* Cornell, 1953.
Morawetz, H. *Macromolecules in Solution.* Wiley/Interscience, 1965.
Tanford, C. *Physical Chemistry of Macromolecules.* Wiley, 1961.

2.091 Project

For Honours students in Pure and Applied Chemistry.

2.102 Chemistry II (BSc(Ed))

Units 2.002A (Physical Chemistry) and 2.002B (Organic Chemistry).

2.103 Chemistry III (BSc(Ed))

Units 2.002C (Inorganic Chemistry), 2.003A (Physical Chemistry) and 2.003D (Analytical Chemistry).

2.104 Chemistry IV (BSc(Ed))

Units 2.003B (Organic Chemistry) and 2.003C (Inorganic Chemistry).

2.211 Applied Organic Chemistry

A discussion of selected topics at advanced level of commercially important groups of organic materials.

Theoretical chemistry, physical properties, thermal and photo-initiated processes are treated together with methods of examination in an overall unit approach correlating structure with behaviour. Emphasis is placed on breakdown to model systems.

Subject-matter covers: Theory of physical techniques, refractometry, polarimetry, etc., from basis of additivity, spectroscopy, visible and ultra-violet definitions and chromophores. Fatty acids with emphasis on unsaturation, thermal and oxidative polymerizations and alkyd resins, analysis of mixtures, isomerizations, clath-rates, etc. Waxes, sterols. Essential oils, review of terpenoid materials, mono-, sesqui-, and diterpenoids, analytical chemistry, correlation of physical constants with composition, methods for individual classes of constituents. Alkaloids and fine chemicals, assays and basis of group separation procedures. Vitamins, synthesis, structural analysis, stability and determination. Antibiotics, treatment of commonly used materials, penicillin, etc. Chromatography of organic materials, theory of processes. Solvent-solute relationships. Synthetic and vegetable insecticides, e.g., pyrethrum and organophosphorus group. Synthetic resins and high polymers, polymerization processes—initiation and inhibitor efficiencies and measurements, thermal and photo degradation, identification and analysis problems. Sulphur in the vulcanization process. Mechanisms in sulphur chemistry. Ozone-processes. Anti-ozonants, mode of action.

TEXTBOOK

No set text.

REFERENCE BOOKS

Carney, T. P. *Laboratory Fractional Distillation.* McMillan, 1949.
Flory, P. J. *Principles of Polymer Chemistry.* Cornell, 1953.
Heftmann, E. *Chromatography.* 2nd ed. Reinhold, 1967.
Kan, R. O. *Organic Photochemistry.* McGraw-Hill, 1966.
Kharasch, N. ed. *The Chemistry of Organic Sulphur Compounds.* Vol 1, 1961.
Lenz, R. W. *Organic Chemistry of Synthetic Polymers.* Interscience, 1967.
Markley, K. L. *The Fatty Acids.* 2nd ed. Interscience, 1960-67.
Pinder, A. R. *Chemistry of the Terpenes.* Chapman & Hall, 1960.
Pryor, W. A. *Mechanisms of Sulphur Reactions.* McGraw-Hill, 1962.
Schwarz, J. C. P. *Physical Methods in Organic Chemistry.* Oliver & Boyd, 1964.
Scott, G. *Atmospheric Oxidation and Antioxidants.* Elsevier, 1965.
Solomon, D. H. *Organic Film Formers.* Wiley, 1967.

2.221 Chemistry and Enzymology of Foods

Subject matter covers areas similar to 2.261 Chemistry and Enzymology of Foods with reduction in scope and depth. Emphasis is continued on the integration of different areas of chemistry.

TEXTBOOK

No set text.

REFERENCE BOOKS

Heftmann, E. *Chromatography*. 2nd ed. Reinhold, 1967.
Joslyn, M. A. *Methods in Food Analysis*. Academic, 1950.
Karrer, P. & Jucker, E. *Carotenoids*. Elsevier, 1950.
Markley, K. L. *The Fatty Acids*. 2nd ed. Interscience, 1960-67.
Neurath, H. *The Proteins*. Vols. I-IV. 2nd ed. Academic, 1963-68.
Pigman, W. *The Carbohydrates*. Academic, 1957.
Winton, A. L. & Winton, K. B. *Structure and Composition of Foods*. Wiley, 1932.

Subsidiary lists are supplied from the Department.

2.261 Chemistry and Enzymology of Foods

Covers the chemistry of food constituents at an advanced level and provides a correct appreciation of the relationship between the chemistry and enzymology associated with the origin and post-harvest handling of the foodstuff. Treatment is given of deteriorative changes in colour and texture occurring during processing and storage. Analytical procedures, chemical and physical are discussed where necessary, integrated with the remainder of the subject matter.

General classification of constituents, role of moisture. Fixed oils and fats, rancidity of enzymic and autoxidative origin, anti-oxidants—natural and synthetic—theories on mechanisms of action, carbohydrates reactivity, role in browning processes, carbohydrate polymers, starch structure, enzymic susceptibility and mode of action, estimation, pectic substances and other gelling agents, gel structure. Proteins, sulphur chemistry of proteins, position in cereal chemistry, bleachers and improvers, theories on mode of action, redox and displacement reactions. Colour systems, origin, development and chemistry of natural food pigments, carotenoids, chlorophyll, etc. Stability and estimations, enzymic degradation and enzymic browning, vitamins, preservatives.

TEXTBOOK

No set text.

REFERENCE BOOKS

Gunstone, F. D. *An Introduction to the Chemistry and Biochemistry of the Fatty Acids and their Glycerides*. Chapman and Hall, 1968.
Heftmann, E. *Chromatography*. 2nd ed. Reinhold, 1967.
Karrer, P. & Jucker, E. *Carotenoids*. Elsevier, 1950.
Markley, K. L. *The Fatty Acids*. 2nd ed. Interscience, 1960-67.
Neurath, H. *The Proteins*. Vols. I-IV. 2nd ed. Academic, 1963-68.
Pigman, W. *The Carbohydrates*. Academic, 1957.
Reed, G. *Enzymes in Food Processing*. Academic, 1966.
Schultz, H. W. ed. *Carbohydrates and Their Roles*. Avi. Pub. Co., 1969.
Schwarz, J. C. P. *Physical Methods in Organic Chemistry*. Oliver & Boyd, 1964.
Scott, G. *Atmospheric Oxidation and Antioxidants*. Elsevier, 1965.

Walton, H. F. *Principles and Methods of Chemical Analysis.* 2nd ed. Prentice-Hall, 1964.
Willard, H. H., Merritt, L. L. & Dean, J. A. *Instrumental Methods of Analysis.* 4th ed. Van Nostrand, 1965.

Subsidiary lists are supplied from the Department.

2.303 Theoretical Chemistry

Advanced physico-chemical topics of a theoretical nature; in two equal strands: (*a*) Wave mechanics, development and applications of group theory. (*b*) Any strand from 2.333 Physical Chemistry.

TEXTBOOK

Golding, R. M. *Applied Wave Mechanics.* Van Nostrand, 1969.

2.311 Physical Chemistry I

Subject description, text and reference book lists as for 2.002A Chemistry II (Physical Chemistry).

2.322 Physical Chemistry II

Subject description, text and reference book lists as for 2.003A Chemistry III (Physical Chemistry).

2.333 Physical Chemistry

Advanced physico-chemical topics, to be chosen from two of the following strands: (*a*) Statistical thermodynamics; its application to gases, liquids and chemical equilibria; states of matter. (*b*) Infrared, Raman, microwave and electronic spectroscopy; lasers; optical properties of molecules. (*c*) Non-ideal thermodynamics, electrode processes and electrolyte solution equilibria. (This series is intended to cover topics of interest in inorganic, organic and analytical chemistry.) (*d*) Physico-chemical properties of macromolecular systems; colligative and electrokinetic properties and conformation in solution; solid state structure and properties.

(A strand chosen as part of 2.303 Theoretical Chemistry cannot be chosen as part of this subject.)

TEXTBOOKS

(b)

Dixon, R. N. *Spectroscopy and Structure.* Methuen, 1965.
King, G. W. *Spectroscopy and Molecular Structure.* Holt, Rinehart & Winston, 1964.

REFERENCE BOOKS

(a)

Andrews, F. C. *Equilibrium Statistical Mechanics.* Wiley, 1963.
Hill, T. L. *Introduction to Statistical Thermodynamics.* Addison-Wesley, 1960.
Knox, J. H. *Molecular Thermodynamics.* Wiley, 1971.
Moelwyn-Hughes, E. A. *Physical Chemistry.* 2nd ed. Pergamon, 1961.
Tabor, D. *Gases, Liquids and Solids.* Penguin, 1969.

(b)

Chang, R. *Basic Principles of Spectroscopy.* McGraw-Hill, 1971.
Eyring, H., Walter, J. & Kimball, G. E. *Quantum Chemistry.* Wiley, 1944.

Heavens, O. S. *Optical Masers.* Methuen, 1964.
Herzberg, G. *Molecular Spectra and Molecular Structure.* II. *Infrared and Raman Spectra of Polyatomic Molecules.* Van Nostrand, 1945.
Herzberg, G. *Molecular Spectra and Molecular Structure.* III. *Electronic Spectra and Electronic Structure of Polyatomic Molecules.* Van Nostrand, 1966.
Herzberg, G. *Spectra and Structures of Simple Free Radicals.* Cornell, 1971.
Wilson, E. B., Decius, J. C. & Cross, P. C. *Molecular Vibrations.* McGraw-Hill, 1955.

(d)

Flory, P. J. *Principles of Polymer Chemistry.* Cornell, 1953.
Flory, P. J. *Statistical Mechanics of Chain Molecules.* Wiley, 1969.
Morawetz, H. *Macromolecules in Solution.* Wiley, 1965.
Oncley, J. L. *Biophysical Science—A Study Program.* Wiley, 1959.
Poland, D. & Scheraga, H. A. *Theory of Helix-Coil Transitions in Biopolymers.* Academic, 1970.
Rich, A. & Davidson, N. *Structural Chemistry and Molecular Biology.* Freeman, 1968.
Tanford, C. *Physical Chemistry of Macromolecules.* Wiley, 1961.

2.391 Basic Diffraction Theory

Symmetry, point and space groups, crystal lattices. Scattering of X-rays by electrons, atoms and ideal lattices. Bragg's law. Effect of temperature and finite atom size, mosaicity, extinction, intensity formula. Structure factors, reciprocal lattice—geometrical interpreation of Bragg's law.

TEXTBOOK

Klug, H. P. & Alexander, L. E. *X-Ray Diffraction Procedure.* Wiley, 1954.

2.392 Structure Determination Methods

Phase problem. Patterson function, heavy atom method, superposition methods and isomorphous replacement. Transform approach. Direct methods, inequalities, equalities and statistical approach. Refinement, difference Fourier syntheses, differential syntheses, least squares. Accuracy, standard deviations of bond lengths and angles, best fit planes. Significance levels. "R" factor.

TEXTBOOK

Buerger, M. J. *Crystal Structure Analyses.* Wiley, 1960.

2.393 Recording Methods

Photographic; powder, focussing methods, Laue, oscillation, Weissenberg procession. Counter methods; powder, parafocussing, three and four circle goniostats, linear diffractometers.

TEXTBOOK

Henry, N. F. M., Lipson, H & Wooster, W. A. *The Interpretation of X-Ray Diffraction Photographs.* 2nd ed. Macmillan, 1960.

2.394 Crystal Optics

Use of microscopics, polarising. Optical goniometer, birefringence, optical diffraction.

TEXTBOOK

Phillips, F. C. *Introduction to Crystallography.* 3rd ed. Longmans, 1963.

2.411 Inorganic Chemistry I

Chemistry of the non-metals including B, C, Si, N, P, S, Se, Te, halogens, and noble gases. Chemistry of the metals of groups IA, IIA, and Al. Typical ionic, giant-molecule and close-packed structures. Transition metal chemistry, including variable oxidation states, paramagnetism, Werner's theory, isomerism of six- and four-coordinate complexes, chelation, stabilization of valency states. Physical methods of molecular structure determination. Chemistry of Fe, Co, Ni, Cu, Ag, Au.

TEXTBOOKS

1.

Jolly, W. L. *The Chemistry of the Non-Metals.* Prentice Hall, 1966.

Larsen, E. M. *Transitional Elements.* Benjamin, 1965.

Quagliano, J. V. & Vallarino, L. M. *Coordination Chemistry.* Heath, Lexington, 1969.

or

2.

Cotton, F. A. & Wilkinson, G. *Advanced Inorganic Chemistry.* 2nd ed. Wiley, 1966.

REFERENCE BOOKS

Bailar, J. C. *Chemistry of Coordination Compounds.* Reinhold, 1960.

Barnard, A. K. *Theoretical Basis of Inorganic Chemistry.* McGraw-Hill, 1965.

Basolo, F. & Johnson, R. *Introduction to Coordination Chemistry.* Benjamin, 1964.

Graddon, D. P. *An Introduction to Coordination Chemistry.* 2nd ed. Pergamon, 1968.

Jones, M. M. *Elementary Coordination Chemistry.* Prentice-Hall, 1964.

Vogel, A. *A Textbook of Macro & Semi-micro Qualitative Inorganic Analysis.* Longmans.

Wells, A. F. *Structural Inorganic Chemistry.* 3rd ed. O.U.P., 1962.

2.422 Inorganic Chemistry II

Chemistry of groups VA, VIA, VIIA, the lanthanides and actinides. More advanced chemistry of groups IIIB, IVB, VB, VIB, VIIB and inert gases. Crystal field theory, formation constants of complex ions, unusual oxidation states of transition metals.

TEXTBOOK

Cotton, F. A. & Wilkinson, G. *Advanced Inorganic Chemistry.* 2nd ed. Wiley, 1966.

REFERENCE BOOKS

Bailar, J. C. *Chemistry of Coordination Compounds.* Reinhold, 1960.

Barnard, A. K. *Theoretical Basis of Inorganic Chemistry,* McGraw-Hill, 1965.

Dwyer, F. & Mellor, D. P. *Chelating Agents & Metal Chelates.* Academic 1964.

Lewis, J. & Wilkins, R. G. *Modern Coordination Chemistry.* Interscience, 1960.

Sienko, M. J. & Plane, R. A. *Physical Inorganic Chemistry.* Benjamin, 1965.

Wells, A. F. *Structural Inorganic Chemistry.* 3rd ed. O.U.P., 1962.

2.433 Inorganic Chemistry

(i) Reaction mechanisms involving metal complexes. (ii) Thermodynamics of complex formation. (iii) Spectroscopic methods for investigating metal complexes, including infrared, electronic, NMR and Mossbauer spectroscopy. (iv) π-complexes.

TEXTBOOK

Cotton, F. A. & Wilkinson, G. *Advanced Inorganic Chemistry*. 2nd ed. Wiley, 1966.

REFERENCE BOOKS

Adams, D. M. & Raynor, J. B. *Advanced Practical Inorganic Chemistry*. Wiley, 1965.
Basolo, F. & Pearson, R. *Mechanism of Inorganic Reactions*. 2nd ed. Wiley, 1965.
Chemical Society of London. Special Publication No. 17, 1964. *Stability Constants of Metal Ion Complexes*.
Cotton, F. A. *Chemical Applications of Group Theory*. Wiley, 1963.
Dwyer, F. P. & Mellor, D. P. *Chelating Agents & Metal Chelates*. Academic, 1964.
Edwards, J. O. *Inorganic Reaction Mechanisms*. Benjamin, 1964.
Hannay, N. B. *Solid State Chemistry*. Prentice-Hall, 1967.
Lewis, J. & Wilkins, R. *Modern Coordination Chemistry*. Interscience, 1959.
Nakamoto, K. *Infrared Spectra of Inorganic and Coordination Compounds*. 2nd ed. Wiley/Interscience, 1970.
Nakamoto, K. & McCarthy, P. J. *Spectroscopy & Structure of Metal Chelate Compounds*. Wiley, 1968.
Wells, A. F. *Structural Inorganic Chemistry*. 3rd ed. O.U.P., 1962.

2.511 Analytical Chemistry I

Sampling; data evaluation; ionic equilibria in solution; electrochemical analysis; volumetric analysis; spectroscopy in analytical chemistry.

TEXTBOOKS

Ewing, G. W. *Instrumental Methods of Chemical Analysis*. McGraw-Hill, 1969.
Fischer, R. B. & Peters, D. G. *Quantitative Chemical Analysis*. Saunders, 1968.

2.513 Analytical Biochemistry

(i) Electrochemistry of biological systems. (ii) Spectroscopy and fluorimetry. (iii) Chromatography of biological systems. (iv) Microscopy.

TEXTBOOK

No set texts.

2.522 Analytical Chemistry II

Solution chromatography; gas chromatography; advanced electrochemical analysis; emission spectroscopy; instruments in analytical chemistry; precision absorption spectrophotometry in solution; evaluation and development of a spectrophotometric method; literature of analytical chemistry.

TEXTBOOKS

Chalmers, R. A. *Aspects of Analytical Chemistry.* Contemporary Science. Oliver & Boyd, 1968. Paperback.

Eckschlager, K. *Errors and Measurements in Chemical Analysis.* Chalmers, R. A. trans. ed. Van Nostrand, 1969.

Ewing, G. W. *Instrumental Methods of Chemical Analysis.* McGraw-Hill, 1969.

Hamilton, L. F., Simpson, S. & Ellis, D. W. *Calculations of Analytical Chemistry.* 7th ed. McGraw-Hill, 1969.

Stock, R. & Rice, C. B. F. *Chromatographic Methods.* 2nd ed. Chapman & Hall, 1967.

2.533 Analytical Chemistry III

Kinetics in analytical chemistry; emission and absorption spectroscopy in flames; spectrometric methods (IR, Mass, XRF, electron probe and NMR); chemical analysis of organic and biological materials; differential thermal analysis; complexes in analytical chemistry; automation and data processing in analytical chemistry.

TEXTBOOKS

Chalmers, R. A. *Aspects of Analytical Chemistry.* Contemporary Science. Oliver & Boyd, 1968. Paperback.

Eckschlager, K. *Errors and Measurements in Chemical Analysis.* Chalmers, R. A. trans. ed. Van Nostrand, 1969.

Ewing, G. W. *Instrumental Methods of Chemical Analysis.* McGraw-Hill, 1969.

Hamilton, L. F., Simpson, S. & Ellis, D. W. *Calculations of Analytical Chemistry.* 7th ed. McGraw-Hill, 1969.

Kolthoff, I. M., Sandell, E. B., Meehan, E. J. & Bruckenstein, S. *Quantitative Chemical Analysis.* Macmillan, 1969.

Schwarzenbach, G. & Flaschka, H. *Complexometric Titrations.* Irving, H. M. trans. 2nd ed. Methuen, 1969.

Stock, R. & Rice, C. B. F. *Chromatographic Methods.* 2nd ed. Chapman & Hall, 1967.

2.611 Organic Chemistry I

Subject description and textbook list as for 2.002B Chemistry II (Organic Chemistry).

2.622 Organic Chemistry II

Subject description, text and reference book lists as for 2.003B Chemistry III (Organic Chemistry).

2.633 Organic Chemistry

(i) Spectroscopic methods in organic chemistry: emphasis on the correlations of spectra with structure. Ultraviolet spectroscopy: absorption laws and techniques. Infrared spectroscopy: experimental techniques. Absorption by common structural groupings. Nuclear magnetic resonance

spectroscopy: the NMR phenomenon, the chemical shift, shielding mechanisms, spin-spin interactions. (ii) Synthetic methods in organic chemistry: reduction by hydrogenation, diimide, metal hydrides and dissolving metal systems. Enamines. Olefin formation. (iii) High energy chemistry: mass spectrometry in the elucidation of the structures of organic compounds. Photochemistry: radical processes, oxidation coupling of phenols, reactions of carbenes.

TEXTBOOK

Dyke, S. F., Floyd, A. J., Sainsbury, M. & Theobald, R. S. *Organic Spectroscopy*. Penguin Books, 1971.

REFERENCE BOOKS

Budzikiewicz, H., Djerassi, C. & Williams, D. H. *Mass Spectrometry of Organic Compounds*. Holden-Day, 1967.

Carruthers, W. *Some Modern Methods of Organic Synthesis*. C.U.P., 1971.

Colthup, N. B., Daley, L. H. & Wiberley, S. E. *Introduction to Infrared and Raman Spectroscopy*. Academic, 1964.

Gilchrist, T. L. & Rees, C. W. *Carbenes, Nitrenes and Arynes*. Nelson, 1969.

Jackman, L. M. & Sternhell, S. *Applications of Nuclear Magnetic Resonance Spectroscopy in Organic Chemistry*. Pergamon, 1969.

Kan, R. O. *Organic Photochemistry*. McGraw-Hill, 1966.

Mathieson, D. W. ed. *Nuclear Magnetic Resonance for Organic Chemists*. Academic, 1967.

Scott, A. I. *Interpretation of the Ultraviolet Spectra of Natural Products*. Pergamon, 1964.

Williams, D. H. & Fleming, I. *Spectroscopic Methods in Organic Chemistry*. McGraw-Hill, 1966.

2.711 Solid State Chemistry

(i) Symmetry, diffraction, and determination of crystal structures. (ii) Typical structures, lattice defects, deviations from stoichiometry, semiconduction. (iii) Electronic structure and physical properties of solids, solid state reactions, surface properties and catalysis. Applications of EPR, NMR and mass spectrometry.

TEXTBOOKS

Bond, G. C. *Catalysis by Metals*. Academic, 1965.

Greenwood, N. N. *Ionic Crystals, Lattice Defects and Non-stoichiometry*. Butterworth, 1969.

Moore, W. J. *Seven Solid States*. Benjamin, 1967.

2.811 Nuclear and Radiation Chemistry

For the student who requires a general foundation in the subject, which he can later apply to other fields. Topics are: Fundamental particles; structure and properties of the nucleus; nuclear reactions and radioactive decay; origin, properties and measurement of nuclear radiations; nuclear instrumentation; preparation and applications of separated stable isotopes and of radioisotopes; radiation chemistry; radiochemical techniques; carbon dating and geochronology; the transuranium elements.

TEXT AND REFERENCE BOOKS

As for 2.003E Chemistry III (Nuclear and Radiation Chemistry).

2.911 Applied Chemistry

(*a*) Information utilization: introductory instrumentation and analogue computation (see also 22.143); an advanced treatment of Fortran programming, data reduction and analysis, regression analysis; information retrieval. (*b*) Chemical resources and environment: ecological relationships between man and the physical and biological world, resources of matter and energy, current and predicted states of human environment, pollution, corrosion; sociological implications of technological advances.

TEXTBOOK

Schaum Outline Series. *Numerical Analysis.* McGraw-Hill, 1968.

Chemistry Graduate Subjects*

2.231G and 2.242G Food and Drugs I and II—(Including Pharmacognosy and Microscopy of Crude Drugs)

Regarded as a unit, and may be spread over two years.

Treatment of the food section develops from considerations of proximate analysis—gross determinations of classes of food components—to detailed examinations within the groups for more important compounds. Conversely the course in drug work progresses from the examination of simple materials, including identification of unknowns by macro and micro procedures to the examination of compounded materials.

A background section on food handling is included, while some attention is given to chemotherapy, etc., in the drug course.

Subject-matter covers treatment of the main classes of food-stuffs, such as:

Foods: Origin, general introduction to analytical methods, relation to likely adulterations and impurities, groups of constituents; carbohydrates, sugars, by physical and chemical methods, jams and preserves, pectin, agar, alginates, oils and fats; protein foods, meat, gelatin, fish products; dairy products, milk, cream, cheese, etc.; fermented liquids, beer, wine, spirits, minor constituents. Principles of food processing, dehydration, quick freezing, canning; cereal products; beverages and flavouring essences; nutritional aspects, vitamins in detail; preservatives and food additives; radiation chemistry of food products. Drugs. Elements of pharmacology, chemotherapy and modes of action, galenicals, identification tests for alkaloids, etc. Analytical chemistry of analgesics, sedatives, hypnotics, steroid hormones, antihistamines, etc. Antibiotics, penicillin, streptomycin, aureomycin, sulphonamides. Activity of enzyme preparations; antiseptics and disinfectants; soaps and detergents.

Pharmacognosy and Microscopy of Crude Drugs

A graded course of 20 hours, progressing from relatively simple structures to the examination of adulterated mixtures.

Examples from the series: hairs and textile fibres of natural origin, woods, stems, leaves, and barks. Seeds, fruits, rhizomes and roots. Flowers, dried juices and gums. Reactions of cell wall and cell contents. Steps in characterization of unknown powders, adulterants of food and drug powders.

*No set texts.

REFERENCE BOOKS
Burger, A. *Medicinal Chemistry*. 2nd ed. Interscience, 1960.
Garrod, L. P. & O'Grady, F. *Antibiotic and Chemotherapy*. 3rd ed. Livingstone, 1971.
Grove, D. C. & Randall, W. A. *Assay Methods of Antibiotics*. Medical Encyclopaedia, 1955.
Kavanagh, F. *Analytical Microbiology*. Academic, 1963.

2.251G Toxicology, Occupational and Public Health

Important classes of toxic materials found in the environment; treatment of pesticide residues, industrial chemicals of various types, toxic gases, mould metabolites and bacterial toxins occurring in food, carcinogenic substances, toxic metals etc.

Effects of these substances on living organisms, particularly man. Practical work: pesticide residue analysis, blood and urine analysis, gas sampling and analysis, trace metal determination and experiments on the animal metabolism of toxic substances.

TEXTBOOKS
No set text.

REFERENCE BOOK
Wallis, T. E. *Analytical Microscopy*. Churchill, 1965.

2.271G Chemistry and Analysis of Foods

Illustrates the bases and application of analytical techniques as applied to foods. Emphasis is placed on the design of methods, on the preparation of material for instrumental analysis and on the interpretation of data.

Subject-matter includes: proteins and flesh foods, carbohydrates and saccharine foods, fats and oils, dairy and fermentation products, vitamins, food additives—preservatives and colouring matters, pesticide residues, metal contaminants—food microscopy.

TEXTBOOKS
No set text.

REFERENCE BOOKS
Heftmann, E. *Chromatography*. 2nd ed. Reinhold, 1967.
Neurath, H. *The Proteins*. 2nd ed. Vols. I-IV. Academic, 1963-68.

2.281G Instrumental Techniques in Food and Drug Analysis

Principles involved in modern instrumental techniques: detailed application and interpretation of results. UV, IR, NMR, and ESR, emission and atomic adsorption spectroscopy, polarography, X-ray methods, fluorescence spectroscopy and gas chromatography. Services 2.231G, 2.242G and 2.251G but is also suitable as a single subject for those wishing to familiarize themselves with modern techniques.

TEXTBOOKS
No set text.

REFERENCE BOOKS
Ewing, G. C. *Instrumental Methods of Chemical Analysis*. Int.Stud.Ed. McGraw-Hill, 1969.
Silverstein, R. M. & Bassler, G. C. *Spectrometric Identification of Organic Compounds*. International Edition. Wiley, 1968.

2.371G Treatment of Analytical Data

Errors of measurement, the treatment, interpretation and comparison of sets of measurements, associated data and problems involving analysis of variance.

Topics are discussed under the headings: Description of sets of measurements, graphical representations, calculation of measures of location and spread; probability and random errors, binomial, normal and Poisson distribution; comparisons of sets of measurements, tests of significance; associated data, linear regression analysis; analysis of variance; biological assays, bacteriological counts, sampling problems.

2.581G Advanced Analytical Chemistry

Lectures: (i) Analytical flame spectroscopy. (ii) Advanced electrochemical analysis. (iii) Chromatography. (iv) Complexes and ionic equilibria in analytical chemistry. (v) Emission, IR, Mass and XRF spectroscopy. (vi) Calculations and statistics in analytical chemistry. *Electives*: Two of: (vii) Solvent extraction in analytical chemistry. (viii) Chemical analysis of organic and biological materials. (ix) Analytical chemistry applied to mineral chemistry and geochemistry. (x) Chemical instrumentation and control including data processing and automation. (xi) Chemical microscopy. (xii) Sampling—procedure and errors. *Laboratory*: Practice, instruction and visits. *Research Project* or *Critical Literature Survey*.

COMPUTER SCIENCE

FOR STUDENTS IN THE SCIENCE COURSE

Students in the Science course may major in Computer Science. This course is provided by the Department of Electronic Computation within the School of Electrical Engineering; the course is available on a full-time basis only and leads to the degree of BSc (pass or honours).

Students of sufficient merit who have completed the undergraduate units in Computer Science may be admitted to the honours course in fourth year. Permission to enter the course is granted by the Head of the Department of Electronic Computation. The honours course consists of prescribed lectures, seminars and reading in the areas of mathematical theory of computation, computer applications, computer logic and organization.

6.601A Introduction to Computer Science

Problem solving: problem formation, construction of mathematical model, algorithm formulation, computer solution. Computer solution using ALGOLW, PL/I or FORTRAN. Classification of algorithms. Simple machine language. Development of symbolic assemblers, high level languages, operating systems. Data representation. Errors. Computability.

REFERENCE BOOKS

Ralston, A. *Introduction to Programming and Computer Science.* McGraw-Hill.

Rice, J. K. & Rice, J. R. *Introduction to Computer Science.* Holt, Rinehart & Winston.

6.601B Assembler Programming and Non-numeric Processing

Computer structure, machine language, instruction execution, addressing techniques and digital representation of data. Symbolic coding. Manipulation of strings, lists and other data structures.

TEXTBOOKS

Griswald, R. E., Peage, J. F. & Polansky, I. P. *The SNOBOL 4 Programming Language.* Prentice-Hall.

IBM *System/360: Principles of Operation.* Form A22-6821. IBM.

6.602A Computer Systems I

Switching algebra, simplification of switching functions, level sequential and pulse sequential analysis. Flow tables, cycles, races, hazards. Number systems, codes. Assembler programming system elements, techniques, organization and structure. Translators, loaders, subroutines, macro-routines, programme segmentation and linkage, libraries, input/output routines, buffering and overlapped processing.

TEXTBOOK

Booth, T. L. *Digital Networks and Computer Systems.* Wiley.

6.602B Computer Systems II

Organization and components of digital computing systems. Alternate organizations. Operating system elements, techniques and structure. Filing systems, libraries and storage management. Supervisor functions. Input/output control systems. Batch processing, multiprogramming and time-sharing operating systems. Command language and job control.

REFERENCE BOOK

Bell, C. G. & Newell, A. *Computer Structures: Readings and Examples.* McGraw-Hill.

6.602C Computer Applications

Simulation and modelling of discrete systems on a computer. Application to queueing systems. Comparison of languages. Random number generation. Theory of linear programming. The Simplex technique. Computer solution of linear programming problems.

TEXTBOOKS

Gass, S. I. *Linear Programming.* McGraw-Hill.
Gordon, G. *System Simulation.* Prentice-Hall.

6.602D Programming Languages and Compiling Techniques

Compiling Techniques: data structures; table look-up; language description; lexical analysis; syntax analysis; semantic analysis/code generation; interpretation/program execution.

Programming Languages: a comparative study.

TEXTBOOKS

No set text.

REFERENCE BOOKS

Foster, J. M. *Automatic Syntactic Analysis.* Macdonald/Elsevier.
Gries, D. *Compiler Construction for Digital Computers.* Wiley.
Hopgood, F. R. A. *Compiling Techniques.* Macdonald/Elsevier.
Higman, B. *A Comparative Study of Programming Languages.* Macdonald/Elsevier.
Knuth, D. *Fundamental Algorithms. The Art of Computer Programming* Vol I. McGraw-Hill.
McKeeman, W. M., Horning, J. J. & Wortman, D. B. *A Compiler Generator.* Prentice-Hall.
Rosen, S. *Programming Systems & Languages.* McGraw-Hill.
Sammet, J. *Programming Languages: History and Fundamentals.* Prentice-Hall.
Wegner, P. *Programming Languages, Information Structures & Machine Organization.* McGraw-Hill.

ENGINEERING

5.001 Engineering I

A. *Introduction to Engineering*

(i) *Engineering Technology: Materials.* Classification of materials in common use, occurrence of raw materials, processing of raw materials, refinements and properties of materials.

(ii) *Computers—Introduction and Concepts:* Introduction to computers to follow the computer work in Mathematics I. To develop: (*a*) familiarity with algorithms; (*b*) the use of procedure oriented languages; and (*c*) an introduction to computing equipment.

Systems—Introduction and Concepts: Concepts and introduction to systems. To give students an appreciation of some of the concepts used in engineering, to relate the concepts to phenomena within their experience, and to illustrate them by case histories and engineering examples. Quantities. Concepts. Components. Systems.

(iii) *Introduction to Engineering Design.* Engineering method, problem identification, creative thinking, mathematical modelling, materials and processes, computer-aided design, communication of ideas, the place of engineering in society.

B.1. *Engineering Mechanics:* Two and three dimensional force systems, composition and resolution of forces, laws of equilibrium. Statics of rigid bars, pin-jointed frames. Shear force, axial force, bending moment. Simple states of stress. Kinematics of the plane motion of a particle. Kinetics of the plane motion of a particle; equations of motion, dynamic equilibrium, work and energy.

C. *Engineering Drawing:* Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and plane; fundamental problems of position and of measurement. Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualize problems and processes involved in their solution. Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic projections.

TEXTBOOKS

A. *Introduction to Engineering*

(i) No set text.

(ii) Karbowiak, A. E. & Huey, R. M. eds. *Information Computers, Machines and Humans.* Wiley.

(iii) Harrisberger, L. *Engineersmanship.* Wadsworth.
or
Krick, E. V. *Introduction to Engineering and Engineering Design.* Wiley.

B.1. *Engineering Mechanics*

Meriam, J. L. *Statics.* Wiley.

C. *Engineering Drawing*

Robertson, R. G. *Descriptive Geometry.* Pitman.
Thomson, R. *Exercises in Graphic Communication.* Nelson.

GENERAL AND HUMAN BIOLOGY

17.001 General and Human Biology

This is an introductory course for students intending to proceed in medicine or in the biological sciences. It may also be taken by students not intending to major in biology.

Syllabus

Characteristics of living organisms. Properties of living matter. Cell structure and function. Life cycles. An introduction to biochemistry, ultrastructure, genetics and cytology. Plant structure and function. Anatomy and physiology of vertebrate animals. Human biology and variation. The biology of micro-organisms. Evolution. Introductory ecology. Practical work to illustrate the lecture course.

TEXTBOOKS

Abercrombie, M., Hickman, C. J. & Johnson, M. L. *A Dictionary of Biology.* Penguin, 1967.
Keeton, W. T. *Biological Science.* Norton, New York, 1967.
Kelly, P. J. ed. *Evidence and Deduction in Biological Science.* Penguin, 1970.

REFERENCE BOOKS

A. Books which cover some area of the course in greater detail than the text:

Aust. Acad. Sci. *Biological Science: The Web of Life.* Canberra, 1967.
Carter, C. O. *Human Heredity.* Penguin, 1962.
Galston, A. W. & Davies, P. J. *Control Mechanisms in Plant Development.* Prentice-Hall, 1971.
Jensen, W. A. & Park, R. B. *Cell Ultrastructure.* Wadsworth, 1967.
Kershaw, K. A. *Quantitative and Dynamic Ecology.* Arnold, 1964.
Loewy, A. G. & Siekevitz, P. *Cell Structure and Function.* 2nd ed. Holt, Rinehart & Winston, 1970.
Marshall, P. T. & Hughes, G. M. *The Physiology of Mammals and Other Vertebrates.* C.U.P., 1967.
Phillipson, J. *Ecological Energetics.* Arnold, 1966.
Postgate, J. *Microbes and Man.* Penguin, 1969.
Sutcliff, J. *Plants and Water.* Arnold, 1968.
Wilson, C. L. & Loomis, W. E. *Botany.* 4th ed. Holt, Rinehart & Winston, 1967.
Young, J. Z. *The Life of Mammals.* O.U.P., 1966.
Young, J. Z. *An Introduction to the Study of Man.* Clarendon, 1971.

B. Books which provide much relevant material for reference and general reading:

Baker, J. J. W. & Allen, G. E. *Matter, Energy, and Life.* 2nd ed. Addison-Wesley, 1970.
Baldwin, E. *The Nature of Biochemistry.* 2nd ed. C.U.P., 1967.
Bold, H. G. *The Plant Kingdom.* 3rd ed. Prentice-Hall, 1970.
Buchsbaum, R. *Animals Without Backbones.* Penguin, 1963.

Burnett, W. & Eisner, K. *Animal Adaptation*. Holt, Rinehart & Winston, 1964.
Fogg, G. E. *Growth of Plants*. Penguin, 1963.
Galston, A. W. *The Life of the Green Plant*. Prentice-Hall, 1964.
Hanson, E. D. *Animal Diversity*. Prentice-Hall, 1964.
Harrison, G. A. et. al. *Human Biology*. O.U.P., 1964.
Howell, F. C. *Early Man*. Time/Life, 1966.
Kennedy, D. ed. *From Cell to Organism*. Freeman, 1967.
Laughlin, W. S. & Osborne, R. H. eds. *Human Variation and Origins*. Freeman, 1967.
McElroy, W. D. *Cell Physiology and Biochemistry*. 2nd ed. Prentice-Hall, 1970.
Romer, A. S. *Man and the Vertebrates*. Penguin, 1963.
Sawson, C. R. *The Cell*. 3rd ed. Prentice-Hall, 1970.
Schmidt-Nielsen, K. S. Animal Physiology. 3rd ed. Prentice-Hall, 1970.
Weiner, J. S. *Man's Natural History*. Weidenfeld & Nicolson, 1971.
Wessels, N. K. ed. *Vertebrate Adaptations*. Freeman, 1969.

REQUIREMENTS FOR PRACTICAL WORK

A list of equipment required for practical work is posted on the notice board in the ground floor of the Biological Sciences Building. Students must purchase this material *before* the first practical class.

GEOGRAPHY

FOR STUDENTS IN THE SCIENCE COURSE

The geographer studies variations from place to place on the earth arising from the spatial relationships of the phenomena making up man's physical and social environment. Apart from its cultural value, an understanding of these relationships is necessary for the conservation and planned development of physical and economic resources. Geography IS should be of particular interest to those studying concurrently in the physical and biological sciences.

27.031 Geography IS

Part I

Economic Geography: The geographic problems of scale and distance. The relevance of theory and quantitative methods. Economic landscape systems. Geographic significance of population growth components in modernizing and advanced countries; natural increase, fertility and mortality patterns and internal and international migration. Patterns and structures of systems of agriculture, manufacturing and tertiary production. Includes an urban field tutorial of one day.

Laboratory classes consist of the application of statistical methods to areal and point data.

TEXTBOOKS

Morrill, R. L. *The Spatial Organisation of Society*. Wadsworth.
Toyne, P. & Newby, P. T. *Techniques in Human Geography*. Macmillan.
Wilson, M. G. A. *Population Geography*. Nelson.

REFERENCE BOOKS

Abler, R., Adams, J. S. & Gould, P. *Spatial Organisation*. Prentice-Hall.
Brock, J. O. M. *Geography: Its Scope and Spirit*. Merrill. Paperback.
Chisholm, M. *Rural Settlement and Land Use*. Hutchinson.
Clarke, J. I. *Population Geography*. Pergamon.
Dohrs, F. E. & Sommers, L. M. eds. *Introduction to Geography: Selected Readings*. Crowell. Paperback.
Estall, R. C. & Buchanan, R. O. *Industrial Activity and Economic Geography*. Hutchinson.
McCarty, H. H. & Lindberg J. B. *A Preface to Economic Geography*. Prentice-Hall.
Mayer, H. H. & Kohn, C. F. eds. *Readings in Urban Geography*. Chicago U.P.
Mountjoy, A. B. *Industrialisation and Under-Developed Countries*. Hutchinson.
Pollard, A. H. *Demography: An Introduction*. Pergamon.
Rose, A. J. *Patterns of Cities*. Nelson.
Rutherford, J., Logan, M. I. & Missen, G. J. *New Viewpoints in Economic Geography*. Martindale.
Taaffe, E. J. *Geography*. Prentice-Hall. Paperback.

Lecture, laboratory and tutorial arrangements for Geography IA are as follows:

	Hours per week for two sessions
Lectures	2
Laboratory	1½
Tutorials	1

Part II

An introduction to Physical Geography: Controls of landform development, cyclic and equilibrium approaches to landform study; processes and factors of soil formation; the mature soil profile; vegetation structure; factors affecting vegetation distribution; plant and soil succession and the ecosystem; particular reference to the Sydney area. The radiation budget and atmospheric circulation; climatic distribution. Laboratory classes include: weather recording and analysis of climatic data; use of maps and air photos; soil profile description. Two field tutorials.

TEXTBOOKS

Strahler, A. N. *Physical Geography*. Wiley International.
Twidale, C. R. *Geomorphology*. Nelson. Paperback.

REFERENCE BOOKS

Bird, E. *Coasts*. A.N.U.P.
Bloom, A. L. *The Surface of the Earth*. Prentice-Hall.
Branagan, D. & Packham, G. *Field Geology of New South Wales*. Science.
Corbett, J. R. *The Living Soil*. Martindale.
CSIRO. *The Australian Environment*. M.U.P.
Dury, G. H. & Logan, M. I. *Studies in Australian Geography*. Heinemann.
Gentilli, J. *Sun Climate and Life*. Jacaranda.
Hare, F. K. *The Restless Atmosphere*. Hutchinson. Paperback.
Morisawa, M. *Streams, Their Dynamics and Morphology*. McGraw-Hill.
Odum, E. P. *Ecology*. Modern Biology Series.
Riley, D. & Young, A. *World Vegetation*. C.U.P.
Taylor, G. *Sydneyside Scenery*. A. & R.
Trewartha, G. T. *An Introduction to Climate*. McGraw-Hill.
Tweedie, A. D. *Water and the World*. Nelson. Paperback.
Twidale, C. R. & Foale, M. R. *Landforms Illustrated*. Nelson.

Practical classes throughout the year introduce the use of maps and diagrams, air photographs and geographical statistics. The approximate cost to students is about $5 for field tutorials and about $8 for the required drawing equipment and a topographic map.

27.103 Climatology

Spatial and temporal distribution of atmospheric components of special relevance to the exchange of energy and water at the earth surface. Components of the radiation and heat balance of the earth surface as affected by differing atmospheric, soil and surface cover conditions. Factors controlling evaporation and transpiration under freely-available and restricted water supply conditions, and methods for the measurement and estimation of evapotranspiration. Characteristic patterns of energy and water exchange for differing types of natural or man-modified land surface. Present and past world climatic patterns in relation to energy and water balance principles. Man's modification of factors affecting the local climate in rural and urban settings. Laboratory work is directed toward developing and appreciation of the operational principles and limitations of instruments commonly used in radiation and water balance studies, and toward

the practical application of energy and water balance models for evaluation of the climatic environment as related to catchment hydrology, agricultural productivity and land resource management problems.

TEXTBOOKS

Miller, D. H. *A Survey Course. The Energy and Mass Budget at the Surface of the Earth.* Assoc. Amer. Geog.
Sellers, W. D. *Physical Climatology.* Chicago U.P.

REFERENCE BOOKS

Bradley, E. F. & Denmead, O. T. eds. *The Collection and Processing of Field Data.* Wiley.
Chang, Jen-Hu. *Climate and Agriculture.* Aldine.
Chorley, R. J. ed. *Water, Earth and Man.* Methuen.
Chow, Ven Te. ed. *Handbook of Applied Hydrology.* McGraw-Hill.
Gates, D. H. *Energy Exchange in the Biosphere.* Harper & Row.
Landsberg, H. E. ed. *World Survey of Climatology.* Vol. 2 *General Climatology.* Elsevier.
Munn, R. E. *Biometeorological Methods.* Academic, 1970.

27.203 Biogeography

The history and distribution of Australian fauna and flora in relation to world patterns. Ecosystems, their structure and microclimates, energy, water and nutrient balances with particular reference to Australian examples. Management of ecosystems and associated land use. Vegetation survey and sampling techniques and airphoto interpretation.

Up to three days field tutorial is an essential part of this course.

REFERENCE BOOKS

Beadle, N. C. W., Evans, O. D. & Carolin, R. L. *Flora of the Sydney District.* Reed.
Costin, A. B. *A Study of the Ecosystems of the Monaro Region of New South Wales.* N.S.W. Govt. Printer.
Detwyler, T. R. *Man's Impact on the Environment.* McGraw-Hill.
Darlington, P. J. *Biogeography of the Southern End of the World.* Harvard U.P.
Eckardt, F. E. ed. *Methodology of Plant Eco-physiology.* Montpellier Symposium. UNESCO.
Greig-Smith, P. *Quantitative Plant Ecology.* 2nd ed. Butterworths.
Hutchinson, J. *The Families of Flowering Plants.* Vols. I and II. O.U.P.
Keast, A., Crocker, R. L. & Christian, C. S. eds. *Biogeography and Ecology in Australia.* Monographiae Biologicae. Vol. 8. W. Junk.
Moore, R. M. ed. *Australian Grasslands.* A.N.U.P.
Rodin, L. E. & Bazilevich, N. I. *Production and Mineral Cycling in Terrestrial Vegetation.* Oliver & Boyd.
Slatyer, R. O. *Plant-water relationships.* Academic.
Slatyer, R. O. & Perry, R. A. eds. *Arid Lands of Australia.* A.N.U.P.
Van Dyne, G. M. *The Ecosystem Concept in Natural Resource Management.* Academic.
Watts, D. *Principles of Biogeography.* McGraw-Hill.

27.413 Geomorphology

Fluvial processes and valley features. Hillslopes and slope mantles. Coastal, volcanic, structural and neotectonic landforms. Case studies illustrating approaches to geomorphic investigations. Classification and mapping of landforms, including airphoto interpretation. Morphometry. Laboratory study of aeolian, fluvial, beach and colluvial materials.

TEXTBOOKS

Bird, E. F. C. *Coasts*. A.N.U.P.

Morisawa, M. *Streams: their Dynamics and Morphology*. McGraw-Hill.

REFERENCE BOOKS

Allen, J. R. L. *Physical Processes of Sedimentation*. Unwin.

Brunsden, D. ed. *Slopes Form and Process*. Inst. Brit. Geographers.

Chorley, R. J. ed. *Water Earth and Man*. Methuen.

Doornkamp, J. C. & King, C. A. M. *Numerical Analysis in Geomorphology*. Arnold.

Dury, G. H. ed. *Rivers and River Terraces*. Macmillan.

Dury, G. H. ed. *Essays in Geomorphology*. Heinemann.

Jennings, J. N. *Karst*. A.N.U.P.

Jennings, J. N. & Mabbutt, J. A. ed. *Landform Studies from Australia and New Guinea*. A.N.U.P.

King, C. A. M. *Beaches and Coasts*. Arnold.

King, C. A. M. *Techniques in Geomorphology*. Arnold.

Leopold, L. B., Wolman, M. G. & Miller, J. P. *Fluvial Processes in Geomorphology*. Freeman.

Miller, V. C. *Photogeology*. McGraw-Hill.

Ollier, C. *Volcanoes*. A.N.U.P.

Scheidegger, A. E. *Theoretical Geomorphology*. 2nd ed. Springer-Verlag.

Selby, M. J. *Slopes and Slope Processes*. N.Z. Geog. Soc., Waikato Branch.

Steers, A. J. ed. *Introduction to Coastline Development*. Macmillan.

Thornbury, W. D. *Principles of Geomorphology*. Wiley.

Twidale, C. R. *Structural Landforms*. A.N.U.P.

27.423 Pedology

Morphologic, physical and chemical properties of soil, including colour, texture, consistence, structure, aeration, moisture, reaction and nutrients. Physical and chemical aspects of soil fertility; soil erosion and conservations; soil-landscape relationships and periodicity. The soil-forming processes of the major Great Soil Groups and their management problems; Soil classification. Laboratory classes include particle size grading, specific gravity and moisture content of soils, soil reaction determination, loss on ignition, soil profile description; soil survey and mapping; analysis of soil maps.

TEXTBOOK

Corbett, J. R. *The Living Soil*. Martindale.

REFERENCE BOOKS

Baver, L. D. *Soil Physics*. Wiley.

Bear, F. E. ed. *The Chemistry of the Soil*. Arnold.

Black, C. A. ed. *Methods of Soil Analysis*. Amer. Soc. Agron. Inc.

Dasmann, R. F. *Environmental Conservation*. Wiley.

Kohnke, H. *Soil Physics*. McGraw-Hill.

Jenny, H. *The Factors of Soil Formation*. McGraw-Hill.

Leeper, G. W. *Introduction to Soil Science*. M.U.P.

Robinson, G. W. *Soils, their Origin, Constitution and Classification*. Murby.

Rose, C. W. *Agricultural Physics*. Pergamon.

Russell, E. W. *Soil Conditions and Plant Growth*. Longman.

Stace, G. T. et al. *A Handbook of Australian Soils*. Rellim.

GEOLOGY

FOR STUDENTS IN THE SCIENCE COURSE

Students may major in Geoscience in the Science course (see the regulations governing this course). This course is available on both a full-time and a part-time basis and leads to the degree of Bachelor of Science, Pass or Honours. Students majoring in Geoscience will complete the following subjects:—

First year—25.111 Geoscience I (as for 25.001 Geology I in the Applied Geology degree course).

Second year—25.112A and Geoscience IIA and 25.112B Geoscience B.

Third year—25.113A Geoscience IIIA and 25.113B Geoscience IIIB.

HONOURS IN GEOLOGY

Full-time students in the Faculty of Science who have completed the two third year Geology subjects and part-time students who have completed course requirements up to the end of the sixth year and whose programme includes the two third year Geology subjects may apply to the Head of the School of Applied Geology to read for an Honours degree in Geology. Students who have majored in either Physics and Geology *or* Chemistry and Geology, may also be admitted to the course which would include some studies in Geophysics or Geochemistry respectively.

The Honours course consists of:—

A field assignment with appropriate work in the laboratory on material collected, the results of both the field and laboratory investigations to be presented in a graduation thesis. Advanced lectures, practical work and seminars. Short laboratory assignments on specific problems may be given.

Further details of the Honours course may be had from the Head of School.

Full-time students cover the Honours work in the fourth year of the course. Part-time students are required to commence their field thesis work at the end of the sixth year of their course and advanced laboratory assignments are done in the eighth year along with the further work necessary to complete the field thesis work.

Students seeking to do Honours in Geology must satisfy the Head of the School that they have attained a sufficient standard in their pass course work to indicate their ability to undertake geological studies at a more advanced level.

25.111 Geoscience I

Physical Geology: The structure and main surface features of the earth; geological cycle—processes of erosion, transportation, sedimentation and lithification. Surface and sub-surface water. Weathering, lakes, rivers, glacial phenomena. Vulcanism, earthquakes, orogenesis and epeirogenesis. Introductory physiography.

Crystallography and Mineralogy: Introduction to crystal symmetry, systems, forms, habit, twinning. Occurrence, form and physical properties of minerals. Basic structures of silicate minerals. Mineral classification. Descriptive mineralogy. Principal rock forming minerals.

Petrology: Field occurrence, lithological characteristics and structural relationships of igneous, sedimentary and metamorphic rocks. Introduction to coal, oil and ore deposits.

Stratigraphy and Palaeontology: Basic principles of stratigraphy; introductory palaeontology. The geological time scale. The geological history of the Australian continent and more specifically that of New South Wales in introductory outline.

Practical Work: Preparation and interpretation of geological maps and sections. Map reading and use of simple geological instruments. Study of simple crystal forms and symmetry. Applied stereoscopic projection. Identification and description of common minerals and rocks in hand specimen. Recognition and description of examples of important fossil groups. Supplemented by three field tutorials, attendance at which is compulsory.

TEXTBOOKS

Black, R. M. *Elements of Palaeontology*. C.U.P., 1970.

Holmes, A. *Principles of Physical Geology*. N.A.P.

or

Longwell, C. R. & Flint, R. F. *Introduction to Physical Geology*. Wiley.

Rutley, F. *Rutley's Elements of Mineralogy*. Rev. Read, H. H. Murby, London.

Tyrrell, G. W. *The Principles of Petrology*. Methuen & Co.

25.112A Geoscience IIA

Mineralogy: Principles of optical crystallography; the construction and use of a polarizing microscope. Polymorphism; the crystal chemistry, crystallography and geological occurrence of the main groups of rock forming minerals. Description and recognition of common ore and rock forming minerals in both hand specimen and thin section.

Igneous Petrology: Occurrence, genesis and classification of the commoner igneous rocks. Crystallization of magma. Binary systems. The reaction series. Introduction to micropetrography.

Metamorphic Petrology: Principles, concepts and theories relating to the occurrence, origin and classification of metamorphic rocks. ACF and AKF diagrams. Metamorphic facies. Practical: megascopic and microscopic examination of selected metamorphic rocks. Field Work: at least one field trip to illustrate the above course.

Sedimentary Petrology: The influence of transportation, deposition and diagenesis on the composition, texture and structure of the sedimentary rocks. The classification of detrital sediments. The non-elastic sediments.

Structural Geology: Description of structures, mesoscopic-macroscopic, fractures, joints, faults, folds and their structural elements; foliation, lineation. Introduction to tectonics and plate tectonics. Practical: stereographic projection; analysis of fractures, faults folds and their structural elements; foliation, lineation, strain analysis and rotation problems. *Field Work:* at least one compulsory field trip to illustrate the above course.

TEXTBOOKS

Mineralogy

Bloss, F. D. *An Introduction to the Methods of Optical Crystallography.* Holt, Rinehart & Winston, 1967.

Heinrich, E. W. *Microscopic Identification of Minerals.* McGraw-Hill, 1965.

Petrology (Igneous, Metamorphic and Sedimentary)

Williams, H., Turner, F. J., & Gilbert, C. M. *Petrography.* Freeman, 1954.

Winkler, H. G. F. *Petrogenesis of Metamorphic Rocks.* 2nd ed. Springer, 1967.

Structural Geology

Spencer, E. W. *Introduction to the Structure of the Earth.* McGraw-Hill, 1969.

Ragan, D. M. *Structural Geology: An Introduction to Geometrical Techniques.* Wiley, 1968.

25.112B Geoscience IIB

Palaeontology: Morphology and systematics of major fossil invertebrate phyla (Part 1) and their stratigraphic distribution. Practical: examination of representative fossils from each phylum.

Sedimentary Environments: Environments of deposition and sedimentary processes. Classification of sedimentary rocks.

Stratigraphy: Stratigraphic principles. Geosynclines and their evolution. Stratigraphy of selected provinces of Eastern Australia.

TEXTBOOKS

Palaeontology

Moore, R. C., Lalicker, C. G. & Fischer, A. G. *Invertebrate Fossils.* McGraw-Hill, 1952.

Sedimentary Environments and Stratigraphy

Dunbar, C. O. & Rodgers, J. *Principles of Stratigraphy.* Wiley, 1957.

Brown, D. A., Campbell, K. S. & Crook, K. A. W. *Geological Evolution of Australia and New Zealand.* Pergamon, 1968.

25.113A Geoscience IIIA

Economic Geology I: Principles and theories of ore formation. Magmatic, hydrothermal, submarine exhalative deposits. Sedimentary deposits including biogenetic alluvial and residual deposits. Metallic and non-metallic economic minerals. Hand specimen and elementary mineragraphic practical work.

X-ray Crystallography: Principles of X-ray diffraction; simple application of X-ray powder cameras and diffractometers. Elementary single crystal camera theory.

Mineralogical Techniques: Optical instrumentation; Berek Compensator, Refractometers, Universal Stage. Volume Distribution analysis. Laboratory methods of mineral separation.

Igneous Petrology: Magma types and differentiation trends. Ternary systems. Effects of load pressure and water vapour pressure on phase equilibria. Micro-petrography of a wide range of igneous rocks.

Tectonics: The geophysical, sedimentological, petrological and structural geological aspects of global geotectonics.

TEXTBOOKS

Economic Geology

Park, C. F., & MacDiarmid, R. A. *Ore Deposits. Freeman,* 1964.

X-ray Crystallography

Azaroff, L. V. & Donahue, R. J. *Laboratory Experiments in X-ray Crystallography.* McGraw-Hill, 1969.

Mineralogical Techniques

As for 25.112B Mineralogy, plus:

Zussman, J. ed. *Physical Methods in Determinative Mineralogy.* Academic, 1967.

Igneous Petrology

Deer, W. A., Howie, R. A. & Zussman, J. *Rock-forming Minerals.* Longmans, 1966.

Turner, F. J., & Verhoogen, J. *Igneous and Metamorphic Petrology.* McGraw-Hill, 1960.

Tectonics

Gaskell, T. F. *Physics of the Earth.* Thames & Hudson, 1970.

25.113B Geoscience IIIB

Stratigraphy: Advanced stratigraphic principles and techniques. Geochronology. Geosynclines and plate tectonics. Sedimentational and tectonic history of selected provinces in Australia. The theory of continental drift and its stratigraphic implications.

Biostratigraphy: Biostratigraphy and the use of selected fossil groups in stratigraphic correlation.

Geophysics: An introduction to the physics, shape, structure, constitution and dynamics of the earth: seismology, gravity, geodesy, geothermy, geomagnetism, palaeomagnetism.

Palaeontology: Morphology and systematics of major fossil invertebrate phyla and their stratigraphic distribution. Palaeobotany.

Palaeoecology: Elements of palaeoecology and practical applications.

Vertebrate Palaeontology: An introduction to evolution of vertebrates.

Oceanography: Dynamic properties of the oceanic water-masses. Physics and chemistry of sea water. Submarine geology and cartography. Recent sedimentation and its correlation with terrestrial stratigraphy. Sediments of organic origin. Oceanic materials of economic importance.

Field Work: To be held during the year. Includes a geological survey camp held in session 1 and ten days of field instruction. Attendance is compulsory.

TEXTBOOKS

Stratigraphy and Biostratigraphy

Berry, W. B. N. *Growth of a Prehistoric Time Scale Based on Organic Evolution.* Freeman, 1968.

Krumbein, W. C. & Sloss, L. L. *Stratigraphy and Sedimentation.* 2nd ed. Freeman, 1963.

Lahee, F. H. *Field Geology.* McGraw-Hill, 1952.

Geophysics

Garland, G. D. *The Earth's Shape and Gravity.* Pergamon, 1964.

Howell, B. *Introduction to Geophysics.* McGraw-Hill, 1959.

Stacey, F. P. *Physics of the Earth. Wiley,* 1969.

Palaeontology
As for 25.112A Palaeontology.

Palaeoecology
Ager, D. V. *Principles of Palaeoecology*. McGraw-Hill, 1963.

Vertebrate Palaeontology
Colbert, E. H. *Evolution of the Vertebrates*. Wiley.
Von Koenigswald, G. H. R. *The Evolution of Man*. Michigan U.P., 1962.

Oceanography
Pickard, G. L. *Descriptive Physical Oceanography*. Pergamon, 1964.

25.014 Geology IV (Honours)

TEXTBOOKS

Mining and Petroleum Geology
Lawrence, L. J. ed. *Exploration and Mining Geology*. Aust. Inst. Min. Met., Melbourne, 1965.

Geophysics
Dobrin, N. B. *Introduction to Geophysical Prospecting*. McGraw-Hill, 1960.
Grant, F. S. & West, G. F. *Interpretation Theory in Applied Geophysics*. McGraw-Hill, 1964.
Parasnis, D. S. *Principles of Applied Geophysics*. Methuen, 1962.

SCHOOL OF HUMAN GENETICS

FOR STUDENTS IN THE SCIENCE COURSE

The course in population genetics theory is relatively new, having been offered for the first time in 1972. This course is a Level III unit and may be taken by students in their third year. It is designed for students who intend to specialize in population genetics or in a field in which population genetics is applied. It is available as a day course only.

Approximately one-third of the lecture time (2 hours) is reserved for mathematics and statistics. The tutorial time (1 hour) is used to relate the models covered in the main part of the course with descriptive treatments of population processes covered in other courses. Students are expected to prepare material for and take an active part in tutorials. Laboratory time is 2 hours.

78.201 Population Genetics Theory

Models of genetic systems and growth of populations, with essential mathematical and statistical theory; illustrated by examples from human genetics. Limitations of models.

Models of population growth in discrete and continuous time with non-overlapping and overlapping generations. An extension of the Hardy-Weinberg principle to finite populations and several loci. The concept of inbreeding, calculation of coefficients of consanguinity, effects of inbreeding, effective population number. Fisher's Fundamental Theorem of Natural Selection. Advanced treatment of factors maintaining gene frequency equllibria in populations, including balance between mutation and selection, heterozygotic advantage, and genetic loads. Effects of finite population number, including random gene frequency drift.

TEXTBOOK

Crow, J. F. & Kimura, M. *An Introduction to Population Genetics Theory.* Harper & Row, 1970.

REFERENCE BOOKS

Cavalli-Sforza, L. L. & Bodmer, W. F. *The Genetics of Human Populations.* Freeman, 1971.

Fraser, A. & Burnell, D. *Computer Models in Genetics.* McGraw-Hill, 1970.

Wallace, B. *Genetic Load—Its Biological and Conceptual Aspects.* Prentice-Hall, 1970.

SCHOOL OF MATHEMATICS

Traditionally, mathematics is classified into Pure Mathematics, Applied Mathematics and Statistics. The classification is not a very sharp one and there is considerable overlap and interaction between the three branches.

The Pure Mathematician is concerned with the study of mathematics in itself, striving to solve new problems, to attain ever greater insight into the relations between different parts of mathematics, and thus to render the whole structure of mathematics more complete, more transparent, and more unified. Possible applications of his subject to problems in science or industry are not his primary concern, but they interest him in so far as they provide stimuli for the growth of new mathematical theories. The main avenues of employment for a Pure Mathematician are the universities, the teaching services and some research establishments such as the CSIRO. Normally, universities now insist on a PhD in mathematics as a minimum qualification for a University Lecturer. Tutors and Senior Tutors are employed with lower qualifications.

Applied Mathematics is concerned with the understanding of scientific phenomena by the construction, analysis, and interpretation of mathematical models. Problems may originate not only in the physical and engineering sciences, but also in the social, computing, biological, economic and management sciences. In the Department of Applied Mathematics at this university there are two main fields of study: (1) Modern theoretical physics, with an emphasis on quantum mechanics, nuclear theory, and statistical mechanics. (2) Theoretical oceanography and related subjects. However, all branches of Applied Mathematics are included in the course. The Applied Mathematics course is common for both above specializations in first and second year, and is largely common in third year. Serious branching occurs first in the Honours year. In this general field the normal qualifications for independent research and for university employment is a PhD degree following upon an Honours degree.

In the past the employment of mathematicians in Australian industry and commerce was rather uncommon. Over the last decade there has been a change, corresponding to the general recognition of the desirability of making quantitative what was previously merely qualitative. One important factor has been the introduction of high-speed computers, making possible the detailed mathematical analysis of complex practical situations in a way which would not have been possible without them. Courses in mathematics include training in programming for digital computers and in numerical analysis.

It must not be thought that an honours degree is necessary for success in all these fields. Pass degrees are satisfactory for a variety of positions in government departments, commercial or industrial organizations and experimental laboratories, but, of course, an honours degree would in almost all cases give priority.

THE COURSES AND SUBJECTS PROVIDED BY THE SCHOOL

The School of Mathematics provides courses at the Pass and Honours levels in Pure Mathematics, Applied Mathematics and Theory of Statistics. Full details of the subjects and their relations with other subjects in the Science Course appear in the University Calendar. Any student who feels that he does not understand the situation should consult one of the enrolment officers of the School.

FIRST YEAR MATHEMATICS

10.001 Mathematics I

This is the standard course and is generally selected by the majority of students in the Faculties of Biological Sciences, Science, Engineering and Applied Science who intend to pursue further studies in mathematics, physics or chemistry. For example, in the case of Science students it is the basic course for a pass degree with a major in mathematics.

For entry into 10.001 Mathematics I, students are required to have passed H.S.C. Mathematics at Level 2F or higher; or mathematics at Level 2S provided that the student's performance in mathematics and his general level of attainment are at standards acceptable to the Professorial Board. Students at the latter level are advised to undertake a bridging course before the beginning of lectures.

10.011 Higher Mathematics I (Day course only)

Covers all the material in 10.001 Mathematics I, plus other topics, at greater depth and sophistication. Though this course starts were Level I of the Higher School Certificate ends, some Level 2F students with ability might find it within their capabilities.

While it is expected that students aiming at the honours level in mathematics will take this course, it would be equally valuable for any mathematically able student whose course requires a considerable amount of mathematics.

10.021 Mathematics IT

This course provides for students who do not intend studying mathematics beyond first year but whose other studies require some knowledge of basic mathematical ideas and techniques. It is particularly designed to meet the needs of such students in Wool and Pastoral Sciences, Optometry, Applied Psychology, Commerce and Biological Sciences.

The course assumes that the student has a mathematical background up to H.S.C. Level 2S Mathematics only; entry is open to all with a pass at this level or better. However, students who select this course should weigh seriously the implications of their choice because no further mathematical units are normally available. However, a student with meritorious performance in 10.021 may be permitted to proceed to any of 10.031, 10.311 and 10.331.

HIGHER LEVEL MATHEMATICS

Many subjects in the School are offered at two levels. The higher caters for students with superior mathematical ability. Where both levels are offered, the highest grade awarded in the ordinary level is Credit, except in exceptional cases.

MATHEMATICS MAJORS AT PASS LEVEL

In the *Faculty of Science* students may take any combination of mathematics units which are allowed by the system of prerequisites and corequisites. However, for students who wish to devote a major part of their undergraduate study to mathematics, the following guidelines are set out for majors in Pure Mathematics, Applied Mathematics and Statistics.

Students should consider the merits of combining courses in Pure Mathematics, Applied Mathematics, Statistics and Computer Science in accordance with their future interests. Senior members of staff in the School of Mathematics are available for consultation by students who wish to discuss their courses.

MATHEMATICS MAJORS IN THE FACULTY OF SCIENCE

Any student who completes at least four level III units in the School of Mathematics is regarded as having majored in Mathematics as part of his BSc degree.

If students wish to specialize and major in Pure Mathematics, Applied Mathematics or Theory of Statistics, the following minimum courses are suggested.

(i) *Pure Mathematics Majors*

In order to major in Pure Mathematics at the ordinary level, a student should pass in seven at least of the following units:

10.211A Applied Mathematics II;
10.111A, 10.111B, 10.111C Pure Mathematics II;
10.112A, 10.112B, 10.112C, 10.112D, 10.112E Pure Mathematics III.

In all cases the student must pass complementary units or subjects in accordance with Faculty rules.

(ii) *Applied Mathematics Majors*

In second year the student should take the level II units 10.211A, 10.211B and 10.211C Applied Mathematics, together with the units 10.111A and 10.111B Pure Mathematics. In third year the student should take the level III units 10.212A, 10.212B, 10.212D and 10.212L Applied Mathematics. Complementary units should be chosen in accordance with Faculty rules.

(iii) *Theory of Statistics Majors*

In second year the student should take 10.311 Theory of Statistics II; in addition, since he will be expected to take some level III Mathematics units in third year, he should take the level II units 10.111A and 10.111B Pure Mathematics and 10.211A Applied Mathematics.

In third year he should take the level III units 10.312A, 10.312B, 10.312C and 10.312D Theory of Statistics, together with at least two level III Mathematics units (Pure or Applied).

In each year he should also take complementary units in accordance with Faculty rules; the recommended complementary units are 6.601A Introduction to Computing in second year, and one or other of 6.602C Computer Applications or 10.212L Optimization together with further level III Mathematics units in third year.

HONOURS COURSES IN MATHEMATICS

There are three separate fourth year honours courses: Pure Mathematics, Applied Mathematics and the Theory of Statistics. The four-year course for an honours degree is intended primarily for professional pure mathematicians, statisticians and mathematical physicists or applied mathematicians, but will prove of interest also to intending specialists in fields such as theoretical physics, engineering and all other theoretical sciences. The minimum requirements for each honours course are given below but students seeking an honours degree in mathematics are advised to choose units or courses in mathematics according to their individual interests in consultation with senior members of staff of the School.

(i) *Honours Course in Pure Mathematics*

In the Faculty of Science in second year the student should attempt 10.121A, 10.121B, 10.121C Higher Pure Mathematics II, and 10.221A Higher Applied Mathematics II. In third year the student should attempt 10.122A, 10.122C, 10.122D and 10.122F Higher Pure Mathematics III.

In all cases complementary units or subjects must be chosen in accordance with Faculty rules.

Permission to enter fourth year in Pure Mathematics is granted only on the recommendation of one of the Professors of Pure Mathematics. Such recommendation is not usually granted unless the student's record contains a satisfactory number of graded passes.

(ii) *Honours Course in Applied Mathematics*

In the Faculty of Science in second year the student should attempt 10.221A, 10.221B and 10.221C Higher Applied Mathematics II, 10.121A and 10.121B Higher Pure Mathematics II. The student should also regard the inclusion of 1.122C Thermodynamics and Mechanics as desirable. Students intending to take mathematical physics options in later years of Applied Mathematics, are advised to take at least one further level II Higher Physics unit.

In third year, students should attempt 10.222B, 10.222C, 10.222F and 10.222D or 10.222E Higher Applied Mathematics III; and at least one level III Higher Pure Mathematics unit.

Students wishing to enter the third year of the honours course are advised to consult members of staff of the Department of Applied Mathematics before enrolment. Permission to enter fourth year is granted on the permission of a Professor of Applied Mathematics.

(iii) *Honours Course in Statistics*

In the Faculty of Science, in second year the student should take 10.321 Higher Theory of Statistics II, 10.111A and 10.111B Pure Mathematics II, or 10.121A and 10.121B Higher Pure Mathematics II, and 10.211A Applied Mathematics II or 10.221A Higher Applied Mathematics II; the student is strongly recommended to take also 6.601A Introduction to Computing. In third year he should take the level III units 10.322A, 10.322B, 10.322C and 10.322D Higher Theory of Statistics, together with at least three level III Mathematics units (Pure or Applied).

In all cases complementary units or subjects must be chosen in accordance with Faculty rules.

Students wishing to attempt Third Year honours courses are advised to discuss their courses with a Professor of the Department of Statistics. Permission to enter the Fourth Year course in the Theory of Statistics is granted on the recommendation of a Professor of Statistics. Such permission will not usually be granted unless the applicant has obtained a graded pass in 10.322 Higher Theory of Statistics III and the student's record contains a satisfactory number of graded passes.

MATHEMATICS AS A SUBSIDIARY SUBJECT

The School also provides the sequence of two Units 10.031 and 10.032, at the second and third levels respectively, for students in the Faculty of Science who are mainly interested in the chemical and biological sciences. These courses offer an introduction to mathematical techniques for scientists and engineers. It should be noted, however, that these two units cannot be counted together with any second level or third level units in Pure and Applied Mathematics.

There is also a single unit in Statistics, 10.331, which is recommended for those scientists who wish to have some knowledge of Statistics but who would not normally wish to proceed to further courses in this subject.

For both the above courses the entry qualification is a pass in 10.001 Mathematics I, but in appropriate cases students who have passed in 10.021 Terminating Mathematics I at a satisfactory level may be given permission to enrol.

SCHOOLTEACHERS

There is no doubt that in order to be well qualified as a high school teacher of mathematics it is desirable that the student should have completed a sequence of Mathematics units similar to that outlined under Pure Mathematics majors at Pass level and that other units should be selected from the Theory of Statistics or Applied Mathematics sequences. This extra work will broaden the prospective teacher's outlook and will certainly improve his teaching.

Those who feel that they may be interested in proceeding to a higher degree after graduation are advised to attempt some of the courses at the higher level.

Pure Mathematics level II, Unit C and Pure Mathematics level III, Unit D, should be of interest to schoolteachers.

STUDENTS WITH LOW MATHEMATICAL QUALIFICATIONS

Students who have only a pass in Mathematics level II (Short) at the Higher School Certificate or who have been inadequately prepared even though they have passed Mathematics level II (Full), should see that they do not fall behind the class. Attention is directed to the Bridging Courses in Mathematics given over the University of N.S.W. Radio Station VL2UV. Tutorial time is provided by the School in Mathematics I. Students should use these tutorial periods to obtain advice on supplementary reading to make up any deficiencies in their pre-university training. If, after receiving this advice, the student cannot keep up with the class, he should consult a senior member of the staff of the School of Mathematics.

In addition to the Radio Course, a Bridging Course in Mathematics consisting of eleven three or four hour sessions will be held at the University during the period January to February, 1973. A feature of these courses will be the contact between staff and students particularly in discussion and tutorials.

The Course is designed mainly for students who have passed Mathematics at the 2S level and intend to take Mathematics I for which subject a knowledge of Mathematics at the 2F level is necessary. The Bridging Course covers the gap between 2S and 2F Mathematics and is a very useful refresher course generally. Its emphasis in Calculus is on the application of techniques already known whereas the Radio Calculus Course explains the ideas of Calculus and assumes no previous knowledge of the subject.

STUDENTS TRANSFERRING FROM OTHER COURSES

In some cases the mathematical subjects of the Science Course differ quite considerably from the mathematics taught to students following other courses (e.g., Engineering). Students transferring to the Science Course and wishing to obtain credit for work done in previous courses should make application through the Admissions Office as early as possible. The staff of the School will advise students in such cases but this does not relieve the student of the responsibility of making an early application through the correct channels.

SUBJECTS SUBSIDIARY TO MATHEMATICS

As mentioned above, a student wishing to major in Mathematics must pass other Science subjects in accordance with Science Course regulations. In this connection it is worth noting that the Applied Mathematics Course has a considerable content of mathematical physics and there is no doubt that Physics I and/or Physics II would assist the student.

Mathematics Prizes

There are prizes available for certain courses in the School of Mathematics. They are open to all Kensington students proceeding to an undergraduate degree or diploma but will not be awarded if there is no candidate of sufficient merit. An award of $25 and a suitably inscribed certificate are available in the following subjects: Higher Mathematics I, Higher Pure Mathematics II, Higher Applied Mathematics II, Higher Pure Mathematics III, Higher Applied Mathematics III.

Similarly, there are prizes of up to $40 available in Theory of Statistics subjects.

MATHEMATICS

10.001 Mathematics I

Calculus, analysis, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

PRELIMINARY READING LIST

Allendoerfer, C. B. & Oakley, C. O. *Principles of Mathematics.* McGraw-Hill.

Bell, E. T. *Men of Mathematics.* 2 vols. Pelican.
Courant, R. & Robbins, H. *What is Mathematics.* O.U.P.
Polya, G. *How to Solve It.* Doubleday Anchor.
Sawyer, W. W. *A Concrete Approach to Abstract Algebra.* Freeman.
Sawyer, W. W. *Prelude to Mathematics.* Pelican.

TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming.* Prentice-Hall.
Kelly, G. M. *Introduction to Linear Algebra and Vector Geometry.* Reed Education, Sydney, 1971.
Tetra, B. C. *Basic Linear Algebra.* Harper & Row.
Thomas, G. B. *Calculus and Analytic Geometry.* 4th ed. Addison-Wesley.

REFERENCE BOOKS

Blatt, J. M. *Basic Fortran IV Programming (IBM/360 Version).* Computer Systems (Aust.).
Campbell, H. F. *Matrices with Applications.* Appleton-Century-Crofts.
Kaplan, W. & Lewis, D. J. *Calculus and Linear Algebra.* Vols. 1 & 2. Wiley.
Lange, I. H. *Elementary Linear Algebra.* Wiley.
Pedoe, D. *A Geometric Introduction to Linear Algebra.* Wiley.
Purcell, E. J. *Calculus with Analytic Geometry.* Appleton-Century-Crofts.
Shields, P. C. *Elementary Linear Algebra.* Worth.
Smith, W. K. *Limits and Continuity.* Collier-Macmillan.
Spivak, M. *Calculus.* Benjamin.
Zelinsky, D. *A First Course in Linear Algebra.* Academic.

10.011 Higher Mathematics I

Calculus, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

PRELIMINARY READING LIST

As for 10.001 plus:
Arnold, B. H. *Intuitive Concepts in Elementary Topology.* Prentice-Hall.
David, F. N. *Games, Gods and Gambling.* Griffin.
Felix, L. *The Modern Aspect of Mathematics.* Science.
Huff, D. *How to Lie with Statistics.* Gollancz.
Reid, C. *From Zero to Infinity.* Routledge.

TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming.* Prentice-Hall.
Fagg, S. V. *Differential Equations.* English Universities P.
Kelly, G. M. *Introduction to Linear Algebra and Vector Geometry.* Reed Education, Sydney, 1971.
Spivak, M. *Calculus.* Benjamin.
Tetra, B. C. *Basic Linear Algebra.* Harper & Row.

REFERENCE BOOKS

As for 10.001 plus:
Abraham, R. *Linear and Multilinear Algebra.* Benjamin.
Blatt, J. M. *Basic Fortran IV Programming (IBM/360 Version).* Computer Systems (Aust.).
Brauer, F. & Nohel, J. *Ordinary Differential Equations.* Benjamin.
Burkhill, J. C. *A First Course in Mathematical Analysis.* C.U.P.
Crowell, R. H. & Williamson, R. E. *Calculus of Vector Functions.* Prentice-Hall.

Hochstadt, H. *Differential Equations.* Holt, Rinehart & Winston.
Lang, S. *Linear Algebra.* Addison-Wesley.
Murdoch, D. C. *Linear Algebra for Undergraduates.* Wiley.
Spivak, M. *Calculus on Manifolds.* Benjamin.

10.021 Mathematics IT

Calculus, analysis, analytic geometry, algebra, probability theory, elementary computing.

TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming.* Prentice-Hall.
Greening, M. G. *First Year General Mathematics.* N.S.W.U.P.
Youse, B. K. & Stalnaker, A. W. *Calculus for the Social and Natural Sciences.* International Textbook Co.

REFERENCE BOOKS

Allendoerfer, C. B. & Oakley, C. O. *Fundamentals of College Algebra.* McGraw-Hill.
Bates, G. E. *Probability.* Addison-Wesley.
Burford, R. L. *Introduction to Finite Probability.* Merrill.
Christian, R. C. *Logic and Sets.* Blaisdell.
Fine, N. J. *Introduction to Modern Mathematics.* Rand McNally & Co.
Hoyt, J. P. *A Brief Introduction to Probability Theory.* International Text Book Co.
Johnson, W. G. & Zaccaro, L. N. *Modern Introductory Mathematics.* McGraw-Hill.

10.031 Mathematics (One Level II Unit)*

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; multiple integrals, matrices and their application to theory of linear equations, eigenvalues; introduction to numerical methods.

TEXTBOOK

Spiegel, M. R. *Advanced Mathematics for Engineers and Scientists.* McGraw-Hill.

REFERENCE BOOKS

Grove, W. E. *Brief Numerical Methods.* Prentice-Hall.
Hildebrand, F. B. *Advanced Calculus for Applications.* Prentice-Hall.
Keane, A. & Senior, S. A. *Mathematical Methods.* Science.
Pipes, L. A. & Harvill, L. R. *Applied Mathematics for Engineers and Physicists.* 3rd ed. McGraw-Hill.
Wylie, C. R. *Advanced Engineering Mathematics.* 3rd ed. McGraw-Hill.

10.032 Mathematics (One Level III Unit)*

Vector Calculus; special functions; numerical solution of ordinary and partial differential equations; complex variable theory; Fourier integrals; Laplace transforms with application to ordinary and partial differential equations.

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* These units are also available to Faculty of Science students as a sequence of two units constituting a terminating service course in mathematics. As such they are mutually exclusive to any other level II or level III units in Pure and/or Applied Mathematics.

TEXTBOOK
Kreyszig, E. *Advanced Engineering Mathematics.* Wiley.

REFERENCE BOOKS
Grove, W. E. *Brief Numerical Methods.* Prentice-Hall.
Hildebrand, F. B. *Advanced Calculus for Applications.* Prentice-Hall.
Jeffreys, G. V. & Jenson, V. G. *Mathematical Methods in Chemical Engineering.* Academic.
Keane, A. & Senior, S. A. *Mathematical Methods.* Science.

10.111A Pure Mathematics II—Algebra

Vector Spaces: inner products, linear operators, spectral theory, quadratic forms. Linear Programming: convex sets and polyhedra, feasible solutions, optimality, duality.

TEXTBOOKS
SESSION 1
Tropper, A. M. *Linear Algebra.* Nelson. Paperback.

SESSION 2
Gass, H. *Linear Programming.* I.S.E. McGraw-Hill.

REFERENCE BOOKS
Hoffman, K. & Kunze, R. *Linear Algebra.* Prentice-Hall.
Lang, S. *Linear Algebra.* Addison-Wesley.

10.111B Pure Mathematics II—Analysis

Complex variables: analytic functions, elementary functions, Taylor and Laurent series, integrals, Cauchy's theorem, residues, evaluation of certain real integrals, maximum modulus principles. Linear differential equations of the second order: equations with constant coefficients, power series solutions, Laplace transforms, Bessel functions.

TEXTBOOKS
SESSION 1
Hilton, P. J. *Partial Derivatives.* Routledge.
Purcell, E. J. *Calculus with Analytic Geometry.* Appleton-Century-Crofts.
or
Thomas, G. B. *Calculus and Analytic Geometry.* 4th ed. Addison-Wesley

SESSION 2
Churchill, R. V. *Complex Variables and Applications.* I.S.E. McGraw-Hill.

REFERENCE BOOK
Kolman, B. & Trench, W. F. *Elementary Multivariable Calculus.* Academic.

10.111C Pure Mathematics II—Algebra and Geometry

Abstract Algebra: Euclidean algorithm, unique factorization theorem, mathematical systems, groups, determination of small groups, homomorphisms and normal subgroups. Geometry: elementary concepts of Euclidean, projective and affine geometries.

TEXTBOOKS
SESSION 1
Dean, R. A. *Elements of Abstract Algebra.* Wiley.

SESSION 2

Gans, D. *Transformations and Geometrics.* Appleton-Century-Crofts.

REFERENCE BOOK

Coxeter, H. S. M. *Introduction to Geometry.* Wiley.

10.121A Higher Pure Mathematics II—Algebra

Linear Algebra: vector spaces, commutative rings, polynomials, modules, linear transformations, eigenvectors, invariant subspaces, canonical forms, linear functions, bilinear and multi-linear algebra. Group Theory: subgroups, quotient groups, isomorphisms, Lagrange's theorem, Sylow's theorem.

TEXTBOOKS

Hartley, B. & Hawkes, T. O. *Rings, Modules and Linear Algebra.* Chapman & Hall.

Herstein, I. M. *Topics in Algebra.* Blaisdell.

REFERENCE BOOKS

Green, J. A. *Sets and Groups.* Macmillan.

Hall, M. *The Theory of Groups.* Macmillan.

Hoffman, K. & Kunze, R. *Linear Algebra.* Prentice-Hall.

Lang, S. *Linear Algebra.* W.S.S. Addison-Wesley.

Ledermann, W. *The Theory of Finite Groups.* Oliver & Boyd.

10.121B Higher Pure Mathematics II—Real and Complex Analysis

Construction of reals; uniform convergence; implicit and inverse function theorems; analytic functions; Laurent and Taylor series; calculus of residues; conformal mapping.

TEXTBOOKS

SESSION 1

Spivak, M. *Calculus.* Benjamin.

SESSIONS 1 AND 2

Jamieson, G. J. D. *A First Course on Complex Functions.* Prentice-Hall.

REFERENCE BOOKS

Crawell, R. H., Williamson, R. & Trotter, H. *Calculus of Vector-Valued Functions.* Prentice-Hall.

Goldberg, R. R. *Methods of Real Analysis.* Blaisdell.

Knopp, K. *Elements of the Theory of Functions.* Dover.

Knopp, K. *Theory of Functions.* Vol. 1. Dover.

10.121C Higher Pure Mathematics II—Number Theory and Geometry

Galois fields, quadratic reciprocity, quadratic forms, continued fractions, number theoretic functions; axioms for a geometry, affine geometry, Desargues' theorem, projective geometry.

TEXTBOOK

SESSION 1

Hardy, G. H. & Wright, E. M. *Introduction to the Theory of Numbers.* O.U.P.

REFERENCE BOOKS
Artin, E. *Geometric Algebra*. Interscience.
Stevenson, F. W. *Projective Planes*. Freeman.

10.112A Pure Mathematics III—Number Theory and Algebra

Euclidean algorithm, congruences, sums of squares, diophantine equations, rings, polynomials, fields.

TEXTBOOKS
SESSION 1
Davenport, H. *The Higher Arithmetic*. Hutchinson.
SESSION 2
Dean, R. A. *Elements of Abstract Algebra*. Wiley.

REFERENCE BOOKS
Birkhoff, G. & MacLane, S. *A Survey of Modern Algebra*. Macmillan.
Hardy, G. H. & Wright, E. M. *Introduction to the Theory of Numbers*. O.U.P.

10.112B Pure Mathematics III—Real Analysis

Convergence of sequences; Cauchy sequences; lim sup and lim inf; convergence tests for series; sequences and series of functions; uniform convergence; Taylor and Fourier series; evaluation of integrals and solutions of differential equations via series; metric spaces; contraction mapping principle and its applications.

TEXTBOOK
Youse, B. K. *Introduction to Real Analysis*. Allyn & Bacon.

REFERENCE BOOKS
Goffman, C. *Introduction to Real Analysis*. Harper.
Spivak, M. *Calculus*. Benjamin.

10.112C Pure Mathematics III—Differential Geometry

Curves and surfaces in space. Differential forms. Curvature.

TEXTBOOK
O'Neill, B. *Elementary Differential Geometry*. Academic.

REFERENCE BOOK
Willmore, T. *Differential Geometry*. O.U.P.

10.112D Pure Mathematics III—Topology and Set Theory

Cardinal and ordinal numbers. Elementary topology of surfaces.

TEXTBOOKS
SESSION 1
Gray, J. D. *Lecture Notes on Set Theory and Transfinite Arithmetic*. Author, 1973.
SESSION 2
Frechet, M. & Fan, K. *Initiation to Combinatorial Topology*. Prindle, Weber & Schmidt.
Kamke, E. *Theory of Sets*. Dover.

REFERENCE BOOKS

Blackett, D. W. *Elementary Topology: A Combinatorial and Algebraic Approach.* Academic Press.
Wilder, R. L. *Introduction to the Foundations of Mathematics.* Wiley.

10.112E Pure Mathematics III—Complex Analysis and Differential Equations

Complex analysis and ordinary differential equations.

TEXTBOOKS

SESSION 1
Churchill, R. V. *Complex Variables and Applications.* I.S.E. McGraw-Hill.

SESSION 2
Plaat, O. *Ordinary Differential Equations.* Holden-Day.

10.122A Higher Pure Mathematics III—Algebra

As in 10.112A but in more detail.

TEXTBOOK

Lang, S. *Algebra.* Addison-Wesley.

REFERENCE BOOKS

Artin, E. *Galois Theory.* Notre Dame.
Goldhaber, J. K. & Ehrlich, G. *Algebra.* Macmillan.
Jacobson, N. *Lectures in Abstract Algebra.* Vol. 3. Van Nostrand.
van der Waerden, B. L. *Modern Algebra.* Vol. 1. Ungar.

10.122C Higher Pure Mathematics III—Differential Geometry and Additional Analysis

Differential geometry of curves and surfaces, Riemannian geometry, theory of ordinary differential equations, eigenfunction expansions, plane autonomous systems.

TEXTBOOKS

SESSION 1
Birkhoff, G. & Rota, G. *Ordinary Differential Equations.* Blaisdell.

REFERENCE BOOKS

O'Neill, B. *Elementary Differential Geometry.* Academic.
Singer, I. M. & Thorpe, J. A. *Lecture Notes on Elementary Topology.* Scott, Foresman, 1967.
Willmore, T. *Differential Geometry.* O.U.P.

10.122D Higher Pure Mathematics III—Number Theory and Logic

Elementary number theory, mathematical logic, axioms of set theory, algebraic number theory.

TEXTBOOKS

SESSION 1
Mendelson, E. *Introduction to Mathematical Logic.* Van Nostrand.

SESSION 2
Hardy, G. H. & Wright, E. M. *Introduction to the Theory of Numbers.* O.U.P.

10.122F Higher Pure Mathematics III—Topology and Functional Analysis

Set theory, metric spaces, continuity, compactness, completeness and connectedness. Lebesgue measure, convergence theorems, Fubini's theorem, Banach spaces, Hahn-Banach theorem and open mapping theorem.

TEXTBOOKS

Royden, H. L. *Real Analysis.* Collier-Macmillan.
Simmons, G. F. *Introduction to Topology and Modern Analysis.* McGraw-Hill, 1963.

10.211A Applied Mathematics II—Mathematical Methods

Review of functions of two and three variables, divergence, gradient, curl; line, surface, and volume integrals; Green's and Stokes' theorems. Special functions, including gamma and Bessel functions. Differential equations and boundary value problems, including vibrating string and vibrating circular membrane; Fourier series and Fourier-Bessel series.

TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming.* Prentice-Hall.
Bowman, F. *Introduction to Bessel Functions.* Dover.
Sneddon, I. N. *Fourier Series.* Routledge.
Spiegel, M. R. *Theory and Problems of Vector Analysis.* Schaum.

REFERENCE BOOKS

Betz, H., Burcham, P. B. & Ewing, G. M. *Differential Equations with Applications.* I.S.R. Harper.
Blatt, J. M. *Basic Fortran IV Programming.* Computer Systems (Aust.).
Dettman, J. W. *Mathematical Methods in Physics and Engineering.* McGraw-Hill.
Smith, G. D. *Vector Analysis Including the Dynamics of a Rigid Body.* O.U.P.

10.211B Applied Mathematics II—Analytical Dynamics

Kinematics of particles and rigid bodies. Dynamics of particles, including simple harmonic motion and motion in a central force field. Dynamics of systems of particles, conservation principles, collisions, rocket motion. Dynamics of rigid bodies, including compound pendulum and Euler's equations. Lagrange's and Hamilton's equations.

TEXTBOOK

Smith, R. C. & Smith, P. *Mechanics.* Wiley.

REFERENCE BOOK

Lawden, D. F. A. *Course in Applied Mathematics.* Vol. I. English U.P.

10.211C Applied Mathematics II—Hydrodynamics

Conservation laws and Bernoulli's equation for one-dimensional flow. Equations of continuity and Euler's equation. Kelvin's theorem. Incompressible, irrotational flow in two and three dimensions, including applications of complex variables, method of images, harmonic functions, and axially symmetric flow. Introduction to compressible and viscous fluids.

TEXTBOOK

Brenkert, K. Jr. *Elementary Theoretical Fluid Mechanics.* Wiley.

10.221A Higher Applied Mathematics II (Mathematical Methods)

As for 10.211A but in greater depth.

TEXTBOOK

Queen, N. M. *Vector Analysis.* McGraw-Hill, 1967.

REFERENCE BOOKS

Blatt, J. M. *Basic Fortran IV Programming.* Computer Systems (Aust.).
Dettman, J. W. *Mathematical Methods in Physics and Engineering.* McGraw-Hill.

10.221B Higher Applied Mathematics II (Analytical Dynamics)

As for 10.211B but in greater depth.

TEXTBOOK

McCuskey, S. W. *Introduction to Advanced Dynamics.* Addison-Wesley.

REFERENCE BOOK

Goldstein, H. *Classical Mechanics.* Addison-Wesley.

10.221C Higher Applied Mathematics II (Hydrodynamics)

As for 10.211C but in greater depth.

TEXTBOOK

No set text.

REFERENCE BOOKS

Chorlton, F. *Textbook of Fluid Dynamics.* Van Nostrand.
Curle, N. & Davies, H. J. *Modern Fluid Dynamics.* Vol. 1. Van Nostrand.

10.212A Applied Mathematics III—Numerical Analysis

Polynomial approximation, interpolation and extrapolation, numerical quadrature, solution of ordinary differential equations, sets of linear equations, matrix eigenvalues and eigenvectors, boundary value problems, partial differential equations. Tutorial exercises will involve the use of an electronic computer.

TEXTBOOK

Conte, S. D. *Elementary Numerical Analysis.* McGraw-Hill.

REFERENCE BOOKS

Fike, C. T. *Computer Evaluation of Mathematical Functions.* Prentice-Hall.
Fox, L. & Mayers, D. F. *Computing Methods for Scientists & Engineers.* O.U.P.
Ralston, A. *A First Course in Numerical Analysis.* McGraw-Hill.

10.212B Applied Mathematics III—Continuum Mechanics

Cartesian tensors, stress and strain in continuous media. Equations of equilibrium and motion. Equations of elasticity. Bending and torsion of beams. Plane elasticity (if time available). Viscous flow of liquids (if time available).

TEXTBOOK

Mase, G. E. *Continuous Mechanics.* Schaum.

REFERENCE BOOK

Long, R. L. *Mechanics of Solids and Fluids.* Prentice-Hall.

10.212D Applied Mathematics III—Mathematical Methods

Sturm-Liouville equation, eigenvalues, expansion in orthonormal functions. Fourier, Fourier-Bessel and Legendre series as special cases. Contour integration. Fourier and Laplace transforms, with application to ordinary and partial differential equations. Diffusion equation and transmission-line equation. Wave equation.

TEXTBOOKS

Rabenstein, A. L. *Introduction to Ordinary Differential Equations.* Academic.

Stephenson, G. *An Introduction to Partial Differential Equations for Science Students.* 2nd ed. Longmans. Paperback.

REFERENCE BOOKS

Birkhoff, G. & Rota, G. *Ordinary Differential Equations.* Ginn & Co.

Carslaw, H. S. & Jaeger, J. C. *Operational Methods in Applied Mathematics.* Dover.

Raven, F. H. *Mathematics of Engineering Systems.* McGraw-Hill.

Schelkunoff, S. A. *Applied Mathematics for Engineers and Scientists.* Van Nostrand.

10.212L Applied Mathematics III—Optimization Techniques

Origins of optimization problems. The Simplex Algorithm. Duality. Transportation problems. Numerical methods. Nonlinear programming. The Kuhn-Tucker theorem. Computational algorithms. Introduction to dynamic programming. Network problems.

TEXTBOOK

Box, M. J. et. al. *Nonlinear Optimization Techniques.* Oliver & Boyd, 1969.

10.222B Higher Applied Mathematics III—Continuum Mechanics

As for 10.212B but in greater depth.

REFERENCE BOOK

Fung, Y. C. *A First Course in Continuum Mechanics.* Prentice-Hall.

10.222C Higher Applied Mathematics III—Maxwell's Equations and Special Relativity

Electrostatic and quasi-static magnetic fields: mathematical formulation of basic laws, field equations, methods of solution, general theorems, polarization, energy and mechanical forces. Electromagnetic fields: Maxwell's equations, Poynting theorem, Maxwell stress tensor, electromagnetic momentum and radiation pressure, electromagnetic potentials, radiation, vector wave equation, solutions, cavity resonators, waveguides. Relativity: relativistic kinematics, dynamics and electrodynamics, radiation from moving charges, radiation damping.

TEXTBOOKS

Jackson, J. D. *Classical Electrodynamics.* Wiley.

Lawden, D. F. *Tensor Calculus and Relativity.* Methuen.

REFERENCE BOOKS

Argence, E. & Kahan, T. *Theory of Waveguides & Resonators.* Blackie.
Cowan, E. W. *Basic Electromagnetism.* Academic.
Einstein, A. et al. *The Principle of Relativity.* Dover.
Moller, C. *The Theory of Relativity.* O.U.P.
Panofsky, W. K. H. & Phillips, M. *Classical Electricity and Magnetism.* Addison-Wesley.
Pauli, W. *Theory of Relativity.* Pergamon.

10.222D Higher Applied Mathematics III—Complex Variables and Integral Transforms

Functions of a complex variable, contour integration. Fourier, Laplace and Mellin transforms, solutions of ordinary and partial differential equations. Asymptotic expansions.

REFERENCE BOOKS

Courant, R. & Hilbert, D. *Methods of Mathematical Physics.* Vol. 1. Willy.
Lighthill, M. J. *Fourier Analysis and Generalised Functions.* C.U.P. Paperback.
Watson, G. N. & Whittaker, E. T. *A Course in Modern Analysis.* C.U.P.

10.222E Higher Applied Mathematics III—Boundary Value Problems and Special Functions

Methods of solution of boundary value problems for partial differential equations, including the Poisson, Laplace, diffusion, and wave equations. Methods discussed include separation of variables; Sturm-Liouville theory; integral representations; Green's functions; perturbation theory.

REFERENCE BOOKS

Courant, R. & Hilbert, D. *Methods of Mathematical Physics.* Vols. 1 & 2. Interscience.
Duff, G. F. D. & Naylor, D. *Differential Equations of Applied Mathematics* Wiley.
Feshback, H. & Morse, P. M. *Methods of Theoretical Physics.* Parts 1 & 2. McGraw-Hill.

10.222F Higher Applied Mathematics III—Quantum Mechanics

Review of physical basis for quantum mechanics, simple harmonic oscillator, hydrogen atom. General formalism, angular momentum, perturbation theory and other approximation methods. Scattering problems.

TEXTBOOK

Schiff, L. I. *Quantum Mechanics.* 3rd ed. I.S.E. McGraw-Hill.

REFERENCE BOOKS

Landau, L. D. & Lifshitz, E. M. *Quantum Mechanics.* Pergamon.
Messiah, A. *Quantum Mechanics.* Vols. 1 & 2. North-Holland.

10.223 Applied Mathematics IV

Specialized study in selected topics for students who intend to graduate with honours. Includes preparation of an undergraduate thesis.

TEXTBOOK

No set text.

STATISTICS

10.311 Theory of Statistics II

An introduction to an axiomatic treatment of probability. Variates (univariates, multivariates, expectations, moment generating and characteristic functions). Standard distributions. Sampling distributions. Point estimation (moments, maximum likelihood, minimum χ^2, etc.). Confidence interval estimation, exact and approximate. Elementary Neyman-Pearson theory of tests of significance, standard significance tests. Regression (including curvilinear) on a single fixed variable.

INTRODUCTORY READING

Moroney, M. J. *Facts from Figures.* Pelican.
Tanur, J. M. ed. *Statistics: A guide to the Unknown.* Holden-Day.

TEXTBOOKS

Graybill, F. A. & Mood, A. M. *Introduction to the Theory of Statistics.* McGraw-Hill.
Hogg, R. V. & Craig, A. T. *Introduction to Mathematical Statistics.* 3rd ed. Collier-Macmillan.
Statistical Tables.

REFERENCE BOOKS

Anderson, R. L. & Bancroft, T. A. *Statistical Theory in Research.* McGraw-Hill.
Hartley, H. O. & Pearson, E. S. *Biometrika Tables for Statisticians.* C.U.P.
Larson, H. J. *Introduction to Probability and Statistical Inference.* Wiley.
Parzen, E. *Modern Probability Theory and its Applications.* Wiley.

10.321 Higher Theory of Statistics II

10.311 at greater depth and covering a slightly wider field.

TEXTBOOKS

As for 10.311, *plus:*
Kendall, M. G. & Stuart, A. *The Advanced Theory of Statistics.* Vols. I & II. 2nd ed. Griffin.

REFERENCE BOOK

Feller, W. *An Introduction to Probability Theory and its Applications.* Vol. 1. 3rd ed. Wiley.

10.312A Theory of Statistics III—Stochastic Processes and Applications

Conditional expectations, generating functions, branching processes, finite Markov chains, introduction to finite-state space Markov processes in continuous time, applications of stochastic processes in genetics.

TEXTBOOK

Bailey, N. J. T. *Elements of Stochastic Processes with Applications to the Natural Sciences.* Wiley.

REFERENCE BOOKS

Cox, D. R. & Miller, H. D. *The Theory of Stochastic Processes.* Methuen.
Karlin, S. *A First Course in Stochastic Processes.* Academic.
Kempthorne, O. *An Introduction to Genetic Statistics.* Wiley.

10.312B Theory of Statistics III—Experimental Design (Applications) and Sampling

Principles of good experimental design, analyses of fully randomized and randomized block designs, factorial treatment structure, components of variance, multiple comparisons; finite populations, simple random sampling, stratified random sampling, optimum allocation, estimation of sample size.

REFERENCE BOOKS

Brownlee, K. A. *Statistical Theory & Methodology in Science & Engineering.* 2nd ed. Wiley.
Cochran, W. G. *Sampling Techniques.* Wiley.
Cox, D. R. *Planning of Experiments.* Wiley.

10.312C Theory of Statistics III—Experimental Design (Theory) and Project

Multivariate normal distribution, quadratic forms, multiple regression, theory of the general linear hypothesis and its application to experimental designs.

TEXTBOOK

Graybill, F. A. *An Introduction to Linear Statistical Models.* McGraw-Hill.

REFERENCE BOOK

Anderson, T. W. *An Introduction to Multivariate Statistical Analysis.* Wiley.

10.312D Theory of Statistics III—Contingency Tables and Probability Theory

General theory of the 2×2 contingency table, χ^2 test and exact test, $m \times n$ contingency table, subdivision of χ^2; characteristic functions, convergence of probability distributions, the central limit theorem, expansions related to the normal distributions, extreme value distributions.

TEXTBOOK

Heathcoate, C. R. *Probability: Elements of the Mathematical Theory.* Allen & Unwin.

REFERENCE BOOKS

Kendall, M. G. & Stuart, A. *The Advanced Theory of Statistics.* Vol. II. 2nd ed. Griffin.
Lamperti, J. *Probability.* Benjamin.
Lancaster, H. O. *The Chi-squared Distribution.* Wiley.

10.322A Higher Theory of Statistics III

As for 10.312A but in greater depth.

TEXTBOOKS

As for 10.312A, *plus:*
Cox, D. R. & Miller, H. D. *The Theory of Stochastic Processes.* Methuen.

REFERENCE BOOKS

As for 10.312A, deleting Cox & Miller.

10.322B Higher Theory of Statistics III

As for 10.312A but in greater depth.

TEXTBOOKS

Cochran, W. G. & Cox, G. M. *Experimental Designs.* I. S. E. Wiley.
Statistical Tables.

REFERENCE BOOKS

Brownlee, K. A. *Statistical Theory and Methodology in Science & Engineering.* 2nd ed. Wiley.
Cochran, W. G. *Sampling Techniques.* Wiley.
Cox, D. R. *Planning of Experiments.* Wiley.

10.322C Higher Theory of Statistics III

As for 10.312C but in greater depth.

TEXTBOOK

As for 10.312C.

REFERENCE BOOKS

As for 10.312C *plus:*
Rao, C. R. *Linear Statistical Inference and its Applications.* Wiley.

10.322D Higher Theory of Statistics III

As for 10.312D but in greater depth.

TEXTBOOK

Chung, K. L. *A Course in Probability Theory.* Harcourt, Brace & World.

REFERENCE BOOKS

As for 10.312D.

10.323 Theory of Statistics IV

Specialized study, from the topics set out, for students attempting honours in the Science or Arts courses with a major in Statistics. Mathematical basis. Experimental design; response surfaces. Stochastic processes. Theories of inference. Sequential analysis. Non-parametric methods. Multivariate analysis. Mathematical programming. Information theory. Discrete distributions. Project.

TEXTBOOKS

Anderson, T. W. *Multivariate Statistical Analysis.* Wiley.
Cox, D. R. & Smith, W. *Queues.* Methuen.
Cramer, H. & Leadbetter, M. R. *Stationary and Related Stochastic Processes.* Wiley.
Feller, W. *An Introduction to Probability Theory and its Applications.* Vol. 2. Wiley.
Graybill, F. A. *An Introduction to Linear Statistical Models.* McGraw-Hill.
Hartley, H. O. & Pearson, E. S. *Biometrika Tables for Statisticians.* C.U.P.
Jenkins, G. M. & Watts, D. G. *Spectral Analysis and its Applications.* Holden-Day.
Kempthorne, O. *The Design and Analysis of Experiment.* Wiley.
Wald, A. *Sequential Analysis.* Wiley.
Wetherill, G. B. *Sequential Methods in Statistics.* Methuen.

REFERENCE BOOKS

Bradley, J. V. *Distribution-free Statistical Tests.* Prentice-Hall.
Cochran, W. G. *Sampling Techniques.* Wiley.
Cochran, W. G. & Cox, G. M. *Experimental Design.* Wiley.
Ferguson, T. S. *Mathematical Statistics—A Decision Theoretic Approach.* Academic.
Fraser, D. A. S. *The Structure of Inference.* Wiley.
Ghosh, B. K. *Sequential Tests of Statistical Hypotheses.* Addison-Wesley.
Godambe, V. P. & Sprott, D. A. *Foundations of Statistical Inference.* Holt, Rinehart & Winston.
Kendall, M. G. & Stuart, A. *The Advanced Theory of Statistics.* Vol. II. 2nd ed. Griffin.
Lehmann, E. L. *Testing Statistical Hypotheses.* Wiley.
Moran, P. A. P. *An Introduction to Probability Theory.* O.U.P.
Noether, G. E. *Elements of Non-parametric Statistics.* Wiley.
Raiffa, H. & Schlaifer, R. *Applied Statistical Decision Theory.* M.I.T.
Rao, C. R. *Advanced Statistical Methods in Biometric Research.* Wiley.
Seal, H. *Multivariate Statistical Analysis for Biologists.* Methuen.
Sarhan, A. E. & Greenberg, B. G. *Contributions to Order Statistics.* Wiley.
Scheffe, H. *The Analysis of Variance.* Wiley.
Wald, A. *Statistical Decision Functions.* Wiley.
Wetherill, G. B. *Sequential Methods in Statistics.* Methuen.
Yaglom, A. M. *An Introduction to the Theory of Stationary Random Functions.* Prentice-Hall.

10.331 Statistics SS

An introduction to the theory of probability, with finite, discrete and continuous sample spaces. The standard elementary univariate distributions: binomial, Poisson and normal; an introduction to multivariate distributions. Standard sampling distributions, including those of χ^2, t and F. Estimation by moments and maximum likelihood (including sampling variance formulae, and regression); confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to experimental design; fixed, random and mixed models, involving multiple comparisons and estimation of variance components.

10.341 Statistics SU
10.351 Statistics SM
10.361 Statistics SE

TEXTBOOKS

Freund, J. E. *Mathematical Statistics.* 2nd ed. Prentice-Hall.
Statistical Tables.

REFERENCE BOOKS

For 10.331 Statistics SS

Bennett, C. A. & Franklin, N. L. *Statistical Analysis in Chemistry and the Chemical Industry.* Wiley.
Davies, O. L. *Statistical Methods in Research and Production.* Oliver & Boyd.
Steel, R. G. D. & Torrie, J. H. *Principles and Procedures of Statistics.* McGraw-Hill.

For 10.341 Statistics SU, 10.351 Statistics SM, 10.361 Statistics SE

Derman, C. & Klein, M. *Probability and Statistical Inference for Engineers.* O.U.P.
Freeman, H. *Introduction to Statistical Inference.* Addison-Wesley.
Hald, A. *Statistical Theory with Engineering Applications.* Wiley.

10.361G Statistics

TEXTBOOK

Papoulis, A. *Probability, Random Variables and Stochastic Processes.* McGraw-Hill.

REFERENCE BOOKS

Blackman, R. B. & Tukey, J. W. *The Measurement of Power Spectra.* Dover.
Thomas, J. B. *An Introduction to Statistical Communication Theory.* Wiley.
Wax, N. ed. *Selected Papers on Noise and Stochastic Processes.* Dover.

10.381G Experimental Design I

TEXTBOOK

Kempthorne, O. *The Design and Analysis of Experiment.* Wiley.

REFERENCE BOOK

Cochran, W. G. & Cox, G. M. *Experimental Designs.* Wiley.

10.382G Experimental Design II

REFERENCE BOOKS

Kempthorne, O. *The Design and Analysis of Experiment.* Wiley.
Scheffe, H. *The Analysis of Variance.* Wiley.

10.383G Stochastic Processes

TEXTBOOKS

Cox, D. R. & Smith, W. *Queues.* Methuen.
Feller, W. *An Introduction to Probability Theory and its Applications.* Vols. I and II. Wiley.

REFERENCE

Cramer, H. & Leadbetter, M. R. *Stationary and Related Stochastic Processes.* Wiley.

10.384G Time Series

TEXTBOOK

Jenkins, G. M. & Watts, D. G. *Spectral Analysis and its Applications.* Holden-Day.

REFERENCE BOOKS

Hannan, E. J. *Multiple Time Series.* Wiley.
Yaglom, A. M. *An Introduction to the Theory of Stationary Random Functions.* Prentice-Hall.

10.385G Multivariate Analysis I

TEXTBOOK

Anderson, T. W. *An Introduction to Multivariate Statistical Analysis.* Wiley.

REFERENCE BOOKS

Rao, C. R. *Linear Statistical Inference and its Applications.* Wiley.
Seal, H. *Multivariate Statistical Analysis for Biologists.* Methuen.

10.386G Multivariate Analysis II

TEXTBOOKS

Anderson, T. W. *An Introduction to Multivariate Statistical Analysis.* Wiley.
Morrison, D. F. *Multivariate Statistical Methods.* McGraw-Hill.

REFERENCE BOOK

Lawley, D. N. & Maxwell, A. E. *Factor Analysis as a Statistical Method.* 2nd ed. Butterworth.

10.388G Sequential Analysis

TEXTBOOK

Wald, A. *Sequential Analysis.* Wiley.

REFERENCE BOOKS

Ghosh, B. K. *Sequential Tests of Statistical Hypotheses.* Addison-Wesley.
Wetherill, G. B. *Sequential Methods in Statistics.* Methuen.

10.390G Statistical Inference

REFERENCE BOOKS

Ferguson, T. S. *Mathematical Statistics, A Decision Theoretic Approach.* Academic.
Fraser, D. A. S. *The Structure of Inference.* Wiley.
Godambe, V. P. & Sprott, D. A. eds. *Foundations of Statistical Inference.* Holt, Rinehart & Winston.
Lehmann, E. L. *Testing Statistical Hypotheses.* Wiley.
Raiffa, H. & Schlaifer, R. *Applied Statistical Decision Theory.* M.I.T.
Wald, A. *Statistical Decision Functions.* Wiley.
Winkler, R. L. *Introduction to Bayesian Inference and Decision.* Holt, Rinehart & Winston.

SCHOOL OF MICROBIOLOGY

The Science of Microbiology is concerned with the nature of microbes, the smallest living forms, and their effects on human welfare. They are beneficial in providing for the decomposition of organic wastes, by maintaining and increasing the fertility of the soil and by the direct production of foodstuffs, beverages, pharmaceuticals (including antibiotics) and other industrially important compounds. On the other hand, microorganisms are important agents of disease and destruction; they can be responsible for serious spoilage of foods and textiles and for the decomposition of structural materials. As well as applying our knowledge directly and utilizing their potential to bring benefits and to minimize or prevent harmful effects, microorganisms are also being used to advance our knowledge of the nature of living organisms and processes, particularly in the areas of molecular biology, genetics and metabolism.

Students may undertake Microbiology as a major or minor Science course, as part of the medical degree, or in Food Technology and in other courses in the Faculty of Applied Science, in Biological Technology, Public Health Engineering and Drug Analysis, or for the degree of BSc(Ed).

The subject can be taken to the honours level and for the Master of Science and Doctor of Philosophy degrees. The last two degrees are also available for science students in the area of Medical Microbiology and Immunology. Medical students can interrupt their course to undertake the Bachelor of Science (Medicine) in Microbiology and higher medical degrees may also be taken in the subject. Such advanced work in Microbiology will include research work as well as an additional programme of reading and more formal instruction. Those who have not majored in Microbiology but have otherwise suitable basic training may enrol for a higher degree in Microbiology at this stage.

A student wishing to undertake Microbiology at any level should ensure that he meets all prerequisites, which may be waived or varied only under special circumstances. He is advised to consult the School's education officer for advice on the best course structure for his particular interests.

Students taking microbiology as a major subject for graduation will be expected ordinarily to undertake at least four level III microbiological units which will include Basic General Microbiology (44.102A Nature of Microorganisms and 44.102B Microbial Physiology and Ecology) and others chosen from 44.102C Higher Microorganisms*—alternatively 43.102D Mycology given in the School of Botany—44.102D General Applied Microbiology, 44.102E Medical Microbiology, 44.102F Immunology, and, in the School of Biological Technology, 42.102 Fermentation Technology. Three stage III units in microbiology will be acceptable with certain combinations that include four stage III biochemistry units.

Students not majoring in microbiology may choose one or more units from 44.102A Basic General Microbiology, 44.102B Basic General Microbiology, 44.102F Immunology and 44.102C Higher Microorganisms*—

*Not available in 1973.

alternatively 43.102D Mycology. Ordinarily 44.102D, 44.102E or 42.102 should not be taken without having done 44.102A and 44.102B.

A student wishing to undertake honours will be expected to have achieved a high standard in courses taken for the pass degree and to have majored in Microbiology. Additionally he must receive the permission of the Head of the School. Those in the Faculty of Medicine wishing to proceed to the Bachelor of Science (Medicine) or higher degrees in Medical Microbiology should consult the Head of that Department and conform with Faculty requirements.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page B22.

44.101 Introductory Microbiology

The general nature, occurrence and importance of microorganisms. A systematic review of the major groups of microorganisms: the eucaryotic protista (micro-algae, protozoa and fungi); procaryotic protista (blue-green algae, "higher" bacteria, typical unicellular bacteria and small bacteria-like forms); plant, animal and bacterial viruses. Microbial physiology and genetics. The relationship between microorganisms and their environment; ecological considerations. Interactions between microorganisms and higher organisms.

TEXTBOOK

Brock, T. D. *Biology of Microorganisms.* Prentice-Hall, 1970.

or

Pelczar, M. J. & Reid, R. D. *Microbiology.* 3rd ed. McGraw-Hill, 1972.

or

Stanier, R. Y., Doudoroff, M. & Adelberg, E. A. *General Microbiology.* 3rd ed. Macmillan, 1971. (Also published as *The Microbial World.* 3rd ed. Prentice-Hall, 1970.)

or

Hawker, L. E. & Linton, A. H. eds. *Micro-organisms: Function, Form and Environment.* Arnold, 1971.

The choice will depend on the likely 3rd year programme. Brock is the first recommendation if no more microbiology is to be undertaken; Stanier *et al.*, if the 3rd year units do not include 44.102D; Hawker & Linton if 44.102D is to be taken.

44.102A Basic General Microbiology: Nature of Microorganisms

Systems for the identification and taxonomic description of bacteria; more detailed treatment of the fine structure, cytochemistry, genetics, and antigenicity of microorganisms (including viruses).

TEXTBOOK

Stanier, R. Y., Doudoroff, M. & Adelberg, E. A. *General Microbiology.* 3rd ed. Macmillan, 1971. (Also published as *The Microbial World.* 3rd ed. Prentice-Hall, 1970.)

or

Hawker, L. E. & Linton, A. H. eds. *Micro-organisms: Function, Form and Environment.* Arnold, 1971.

or

Davis, B. D., Dulbeco, R., Eisen, H. N., Ginsberg, H. S. & Wood, W. B. *Microbiology.* Complete ed. Harper & Row, 1968.

Hawker & Linton is recommended when unit 44.102D is also to be taken; Davis *et al.* when unit 44.102E is programmed. Stanier *et al.* is available in a paperback edition.

44.102B Basic General Microbiology: Microbial Physiology and Ecology

The metabolic requirements of microorganisms; relationship between the microorganism and its environment: growth, inhibition, death; energy-yielding and biosynthesising systems; genotypic and phenotypic control systems.

TEXTBOOK
As for 44.102A.

44.102C Higher Microorganisms*

Aims to round out the brief treatment these, mostly eucaryotic protista, received in the introductory course. The filamentous fungi, yeasts, micro-algae and protozoa will each be dealt with in a short taxonomic fashion but giving attention also to particular features associated with their morphology, cytology, cytochemistry, physiology, genetics and their relationship to other organisms and human welfare generally.

Note: 43.102D Mycology is alternative to this unit. (See entry under Botany.)

44.102D General Applied Microbiology

Endeavours to relate basic facts about microorganisms to practical conditions affecting the occurrence, importance, activity and control of microorganisms in soil, air, water, in their relationship to higher organisms (other than Man); their relationship to the manufacture, preservation and spoilage of food, including dairy products; and their industrial application.

TEXTBOOK
Hawker, L. E. & Linton, A. H. eds. *Micro-organisms: Function, Form and Environment*. Arnold, 1971.

44.102E Medical Microbiology (for Science Students)

The nature of bacterial and viral diseases of man: cultural and serological diagnostic procedures; epidemiology of infectious disease; fundamentals of chemotherapy, immunoprophylaxis, immunotherapy; mycology and parasitology in relation to human disease.

TEXTBOOK
Davis, B. D., Dulbecco, R., Eisen, H. N., Ginsberg, H. S. & Wood, W. B. *Microbiology*. Complete ed. Harper & Row, 1968.

44.102F Immunology

Basic immunology and immunological techniques. The interdisciplinary nature of the subject makes this unit suitable for students taking any major sequence in biological science and also for higher degree students who require a background training in immunology. The course includes phylogeny and ontogeny of the immune response; antigen and antibody structure; antigen-antibody reaction; immunochemistry; immunogenetics; clinical immunology; transplantaton.

*Not available in 1973.

TEXTBOOKS

Weir, D. M. *Immunology for Undergraduates*. 2nd ed. Livingstone, 1971.
Weiser, R. S., Myrvick, Q. N. & Pearsall, N. N. *Fundamentals of Immunology*. Lea & Febiger, 1969.

Davis, *et al.*, recommended for 44.102E, will also serve for this unit.

44.103 Microbiology II (Honours)

Advanced formal study in approved subjects, together with a research project. The results of the latter are embodied in a thesis.

44.111 Microbiology

A short introductory course to microbiology which is designed to familiarize students, without previous biological training, with micro-organisms and with the methods used in their isolation and identification. The content of the course is similar to that of 44.101.

TEXTBOOK

Brock, T. D. *Biology of Microorganisms*. Prentice-Hall, 1970.
or
Pelczar, M. J. & Reid, R. D. *Microbiology*. 3rd ed. McGraw-Hill, 1972.

SCHOOL OF PHILOSOPHY

The study of philosophy is partly the study of perennial problems of common interest to everyone; for example, the foundations of morality, the grounds of religious belief, the source and reliability of knowledge, and the relation between body and mind. Philosophy also leans out to and illuminates other fields of study. Consequently courses in philosophy are designed to make it possible for students to pursue a philosophical interest related to their other interests.

The first year course in philosophy is a wide-ranging course which is intended to give a broad introduction to the subject and assumes no previous acquaintance with it. It is broken into two sessions, with an examination at the end of each session, but Arts students take it as a whole and other students are advised to do so. There is no distinction between Pass and Honours.

For second year, Pass courses are presented and examined in session-length units. This arrangement makes it possible to offer a wide range of units from which students may select freely, subject only to certain stipulations regarding prerequisites. In a normal course, students take two course units in each session.

SELECTION OF UNITS

The pattern of courses after the first year is intended to give students a wide range. Constraints are imposed by, firstly, the prerequisites of the various subjects; secondly, the distribution of courses as between Sessions 1 and 2; and to some extent, timetabling. The following details will assist students with their initial choice.

The course-units available in Session 1 having no prerequisite apart from Introductory Philosophy A and B are:

Predicate Logic;
Descartes;
British Empiricism;
Greek Philosophy;
Scientific Method.

Of these, Predicate Logic is prerequisite to a range of advanced logic courses, and some of the others are also prerequisites, alone or as alternatives, to certain other subjects.

HONOURS COURSES

There is no division of students into Pass and Honours during the first year. From the second year special additional course-units are provided for Honours students.

52.111 Philosophy I

The course-units Introductory Philosophy A and Introductory Philosophy B as detailed below. There will be examinations at the end of each session but for Arts students the course will be treated as an integrated whole-year one.

52.112 Philosophy II

Four course-units, normally two in each session.

52.122 Philosophy II (Honours)

As for Pass course, plus Honours Seminars A and B.

COURSE UNITS

Introductory Philosophy A (Session 1)

A first course for students new to the subject. The course divides into three parts. 1. *Plato:* A study of some dialogues of Plato, paying special attention to the theory of definition, and to questions of conceptual analysis as these arise from attempts to define virtue and to prove the immortality of the soul. 2. *Hume:* A study of those sections of Hume's Enquiry concerned with the existence of God and with miracles. 3. *Informal Logic:* An approach to logic by way of language, treating such topics as the uses of utterances, the truth and significance conditions of statements, the non-formal analysis of arguments, and the logical relations of propositions.

RECOMMENDED FOR PRELIMINARY READING

Popkin, R. H. & Stroll, A. *Philosophy Made Simple.* Made Simple Books.
Russell, B. *The Problems of Philosophy.* Oxford H.U.L.

TEXTBOOKS

Flew, A. *An Introduction to Western Philosophy.* Thames & Hudson.
Hume, D. *On Human Nature and the Understanding.* Flew, A. ed. Collier.
Plato. *Protagoras and Meno.* Guthrie, W. K. C. trans. Penguin Classics.
Plato. *The Last Days of Socrates.* Tredinnick, H. trans. Penguin Classics.
Vlastos, G. ed. *The Philosophy of Socrates.* Macmillan.

REFERENCE BOOKS

Allen, R. E. *Plato's Euthyphro and the Earlier Theory of Forms.* Routledge.
Ayer, A. J. *The Concept of a Person.* Macmillan.
Bluck, R. S. *Plato's Phaedo.* Routledge.
Bluck, R. S. *Plato's Meno.* C.U.P.
Burnet, J. *Greek Philosophy.* Macmillan.
Cross, R. C. & Woozley, A. D. *Plato's Republic.* Macmillan.
Flew, A. *Hume's Philosophy of Belief.* Routledge & Kegan Paul.
Hackforth, R. *Plato's Phaedo.* Bobbs-Merrill.
Hamblin, C. L. *Elementary Formal Logic—A Programmed Course.* Hicks Smith and University Paperbacks.
Hick, J. *The Existence of God.* Macmillan.
Hospers, J. *Introduction to Philosophical Analysis.* 2nd ed. Prentice-Hall *or* Routledge & Kegan Paul, 1967.
Robinson, R. *Plato's Earlier Dialectic.* O.U.P.
Russell, B. *Problems of Philosophy.* Oxford H.U.L.
Sesonske, A. & Fleming, N. eds. *Human Understanding.* Wadsworth.
Smart, N. *Philosophers and Religious Truth.* S.C.M.
Taylor, A. E. *Plato.* Methuen.
Taylor, D. M. *Explanation and Meaning.* C.U.P.

Introductory Philosophy B (Session 2)

A continuation of Introductory Philosophy A. The three parts of the course will be: 1. *Plato:* The further study of some dialogues of Plato, with special reference to problems of knowledge and the study of

universals. 2. *Hume:* The further study of Hume's *Enquiry*, with special reference either to the mind-body problem and personal identity, or else to the freedom of the will. 3. *Formal Logic:* An introduction to a system of Natural Deduction sufficient for the symbolization of such ordinary language arguments and the construction of such proofs as lie within the field of propositional logic and simple predicate logic.

TEXTBOOKS

As for Introductory Philosophy A, plus:

Berofsky, B. ed. *Free Will and Determinism.* Harper & Row.
Flew, A. *Body, Mind and Death.* Macmillan.
Kalish, D. & Montague, R. *Logic: Techniques of Formal Reasoning.* Harcourt, Brace & World.

Predicate Logic (Session 1)

Prerequisite: Introductory Philosophy A and B.

A system of natural deduction is presented for the first order predicate calculus, including identity and definite descriptions. Emphasis is upon construction of formal derivations, methods of showing the invalidity of formal arguments, and the evaluation of informal arguments by symbolization.

TEXTBOOK

Kalish, D. & Montague, R. *Logic: Techniques of Formal Reasoning.* Harcourt, Brace & World.

REFERENCE BOOK

Church, A. *Introduction to Mathematical Logic.* Princeton.

Descartes (Session 1)

Prerequisite: Introductory Philosophy A and B.

A study of the main issues raised in the philosophy of Descartes and their importance for the development of modern philosophy. Emphasis is on the *cogito ergo sum* argument, the Cartesian method and the search for rational certainty, his theory of ideas, the body-mind problem, and his account of freedom.

TEXTBOOK

Anscombe, G. E. M. & Geach, P. T. eds. *Descartes's Philosophical Writings.* Nelson.

REFERENCE BOOKS

Beck, L. J. *The Metaphysics of Descartes.* Clarendon.
Beck, L. J. *The Method of Descartes.* Clarendon.
Buchdahl, G. *Metaphysics and the Philosophy of Science.* Blackwell.
Copleston, F. *A History of Philosophy.* Vol. 4. Doubleday.
Doney, W. ed. *Descartes: A Collection of Critical Essays.* Doubleday.
Frankfurt, H. G. *Demons, Dreamers and Madmen: The Defence of Reason in Descartes's Meditations.* Bobbs-Merrill.
Haldane, E. & Ross, G. R. T. eds. *The Philosophical Works of Descartes.* Dover.
Joachim, H. H. *Descartes's Rules for the Direction of the Mind.* Allen & Unwin.
Keeling, S. V. *Descartes.* O.U.P.
Kenna, A. *Descartes: A Study of His Philosophy.* Random House.
Popkin, R. H. *Scepticism from Erasmus to Descartes.* Van Gorcum.

Sesonske, A. & Fleeming, N. *Meta-Meditations: Studies in Descartes.* Wadsworth.
Smith, N. K. *New Studies in the Philosophy of Descartes.* Macmillan.
Smith, N. K. *Studies in the Cartesian Philosophy.* Russell & Russell.

British Empiricism (Session 1)

Prerequisite: Introductory Philosophy A and B.

A survey of the empiricist tradition with special concentration on Locke and Berkeley.

TEXTBOOKS

Armstrong, D. M. *Berkeley's Philosophical Writings.* Collier. Paperback.
Hume, D. *Treatise of Human Nature.* 2 vols. Everyman.
Locke, J. *An Essay Concerning Human Understanding.* Fontana.

REFERENCE BOOKS

References will be given in lectures.

Greek Philosophy: Thales to Plato (Session 1)

Prerequisite: Introductory Philosophy A and B.

The leading ideas of the Greek Philosophers from Thales to Plato, with special reference to the Pre-Socratics.

PRINCIPAL REFERENCE BOOK

Guthrie, W. K. C. *A History of Greek Philosophy.* Vols. I & II. C.U.P.

REFERENCE BOOKS

Aristotle. *The Works of Aristotle Translated into English.* Vol. VIII. *Metaphysics.* O.U.P.
Burnet, J. *Early Greek Philosophy.* Black.
Burnet, J. *Greek Philosophy.* Macmillan.
Cornford, F. M. *From Religion to Philosophy.* Harper.
Cornford, F. M. *Principium Sapientiae.* Harper.
Cornford, F. M. *Plato and Parmenides.* Routledge.
Farrington, B. *Greek Science.* Penguin.
Furley, D. J. & Allen, R. E. eds. *Studies in Presocratic Philosophy.* Vols. I and II. Routledge.
Freeman, K. *Ancilla to the Pre-Socratic Philosophers.* Blackwell.
Gershenon, D. E. & Greenberg, D. A. *Anaxagoras and the Birth of Physics.* Blaisdell.
Grunbaum, A. *Modern Science and Zeno's Paradoxes.* Allen & Unwin, 1968.
Jaeger, W. *The Theology of the Early Greek Philosophers.* O.U.P.
Kahn, C. H. *Anaximander and the Origins of Greek Cosmology.* Columbia.
Kirk, G. S. *Heraclitus. The Cosmic Fragments.* C.U.P.
Kirk, G. S. & Raven, G. E. *The Pre-Socratic Philosophers.* C.U.P.
Lee, H. D. P. *Zeno of Elea.* C.U.P.
O'Brien, D. *Empedocles' Cosmic Cycle: A Reconstruction from the Fragments and Secondary Sources.* C.U.P.
Philip, J. A. *Pythagoras and Early Pythagoreanism.* O.U.P.
Raven, J. E. *Pythagoreans and Eleatics.* C.U.P.
Robinson, R. *Essays in Greek Philosophy.* O.U.P.
Salmon, W. C. *Zeno's Paradoxes.* Bobbs-Merrill.
Sambursky, S. *The Physical World of the Greeks.* Routledge.
Seligman, P. *The Apeiron of Anaximander.* Univ. of London.
Thomson, G. *Studies in Ancient Greek Society.* Vol. 2. *The First Philosophers.* Lawrence & Wishart.

Scientific Method (Session 1)

Prerequisite: Introductory Philosophy A and B.

A study of the nature of empirical knowledge as exemplified in the physical and social sciences and in history, with emphasis on the concept of explanation, the nature of induction and scientific laws, counterfactual statements, and the paradoxes of confirmation.

TEXTBOOKS

Hempel, C. G. *Philosophy of Natural Science.* Prentice-Hall.
Rudner, R. S. *Philosophy of Social Science.* Prentice-Hall.

REFERENCE BOOKS

Barker, I. F. *Induction and Hypothesis.* Cornwall U.P.
Brown, R. *Explanation in Social Science.* Routledge.
Danto, A. & Morgenbesser, S. eds. *Philosophy of Science—Readings.* Meridian.
Draw, W. H. *Laws and Explanation in History.* O.U.P.
Draw, W. H. ed. *Philosophical Analysis and History.* Harper & Row.
Feigl, H. & Sellars, W. *Readings in Philosophical Analysis.* Appleton-Century-Crofts.
Hempel, C. G. *Aspects of Scientific Explanation.* Free Press.
Hintikka, J. & Suppes, P. *Aspects of Inductive Logic.* North Holland.
Hume, D. *On Human Nature and the Understanding.* Flew, A. ed. Collier.
Mill, J. S. *A System of Logic.* Longmans Green.
Nagel, E. *The Structure of Science.* Routledge.
Pap, A. *An Introduction to the Philosophy of Science.* Free Press.
Popper, K. R. *The Logic of Scientific Discovery.* Hutchinson.
Popper, K. R. *The Poverty of Historicism.* Routledge.
Popper, K. R. *Conjectures and Refutations.* Routledge.
Scheffler, I. *The Anatomy of Inquiry.* Knopf.
Strawson, P. F. *Introduction to Logical Theory.* Methuen.

Foundations of Mathematics (Session 2)

Prequisite: Predicate Logic.

An introduction to a selection of problems concerning the foundations of Mathematics including the following topics: Non-Euclidean Geometry and consistency proofs, Axiomatics, Antinomies of naive set theory, Logicism, Intuitionism, Formalism, Gödel's Incompleteness result.

TEXTBOOK

Wilder, R. S. *An Introduction to the Foundations of Mathematics.* Wiley.

REFERENCE BOOKS

Benacerraf, P. & Putman, H. *Philosophy of Mathematics.* Prentice-Hall.
Blanche, R. *Axiomatics.* Routledge.
Fraenkel, A. A. & Bar-Hillel, Y. *Foundations of Set Theory.* North-Holland.
Kleene, S. C. *An Introduction to Meta-mathematics.* Princeton.
Korner, S. *The Philosophy of Mathematics.* Hutchinson.
Mendelson, E. *Mathematical Logic.* Van Nostrand.
Nagel, E. & Newman, J. R. *Gödel's Proof.* N.Y.U.P. or Routledge.

Argument (Session 2)

Prerequisite: Introductory Philosophy A and B.

A theoretical study of practical argumentation in the courtroom, politics and everyday life as compared with argument in logic, mathematics and

theoretical science. Confirmation and probability, authority, testimony, precedent; rules of debate; criteria of validity; problem of mechanization of practical arguments; logical rationalism and scepticism.

REFERENCE BOOKS

Ackermann, R. *Nondeductive Inference*. Routledge.
Hamblin, C. L. *Fallacies*. Methuen.
Hart, H. L. A. *The Concept of Law*. O.U.P.
Kneale, W. C. *Probability and Induction*. O.U.P.
Passmore, J. A. *Philosophical Reasoning*. Duckworth.
Toulmin, S. *The Uses of Argument*. C.U.P.

Logical Atomism (Session 2)

Prerequisite: Introductory Philosophy A and B.

A survey of the logical atomism of Russell and Wittgenstein and of the logical positivist movement.

TEXTBOOKS

Pears, D. ed. *Russell's Logical Atomism*. Fontana.
Wittgenstein, L. *Tractatus Logico-Philosophicus*. Pears, D. F. & McGuinness, B. F. trans. Routledge.

REFERENCE BOOKS

Reference books will be given in lectures.

Philosophy of Psychology (Session 2)

Prerequisite: Scientific Method.

A critical examination of some aspects of fundamental theory of psychology, with special emphasis on classical and contemporary behaviourism and behaviourist orientated psychology, and on the general conceptions of 'behaviour' and 'purpose'.

While Psychology I is not a prerequisite for this course, a preparatory survey of the introductory chapters of J. O. Whittaker's *Psychology* will be of value to students.

TEXTBOOK

Fodor, J. A. *Psychological Explanation*. Random House, 1968.

Philosophy of Biology (Session 2)

Prerequisite: Introductory Philosophy A and B.

An introduction to some of the problems associated with the philosophy of biology. Main consideration is the autonomy of biology; i.e., whether biology is in principle reducible to the physical sciences and, ultimately, to physics, or whether the biologist necessarily employs types of description and explanation that have no application in the explanation and description of merely physical phenomena. No prior knowledge of biology is assumed but candidates will be expected to familiarize themselves with the attitudes of various biologists to these issues.

TEXTBOOK

Nagel, E. *The Structure of Science*. Routledge.

REFERENCE BOOKS

Beckner, M. *The Biological Way of Thought*. Columbia U.P.
Agar, W. E. *A Contribution to the Theory of Living Organisms*. Melbourne U.P. and C.U.P.

Bertalanffy, L. von. *Problems of Life.* Watts & Co.
Bertalanffy, L. von. *Modern Theories of Development.* O.U.P.
Braithwaite, R. B. *Scientific Explanation.* C.U.P.
Haldane, J. S. *Mechanism, Life and Personality.* John Murray.
Haldane, J. S. *The Philosophical Basis of Biology.* Hodder & Stoughton.
Lillie, R. S. *General Biology and Philosophy of Organism.* Chicago U.P.
Schubert-Soldern, R. *Mechanism and Vitalism: Philosophical Aspects of Biology.* Notre Dame U.P.
Russell, E. S. *The Directiveness of Organic Activities.* C.U.P.
Sommerhoff, G., *Analytical Biology.* O.U.P.
Tinbergen, N. *The Study of Instinct.* O.U.P.
Woodger, J. H. *Biological Principles.* Routledge.
Woodger, J. H. *Biology and Language.* C.U.P.

Aesthetics (Session 2)

Prerequisite: Introductory Philosophy A and B.

An examination of the central concepts, types of judgment and theories occurring in the fields of aesthetics, art criticism and literary criticism.

TEXTBOOK

Coleman, F. J. ed. *Contemporary Studies in Aesthetics.* McGraw-Hill.

REFERENCE BOOKS

Boyce Gibson, A. *Muse and Thinker.* Methuen.
Elton, W. ed. *Aesthetics and Language.* O.U.P.
Gombrich, E. H. *Art and Illusion.* Phaidon.
Goodman, N. *Languages of Art.* Bobbs-Merrill.
Langer, S. K. *Problems of Art.* Scribners, N.Y.
Margolis, J. ed. *Philosophy Looks at the Arts.* Scribners.
Margolis, J. *The Language of Art and Art Criticism.* Wayne State U.P.
Vivas, E. & Murray, K. eds. *The Problems of Aesthetics.* Holt, Rinehart & Winston.
Wolheim, R. *Art and Its Objects.* Harper & Row.
Wittgenstein, L. *Lectures and Conversations on Aesthetics, Psychology, and Religion.* Barrett, C. ed. Blackwell.
Ziff, P. *Philosophic Turnings: Essays in Conceptual Appreciation.* O.U.P.

Existentialism (Session 2)

Not offered in 1973.

Prerequisite: Descartes.

Sartre's account of man-in-the-world. Sartre's ontology, his use of a phenomenological method and his ethics.

Plato and Aristotle (Session 2)

Prerequisite: Greek Philosophy: Thales to Plato.

A course centred around some of the later dialogues of Plato (*Parmenides, Theaetetus, Sophist*) and the *Categories* and *De Interpretatione* of *Aristotle.*

TEXTBOOK

Plato. *Parmenides, Theaitetos, Sophist, Statesman.* Everyman.

REFERENCE BOOKS

Allen, R. E. *Studies in Plato's Metaphysics.* Routledge.
Aristotle. *The Works of Aristotle Translated into English.* Vol. I. Logic. O.U.P.

Bamborough, R. ed. *New Essays on Plato and Aristotle.* Routledge & Kegan Paul.
Burnet, J. *Greek Philosophy.* Macmillan.
Cornford, F. M. *Plato and Parmenides.* Routledge.
Cornford, F. M. *Plato's Theory of Knowledge.* Routledge.
Crombie, I. M. *An Examination of Plato's Doctrines.* Vol. II. *Plato on Knowledge and Reality.* Routledge.
Moravcsik, J. M. E. *Aristotle.* Papermac.
Robinson, R. *Plato's Earlier Dialectic.* O.U.P.
Robinson, R. *Essays in Greek Philosophy.* O.U.P.
Ross, W. D. *Plato's Theory of Ideas.* O.U.P.
Vlastos, G. ed. *Plato. Vol. I. Metaphysics and Epistemology.* Macmillan.

Spinoza and Leibniz (Session 2)

Prerequisite: Descartes.

A study of the main issues raised in the philosophy of the two great seventeenth century rationalists, with emphasis upon the development of their metaphysical systems in response to unresolved problems in the philosophy of Descartes and to contemporary scientific thinking. Their ethical views.

TEXTBOOKS

Leibniz, G. W. *Selections.* Weiner, P. P. ed. Scribner.
Spinoza, B. *Ethics* and *On the Improvement of the Understanding.* Both available in *Works of Spinoza.* Elwes, R. H. M. trans. Dover.

REFERENCE BOOKS

Alexander, H. G. ed. *The Leibniz-Clarke Correspondence.* Manchester U.P.
Buehdahl, G. *Metaphysics and the Philosophy of Science.* Blackwell.
Copleston, A. *A History of Philosophy.* Vol. 4. Doubleday.
Curley, E. M. *Spinoza's Metaphysics: An Essay in Interpretation.* Harvard U.P.
Hallett, H. F. *Spinoza: The Elements of His Philosophy.* Athlone.
Joseph, H. W. B. *Lectures on the Philosophy of Leibniz.* Clarendon.
Leibniz, G. W. *Monadology and Other Writings.* Latta, R. H. ed. O.U.P.
Leibniz, G. W. *Discourse on Metaphysics.* Lucas, P. G. & Grint, L. eds. Manchester U.P.
Parkinson, G. H. R. *Logic and Reality in Leibniz's Metaphysics.* Clarendon.
Parkinson, G. H. R. *Spinoza's Theory of Knowledge.* Clarendon.
Rescher, N. *The Philosophy of Leibniz.* Prentice-Hall.
Russell, B. *The Philosophy of Leibniz.* Allen & Unwin.
Saw, R. L. *Leibniz.* Pelican.
Saw, R. L. *The Vindication of Metaphysics.* Macmillan.
Spinoza, B. *Earlier Philosophical Writings.* Hayes, F. A. trans. Library of Liberal Arts.

Set Theory (Session 1)

Prerequisite: Predicate Logic.

An axiomatic development of Zermelo-Fraenkel set theory, including a construction of the natural numbers, equinumerosity, ordinal and cardinal numbers, the axiom of choice and some of its consequences.

TEXTBOOK

Suppes, P. *Axiomatic Set Theory.* Van Nostrand.

REFERENCE BOOKS

Bernays, P. & Fraenkel, A. A. *Axiomatic Set Theory*. North Holland.
Fraenkel, A. A. *Abstract Set Theory*. North Holland.
Fraenkel, A. A. & Bar-Hillel, Y. *Foundations of Set Theory*. North Holland.
Halmos, P. *Naive Set Theory*. Van Nostrand.
Kalish, D. & Montague, R. *Logic: Techniques of Formal Reasoning*. Harcourt, Brace & World.
Quine, V. W. *Set Theory and Its Logic*. Harvard U.P.
Russell, B. *Introductions to Mathematical Philosophy*. Allen & Unwin.
Sierpinski, W. *Cardinal and Ordinal Numbers*. Polish Scientific Publishers.

Honours Seminar A (Session 1)

For Honours students in their second year. An examination of contemporary philosophical thought concerning, broadly speaking, the nature of ethical judgment.

TEXTBOOKS

Foot, P. *Theories of Ethics*. O.U.P.
Warnock, G. J. *Contemporary Moral Philosophy*. Macmillan.

Honours Seminar B (Session 2)

For Honours students in their second year. The course is based on articles from recent issues of philosophy journals. Students will be expected to read and prepare papers on an individual basis.

REFERENCE BOOKS

To be advised in class.

SCHOOL OF PHYSICS

The School of Physics provides both pass and honours courses. The pass course with major studies is available by taking Physics or Higher Physics units and may be completed in three years. This course may include the core units which aim to present a broad and balanced treatment of all branches of physics without undue emphasis on topics which may be temporarily prominent, and also a choice of elective units which aim to present more specific and detailed study in certain specialized areas. The course including Higher Physics units is normally a prelude to entry into the Honours year. These studies which are completed within the framework of the Science Course (see earlier) provide unit groupings which are appropriate for students seeking qualification as professional physicists, whether they intend to engage in research, industrial practice or the teaching of science.

A student intending to take a pass degree with a major in Physics must complete Physics 1.001, three level II Physics units and four level III Physics units of which three must be from 1.113A, B, C or D. Note that 10.001 Mathematics is a prerequisite of all Physics level II units and that 10.211A Applied Mathematics is a co-requisite of all Physics level II units. Students are also advised to take units 10.111A and 10.111B of Pure Mathematics in second year. Additional Mathematics units are prerequisite to Higher Physics level III units (see regulations). Students are also advised to complete supporting units in accordance with the Science Course regulations and will normally include 2.001 Chemistry I. It should be understood that units of corresponding higher subjects can often be substituted for those mentioned above.

HONOURS

A student intending to take Honours in Physics will normally complete the sequence of Higher Physics units 1.011; 1.122 A, B and C; 1.123 A, B, C and D. However, students with a very good record in Physics 1.001 or in 1.112 A, B and C may be considered for admission to Higher Physics units on application to the Head of School. Applied Mathematics 10.211A (or the Higher Applied Mathematics equivalent) is a co-requisite of Higher Physics level II units and Pure Mathematics 10.111A and B (or the Higher Pure Mathematics equivalents) are prerequisites to Higher Physics level III units. Students are also strongly advised to take Applied Mathematics units 10.212A and D (or equivalents) in their third year of study.

The following show typical programmes which, together with the prescribed General Studies subjects, complete requirements for a degree.

A. Pass Course Majoring in Physics (suitable for Science Teachers)

		Level	No. Units
	FIRST YEAR		
1.001	Physics	I	2
10.001	Mathematics	I	2
2.001	Chemistry	I	2
17.001	General and Human Biology	I	2

SECOND YEAR

		Level	No. Units
1.112A, B, C	Physics	II	3
10.211A	Applied Mathematics	II	1
25.111	Geoscience	I	2
	Other Units	II	2

THIRD YEAR

1.113A, B, C, D	Physics	III	4
2.002A, B, C	Chemistry	II	3
	Other Units	II/III	1

OR

B. Pass Course Majoring in Physics

FIRST YEAR

		Level	No. Units
1.001	*Physics	I	2
10.001	Mathematics	I	2
2.001	Chemistry	I	2
	Other Units	I	2

SECOND YEAR

1.112A, B, C	*Physics	II	3
10.211A	Applied Mathematics	II	1
	Other Units	II	4

THIRD YEAR

1.113A, B, C, D	Physics†	III	4
	Other Units	II/III	4

C. Leading to Honours in Physics

FIRST YEAR

		Level	No. Units
1.011	Higher Physics	I	2
10.001	Mathematics	I	2
2.001	Chemistry	I	2
	Other Units	I	2

SECOND YEAR

1.122A, B, C	Higher Physics	II	3
10.111A, B	Pure Mathematics	II	2
10.211A	Applied Mathematics	II	1
	Other Units	II	2

THIRD YEAR

1.123A, B, C, D	†Higher Physics	III	4
	‡Other Units	III	4

For footnotes, see overleaf.

* Admission to Physics level II units or to Higher Physics level II units normally requires completion of 1.001 Physics or 1.011 Higher Physics. Students who gain a superior pass in 1.041 Physics IC and who have also passed 10.001 Mathematics or 10.011 Higher Mathematics may, subject to the approval of the Head of School, be permitted to proceed to 1.112 Physics level II units.

† Students must note that certain Applied Mathematics level III units cannot be counted with certain Physics level III units.

‡ Entry to the Honours year may, subject to the approval of the Head of School, be permissible from a course containing as a minimum the four Higher Physics level III Units, A, B, C and D, plus four other level III units. Students are strongly advised to include Applied Mathematics level III units. Numerical Analysis, 10.212A and Mathematical Methods, 10.212D among the four elective units.

Physics Prizes

The following prizes are offered annually:

The School Prize, for the best overall performance in Physics level II units or Higher Physics level II units, value $40.

The Physics Staff Prize, for the best overall performance in Physics level III Units or Higher Physics level III Units. Value $60.

The Head of School's Prize, for the best performance in laboratory work at level III in the School of Physics, value $20.

The Physics IV Prize for the best performance in Physics IV, value $40.

1.001 Physics I

(For students taking 2 full years of Physics.)

Mechanics. Wave motion and sound. Physical optics. Electricity and magnetism.

TEXTBOOKS

Bueche, P. *Introduction to Physics for Scientists and Engineers.* McGraw-Hill.

Bueche, P. *A Workbook in Physics for Science and Engineering Students.* McGraw-Hill.

Dunlop, J. I. & Mann, K. *Introductory Electronics.* Clarendon.

Russell, G. J., Dunn, I. & Higinbotham, J. *Laboratory Notes for Physics I.* U.N.S.W.

Russell, G. J. & Mann, K. *Alternating Current Circuit Theory.* N.S.W.U.P.

1.011 Higher Physics I

(For students taking 2 full years of Physics.)

As for 1.001 but treated at greater depth.

TEXTBOOKS

Halliday, D. & Resnick, R. *Physics for Students of Science and Engineering.* Vols. I & II, or combined volume. Wiley.

Russell, G. J., Dunn, I. & Higinbotham, J. *Laboratory Notes for Physics I.* U.N.S.W.

Russell, G. J. & Mann, K. *Alternating Current Circuit Theory.* N.S.W.U.P.

Spiegel, M. R. *Theory and Problems of Theoretical Mechanics.* Schaum.

1.041 Physics IC

(For students taking only one full year of Physics.)

Mechanics, wave-motion and sound, optics, properties of matter, electricity and magnetism and modern physics.

TEXTBOOKS

(For students not taking further Physics.)

Giutronich, J. E. *Electricity*. Clarendon.

Halliday, D. & Resnick, R. *Physics for Students of Science and Engineering*. Vol. I. Wiley.

Lishmund, R. E. *Introductory Physical and Geometrical Optics*. U.N.S.W.

Parry, L. G. & Jennings, P. J. *Modern Physics*. U.N.S.W.

Russell, G. J., Dunn, I. & Higinbotham, J. *Laboratory Notes for Physics I*. U.N.S.W.

Russell, G. J. & Mann, K. *Alternating Current Circuit Theory*. N.S.W.U.P.

Physics Level II Units (Professional)

1.112A Electromagnetism

Electrostatics in vacuum and in dielectrics. Magnetostatics in vacuum and in magnetic materials. Maxwell's equations and simple applications.

TEXTBOOKS

Coster, H. G. L. *Experimental Physics*. U.N.S.W.

Reitz, J. R. & Milford, F. J. *Foundation of Electromagnetic Theory*. 2nd ed. Addison-Wesley.

1.112B Modern Physics

Special relativity. Quantum theory. Schrödinger wave equation and simple applications. Atomic and nuclear physics. Nuclear reactions.

TEXTBOOKS

Beiser, A. *Perspectives of Modern Physics*. Rev. ed. McGraw-Hill, 1969.

Coster, H. G. L. *Experimental Physics*. U.N.S.W.

1.112C Waves in Continuous Media and Thermodynamics

Waves in continuous media: Oscillations and forced vibrations, Fourier analysis, travelling waves and wave packets. *Thermodynamics:* First and second laws of thermodynamics. Thermodynamic functions and simple applications. Statistical foundations of thermodynamics.

TEXTBOOKS

French, A. P. *Vibrations and Waves*. Nelson, 1971.

Mandl, F. *Statistical Physics*. Wiley, 1971.

1.122A Electromagnetism

Further electrostatics. Poisson's and Laplace's equations. Ferro-magnetism. Maxwell's equations and application to waves in isotropic dielectrics. Poynting vector.

TEXTBOOK

Corson, D. & Lorrain, P. *Introduction to Electromagnetic Fields and Waves*. Freeman, 1962.

1.122B Quantum Physics

Syllabus as for 1.112B but treated at a higher level and including some solid state physics.

TEXTBOOK

Eisberg, R. M. *Fundamentals of Modern Physics.* Wiley, 1961.

1.122C Thermodynamics and Mechanics

Thermodynamics: as for 1.112C Thermodynamics but at higher level and with some additional topics. *Mechanics:* oscillations and forced vibrations. Lagrange's equation, variational principles, Hamilton's equations.

Note: 1.122A, B and C are units of Higher Physics II and the prerequisite is normally 1.011 Physics.

TEXTBOOKS

Symon, K. R. *Mechanics.* 2nd ed. Addison-Wesley, 1965.

Reif, F. *Fundamentals of Statistical and Thermal Physics.* McGraw-Hill, 1965.

(For all students taking level II Physics Laboratory.)

Coster, H. G. L. *Experimental Physics.* U.N.S.W.

1.212 Physics IIT

Any two of the following half-units.

1.212A Geometrical Optics

Reflection, Refraction. Thin and thick lenses and lens systems. Instruments and their aberrations. Photometry.

TEXTBOOK

Fincham, W. *Optics.* Hatton.

1.212B Electronics

Vacuum tubes and applications. Conduction in solids; solid state diodes, transistors, amplifiers, feed back.

TEXTBOOK

Smith, R. J. *Circuits, Devices and Systems.* 2nd ed. Wiley, 1972.

1.212C Introduction to Solids

Introductory quantum mechanics and atomic physics; crystal structure; point and line defects; introductory band theory; conductors, semiconductor and insulators; energy level diagrams.

TEXTBOOK

Wert, C. A. & Thomson, R. M. *Physics of Solids.* Int. Stud. Ed. McGraw-Hill, 1964.

1.212D Biophysics

Thermodynamic equilibrium, the first and second law of thermodynamics, chemical potential. Transport phenomena. Diffusion of electrolytes through membranes, bioelectric potentials. Excitability in nerve. Fixed charge systems. Active transport. Experimental techniques of Biophysics.

TEXTBOOK

To be announced in class.

Physics Level III Units

1.113A Wave Mechanics and Spectroscopy

Concepts, harmonic oscillator, uncertainty principle, the free particle, barriers, the hydrogen atom, many electron atoms, removal of degeneracy, spectroscopy, molecules, periodic potentials, band structure, perturbations.

TEXTBOOK

Beiser, A. *Perspectives of Modern Physics.* Rev. ed. McGraw-Hill, 1969.

1.113B Electromagnetic Fields and Physical Optics

Wave equation; propagation in dielectrics and ionized media; reflection and transmission; guided waves; coherence of radiation; interaction of radiation with matter; stimulated emission; laser oscillators; properties of laserlight; interferometry; diffraction; convolution theorem X-ray and neutron diffraction.

TEXTBOOK

Lipson, H. & S. S. *Optical Physics.* C.U.P., 1969.

1.113C Statistical Mechanics and Solid State

Thermodynamic potentials, ensembles and partition functions, lattice vibrations, the grand canonical ensemble, Pauli exclusion principle, Bose-Einstein and Fermi-Dirac distributions.

Structure of crystals, imperfections, specific heat. Band theory of solids, semiconductors.

TEXTBOOKS

Blakemore, J. S. *Solid State Physics.* Saunders, 1969.
Jackson, E. A. *Equilibrium Statistical Mechanics.* Prentice-Hall, 1968.

1.113D Astrophysics and Nuclear Physics

The observational environment, optical astronomy, radio astronomy, X-ray astronomy, stellar evolution, radio sources, the sun.

Detecting instruments and accelerators for nuclear particles, radioactive processes, nuclear reactions, angular distributions, mesons, baryons, excited nuclear states.

TEXTBOOK

Tayler, R. J. *The Stars: Their Structure and Evolution.* Wykeham Sci. Series.

Higher Physics Level III Units

1.123A Quantum Mechanics

Concepts, measurements, expectation values, wave mechanics, matrix mechanics, free particle and barrier problems, hydrogen atom spin, exclusion principle, stationary and time dependent perturbation methods, scattering. Born approximation and partial waves.

TEXTBOOK

Schiff, L. I. *Quantum Mechanics.* 2nd ed. McGraw-Hill.

1.123B Electromagnetic Theory and Statistical Mechanics

Metallic boundary conditions, eigenfunctions and eigenvalues, cavities, wave guides, scattering by a conductor, wave equation for potentials, radiation fields, Hertz potential, dipole and multi-pole radiation, radiated energy and angular momentum.

Statistical mechanics: Kinetic theory, the Boltzmann equation, Maxwell-Boltzmann distribution, Boltzmann's H-theorem; classical statistical mechanics: postulates, equipartition, ensembles, difficulties; quantum statistical mechanics; postulates, ensembles, Fermi and Bose statistics.

TEXTBOOKS

Corson, D. & Lorrain, P. *Introduction to Electromagnetic Fields and Waves.* Freeman, 1962.

Reif, F. *Fundamentals of Statistical and Thermal Physics.* McGraw-Hill.

1.123C Solid State and Nuclear Physics

Chystallography, binding energy, phonons, lattice conduction, free electron gas, band theory.

Nuclear models, binding energy, nuclear forces, elementary particles, nuclear reactions, radioactive decay.

TEXTBOOKS

Burcham, W. E. *Nuclear Physics, an Introduction.* Longmans, 1963.

Kittel, C. *Introduction to Solid State Physics.* 3rd ed. Wiley, 1967.

1.123D Atomic Physics and Spectroscopy

Collision parameters, transport coefficients, potential functions, atomic collisions, scattering of heavy particles, scattering of electrons, avalanche formation, recombination, radiation processes, stimulated emission, detectors.

Spectrum of hydrogen, fine structure, electron spin, vector treatment of spectroscopy, emission and absorption of radiation, diatomic molecules.

TEXTBOOKS

McDaniel, E. W. *Collision Processes in Ionised Gases.* Wiley, 1964.

White, H. W. *Introduction to Atomic Spectra.* McGraw-Hill, 1934.

Physics Level III Supplementary Units

1.133A Electronics

A.C. circuit analysis, band theory of semiconductors, diode, field effect transistor, rectifier circuits, power supplies, single and multistage amplifiers, positive feedback, oscillators.

TEXTBOOKS

Delaney, C. F. G. *Electronics for the Physicist.* Penguin, 1969.

Russell, G. J. & Mann, K. *Alternating Current Circuit Theory.* N.S.W.U.P.

Transistor Manual. General Electric Co. 1972 *or* 1971.

1.143A Biophysics

Ear and sound, eye and light, impulses by nerves, the brain, hearing, vision muscles, heart-beat, structure of proteins, nucleic acid, radiation effects, enzymes, diffusion and permeability.

TEXTBOOK

Ackerman, E. *Biophysical Science.* Prentice-Hall, 1962.

1.143B Solid State Devices and Electronics

(Syllabus follows on from 1.133A which is a prerequisite.)

Generalized amplifiers, negative feedback, special amplifiers, regulated power supplies, modulation, pulse circuits, silicon-controlled rectifier circuits, instruments.

TEXTBOOKS

Gibbons, J. F. *Semiconductor Electronics.* McGraw-Hill, 1966.
S.C.R. Handbook. General Electric Co.
Van der Ziel, A. *Introduction to Electronic Circuits.* Allyn & Bacon, 1969.

1.143C Magnetism

Diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, domains, technical magnetism, geomagnetism, magnetic resonances as a tool in solid state research.

TEXTBOOK

No set text.

1.143D Conceptual Framework of Physics

Physics and Metaphysics: The place of speculation in theory formation. Space and Time: Systems of coordinates, the nature and arrow of time, parity, micro causality. Fundamental Physical Phenomena: The fundamental phenomena on which physical theories have been based; electrical, gravitational, inertial nuclear and entropy/probability. Field Theory: In particular e.m. and gravitational field theory. Mathematical formalization of physical phenomena, action at a distance, field propagation, field energy, connection to relativity. Relativity: The fundamental postulates, simultaneity, limiting speeds, connection with field theory, mass and energy. Relationship between Micro- and Macro-Cosmos: Divisibility of matter (molecules, atoms, nuclei, nucleon), matter and anti matter, statistical nature of the behaviour of large aggregates or systems, the concept of entropy, the second law of thermodynamics. The place of determinism in physics. Matter and Energy: Conservation laws, inertial mass, equivalence principle, field energy, spatial delimitation of material particles. Theory of Quantum Processes: Granularity effects, uncertainty principle, effects of measurements, virtual processes. Determinism vs. indeterminism in physics, application to nuclear phenomena.

TEXTBOOK

No set text.

1.143E Electrical and Optical Properties of Solids

Equilibrium properties of semiconductors and insulators, conductivity, excess carriers, flow equations, contact barriers; luminescence, relaxation phenomena.

TEXTBOOKS

Adler, R. B., Smith, A. C. & Longini, L. D. *Introduction to Semiconductor Physics.* Wiley, 1964.

Blakemore, J. S. *Solid State Physics.* Saunders, 1969.

Gray, P. E., De Witt, D., Boothroyd, A. R. & Gibbons, J. F. *Physical Electronics and Circuit Models of Transistors.* Wiley.

Physics Higher Level III Supplementary Units

1.153A Hydrodynamics and Magnetohydrodynamics

Not offered in 1972.

1.153B Relativity and Electromagnetism

Scalars and vectors in non-Cartesian frames. Principle of relativity and signal propagation. Space-time. Four-vectors. Mass-energy. Four-momentum. Electromagnetic field equations. Gauges. Wave equation. Solutions. Introductory tensors. Field tensor. Stress tensor. Four-momentum of free field. Moving charges. Electromagnetic mass.

TEXTBOOK

No set text.

1.114 Physics IV (Honours)

Four compulsory courses:

Quantum Mechanics

TEXTBOOK

Schiff, L. F. *Quantum Mechanics.* 3rd ed. McGraw-Hill, 1968.

Statistical Mechanics

TEXTBOOK

No set text.

Solid State Physics

TEXTBOOKS

Goldsmid, H. J. *Problems in Solid State Physics.* Pion, 1968.

Kittel, C. *Introduction to Solid State Physics.* 4th ed. Wiley, 1971.

Low Energy Nuclear Physics

TEXTBOOK

Blatt, J. M. & Weisskopf, V. F. *Theoretical Nuclear Physics.* Wiley, 1952.

Statistical Mechanics

TEXTBOOK

No set text.

Four electives chosen from:

Non-equilibrium Statistical Mechanics
TEXTBOOK
No set text.

Methods of Solid State Physics
TEXTBOOK
No set text.

Solid State Applications
TEXTBOOK
Beeforth, T. H. & Goldsmid, H. J. *Physics Solid State Devices.* Pion-London, 1970.

Dielectric and Defect Properties of Solids
TEXTBOOK
No set text.

Biophysics
TEXTBOOKS
Katchalsky, A. & Curran, P. F. *Non Equilibrium Thermodynamics in Biophysics.* Harvard U.P., 1965.
Prigogine, I. *Introduction to Thermodynamics of Irreversible Processes.* Interscience, 1967.

Physical Acoustics
TEXTBOOK
No set text.

Quantum Electrodynamics
TEXTBOOK
No set text.

Nuclear Fields
TEXTBOOK
No set text.

Diffraction Theory
TEXTBOOK
No set text.

SCHOOL OF PHYSIOLOGY AND PHARMACOLOGY

FOR STUDENTS IN THE SCIENCE COURSE

Courses in physiology for students in the Science Course were commenced in 1963. During the second and third years of their BSc course, students may take Principles of Physiology and Physiology II. Students reaching an adequate standard in these subjects may proceed to a BSc degree with honours by taking Physiology III during the fourth year of the course. For the present, Physiology will be available only as a day course.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page B27.

73.011A Principles of Physiology

An introductory course in physiology. It considers in some detail the basic problems of homeostasis encountered in man and animals. Function is considered at cellular and systemic levels, and examples are drawn from mammalian and invertebrate species.

TEXTBOOK

Vander, A. J., Sherman, J. H. & Luciano, D. S. *Human Physiology*. McGraw-Hill, 1970. ($12.50).

73.012 Physiology II

An advanced course in the principles of physiology, centred on four major areas: circulation, respiration, control of body fluids and neurophysiology.

TEXTBOOKS

Lists given from time to time.

The course consists of lectures, tutorials, seminars and laboratory work. On some occasions students may be required to attend at other times for the maintenance and treatment of experimental animals.

SCHOOL OF PSYCHOLOGY

The study of psychology as a formal discipline in undergraduate courses is traditional in Australian Universities. Psychology as a subject is concerned with the systematic study of human behaviour and associated mental processes. The School of Psychology offers psychology as a major subject in the full-time Arts and Science Courses and also offers a full-time undergraduate professional degree course in psychology in the Faculty of Biological Sciences.

In the Science course, Psychology may be studied as a major sequence in accordance with Science course regulations. A student who wishes to proceed to Honours in Psychology should refer to the requirements set out in Clause 2(b) of the same regulations.

The four-year course in Psychology, which leads to the degree of Bachelor of Science in the Faculty of Biological Sciences, is a full-time course designed to meet the requirements of students who intend to become professional psychologists, as either practitioners or research workers. It provides extensive study of psychological theory and practice, supported by an appropriate selection of other subjects. Full details of this course are given on pages B17-19.

Prizes in Psychology

The *Australian Psychological Society* Prize in Psychology is awarded annually to a fourth-year student. The Society also awards annually two-years Student Subscriberships to the *Australian Journal of Psychology* to two outstanding students at the end of second year.

The Staff Prize in Psychology is awarded annually to an outstanding second-year student.

12.001 Psychology I

An introduction to the content and methods of psychology as a behavioural science, with special emphasis on (a) the biological and social bases of behaviour, (b) learning, and (c) individual differences.

The course includes training in methods of psychological enquiry, and the use of elementary statistical procedures.

Part A: Theory

TEXTBOOKS

Hebb, D. O. *Textbook of Psychology*. 2nd ed. Saunders, London, 1966. (Recommended as an additional textbook for intending Honours students.)

Morgan, C. T. & King, R. A. *Introduction to Psychology*. 4th ed. McGraw-Hill, 1971.

REFERENCE BOOKS

Allport, G. W. *Pattern and Growth in Personality*. Holt, 1961.

Allport, G. W. *Personality*. Holt, 1937.

Anastasi, A. *Individual Differences.* Wiley, 1965.
Beech, H. R. *Changing Man's Behaviour.* Penguin, 1969.
Coopersmith, S. *Frontiers of Psychological Research.* Readings from Scientific American. Freeman, 1964.
Cronbach, L. J. *Essentials of Psychological Testing.* 2nd ed., 1960, *or* 3rd ed., 1970. Harper & Row.
Deese, J. *Psycholinguistics.* Allyn & Bacon, 1970.
Lazarus, R. S. *Personality.* 2nd ed. Prentice-Hall, 1971.
McGaugh, J. L., Weinberger, N. M. & Whalen, R. E. *Psychobiology: The Biological Bases of Behavior.* Readings from Scientific American. Freeman, 1966.
McKinney, F. *Understanding Personality: Cases in Counselling.* Houghton, 1965.
Reynolds, G. *Primer of Operant Conditioning.* Scott, Foresman, 1968.
Vernon, P. E. *Personality Assessment: A Critical Survey.* Methuen, 1964.
Vernon, P. E. *Personality Tests and Assessments.* Methuen, 1953.
Walker, E. L. *Conditioning and Instrumental Learning.* Brooks/Cole, 1967.

Part B: Practical

TEXTBOOK

Lumsden, J. *Elementary Statistical Method.* Univ. of W.A. Press, 1969.

12.004 Psychology IV

Psychology IV in the BSc (Psychology) course. A program of selected study from the School's Advanced Electives. In consultation with the Head of School or his representative, plus a research thesis or project. Combinations of electives are available for students intending to specialize in areas of professional practice (e.g., clinical, industrial, educational psychology) or in research.

TEXTBOOKS

To be determined in consultation with Head of School.

12.042 Psychology IIA

(BSc Psychology students only.)

Observational methods and laboratory instrumentation in applied psychology.

REFERENCE BOOKS

Bradford, L. P., Gibb, J. R. & Benne, K. D. *T-Group Theory and Laboratory Method.* Wiley, 1964.
Kleinmuntz, B. *Personality Measurement.* Dorsey, 1967.
Richardson, S. A., Dohrenwend, E. S. & Klein, D. *Interviewing: Its Forms and Functions.* Basic Books, 1965.
Shouksmith, G. *Assessment Through Interviewing.* Pergamon, 1968.
Sidowski, J. B. *Experimental Methods & Instrumentation in Psychology.* McGraw-Hill, 1966.
Webb, E. J., Campbell, D. T., Schwartz, R. D. & Seechrest, L. *Unobtrusive Measures: Non-reactive Research in the Social Sciences.* Rand McNally, 1966.

12.152 Research Methods II

General introduction to the design and analysis of experiments; hypothesis testing, estimation, power analysis; general treatment of simple univariate procedures; correlation and regression.

TEXTBOOKS

Campbell, D. T. & Stanley, J. C. *Experimental and Quasi-experimental Designs for Research.* Rand McNally, 1963.

Ewen, R. B. *Introductory Statistics for the Behavioral Sciences Workbook.* Academic, 1971.

Welkowitz, J., Ewen, R. B. & Cohen, J. *Introductory Statistics for the Behavioral Sciences.* Academic, 1971.

REFERENCE BOOKS

Hays, W. L. *Statistics.* Holt Int. Ed. Holt, Rinehart & Winston, 1969.

Lumsden, J. *Elementary Statistical Method.* Uni. of W.A. Press, 1969.

McGuigan, F. J. *Experimental Psychology: A Methodological Approach.* 2nd ed. Prentice-Hall, 1968.

Underwood, B. J. *Psychological Research.* Appleton-Century-Crofts, 1957.

12.153 Research Methods IIIA

Introduction to analysis of variance—one way and complete factorial designs. Elementary Fortran programming, emphasizing editing of data for use in package programmes.

TEXTBOOKS

Hays, W. L. *Statistics.* International ed. Holt, Rinehart & Winston, 1969.

and either

Blatt, J. M. *Introduction to Fortran IV Programming: Using the Watfor Computer.* Goodyear Pub. Coy, 1968 (or later).

or

Lee, R. M. *A Short Course in Fortran IV Programming.* McGraw-Hill, 1967.

12.163 Research Methods IIIB

Experimental Design; complex analysis of variance; planned and *post hoc* comparisons; multivariate procedures as data reduction techniques.

TEXTBOOKS

Hays, W. L. *Statistics.* International Ed. Holt, Rinehart & Winston, 1969.

Lieberman, B. *Contemporary Problems in Statistics.* O.U.P., 1971.

REFERENCE BOOKS

Nunnally, J. *Psychometric Theory.* McGraw-Hill, 1967.

Winer, B. J. *Statistical Principles in Experimental Design.* McGraw-Hill, 1962.

12.173 Psychological Issues

Historical background to modern psychology, emphasizing philosophical, conceptual, and methodological problems. Literature project.

TEXTBOOKS

Mischel, T. *Human Action: Conceptual and Empirical Issues.* Academic Press, 1969.

Simpkins, L. D. *The Basis of Psychology as a Behavioural Science.* Blaidsell, 1969.

12.252 Learning II

History of the study of learning. Basic phenomena of conditioning and verbal and perceptual motor learning. Problems and applications.

TEXTBOOKS

Deese, J. & Hulse, S. H. *The Psychology of Learning*. McGraw-Hill, Tokyo, 1967.
Selected Bobbs-Merrill Reprints.

REFERENCE BOOKS

Boe, E. E. & Church, R. M. eds. *Punishment: Issues and Experiments*. Appleton, 1968.
Bolles, R. C. *Theory of Motivation*. Harper, 1967.
Carroll, J. B. *Language and Thought*. Foundations of Modern Psychology Series. Prentice-Hall, 1964.
Honig, W. K. ed. *Operant Conditioning*. Appleton, 1966.
Kimble, G. A. *Hilgard & Marquis' Conditioning and Learning*. Appleton, 1961.
Mednick, S. A. *Learning*. Foundations of Modern Psychology Series. Prentice-Hall, 1964.
Pavlov, I. P. *Conditioned Reflexes*. Dover, 1960.
Prokasy, W. F. ed. *Classical Conditioning*. Appleton, 1965.
Reynolds, G. S. *A Primer of Operant Conditioning*. Scott, Foresman, 1968.

12.253 Learning IIIA

Current experimental and theoretical problems in learning; classical and operant conditioning; reinforcement issues; aversive control of behaviour.

TEXT AND REFERENCE BOOKS

As for 12.252 Learning II.

12.302 Personality II

History of the study of personality. Developmental influences. Tests and assessments and their applications in the prediction of behaviour.

REFERENCE BOOKS

As for 12.303 Personality IIIA.

12.303 Personality IIIA

The development and structure of personality, with reference to biological and social determinants. Problems of theory and measurement.

REFERENCE BOOKS

Major Reference Books

Lazarus, R. S. & Opton, E. M. *Personality*. Penguin, 1967.
Mischel, W. *Introduction to Personality*. Holt, Rinehart & Winston, 1971.
Sarason, I. G. *Personality: An Objective Approach*. Wiley, 1966.
Sarnoff, I. *Personality Dynamics and Development*. Wiley, 1962.

This course cannot be covered adequately by any one book. Consequently reference books only are listed. The first four of these are considered to be the more significant. It is suggested that students could form themselves into syndicates and thereby acquire these four reference books.

Other Reference Books

Baughman, E. E. *Personality: The Psychological Study of the Individual.* Prentice-Hall, 1972.
Bischof, L. J. *Adult Psychology.* Harper & Row, 1969.
Blum, G. S. *Psychodynamics: The Science of Unconscious Mental Forces.* Wadsworth, 1966.
Lazarus, R. S. *Patterns of Adjustment & Human Effectiveness.* McGraw-Hill, 1969.
Lundin, R. W. *Personality: A Behavioral Analysis.* Collier-Macmillan, 1969.
McCurdy, H. G. *The Personal World.* Harcourt, 1961.
McNeil, E. B. *The Concept of Human Development.* Wadsworth.
Martin, W. & Stendler, C. R. *Readings in Child Development.* Harcourt, 1961.
Mednick, M. & Mednick, S. *Research in Personality.* Holt, 1964.
Tucker, I. F. *Adjustment: Models and Mechanisms.* Academic, 1970.
Vernon, P. E. *Personality Tests and Assessments.* Methuen, 1953.
Vernon, P. E. *Personality Assessment.* Methuen, 1964.

12.313 Personality IIIB

The psychology of interpersonal relationships and transactions. Techniques of interpersonal influence.

TEXTBOOK

Ehrenwald, J. ed. *From Medicine Man to Freud.* Dell, 1956.

REFERENCE BOOKS

Carkhuff, R. R. & Berenson, B. G. *Beyond Counselling and Therapy.* Holt, Rinehart & Winston, 1967.
Carkhuff, R. R. *Helping and Human Relations.* Vol. I: *Selection and Training.* Vol. II: *Practice and Research.* Holt, Rinehart & Winston, 1969.
Carkhuff, R. R. *The Development of Human Resources.* Holt, Rinehart & Winston, 1971.

12.322 Motivation II

The spectrum of human motivation and emotion: hunger, sex, fear, stress, achievement, altruism, personal causation.

TEXTBOOK

Murray, E. J. *Motivation and Emotion.* Foundations of Modern Psychology Series. Prentice-Hall, 1964.

12.323 Motivation IIIA

A study of the conditions governing the arousal and direction of behavioural sequences, with particular reference to the social determinants of the goals of behaviour.

TEXTBOOKS

Murray, E. J. *Motivation and Emotion.* Foundations of Modern Psychology Series. Prentice-Hall, 1964.
Russell, W. A. ed. *Milestones in Motivation: Contribution to the Psychology of Drive and Purpose.* Appleton-Century-Crofts, 1970.

REFERENCE BOOKS

Atkinson, J. W. ed. *Motives in Fantasy, Action and Society.* Van Nostrand, 1958.
Atkinson, J. W. *An Introduction to Motivation.* Van Nostrand, 1964.
Atkinson, J. W. & Feather, N. eds. *Theory of Achievement Motivation.* Wiley, 1966.
Berkowitz, L. *Aggression: A Social Psychological Analysis.* McGraw-Hill, 1962.
Bolles, R. C. *Theory of Motivation.* Harper, 1966.
Brown, J. S. *The Motivation of Behaviour.* McGraw-Hill, 1961.
Buss, A. H. *The Psychology of Aggression.* Wiley, 1961.
Cattell, R. B. *Personality and Motivation, Structure and Measurement.* World Book Co., 1957.
Cofer, C. N. & Appley, M. H. *Motivation Theory and Research.* Wiley, 1964.
De Charms, R. *Personal Causation.* Academic, 1969.
Haber, R. N. ed. *Current Research in Motivation.* Holt, 1966.
Hall, J. F. *Psychology of Motivation.* Lippincott, 1961.
Hall, J. F. *The Psychology of Learning.* Lippincott, 1966.
Heckhausen, H. *The Anatomy of Achievement Motivation.* Academic, 1967.
Hokanson, J. E. *The Physiological Bases of Motivation.* Wiley, 1969.
Lazarus, R. S. *Psychological Stress and the Coping Process.* McGraw-Hill, 1966.
Macaulay, J. & Berkowitz, L. eds. *Altruism and Helping Behaviour.* Academic, 1970.
Mednick, M. T. & Mednick, S. A. eds. *Research in Personality.* Holt, 1963.
McClelland, D. C. ed. *Studies in Motivation.* Appleton, 1955.
Peters, R. S. *The Concept of Motivation.* Routledge, 1958.
Stacey, C. L. & De Martino, M. F. eds. *Understanding Human Motivation.* Allen, 1958 & 1963.
Yates, A. J. *Frustration and Conflict.* Methuen, 1963.
Young, P. T. *Motivation and Emotion.* Wiley, 1961.

12.372 Psychological Assessment II

Introduction to the theory of psychological measurement. Properties of scales; elementary scaling methods. Test theory.

TEXTBOOKS

Gathercole, C. E. *Assessment in Clinical Psychology.* Penguin, 1968.
Hays, W. L. *Basic Statistics.* Brooks/Cole, 1967.
Hays, W. L. *Quantification in Psychology.* Brooks/Cole, 1967.

12.373 Psychological Assessment (Testing) IIIA

Principles and techniques of psychological assessment. Types of tests and their application in selection and allocation procedures.

TEXTBOOK

Anastasi, A. *Psychological Testing.* Macmillan, 1968.

REFERENCE BOOKS

Cronbach, L. J. *Essentials of Psychological Testing.* 3rd ed. Harper, 1970.
Helmstadter, G. C. *Principles of Psychological Measurement.* Appleton, 1964.
Nunnally, J. C. *Tests and Measurements.* McGraw-Hill, 1959.
Vernon, P. E. *Intelligence and Attainment Tests.* U.L.P., 1960.
Vernon, P. E. *The Structure of Human Abilities.* Methuen, 1961.

12.383 Psychological Assessment (Psychometric Theory) IIIB

Uni-dimensional and multi-dimensional scaling models. Test theory, factor analysis, and other multivariate methods.

TEXTBOOKS

Hammer, A. G. *Elementary Matrix Algebra for Psychologists.* Pergamon.
Nunnally, J. *Psychometric Theory.* McGraw-Hill, 1967.

REFERENCE BOOKS

Cattell, R. B. ed. *Handbook of Multivariate Experimental Psychology.* Rand McNally, 1966.
Coombs, C. H. et al. *Mathematical Psychology. An Elementary Introduction.* Prentice-Hall, 1970.
Torgerson, W. S. *Theory and Methods of Scaling.* Wiley, 1958.
Van der Geer, J.P. *Introduction to Multivariate Analysis for the Social Sciences.* Freeman, 1971.
Whitla, D. K. ed. *Handbook of Measurement and Assessment in Behavioral Sciences.* Addison-Wesley, 1968.

12.402 Physiological Psychology

(BSc Psychology students only.)
Neural and endocrinal bases of behaviour, psychophysiology, comparative behaviour (including ethology), behaviour genetics, with brief treatments of the behavioural effects of drugs and physiological malfunction.

TEXTBOOKS

Hokanson, J. E. *The Psychological Bases of Motivation.* Wiley, 1969.
Isaacson, R. L. Douglas, R. J., Lubar, J. F. & Schmaltz, L. W. *A Primer of Physiological Psychology.* Harper & Row, 1971.

REFERENCE BOOK

Thompson, R. *Foundations of Physiological Psychology.* Harper, 1967.

12.412 Physiological Psychology II

Elementary neurophysiology and neuroanatomy. Neural and endocrinal bases of sensory and motor processes, motivation, emotion and learning.

TEXT AND REFERENCE BOOKS

As for 12.402 Physiological Psychology.

12.413 Physiological Psychology IIIA

Advanced treatment of physiology of motivation, emotion and learning with practical work. Psychopharmacology; psychophysiology; genetics and behaviour.

TEXT AND REFERENCE BOOKS

As for 12.402 Physiological Psychology.

12.452 Human Information Processing II

An introduction to psychophysical methods by which man's ability to make discriminations is measured, and the application of these methods to problems of perception, learning and memory.

TEXTBOOKS

McNicol, D. *A Primer of Signal Detection Theory.* Allen & Unwin, 1971.
Norman, D. *Memory and Attention.* Wiley, 1969.

REFERENCE BOOKS

Annett, J. *Feedback and Human Behaviour.* Penguin, 1969.
Mackworth, J. F. *Vigilance and Habituation.* Penguin, 1969.
Mackworth, J. F. *Vigilance and Attention.* Penguin, 1970.
Moray, N. *Listening and Attention.* Penguin, 1969.
Neisser, U. *Cognitive Psychology.* Appleton-Century-Crofts, 1967.

12.453 Human Information Processing IIIA

A study of the stages involved in the reception of stimulus information from the environment, its analysis, storage, and translation into responses. Particular emphasis will be given to the perception and storage of verbal information. Topics include attention, vigilance, discrimination, memory and retrieval.

TEXT AND REFERENCE BOOKS

As for 12.452 Human Information Processing II.

12.472 Perception II

Modern approaches to the study of perception and their historical antecedants. Consideration will be given to the differing emphases of theories in terms of the phenomena considered and the variables utilized in the attempted explanations.

TEXTBOOK

Hochberg, J. E. *Perception.* Prentice-Hall, 1964.

REFERENCE BOOKS

Boring, E. G. *A History of Experimental Psychology.* 2nd ed. Appleton, 1950.
Dember, W. N. *The Psychology of Perception.* Holt, 1960.
Dodwell, P. C. ed. *Perceptual Learning and Adaptation.* Penguin, 1970.
Gibson, E. J. *Principles of Perceptual Learning and Development.* Appleton-Century-Crofts, 1969.
Gibson, J. J. *The Senses Considered as Perceptual Systems.* Allen & Unwin, 1966.
Gregory, R. L. *Eye and Brain.* Weidenfeld & Nicolson, 1966.
Gregory, R. L. *The Intelligent Eye.* Weidenfeld & Nicolson, 1970.
Haber, R. N. ed. *Contemporary Theory and Research in Visual Perception.* Holt, Rinehart & Winston, 1968.
O'Neil, W. M. *The Beginnings of Modern Psychology.* Penguin, 1968.

12.473 Perception IIIA

The characteristics and processes of visual perception. Topics include the basic requirement for visual perception and the relative contributions of the observer and the stimulus in a range of visual situations.

TEXT AND REFERENCE BOOKS

As for 12.472 Perception II.

12.483 Perception IIIB

Man in a spatial environment. A study of the organization and stability of the visual world with particular reference to the constancies, object movement, eye movement and locomotion.

TEXTBOOK

Haber, R. N. ed. *Contemporary Theory and Research in Visual Perception.* Holt, Rinehart & Winston, 1968.

REFERENCE BOOKS

Cornsweet, T. N. *Visual Perception.* Academic, 1970.
Day, R. H. *Human Perception.* Wiley Australasia, 1969.
Dodwell, P. C. ed. *Perceptual Learning and Adaptation.* Penguin, 1970.
Graham, C. H. ed. *Vision and Visual Perception.* Wiley, 1965.

12.502 Social Psychology II

A study of behaviour in a variety of interpersonal situations. Culture and social structure as determinants of the range and content of behaviour.

TEXTBOOKS

Freedman, J. L., Carlsmith, J. M. & Sears, D. O. *Social Psychology.* Prentice-Hall, 1970.
Proshansky, H. M., Ittelson, W. H. & Rivlin, L. G. eds. *Environmental Psychology: Man and his Physical Setting.* Holt, Rinehart & Winston, 1970.

12.503 Social Psychology IIIA

The bases of interpersonal attraction; class and race as determinants of behaviour; the experimental study of social processes in small groups; cross-cultural studies of social influence.

TEXTBOOKS

As for 12.502 Social Psychology II.

12.552 Developmental Psychology II

A study of the acquisition, maintenance and modification of behaviour in the developing human organism.

REFERENCE BOOKS

Bischof, L. J. *Adult Psychology.* Harper & Row, 1969.
C.R.M. *Developmental Psychology Today.* CRM Books, Del Mar, 1971.
Danziger, K. *Socialization.* Penguin, 1971.
Engel, G. L. *Psychological Development in Health & Disease.* Saunders, 1962.
Hurlock, E. B. *Developmental Psychology.* 3rd ed. or later. McGraw-Hill, 1968.
Lidz, T. *The Person.* Basic Books, 1968.
Luria, A. R. & Yudovich, F. La. *Speech and the Development of Mental Processes in the Child.* Penguin, 1971.
Mussen, P. H., Conger, J. J. & Kagan, J. *Child Development and Personality.* 3rd ed. Harper International, 1969.
Nash, J. *Developmental Psychology: A Psychobiological Approach.* Prentice-Hall, 1970.
Rayner, E. *Human Development: An Introduction to the Psychodynamics of Growth, Maturity and Ageing.* Allen & Unwin, 1971.

Sebald, H. *Adolescence*. Appleton-Century-Crofts, 1968.
Sluckin, W. *Early Learning in Man and Animal*. Allen & Unwin, 1970.
Wesley, F. *Child-rearing Psychology*. Behavioral Publications, N.Y., 1971.
Woodward, W. M. *The Development of Behaviour*. Penguin, 1971.

12.553 Developmental Psychology IIIA

The study of individual differences and basic psychological processes within a developmental framework. Psychological processes at various stages from infancy to senescence.

REFERENCE BOOKS

As for 12.552 Developmental Psychology II.

12.602 Abnormal Psychology II

Concepts of normality, neurosis and psychosis. The range of behaviour disorders. Medical, dynamic and behavioural models of psyochopathology.

TEXTBOOKS

Buss, A. H. *Psychopathology*. Wiley, 1966.
Maher, B. A. *Principles of Pyschopathology*. McGraw-Hill, 1966.

REFERENCE BOOKS

Freedman, A. M. & Kaplan, H. I. *A Comprehensive Textbook of Psychiatry*. Williams & Wilkins, 1967.
Kisker, G. W. *The Disorganized Personality*. McGraw-Hill, 1972.

12.603 Abnormal Psychology IIIA

Conflict, anxiety and avoidance behaviour. Anti-social behaviour, psychosomatic disorders, brain pathology, mental deficiency, schizophrenia, depression, methods of diagnosis and treatment.

TEXTBOOKS

Buss, A. H. *Psychopathology*. Wiley, 1966.
Gorlow, L. & Katkovsky, W. *Readings in the Psychology of Adjustment*. McGraw-Hill, 1968.
Maher, B. A. *Principles of Psychopathology*. Mc-Graw Hill, 1966.
Wolpe, J. *The Practice of Behaviour Therapy*. Permagon, 1969.

REFERENCE BOOKS

Beck, A. T. *Depression*. Staples, 1967.
Eysenck, H. J. *Experiments in Behaviour Therapy*. Pergamon, 1964.
Eysenck, H. J. & Rachman, S. *The Causes and Cures of Neurosis*. Routledge, 1965.
Fenichel, O. *The Psychoanalytic Theory of Neurosis*. Norton, 1945.
Frank, C. *Behaviour Therapies*. McGraw-Hill, 1969.
Freedman, A. M. & Kaplan, H. I. *A Comprehensive Textbook of Psychiatry*. Williams & Wilkins, 1967.
Jackson, D. D. ed. *The Aetiology of Schizophrenia*. Basic, 1960.
Kisker, G. W. *The Disorganized Personality*. McGraw-Hill, 1972.
Lidz, T. *The Person*. Basic Books, 1968.
Pronko, N. K. *Textbook of Abnormal Psychology*. Williams & Wilkins, 1963.
Rachman, S. *Critical Essays on Psychoanalysis*. Pergamon, 1963.
Shirley, H. F. *Pediatric Psychiatry*. Harvard U.P., 1963.

12.623 Guidance and Counselling III

The application of Psychological Tests and other techniques of appraisal to educational and vocational selection and guidance. Advice, and other procedures used to assist client decision making.

TEXTBOOKS

Dunnett, M. D. *Personnel Selection and Placement.* Tavistock, 1966.
Tyler, L. *The Work of the Counsellor.* Appleton, 1961.

12.653 Industrial Psychology III

The role of the psychologist in industry. Social, psychological and physical conditions affecting work behaviour. Selected aspects of human factors engineering and of human and industrial relations.

TEXTBOOKS

Goldthorpe, J. H. et al. *The Affluent Worker.* C.U.P., 1968.
McCormick E. J. *Human Factors Engineering.* 3rd ed. McGraw-Hill, 1970.

REFERENCE BOOKS

Boritz, L. *Servants of Power.* Science Editions, 1960.
Herzberg, F. *Work and the Nature of Man.* Staples Press, 1966.
White, W. H. *The Organization Man.* Penguin, 1956.

12.703 Psychological Techniques

Laboratory techniques, including the use of recording stimulating, and control equipment. Observation, and other forms of appraisal.

REFERENCE BOOKS

Bradford, L. P., Gibb, J. R. & Benne, K. D. *T-Group Theory and Laboratory Method.* Wiley, 1964.
Kleinmuntz, B. *Personality Measurement.* Dorsey, 1967.
Richardson, S. A., Dohrenwend, E. S. & Klein, D. *Interviewing: Its Forms and Functions.* Basic Books, 1965.
Shouksmith, G. *Assessment Through Interviewing.* Pergamon, 1968.
Webb, E. J., Campbell, D. T., Schwartz, R. D. & Seechrest, L. *Unobstrusive Measures: Non-reactive Research in the Social Sciences.* Rand McNally, 1966.

12.713 Behaviour Control and Modification

Aversive and appetitive reinforcement in the control and modification of undesirable behaviour. The conditions of attitude change and behavioural influence. Ethical Issues.

TEXTBOOKS

Bandura, A. *The Principles of Behavior Modification.* Holt, Rinehart & Winston, 1969.
Brenman, M. & Gill, M. *Hypnotherapy.* Wiley, 1964.
Jahoda, M. & Warren, N. *Attitudes.* Modern Psychology Series. Penguin, 1966.
Weitzenhoffer, A. M. & Hilgard, E. R. *Stanford Hypnotic Susceptibility Scale, Forms A and B.* Consulting Psychologists, 1959.
Wolpe, J. *The Practice of Behavior Therapy.* Pergamon, 1969.

REFERENCE BOOKS

Ayllon, T. & Azrin, N. *The Token Economy*. Appleton-Century-Crofts, 1968.
Bergin, A. E. & Garfield, S. L. eds. *Handbook of Psychotherapy and Behaviour Change*. Wiley, 1971.
Gordon, J. E. ed. *Handbook of Clinical and Experimental Hypnosis*. Macmillan, 1967.
Lifton, R. J. *Thought Reform & The Psychology of Totalism*. Pelican, 1961.
Rosnow, R. L. & Robinson, E. J. eds. *Experiments in Persuasion*. Academic, 1967.
Truax, C. B. & Carkhuff, R. R. *Toward Effective Counselling and Psychotherapy*. Aldine, 1967.

12.741 Psychology (Optometry)

Visual Perception—The nature and characteristics of visual perception. Topics to be discussed include: psychophysics, the organization of visual perception, the influence of context, and the effects of learning and motivation on perception. Throughout the course emphasis will be placed on an examination of relevant experimental data. *Abnormal Psychology*—The concept of normality-abnormality, and an examination of the principle psychodynamic processes. Causes and symptoms of various mental disorders are introduced with some emphasis on symptoms and their importance in optometrical practice.

Part A—Visual Perception

TEXT AND REFERENCE BOOKS

As for 12.472 Perception II.

Part B—Abnormal Psychology

TEXTBOOK

Coleman, J. C. *Abnormal Psychology and Modern Life*. 4th ed. Scott, Foresman, 1971.

REFERENCE BOOK

Buss, A. H. *Psychopathology*. Wiley, 1966.

SCHOOL OF ZOOLOGY

The School provides undergraduate courses in Zoology and Entomology taught as part of a Unit pattern. The School offers nine units of Zoology and four units of Entomology and contributes to a unit of Biometry and Genetics offered jointly with the School of Botany. All courses leading to a Science degree in Zoology are dependent on an adequate background in Biochemistry and in Genetics and Biometry. The units offered place an emphasis on experimental Animal Physiology, experimental and applied Entomology and an ecological approach to Marine Science.

Graduates at the bachelor level may find employment in scientific and technical departments of various State and Commonwealth organizations, in certain industries and in teaching. Students intending to pursue research careers in any of the various branches of Zoology are urged to complete the requirements for Honours, Master's or Doctor's degrees.

Courses in Zoology are taught mainly in the lecture theatres and laboratories, but field work, including field camps and excursions, is an essential part of all courses. To this end, the School maintains an undergraduate teaching Field Station at Smith's Lake, where compulsory courses are taught during vacations. The animal physiology teaching is strongly oriented towards Australian invertebrate and vertebrate animals, and the School has interests in field stations at which marsupials are studied.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see pages B22-23.

HONOURS IN ZOOLOGY OR ENTOMOLOGY

Students must receive permission of the Head of School before proceeding to Honours. Generally speaking they should have completed all subjects or units required for a Bachelor's degree and have achieved a consistently high standard in relevant units offered by the School of Zoology.

43.101A/45.101A Genetics and Biometry

For details of this course, which is offered jointly by the Schools of Zoology and Botany, see under School of Botany.

45.101B Invertebrate Zoology

A comparative study of the major invertebrate phyla with emphasis on morphology, systematics and phylogeny. Practical work to illustrate the lecture course. Obligatory field camp.

TEXTBOOK

Meglitsch, P. A. *Invertebrate Zoology*. 2nd ed. O.U.P., 1972.

REFERENCE BOOKS

Al-Hussaini, A. H. & Demian, E. J. *Practical Animal Morphology*. MacMillan, 1967.

Barnes, R. D. *Invertebrate Zoology*. Saunders, 1968.

Fraenkel, G. S. & Gunn, D. L. *Orientation of Animals*. Dover, 1961.

Hyman, L. *The Invertebrata.* Vols. 1-6. McGraw-Hill.
Imms, A. D. *Textbook of Entomology.* Methuen, 1962.
MacGinitie, G. E. & MacGinitie, N. *Natural History of Marine Animals.* McGraw-Hill, 1968.
Nicol, J. A. C. *The Biology of Marine Animals.* Pitman, 1967.
Prosser, C. L. & Brown, F. A. *Comparative Animal Physiology.* Saunders, 1961.
Wilbur, K. & Yonge, C. M. *Physiology of a Mollusc.* Vols. 1 & 2. Academic, 1966.

45.101C Vertebrate Zoology

A comparative study of the Chordata. Morphology, systematics, evolution, natural history, with reference to selected aspects of physiology and reproduction. Practical work to supplement the lecture course. Field excursions as arranged.

TEXTBOOKS

Saunders, J. T. & Manton, S. M. *A Manual of Vertebrate Morphology.* 4th ed. O.U.P., 1969.
Weichert, C. K. *Anatomy of the Chordates.* 3rd ed. McGraw-Hill, 1969.
Young, J. Z. *The Life of the Vertebrates.* O.U.P., 1958.

REFERENCE BOOKS

Anderson, S. & Knox Jones, J. *Recent Mammals of the World.* Ronald, 1967.
Bellairs, A. *The Life of Reptiles.* Vols. 1 & 2. Weidenfeld & Nicolson Natural History, 1969.
Berrill, N. J. *The Tunicata.* Ray Society Monograph, 1950.
Marshall, A. J. *Biology and Comparative Physiology of the Birds.* Vols. 1 & 2. Academic, 1960-1961.
Mathews, L. H. *The Life of Mammals.* Vols. 1 & 2. Weidenfeld & Nicolson Natural History, 1969.
Romer, A. S. *The Vertebrate Body.* Saunders, 1962.
Torrey, T. W. *Morphogenesis of the Vertebrates.* 2nd ed. Wiley, 1967.
Young, J. Z. *The Life of Mammals.* Clarendon, 1957.

45.101D Field Ecology

A lecture series on the basic principles of ecology followed by an examination and evaluation of the field methods used to measure the environment and the distribution and abundance of organisms.

TEXTBOOK

Southwood, T. R. E. *Ecological Methods.* Methuen, 1966.

This unit is offered as a lecture series (two per week) and a two-week camp in November/December at the University's Smith's Lake Field Station.

45.102A Marine Ecology

A study of the metabolic, regulatory and reproductive activities of marine organisms with particular reference to the physical, chemical and biological environment in which they occur. Both field and laboratory practical work are included.

TEXTBOOK

Moore, H. B. *Marine Ecology.* Wiley, 1958.

REFERENCE BOOKS

McConnaughey, Bayard H. *Introduction to Marine Biology.* The C. V. Mosby Co., 1970.

Newell, R. C. *Biology of Intertidal Animals.* Elek, 1970.

Pickard, G. L. *Descriptive Physical Oceanography.* Pergamon, 1963.

Winberg, G. G. *Methods for the Estimation of Aquatic Animals.* Academic, 1971.

45.102B Animal Behaviour

An introduction to Ethology, the biological study of behaviour. Physiological, ecological, developmental and evolutionary aspects of behaviour are examined as important elements of the study of causal factors underlying behaviour. Both field and laboratory work are included.

TEXTBOOKS

Dimond, S. J. *Social Behaviour in Animals.* Harper, 1970.

or

Smith, F. V. *Purpose in Animal Behaviour.* Hutchinson, 1971.

and

Manning, A. *An Introduction to Animal Behaviour.* 2nd ed. Arnold, 1972.

REFERENCE BOOKS

Aronson, L., Tobach, E., Lehrman, D. S. & Rosenblatt, J. S. *Development and Evolution of Behaviour.* Freeman, 1970.

Crook, J. H. *Social Behaviour in Birds and Mammals.* Academic, 1970.

Hinde, R. A. *Animal Behaviour.* McGraw-Hill, 1970.

Hinde, R. A. ed. *Bird Vocalization.* C.U.P., 1970.

Klopfer, P. H. *Habitats and Territories.* Basic Books, 1969.

Marler, P. & Hamilton, W. J. *Mechanisms of Animal Behaviour.* Wiley, 1966.

Sluckin, W. J. *Early Learning in Animals and Man.* Allen & Unwin, 1969.

45.102C Comparative and Environmental Physiology

A study of the physiology of the various animal groups with particular emphasis on the adaptation of the animal to its environment. Subjects in this examination include the following. Osmotic and ionic regulation. Respiration and the cardio-vascular system. Temperature regulation and hibernation. Nerve and muscle physiology.

TEXTBOOK

Gordon, M. S. *Animal Function: Principles and Adaption.* 2nd ed. Macmillan, 1972.

45.102D Comparative Reproductive Physiology

A survey of reproductive mechanisms, reproductive histology, reproductive endocrinology, and embryology, with particular reference to the comparative aspects in vertebrate species. A detailed treatment of marsupial and monotreme reproduction.

TEXTBOOKS

Gilchrist, F. G. *A Survey of Embryology.* McGraw-Hill, 1968.

Nalbandov, A. V. *Reproductive Physiology.* Freeman, 1964.

45.102E Invertebrate Physiology

An examination of certain aspects of general and reproductive physiology of invertebrates, including studies on body water and salts, excretion, vascular systems, respiration, digestion and absorption, the effects of temperature on invertebrate physiology, gametogenesis, fertilization, egg cleavage, reproductive cycles and endocrinology. The embryonic and evolutionary aspects of modes of larval development are also considered.

TEXTBOOKS

Barrington, E. J. W. *Invertebrate Structure and Function.* Nelson, 1967.
Yapp, W. B. *An Introduction to Animal Physiology.* 3rd ed. O.U.P., 1970.

REFERENCE BOOKS

Florey, E. *An Introduction to General and Comparative Animal Physiology.* Saunders, 1966.
Hoar, W. S. *General and Comparative Physiology.* Prentice-Hall, 1966.
Newell, R. C. *Biology of Intertidal Animals.* Elek, 1970.

45.102F Invertebrate Behaviour

Phylogenetic examination of behaviour in relation to the increasing complexity of invertebrates, with emphasis on orientation and movement; feeding, defensive, reproductive, social and rhythmic behaviour. Involves both exogenous and endogenous contributions to invertebrate behaviour.

TEXTBOOKS

Carthy, J. D. *The Behaviour of the Arthropods.* Oliver & Boyd, 1965.
Marler, P. & Hamilton, W. J. *Mechanisms of Animal Behaviour.* Wiley, 1965.

REFERENCE BOOKS

Fraenkel, G. S. & Gunn, D. C. *Orientation of Animals.* Dover, 1961.
Harker, J. E. *The Physiology of Diurnal Rhythms.* C.U.P., 1964.
Haskell, P. T. *Insect Sounds.* Witherby, 1961.
Highnam, K. C. & Hill, L. *The Comparative Endocrinology of the Invertebrates.* Arnold, 1969.
Howse, P. E. *Termites: A Study in Social Behaviour.* Hutchinson, 1970.
Wells, M. J. *Brain and Behaviour in Cephalopods.* Heinemann, 1962.

45.201A Insect Structure and Classification

A comparative study of the internal anatomy and external morphology of insects. Classification and bionomics of major groups and families. A collection of insects is to be made. Practical work to include dissections, a study of mouthparts, wing venations, segmentation, etc. Field excursions as arranged.

TEXTBOOK

C.S.I.R.O. *The Insects of Australia.* M.U.P., 1969.

REFERENCE BOOKS

Guthrie, E. M. & Tindall, A. R. *The Cockroach.* Arnold.
Imms, A. D. *Textbook of Entomology.* Methuen.
Ross, H. H. *Textbook of Entomology.* Wiley.
Snodgrass, R. E. *Principles of Insect Morphology.* McGraw-Hill.

45.201B Insect Physiology

A study of the functions of the various organ systems and of the whole insect. Various aspects of reproduction, growth and metabolism. Experimental work to illustrate the lecture course.

TEXTBOOK

Chapman, P. F. *The Insects, Structure and Function.* E.U.P., 1969.

REFERENCE BOOKS

Beck, S. D. *Insect Photoperiodism.* Academic.
Dethier, V. G. *The Physiology of Insect Senses.* Methuen.
Highnam, K. C. & Hill, L. *The Comparative Endocrinology of the Invertebrates.* Arnold.
Roeder, K. D. *Nerve Cells and Insect Behaviour.* Harvard U.P.
Wigglesworth, V. B. *Principles of Insect Physiology.* Methuen.

45.201C Applied Entomology

Fundamentals of insect control. Pest species and types of damage caused. Control by insecticides, physical and biological means. Insect toxicology. Insecticide resistance. Practical work to illustrate the above and also various aspects of bioassay in Entomology. Field excursions as arranged.

TEXTBOOK

To be announced.

45.201D Project

Detailed studies of selected aspects of insect physiology; ecology and toxicology. Treatment of topics will be in depth rather than breadth. Practical work will illustrate the lectures and will place emphasis on design and planning of experiments.

REFERENCE BOOKS

Beament, J. W. L., Treherne, J. E. & Wigglesworth, V. B. eds. *Advances in Insect Physiology.* Academic.
Bunning, E. *The Physiological Clock.* Springer Verlag.
Dethier, V. G. *To Know a Fly.* Holden-Day.
Johanssen, O. A. & Butt, F. H. *Embryology of Insects & Myriopods.* McGraw-Hill.
Lees, A. D. *Diapause in Arthropods.* C.U.P.

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STUDENT'S TIMETABLE

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11					
11-12					
12-1					
1-2					
2-3					
3-4					
4-5					
5-6					
6-7					
7-8					
8-9					

PLEASE TEAR HERE

HELP IMPROVE YOUR HANDBOOK

It is important to the University and to yourself that you understand its conventions and regulations. The University Calendar and faculty handbooks are means by which the University attempts to convey, amongst other things, information regarding the facilities it has to offer, and the rules and regulations which govern the conduct and progress of students. You can help us assess the efficacy of the handbooks by completing this questionnaire, and thereby help yourself and your fellow students in the years to come.

If you would like to discuss any aspect of the Calendar or handbooks personally, please contact Mr Douglas Howie, Room 307, The Chancellery, or phone extension 3340.

1. Name of faculty.....Course.....Yr./Stage.....

A. CONTENTS

2. What information in your handbook did you find most useful?.....
.....
.....

3. (a) What information did you find least useful?.....
.....
.....

(b) Why was the information of so little use to you?.....
.....
.....

4. How would you rate the following information areas for inclusion in the handbook?

	(TICK APPROPRIATE SQUARE)		
	ESSENTIAL	INTERESTED TO HAVE THEM	UNNECESSARY
Calendar of dates	☐	☐	☐
List of academic staff	☐	☐	☐
Course outlines or rules governing course	☐	☐	☐
Descriptions of subjects	☐	☐	☐
Textbook lists	☐	☐	☐
Reference book lists	☐	☐	☐
Requirements for admission	☐	☐	☐
Admission and enrolment procedures	☐	☐	☐
Course fees	☐	☐	☐
Rules relating to students	☐	☐	☐
Student services	☐	☐	☐
Scholarships	☐	☐	☐
Student activities	☐	☐	☐
Examination procedures	☐	☐	☐
Timetables	☐	☐	☐

5. Please comment on any aspect of the information areas listed in Question 4 and particularly, if you think necessary, on the form of presentation i.e., its content, layout, position.....
.....
.....

6. If there is any section which you feel might be expanded, please list and state why you feel it should be expanded.....

.....

7. Would you like any of the following included in the handbook?

	YES	NO
Photographs of senior academic and administrative personnel	☐	☐
Prices of textbooks	☐	☐
Names of lecturers listed alongside subject descriptions	☐	☐
Timetables	☐	☐
Map of the Campus	☐	☐
Any other items	☐	☐

8. Do you use the textbook lists in your handbook when buying your books? .... ☐ ☐

   If 'NO', please state where you obtained a list of the required textbooks .....

9. Do you use your handbook when selecting reference books? ☐ ☐

   If 'NO', please state where you obtained your list of reference books .....

10. The handbooks are generally available at the latest by mid-December. Is this date early enough for your purposes? ☐ ☐

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11. Have you ever sought information from the University Calendar because it was not available in the handbook? ☐ ☐

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    .....

12. If you had any difficulty in obtaining a copy of your handbook, please outline problem .....

    .....

B. FORMAT

13. Is the handbook a convenient size? .... ☐ ☐

14. Would you prefer some of the information to be presented differently, e.g., in tabular form, or expressed in a less complex manner or perhaps communicated in some other way? .... ☐ ☐

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    .....

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    .....

When you have completed this form, please either return it personally to Mr. Douglas Howie, Publications Officer, Room 307, The Chancellery, or post it via the internal mail system. Thank you for your co-operation.

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