FACULTY OF BIOLOGICAL SCIENCES AND FACULTY OF SCIENCE

COMBINED 1972 HANDBOOK

THE UNIVERSITY OF NEW SOUTH WALES

80 CENTS

COMBINED
FACULTY OF BIOLOGICAL SCIENCES AND FACULTY OF SCIENCE

1972 HANDBOOK

EIGHTY CENTS

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University of New South Wales—*Faculty of Science*—Periodicals

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. 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. H. A. Borchardt
School of Electrical Engineering	
Computer Science†	Mr. G. B. McMahon

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

CALENDAR OF DATES FOR 1972

Session 1: March 6 to May 13
May Recess May 14 to May 21
May 22 to June 17
Midyear Recess June 18 to July 23

Session 2: July 24 to August 12
August Recess August 13 to August 27
August 28 to November 11

JANUARY

Friday 21	Last day for acceptance of applications to enrol by new students and students repeating first year
Monday 31	Australia Day—Public Holiday

FEBRUARY

Tuesday 1 to Saturday 12	Deferred examinations
Monday 21	Enrolment period begins for new students and students repeating first year
Monday 28	Enrolment Week commences for students re-enrolling (second and later years)

MARCH

Monday 6	**Session 1 commences**
Friday 17	Last day of enrolment for new students (late fee payable)
Thursday 30	Last day for later year enrolments (late fee payable)
Friday 31 to Monday, 3 April ..	Easter

APRIL

Tuesday 25	Anzac Day—Public Holiday

MAY

Sunday 14 to Sunday 21	May Recess

JUNE

Monday 12	Queen's Birthday—Public Holiday
Saturday 17	**Session 1 ends**
Friday 30	Last day for acceptance of applications for re-admission after exclusion under rules governing re-enrolment

JULY

Monday 24	**Session 2 commences**
Thursday 27	Foundation Day

AUGUST

Sunday 13 to Sunday 27	August Recess

SEPTEMBER

Friday 15	Last day for acceptance of corrected enrolment details forms

OCTOBER

Monday 2	Eight Hour Day—Public Holiday
Friday 6	Last day for acceptance of corrected enrolment details forms (late fee payable)

NOVEMBER

Saturday 11	**Session 2 ends**
Tuesday 14	Examinations begin

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

Tuesday 30 to Saturday, 10 Feb.	Deferred examinations

FEBRUARY

Monday 19	Enrolment Week commences for new students and students repeating first year
Monday 26	Enrolment Week commences for students re-enrolling (second and later years)

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

SCHOOL OF APPLIED PSYCHOLOGY

Professor of Applied Psychology and Head of School
S. H. Lovibond, BA *Melb.*, MA PhD DipSocSc *Adel.*

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

Associate Professor (Clinical Psychology)
R. T. Martin, BA DipPubAdmin *Syd.*, MBPsychoanalSoc

SCHOOL OF BIOCHEMISTRY

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

Associate Professors
J. B. Adams, MSc *Syd.*, PhD *N.S.W.*, ARACI
K. G. Rienits, MSc *Syd.*, PhD *Birm.*

SCHOOL OF BIOLOGICAL TECHNOLOGY

Professor of Biochemistry and Head of School
B. J. F. Ralph, BSc *Tas.*, *PhD* Liv., FRACI

Associate Professor
F. J. Moss, MB BS *Melb.*

SCHOOL OF BOTANY

Professor of Botany and Head of School
D. J. Anderson, BSc *Nott.*, PhD *Wales*

Associate Professor
C. J. Driscoll, MScAgr *Syd.*, PhD *Corn.*

SCHOOL OF MICROBIOLOGY

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

Professor of Medical Microbiology
G. N. Cooper, MSc PhD *Melb.*

Associate Professor of Microbiology
A. D. Brown, MSc *Syd.*, PhD *Manc.*

SCHOOL OF ZOOLOGY

Professor of Zoology and Head of School
T. J. Dawson, BRurSc PhD *N.E.*

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

FACULTY OF SCIENCE

Dean—Professor S. J. Angyal

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

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

SCHOOL OF APPLIED PHYSICS AND OPTOMETRY

Professor of Applied Physics and Head of School
C. J. Milner, MA PhD *Camb.*, 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

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

SCHOOL OF CHEMISTRY

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

Professor of Organic Chemistry
S. J. Angyal, PhD *Bud.*, DSc *N.S.W.*, FAA, FRACI

Professor of Theoretical and Physical Chemistry
R. M. Golding, MSc *Auck.*, PhD *Camb.*, FNZIC, MInstP

Professor† and Head of Department of Inorganic Chemistry
S. E. Livingstone, PhD DSc *N.S.W.*, FSTC, FRACI

Professor of Analytical Chemistry
L. E. Smythe, MSc *Syd.*, PhD *Tas.*, FRACI

Professor of Chemistry
J. S. Shannon, DIC, PhD *Lond.*, DSc *Adel.*, FRACI

Associate Professors
D. J. Carswell, MSc PhD DipEd *Syd.*, FRACI
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, BSc PhD DSc *N.S.W.*, ASTC, FRACI
R. J. L. Martin, MSc *Melb.*, PhD *Lond.*, ARACI
J. J. Simes, MSc DipEd *Syd.*, PhD *Liv.*, FRACI
N. C. Stephenson, MSc *Syd.*, PhD DSc *N.S.W.*, ARACI
G. J. Sutton, MSc PhD DSc *N.S.W.*, ASTC, FRIC, FRACI

* In the field of organic chemistry
† In the field of inorganic chemistry

Director of First Year Classes in Chemistry
June C. Griffith, MSc *N.S.W.*, PhD *Syd.*

Executive Assistant to Head of School
W. J. Dunstan, MSc *Syd.*, ARACI

SCHOOL OF MATHEMATICS

Professor of Statistics and Head of School
A. M. Hasofer, BEE *Faruk*, BEc PhD *Tas.*, MIEAust

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

Professor of Pure Mathematics
G. M. Kelly, BSc *Syd.*, BA PhD *Camb.*
G. Szekeres, DiplChemEng *Bud.*, FAA

Associate Professor of Mathematical Statistics
J. B. Douglas, MA BSc DipEd *Melb.*

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

Associate Professor (Applied Mathematics)
W. E. Smith, MSc *Syd.*, BSc *Oxon.*, PhD *N.S.W.*, MInstP

Director of First Year Studies
Associate Professor A. H. Low, MSc DipEd *Syd.*, PhD *N.S.W.*

Administrative Officer
Mrs. Veronica J. Barbeler, BA BEd *Qld.*

SCHOOL OF PHYSICS

Professor of Physics and Head of School
E. P. George, BSc PhD *Lond.*, DSc *N.S.W.*, FInstP, FAIP

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

Associate Professors
D. Haneman, MSc *Syd.*, PhD *R'dg.*, FAIP
J. C. Kelly, BSc *Syd.*, PhD *R'dg.*, GradInstP, AAIP
J. F. McConnell, MSc *Syd.*, PhD *N.S.W.*, AInstP, 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.*, AInstP, 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 Museum Station), Sydney (P.O. Box 7049, G.P.O., Sydney, 2001). 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 1972, 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) by 29th October, 1971.

(b) New South Wales residents qualifying for admission by the 1971 New South Wales Higher School Certificate Examination or the 1972 Sydney University Matriculation Examination and those who have attended a University in New South Wales in 1971 must apply for enrolment to the Metropolitan Universities

Admissions Centre, 13-15 Wentworth Avenue, Sydney (P.O. Box 7049, G.P.O., Sydney) by 21st January, 1972.

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.

Failure in First Year—First year students who failed all subjects at the 1971 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, "Enrolment Procedure for Students Re-enrolling". 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 published in the booklet, "Enrolment Procedure for Later Year Students".

A late fee of $7 will be incurred by students failing to enrol during Enrolment Week.

Miscellaneous Subject Enrolments—Students may be accepted for enrolment in miscellaneous subjects (i.e., as students not proceeding to a degree or diploma) provided the Head of the School offering the subject considers it will be of benefit to the student and there is accommodation available. Under no circumstances will subjects taken in this way count towards a degree or diploma.

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 (17th March, 1972) 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 1972, it will be necessary for the University to limit the number of students enrolling in all undergraduate courses.

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 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

* 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.

(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

UNDERGRADUATE COURSE FEES

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. 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)—$231 per session.

(ii) Part-time Course Fee (over 6 hours' and up to 15 hours' attendance per week)—$115.50 per session.

(iii) Part-time Course Fee (6 hours' or less attendance per week)—$57.50 per session.

(iv) Course Continuation Fee—A fee of $33 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(s) 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—$9—payable at the beginning of first year.
Library Fee—annual fee—$16.
University Union*—entrance fee—$20.

Student Activities Fees

University Union*—$30—annual subscription.
Sports Association*—$4—annual subscription.
Students' Union*—$6—annual subscription.
Miscellaneous—$17—annual fee.

Graduation or Diploma Fee—$9—payable at the completion of the course.

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

Applied 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—$7 for each subject.

Examinations conducted under special circumstances—$9 for each subject.

Review of examination result—$9 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	$8
Fees paid during the first and second weeks of Session 1	$16
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	$33

Session 1—Re-Enrolments

Failure to attend enrolment centre during enrolment week	$8
Fees paid after the commencement of the third week of Session 1 to 31st March	$16
Fees paid after 31st March where accepted with the express approval of the Registrar	$33

Session 2—All Enrolments

Fees paid in third and fourth weeks of Session 2	$16
Fees paid thereafter	$33
Late lodgement of corrected enrolment details forms (late applications will be accepted for three weeks only after the prescribed dates)	$7

WITHDRAWAL FROM COURSE

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

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.

Where a student terminates for acceptable reasons a course of study before half a session has elapsed, one half of the session's course fees may be refunded. 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.

The Library fee is an annual fee and is not refundable where notice of withdrawal is given after the commencement of Session 1.

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.

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, 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.

Miscellaneous—where notice is given prior to 30th April, $8.50, thereafter no refund.

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 $8.

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.

* The enrolment periods for Sydney students are prescribed annually in the leaflets "Enrolment Procedure for New Students" and "Enrolment Procedure for Students Re-enrolling".

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., 17th March, 1972), 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 Registrar 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 (18th August, 1972).

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.

RULES RELATING TO STUDENTS

ATTENDANCE AT CLASSES

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.

COURSE TRANSFERS AND CLAIMS FOR ADVANCED STANDING

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.

Students claiming advanced standing (exemptions from subjects) by reason of courses completed in other places should do so by applying to the Registrar on the appropriate form. Copies of the form may be obtained from the Admissions Office.

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

of their programme must make application to the Head of the School responsible for the course on a form available from School offices.

Any addition or substitution of subjects after 31st March will be accepted only with the express approval of the Registrar on the recommendation of the appropriate Head of School, and will be given in exceptional circumstances only.

In the case of students wishing to terminate their enrolment the application must be lodged at the Examinations and Student Records Section.

The Registrar will inform students of the decision. 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.

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.

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 21st January, 1972. 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 take place in November-December although some are held in the midyear recess. Timetables showing time and place at which individual examinations will be held are posted on the central notice boards in the Bio-Medical Building, Central Lecture Theatre Block, The Chancellery, Dalton Building, Main Building and Western Grounds Area. Misreading of the timetable is not an acceptable excuse for failure to attend an examination. Examination results are posted to the term addresses of students. No results will be given by telephone.

All students will receive an enrolment details form by 30th August. It is not necessary to return this form, unless any information recorded there is incorrect. Amended forms must be returned to the Examinations Branch by 15th September. 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 $6 will be payable. Amended forms returned to the Registrar will be acknowledged in writing within fourteen days.

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 shall, without showing cause, be permitted to continue a course unless all subjects of the first two stages of his course are completed by the end of his fourth year of attendance and all subjects of the third and fourth stages 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 Admissions Committee of the Professorial Board.

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.

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: 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. Permit will allow access to campus between 5 p.m. and 11 p.m. on weekdays and during library hours on Saturdays, Sundays and public holidays (annual fee $3.90). Applications should be made to the Property Section. It should be noted that increasing demand for parking space may require the imposition of further restrictions.

STUDENT SERVICES

THE LIBRARY

The University Library is located on the Upper Campus adjacent to the Chancellery, the Commerce Building and the Arts Building. The Bio-Medical Library is in the Biological Sciences Building with a branch at Prince Henry Hospital ('Phone: 661 0111).

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 is a common meeting ground for all students. Eating and general recreational facilities are available, as

well as a shop for stationery and other student requisites, branches of several banks, a pharmacy, a branch of David Jones, and hairdressing facilities. Membership is compulsory for all registered students.

STUDENT ACCOMMODATION

Residential Colleges

Accommodation for students is provided within the complex of the Residential Colleges of the University which comprise Basser College, Phillip Goldstein Hall and Philip Baxter College. The College complex 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 term basis, amount to $22 per week. Intending students should apply in writing to the Master, Box 24, Post Office, Kensington, N.S.W., 2033, from whom further information is available.

Accommodation is also available at International House, New College (Church of England) and Warrane College (Roman Catholic). Students should write to the college of their choice for information regarding accommodation.

Other Accommodation

Students requiring other than Residential College accommodation may make application to the Student Amenities Service where current lists are kept of accommodation available at recognised boarding houses, private homes, and in serviced and unserviced apartments.

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.

STUDENT AMENITIES UNIT

This Unit is closely associated with the Sports Association and also handles applications for student concession fares and provides a service for students requiring other than College accommodation. It is located in Hut B at the foot of Basser Steps. (Tel. 663 0351, extension 2235.)

STUDENT EMPLOYMENT UNIT

Assistance is offered in finding full-time employment for evening students, and permanent employment after graduation. The Unit also administers the University's industrial training programme and is located in the Chancellery (Administration Building) located off High Street.

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.

It is confidential and students are encouraged to attend the centre for advice on matters pertaining to their health.

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.

In all cases assistance is limited to students with reasonable academic records and whose financial circumstances warrant loans. Students granted assistance of either kind are required to give an undertaking to repay the loan under the conditions agreed upon.

Applications may be made personally 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.

SCHOLARSHIPS, BURSARIES AND CADETSHIPS

Students undertaking courses in the Faculty of Science are eligible to apply for the following scholarships.

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, within seven days of the publication of the award of Commonwealth University 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 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.

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 P.O. Box R42 Royal Exchange, N.S.W. 2000.

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 also offers annually a scholarship to the total value of $1,600: $500 for both second and third year, and $600 for fourth year. This scholarship is available to students proceeding to the second year of the full-time degree courses in Optometry leading to the degree of Bachelor of Optometry.

Applicants must be residents of New South Wales. While scholarship holders are not under any bond or obligation, it is expected that they will practise optometry in Australia. Candidates must be under 21 years of age at the time of application.

Each scholarship will normally be tenable for the duration of the course but its tenure shall be at all times subject to the holder maintaining a standard of conduct and progress acceptable to the Professorial Board. The annual allowance of the scholarship is payable to the holder in two session instalments.

These scholarships will be awarded on the understanding that applicants will normally hold a Commonwealth Scholarship which covers the cost of University fees. However, applicants who are not holders of a Commonwealth Scholarship may also be considered.

Application for these scholarships, on forms obtainable from the Registrar, must be lodged with the Registrar after publication of examination results and the announcement of the award of Commonwealth University Scholarships, but not later than 31st January each year.

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).

The Olivetti Australia Pty. Ltd. Scholarship

Olivetti Australia Pty. Ltd. offers annually a $500 scholarship to a student enrolled in the third year of an honours degree course in arts or science. The scholarship may be held together with a Commonwealth Scholarship.

An award shall be made in one of the fields of Mathematics (including Numerical Analysis) or Statistics, with preference being given to Statistics.

Applications shall be lodged on the prescribed forms with the Registrar within seven days of the notification of second year examination results of the University.

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.

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 Applied 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 Microbiology School of Zoology:	1.001, 1.011 or 1.041 Physics and 2.001 and 17.001 General and Human Biology except that, with the consent of the Head of the particular School concerned and in special circumstances, 25.111 Geoscience or 12.001 Psychology may be taken in lieu of Physics I in first year. In this case credit will not be given for level III units offered by these Schools until level I Physics or 12.013 Psychology III is completed.

School of Botany:	1.001, 1.011 or 1.041 Physics and 2.001 Chemistry and 17.001 General and Human Biology except that, with the consent of the Head of School and in special circumstances, Physics may be deferred to second year and 25.111 Geoscience or 12.001 Psychology taken in lieu in first year. In this case, credit will not be given for level III units offered by this School until level I Physics is completed.
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.

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* 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.

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 46-61.

(b) *General Studies*

Turn to page 62.

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§	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

* 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.

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		‡
10.911	Mathematics II	A subject consisting of units 10.211A & 10.111A & 10.111B						
10.032	Mathematics	III	1	Full yr.	2	10.031		§
				PURE MATHEMATICS				
	Pure Mathematics Level II							
10.111A	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	Abstract Algebra	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	Analysis	IIH	1	Full yr.	2½	10.011		10.111B
10.121D¶	Real Variable Theory	IIH	1	Full yr.	2½	10.011	10.121A, 10.121B, 10.221A *or* 10.211A	
	Pure Mathematics Level III							
10.112A	Algebra	III	1	Full yr.	2	10.111A	10.111C	10.121A, 10.122A
10.112B	Functional Analysis	III	1	Full yr.	2	10.111A, 10.111B		
10.112C	Differential Geometry	III	1	Full yr.	2	10.111A, 10.211A, 10.111B		10.122C
10.112D	Set Theory	III	1	Full yr.	2	10.001 *or* 10.011	10.111A, 10.111B, 10.211A	

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
10.112E	Analysis	III	1	Full yr.	2	10.111B, 10.211A		
	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	Topology and Integration	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 D 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 10.121D 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.

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.	4	10.011†, 1.011†		10.211B
10.221C	Hydrodynamics	IIH	1	Full yr.	4	10.011†, 1.011†		10.211C
	Applied Mathematics Level III							
10.212A	Numerical Analysis	III	1	Full yr.	1½	10.111A		10.222A
10.212B	Continuum Mechanics	III	1	Full yr.	1½	10.111A, 10.111B & 10.211A, B, C		10.222B
10.212C	Maxwell's Equations	III	1	Full yr.	1½	10.211A, 10.111A, 10.111B, 1.001		1.113B, 1.123B, 1.153B, 10.222C
10.212D	Mathematical Methods	III	1	Full yr.	1½	10.211A, 10.111A, 10.111B		10.032, 10.222D; 10.222E
	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		10.212C, 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

* Normally, both Quantum Mechanics and Continuum Mechanics would not be taken by the student in the same year.
† 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.

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 10.311T
10.311T	**Statistics**	II	1	Full yr.	2	10.001 *or* 10.011 *or* 10.021 Cr		10.311, 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; 10.311T
	Theory of Statistics Level III							
10.312A	Stochastic Processes and Applications Statistics	III	1	Session 2	4	10.311 *or* 10.321 *or* 10.311T; 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* 10.311T (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; 10.312B; 10.111A, *or* 10.121A *or* 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* 10.311T	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	10.211A *or* 10.221A; 10.321		10.312A
10.322B	Experimental Design Applications	IIIH	1	Session 1	4½	10.321	10.211A *or* 10.221A	10.312B
10.322C	Experimental Design (Theory) and Project	IIIH	1	Session 1	4½	10.111A *or* 10.121A; *or* 10.211A *or* 10.221A; 10.321;	10.312B *or* 10.322B*	10.312C
10.322D	Contingency Tables, Probability Theory	IIIH	1	Session 2	4½	10.321	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 APPLIED 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	
12.352	Psychometrics II	II	½	Sessions 1 & 2	3	12.001	
12.412	Physiological Psychology II	II	½	Sessions 1 & 2	3	12.001	12.402
12.452	Human Information Processing II	II	½	Sessions 1 & 2	3	12.001	
12.502	Social Psychology II	II	½	Sessions 1 & 2	3	12.001	
12.552	Developmental Psychology II	II	½	Sessions 1 & 2	3	12.001	
12.602	Abnormal Psychology II	II	½	Sessions 1 & 2	3	12.001	
12.044	Psychology III (supplementary)	III	4	Full yr.	*8	12.013	Any Psychology subject except 12.001, 12.012, 12.013, 12.042, 12.402
12.153	Research Methods IIIA	III	1	Session 1	6	12.152 *or* (12.012)	
12.163	Research Methods IIIB	III	1	Session 2	6	12.153	

SCHOOL OF APPLIED PSYCHOLOGY (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Excluded
12.173	Psychological Issues	III	1	Session 2	6	12.001	
12.253	Learning IIIA	III†	1	Session 1	6	12.001	
12.263	Learning IIIB	III	1	Not offered in 1972‡	6	12.253	
12.303	Personality IIIA	III†	1	Session 2	6	12.001	
12.313	Personality IIIB	III	1	Session 1	6	12.001	
12.353	Psychometrics IIIA	III	1	Session 1	6	12.352 *or* (12.012)	
12.363	Psychometrics IIIB	III	1	Session 2	6	12.352 *or* (12.353)	
12.413	Physiological Psychology IIIA	III	1	Session 2	6	12.412	12.402
12.423	Physiological Psychology IIIB	III	1	Not offered in 1972‡	6	12.412	
12.453	Human Information Processing IIIA	III	1	Session 1	6	12.452 *or* (12.012)	
12.463	Human Information Processing IIIB	III	1	Session 2	6	12.452 *or* (12.453)	
12.503	Social Psychology IIIA	III	1	Session 1	6	12.502 *or* (12.012)	
12.513	Social Psychology IIIB	III	1	Not offered in 1972‡	6	12.502	
12.553	Developmental Psychology IIIA	III	1	Session 1	6	12.552 *or* (12.012)	

SCHOOL OF APPLIED PSYCHOLOGY (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Excluded
12.563	Developmental Psychology IIIB	III	1	Not offered in 1972‡	6	12.552	
12.603	Abnormal Psychology IIIA	III	1	Session 1	6	12.602 *or* (12.012)	
12.613	Abnormal Psychology IIIB	III	1	Not offered in 1972‡	6	12.602	
12.703	Psychological Techniques	III	1	Session 2	6	3 Level II units	12.042
12.713	Behavioural Control and Modification	III	1	Session 2	6	3 Level II units	

* Students are required to undertake such additional field work and clinical studies, averaging 2 hours per week, as may be prescribed by the Head of School of Applied Psychology.

† May be taken in Second Year.

$ Not all courses will be offered each year. This applies particularly to courses designated as IIIB. Courses thus indicated will not be offered in 1972. Numbers in brackets are permissible alternative prerequisites for 1972 only.

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	1.001 *or* 1.011 *or* 1.041; 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:** both 41.101A and 41.101B and 2 level II Chem. units, including 2.002B and preferably 2.002A as the 2nd Chem. unit; 41.101C is advisable.	
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.

NOTE: Students who take more than four level II *or* level III units from those offered by the Schools of Biochemistry, Botany, Microbiology and Zoology must include the units 41.101A, 41.101B and 43.101A in their course.

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 who take more than four Level II and/or Level III units from those offered by the Schools of Biochemistry, Botany, Microbiology and Zoology must include units 41.101A, 41.101B and 43.101A in their course. If, however, at least four units offered by the School of Botany are taken in the final year of the course, students may substitute two Level II units offered by the Schools of Chemistry or Mathematics or Physics for units 41.101A and 41.101B.

* 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.
† Not available in 1972.

SCHOOL OF MICROBIOLOGY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites*	Co-requisites
44.101	Introductory Microbiology	II	1	Full yr.	3	17.001	
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	

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

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 1.001 *or* 1.011 *or* 1.041	
45.101B	Invertebrate Zoology	II	1	Session 2	6	2.001 *or* 2.011 10.001 *or* 10.011 *or* 10.021	
45.101C	Vertebrate Zoology	II	1	Session 2	6		
45.101D	Field Ecology	II	1	Session 2	6*	43.101A/45.101A	45.101B *or* 45.101C
45.102A	Marine Ecology	III	1	Session 1	6	As above	
45.102B	Animal Behaviour	III	1	Session 2	6	As above	
45.102C	Comparative and Environmental Physiology	III	1	Session 2	6	41.101A & B	45.101C

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

SCHOOL OF ZOOLOGY (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
45.102D*	Comparative Reproductive Physiology	III	1	Session 1	6	41.101A & B and 45.101C		70.012E
45.102E	Invertebrate Behaviour	III	1	Session 1	6	As for 45.101B		
45.102F	Invertebrate Physiology	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:
41.101A, 41.101B Biochemistry, and 43.101A, 43.101A/45.101A Genetics and Biometry must be completed if more than four second or third level units are chosen from those offered by the Schools of Biochemistry, Botany, Microbiology or Zoology.

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

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 6	25.111 2.001	

SCHOOL OF APPLIED GEOLOGY (Continued)

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites
25.112B**	Geoscience IIB	II	1	Full yr.	3 3	25.111 2.001	
25.003A†	Mineralogy, Petrology & Stratigraphy	III	2	Full yr.	6*	25.002 (A + B)	
25.003B†	Geophysics, Stratigraphic Palaeontology, Structural Geology, Economic Geology	III	2	Full yr.	7*	25.002 (A + B)	
25.013‡	Geology III (Supplementary)	III	4	Full yr.	12	25.002 (A + B)	25.003 (A + B)

* 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.
† In 1973 25.003A and 25.003B will be replaced by 25.113A Geoscience IIIA and 25.113B Geoscience IIIB.
‡ Offered for the last time in 1972.

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.		

FACULTY OF ARTS

SCHOOL OF PHILOSOPHY

No.	Name	Level	Unit Value	When Offered	Hours p.w.	Prerequisites	Co-requisites	Excluded
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	Excluded
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	Excluded
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		
70.012F	Comparative Embryology†	III	1	Session 2	6	70.011B		45.102D
70.012F	Microscopy & Histological Techniques†	III	1	Session 1	6			

* In some circumstances this subject may be taken as a co-requisite rather than a prerequisite.
† Not available in 1972.

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	Excluded
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* of the following subjects provided at least *one* is from the *first five listed:*

26.501	English	Full	year	1½	hours
26.511	History	,,	,,	,,	,,
26.521	Philosophy	,,	,,	,,	,,
26.571	An Introduction to Modern Drama	,,	,,	,,	,,
26.641	German Literature and Civilization	,,	,,	,,	,,
26.121	Psychology	,,	,,	,,	,,
26.151	Economics	,,	,,	,,	,,
26.211	Arts and Crafts	,,	,,	,,	,,
26.301	Music	,,	,,	,,	,,
26.531	Sociology	,,	,,	,,	,,
26.541	Political Science	,,	,,	,,	,,
11.011H	History of Fine Arts	,,	,,	,,	,,
11.021H	History of Architecture	,,	,,	,,	,,
26.621	Cosmology	,,	,,	,,	,,
26.671	*Japanese	,,	,,	3	,,

* Counts as an Elective plus an Advanced Elective.

Additional for an Honours Degree: Advanced General Studies Elective, two terms, two hours/week.

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 2 units of level I Mathematics and 6 other level I units including those essential to the intended major sequence of units.

Second year: One general studies elective and 8 units from level II *or* 6 units from level II and 2 from level I.

Third year: Two general studies electives and at least 4 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 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.

*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.

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.

PURE AND APPLIED CHEMISTRY—FULL-TIME COURSE

		Hours per week for 2 sessions Lec.	Lab. Tut.
YEAR 1			
1.011 Higher Physics I *or* 1.001 Physics I *or* 1.041 Physics IC		3	3
2.001	Chemistry I	2	4
10.011 Higher Mathematics I *or* 10.001 Mathematics I *or* 10.021 Mathematics IT		4	2
Plus one of—			
5.001 Engineering I 17.001 General and Human Biology 25.111 Geoscience I		3	3
27.031	Geography IS	2	4
		12	12
		or	
		11	13

YEAR 2		Hours per week for 2 sessions Lec.	Lab. Tut.	Total
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				
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

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.

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 25.111 Geoscience I*		3	3
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.

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.

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 APPLIED PSYCHOLOGY COURSE

The course in Applied Psychology, which leads to the degree of Bachelor of Science, is designed as a professional undergraduate course for the training of psychologists. It provides extensive study of psychological theory and practice, supported by an appropriate selection of other subjects. Candidates may complete the course in a minimum of four years full-time, or six years part-time. Entry to the course is competitive, and candidates are encouraged to enrol as full-time students. Three main fields of specialization are currently offered (clinical, industrial and applied research) and students in their final year will elect to study in one of these fields.

The elective in industrial psychology is intended to meet the demand for those who will engage in personnel work in industry. It involves a study of the individual worker and the organizations in which he works, and embraces such aspects of this study as job success, job satisfaction, industrial motivation, employer-employee relations, acquisition of job skill, conditions affecting job efficiency and the like.

The clinical elective provides basic theoretical and practical training in clinical psychology. It includes training in the assessment of personality and the diagnosis and treatment of behaviour disorders. Training is given in case studies and in preventive and therapeutic teamwork, and research in clinical psychology is also covered.

The applied research elective provides research training in an area of specialization selected by the student, and includes a programme of supporting studies. The elective is intended to meet the needs of students who wish to undertake graduate studies with a major research component.

Details of qualifications for admission to the BSc in Applied Psychology 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 APPLIED 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 Applied Psychology under these regulations a candidate must attend classes and satisfy the examiners in the following subjects:—

1. *Each of:*—
   12.001 Psychology I
   12.012 Psychology II
   12.042 Psychology IIA
   12.013 Psychology III
   12.044 Psychology III (Supplementary)

   (In special cases, the Head of the School of Applied Psychology or his representative may approve of the substitution of any other appropriate course or equivalent units for 12.044 Psychology III (Supplementary).

   and

   12.045 Psychology IV (Industrial)

   or

   12.055 Psychology IV (Clinical)

   or

   12.065 Psychology IV (Applied Research)

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 Applied 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 I.

(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 Applied 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 Applied Psychology at graduation shall be at either Pass level or with Honours after a minimum of 4 years of full-time study or 6 years of part-time study.

RULES GOVERNING ADMISSION TO THE BSc IN APPLIED PSYCHOLOGY COURSE WITH ADVANCED STANDING

1. Graduates of the University of New South Wales may be admitted to the Applied 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 Applied Psychology BSc course may be admitted to the Applied Psychology BSc course with exemption in no more than seven Applied Psychology BSc course subjects or their unit equivalents.

3. Graduates or undergraduates of other universities may be admitted to the Applied 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 Applied 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 BSc APPLIED PSYCHOLOGY 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 6 compulsory psychology subjects [although the student may choose from a number of electives within the subjects comprising Psychology III, III (Supplementary) and IV];

(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	12.012 12.042	12.013 12.044	12.045 *or* 12.055 *or* 12.065
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 BSc APPLIED PSYCHOLOGY COURSE SUBJECTS

	No.	Subject or Unit	Level	Hours p.w.	When Offered	Prerequisites	Co-requisites
PSYCHOLOGY	12.001	Psychology I	I	5	Full yr.		
	12.012	Psychology II	II	8	Full yr.	12.001	
	12.042	Psychology IIA*	II	6	Full yr.	12.001	12.012
	12.013	Psychology III†	III	9	Full yr.	12.012	
	12.044	Psychology III (Supp.)†	III	8	Full yr.	12.012	12.013
	12.045	Psychology IV (Indust.)*‡	IV	15	Full yr.	12.013, 12.044	
	12.055	Psychology IV (Clinical)*‡	IV	15	Full yr.	12.013, 12.044	
	12.065	Psychology IV (Applied Research)*	IV	15	Full yr.	12.013, 12.044	
	12.402	Physiological Psychology	II	4	Full yr.	12.001, 17.001	
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.

† Students are required to undertake such additional field work and clinical studies, averaging 2 h.p.w., as may be prescribed by the Head of the School of Applied Psychology.

‡ In cases where students are unable to satisfy the day-time attendance requirements, the Head of the School may arrange alternative programmes for practical work and tutorials.

§ 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 subject; 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, commencing in 1972. For full details see Calendar.

The School of Applied 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, 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 MSc(Physics). 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 94.

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, prerequisites and co-requisites, see page 65.

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. Abdominopelvic cavity. Peritoneum. Stomach, intestine, liver, pancreas. Kidney, ureter, bladder, urethra. Male and female reproductive organs. Innervation, blood supply and lymph drainage of gastrointestinal 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

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.

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.

The Department also offers certain Level III units (31.113A, B and C)†, both as part of preparation for applied physics honours study, and as units in a Science Course programme for those, not contemplating applied physics honours, but who are nevertheless interested in the application of physics in technology.

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.

* The Science Course Regulations (see 2(a)(ii) on p. 43) require that not less than 8 nor more than 10 units be from Level I.

† For further details, see page 56.

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 attaining 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.

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.

31.113C Applications of Radiation

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

TEXTBOOK

No set text.

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 Press.
Emsley, H. H. *Visual Optics.* Vols. I and II. Hatton Press.
Fincham, W. H. A. *Optics.* Hatton Press.

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.

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 electrophysiology. 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

Bennet, 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.

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 ocular 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, B. *The Anatomy of the Eye and Orbit.* Lewis.

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. Disturb-

ances 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.

SCHOOL OF APPLIED 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 Applied Psychology offers psychology as a major subject in the full-time Arts Course and in the full-time and part-time Science and Commerce Courses. It also offers a full-time and a part-time undergraduate professional degree course in Applied Psychology.

In the Science course, Psychology I, II and III and Psychology III (Supplementary) may be studied subject to the Science course regulations, and a student who wishes to proceed to honours in the subject must have completed three full courses of psychology in his pass degree and must have obtained at least credit in Psychology II and III in order to be admitted to the honours year.

The course leading to the degree of Bachelor of Science in Applied Psychology has been introduced in order to meet the increasing demands of professional psychologists in the various fields of applied psychology. This course provides extensive study of psychological theory and practice, supported by an appropriate selection of studies in other subjects. The later years of the course lead to increasing specialization in either industrial psychology, clinical psychology, human engineering or guidance and counselling or applied research. Full details of this course are given on pages 78-87.

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.

PSYCHOLOGY TEXTBOOKS

12.001 Psychology I

Part A: Theory

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.

Part B: Practical

Lumsden, J. *Elementary Statistical Method*. Univ. of W.A. Press, 1969.

12.012 Psychology II

(BSc Applied Psychology students only.)

Research Methods plus one topic from List A and two topics from List B. (Students planning to proceed to 3rd year should consult with School regarding choice of topics.)

Research Methods II

As for 12.152.

LIST A

Learning IIIA

As for 12.253.

Personality IIIA

As for 12.303.

LIST B

Psychometrics II

As for 12.352.

Physiological Psychology II

As for 12.412.

Human Information Processing II

As for 12.452.

Social Psychology II

As for 12.502.

Developmental Psychology II

As for 12.552.

Abnormal Psychology II

As for 12.602.

12.013 Psychology III

(BSc Applied Psychology students only.)

Session 1: Research Methods IIIA plus two topics from List C.

Session 2: Two topics from List D.

Research Methods IIIA
As for 12.153.

LIST C
As for List B. See under 12.012 above.

LIST D
**Psychometrics IIIB (Scaling and Multivariate)*
As for 12.363.
**Physiological Psychology IIIA*
As for 12.413.
**Human Information Processing IIIB (Perception)*
As for 12.463.
Behaviour Control and Modification III
As for 12.713.
Psychological Issues III
As for 12.173.
Psychological Techniques III
As for 12.703.

* This topic cannot be selected unless the one of the same name has been completed from List C (12.013).

12.042 Psychology IIA

(BSc Applied Psychology students only.)

Part A: Observation and Assessment of Behaviour

Bradford, L. P., Gibb, J. R. & Benne, K. D. *T-Group Theory and Laboratory Method.* Wiley, 1964.
Kleinmuntz, B. *Personality Measurement.* Dorsey, 1967.
Sidowski, J. B. *Experimental Methods & Instrumentation in Psychology.* McGraw-Hill, 1966.
Vernon, P. E. *Personality Assessment: A Critical Survey.* Methuen, 1964.

Part B: Psychological Testing

Anastasi, A. *Psychological Testing.* MacMillan, 1968.

12.044 Psychology IIIA (Supplementary)

Session 1: Two topics from List E.
Session 2: Research Methods IIIB; plus two topics from List C, *or* one topic from List D (see 12.013).
(Students who have already passed 12.013 should enquire from the School.)

Research Methods IIIB
As for 12.163.

LIST E
Personality IIIB (Motivation)
As for 12.313.

Psychometrics IIIA
As for 12.353.

Abnormal Psychology III
As for 12.603.

Developmental Psychology III
As for 12.553.

Social Psychology III
As for 12.503.

Human Information Processing IIIA
As for 12.453.

Part A: Electives (as for 12.013, Part B)

Part B: Computer Programming

Blatt, J. M. *Introduction to Fortran IV Programming: Using the Watfor Computer*. Goodyear, California, 1968.

12.045 Psychology IV (Industrial)

Part A: Industrial Psychology and Personnel Techniques

Bass, B. *Organizational Psychology*. Allyn & Bacon Inc., 1966.
Schultz, D. P. *Psychology and Industry*. Macmillan, N.Y., 1970.
Thorndike, R. L. *Personnel Selection*. Wiley, N.Y., 1949.

Part B: Counselling Procedures

Bordin, E. S. *Psychological Counselling*. Appleton-Century-Crofts, N.Y., 1968.
Gorden, R. L. *Interviewing: Strategy, Techniques and Tactics*. Dorsey Press, Illinois, 1969.
Mahrer, A. R. ed. *The Goals of Psychotherapy*. Appleton-Century-Crofts, N.Y., 1967.

12.055 Psychology IV (Clinical)

Part A: Clinical Psychology

Part B: Counselling Procedures

As for 12.045 Part B.

12.463 Human Information Processing IIIB

Day, R. H. *Perception*. Wm. C. Brown Co., 1966.
Dember, W. N. *The Psychology of Perception*. Holt, 1960.

12.502 Social Psychology II

Lindgren, H. C. *An Introduction to Social Psychology*. Wiley, 1969.

12.503 Social Psychology IIIA

Hollander, E. P. & Hunt, R. G. eds. *Current Perspectives in Social Psychology*. O.U.P., N.Y., 1967.
Lindgren, H. C. *An Introduction to Social Psychology*. Wiley, 1969.

12.552 Developmental Psychology II

No set text.

12.602 Abnormal Psychology II

Maher, B. A. *Principles of Psychopathology*. McGraw-Hill, 1966.

12.603 Abnormal Psychology IIIA

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*. McGraw-Hill, 1966.
Wolpe, J. & Lazarus, A. A. *Behaviour Therapy Techniques*. Pergamon, 1966.

12.703 Psychological Techniques

Bradford, L. P., Gibb, J. R. & Benne, K. D. *T-Group Theory and Laboratory Method*. Wiley, 1964.
Kleinmuntz, B. *Personality Measurement*. Dorsey, 1967.
Vernon, P. E. *Personality Assessment: A Critical Survey*. Methuen, 1964.

12.713 Behaviour Control and Modification

Hilgard, E. R. *The Experience of Hypnosis*. Harcourt, Brace & World, 1968.
Jahoda, M. & Warren, N. *Attitudes*. Modern Psychology Series. Penguin, 1966.
Kanfer, F. H. & Phillips, J. S. *Learning Foundations of Behaviour Therapy*. Wiley.

12.065 Psychology IV (Applied Research)

Textbooks to be determined in consultation with the Head of School.

12.152 Research Methods II

Armore, S. J. *Introduction to Statistical Analysis and Inference*. Wiley, Sydney, 1966.
Campbell, D. T. & Stanley, J. C. *Experimental and Quasi-experimental Designs for Research*. Rand McNally, 1963.
Lumsden, J. *Elementary Statistical Method*. W.A.U.P., 1969.

12.153 Research Methods IIIA

Hays, W. L. *Statistics*. International ed. Holt, Rinehart & Winston, 1969.
Lee, R. M. *A Short Course in Fortran IV Programming*. McGraw-Hill, 1967.

12.163 Research Methods IIIB

Hays, W. L. *Statistics*. International ed. Holt, Rinehart & Winston, 1969.
Heerman, E. F. & Braskamp, L. S. eds. *Readings in Statistics for the Behavioural Sciences*. Prentice-Hall, 1970.

12.173 Psychological Issues

Mischel, T. *Human Action: Conceptual and Empirical Issues.* Academic Press, 1969.

12.253 Learning IIIA

Kimble, G. A. *Hilgard & Marquis' Conditioning and Learning.* Appleton, 1961.

12.303 Personality IIIA

No set text.

12.313 Personality IIIB

Murray, E. J. *Motivation and Emotion.* Foundations of Modern Psychology Series. Prentice-Hall, 1964.

Campbell, D. T. & Stanley, J. C. *Experimental and Quasi-experimental Designs for Research.* Rand McNally, 1963.

12.352 Psychometrics II

No set text.

12.353 Psychometrics IIIA

Anasrasi, A. *Psychological Testing.* Macmillan, 1968.

12.363 Psychometrics IIIB

Hammer, A. G. *Elementary Matrix Algebra for Psychologists.* Pergamon.

Nunnally, J. *Psychometric Theory.* McGraw-Hill, 1967.

12.402 Physiological Psychology

(BSc Applied Psychology students only.)

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.

12.412 Physiological Psychology II

Isaacson, R. L., Douglas, R. J., Lubar, J. F. & Schmaltz, L. W. *A Primer of Physiological Psychology.* Harper & Row, 1971.

12.413 Physiological Psychology IIIA

As for 12.402.

12.452 Human Information Processing II

McNicol, D. *A Primer of Signal Detection Theory.* Allen & Unwin, 1971.

Norman, D. *Memory and Attention.* Wiley, 1969.

12.453 Human Information Processing IIIA

As for 12.452.

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 Bio-

chemistry 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 60.

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

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

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

Segal, I. H. *Biochemical Calculations.* Wiley, 1968.

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

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

Davidson, J. N. *The Biochemistry of the Nucleic Acids.* 6th ed. Methuen, 1969.

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

Segal, I. H. *Biochemical Calculations.* Wiley, 1968.

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

41.102B Metabolic Pathways and Control Mechanisms

Haemoproteins, and electron transport, photosynthesis, photophosphorylation and oxidative phosphorylation. The nature and function of co-enzymes. 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

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

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.

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, Fermenation 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, 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

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

Rhodes, A. & Fletcher, D. *Principles of Industrial Microbiology*. Pergamon, 1966.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page 61.

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. 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, 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 or research work in the laboratories of State or Commonwealth organizations.

For details of level, unit value, when offered, hours per week, prerequisites and co-requisites, see page 61.

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 organisation into terrestrial communities; identification, evolution and distribution of elements of the Australian flora. Field excursions are an integral part of 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.

* Students are required to attend excursions as arranged during the course.

43.101C Plant Physiology

Photosynthesis and selected aspects of plant metabolism. Translocation and uptake of inorganic ions; the physiology of growth and development in plants; plant growth hormones and herbicides.

TEXTBOOKS

Devlin, R. M. *Plant Physiology.* 2nd ed. Van Nostrand, 1969.
Leopold, A. C. *Plant Growth and Development.* McGraw-Hill, 1964.
Salisbury, F. B. & Ross, C. *Plant Physiology.* Wadsworth, 1969.

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*

(Not offered this year.)

Considers the assessment analysis and presentation of data for classifying plants both at the specific and spura-specific level. Some field excursions are necessary.

TEXTBOOKS

Beadle, N. C. W., Evans, O. D. & Carolyn, 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.

* Students are required to attend some weekend day field trips.

43.102C Plant Physiology and Biochemistry

Aims to introduce students to the application of scientific methods to problems in the biochemistry and physiology of plants. Students will design and carry out appropriate experiments and interpret the results in the light of information received from lectures, tutorials and reading scientific literature. The following topics will be emphasized: (a) plant metabolism; (b) hormone physiology; (c) developmental physiology.

TEXTBOOK

Salisbury, F. B. & Ross, C. *Plant Physiology.* Wadsworth, 1969.

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. *Fundamentals 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.

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 disease 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. A. & Findlay, T. J. V. eds. *Chemical Data Book*. 2nd ed. Wiley, 1966.

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*. 4th ed. Feffer & Simons, 1967.

Schaum Outline Series. *Theory and Problems of College Chemistry*. McGraw-Hill.

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

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.

Daniels, F. et al. *Experimental Physical Chemistry*. 7th ed. McGraw-Hill, 1970.
Shaw, D. J. *Introduction to Colloid and Surface Chemistry*. 2nd ed. Butterworth, 1970.

2.002B Chemistry II (Organic Chemistry)

Aromatic and introductory heterocyclic chemistry; organometallic compounds; substitution and elimination reactions at saturated carbon atoms; carbanions; dienes.

TEXTBOOKS
1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*. 2nd ed. Allyn & Bacon, 1966.
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
Day, R. A. & Underwood, A. L. *Quantitative Analysis*. 2nd ed. Prentice-Hall, 1967.
Hamilton, L. E. & Simpson, S. *Calculations of Analytical Chemistry*. 7th ed. McGraw-Hill, 1968.
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 & Co., Lexington, 1969.

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; mass spectrometry. Chemical kinetics—transition state theory; theories of unimolecular 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.

2.003B Chemistry III (Organic Chemistry)

Stereochemistry and reaction mechanisms; applications of physical methods in organic chemistry; oxygen and nitrogen heterocyclics.

TEXTBOOKS

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*. 2nd ed. Allyn & Bacon, 1966, *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.
2. 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.

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.

2.003D Chemistry III (Analytical Chemistry)

Methods of separation, electrochemical analysis, absorption spectrophotometry, use of organic reagents, complex formation and the analytical chemistry of selected groups of the periodic systems.

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.

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.

2.003E 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.

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.

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 aligner 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).

2.091 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) and 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, clathrates, 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.

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.

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, antioxidants—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.

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.

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

2.311 Physical Chemistry I

Introduction to quantum mechanics; the hydrogen atom; types of molecular energy—translational, vibrational and rotational. Chemical thermodynamics—the first, second and third laws and their applications to physical and chemical equilibria in ideal and

non-ideal systems, and to transition state theory. Physical chemistry of solutions and colloid systems.

TEXTBOOKS

Aylward, G. H. & Findlay, T. J. V. *SI Chemical Data.* Wiley, 1971.
Barrow, G. M. *Physical Chemistry.* 2nd ed. McGraw-Hill, 1966.
Daniels, F. et al. *Experimental Physical Chemistry.* 7th ed. McGraw-Hill, 1970.
Shaw, D. J. *Introduction to Colloid and Surface Chemistry.* 2nd ed. Butterworth, 1970.

2.322 Physical Chemistry II

A more detailed study of certain aspects of physical chemistry, including the following: Physico-chemical aspects of spectroscopy —quantum mechanical approach; electronic and vibrational spectra; nuclear magnetic resonance and electron spin resonance spectroscopy; mass spectrometry. Chemical kinetics—transition state theory; theories of unimolecular 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.

2.331 Applied Physical Chemistry

Physical methods for the investigation of molecular structure such as spectroscopy, mass spectroscopy, X-ray diffraction, nuclear magnetic resonance spectroscopy, surface films, etc. Examples to illustrate the use of these methods. Special topics of current importance as time permits, e.g., modern electrochemistry. Seminars are conducted in the latter part of the year on physico-chemical topics.

TEXTBOOK

No set text.

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.)

TEXTBOOK
(b)
Chang, R. *Basic Principles of Spectroscopy*. McGraw-Hill, 1971.

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 interpretation 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 precession. 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

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.

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.

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.

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.

Hamilton, L. F., Simpson, S. & Ellis, D. W. *Calculations of Analytical Chemistry.* 7th ed. McGraw-Hill, 1969.

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

Aromatic and introductory heterocyclic chemistry; organometallic compounds; substitution and elimination reactions at saturated carbon atoms; carbanions; dienes.

TEXTBOOKS

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*. 2nd ed. Allyn & Bacon, 1966.

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.

2.622 Organic Chemistry II

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.* 2nd ed. Allyn & Bacon, 1966
   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.* 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.

2.633 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.

2.711 Solid State Chemistry

(i) Symmetry, diffraction and determination of crystal structures. (ii) Typical structures, lattice defects, deviations from stoichiometry, semi-conduction. (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.

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.

2.911 Applied Chemistry

(*a*) Information utilization: computer organization and programming, formal languages, numerical analysis and information structures; information retrieval; dimensional analysis. (*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; social 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

*No set texts.

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 foodstuffs, 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 and chemotherapy, galenicals, identification tests for alkaloids, etc. Analytical chemistry of analgesics, sedatives, hypnotics, steroid hormones, antihistamines, etc. Antibiotics, penicillin, streptomycin, aureomycin. 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.

2.251G Toxicology, Occupational and Public Health

Detection and estimation of poisonous materials, with greatest emphasis on industrial problems. Extensions to matters of public health, air pollution and water supplies, sewage, etc.

Covers: The development of problems. Industrial poisons. Air and gas sampling methods, dusts and fumes, silica, metal poisons, radioactive substances, poisonous derivatives of sulphur, phosphorus and nitrogen. Combustible and solvent vapours, micro gas methods. Blood and urine analysis. Water collection and analysis,

interpretations of results, criteria of pollution purification. Industrial wastes, sewage effluents.

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.

2.281G Instrumental Techniques in Food and Drug Analysis

A discussion of principles of operation of instruments and calibration procedures where necessary, together with an assessment of background procedures. Designed to service 2.231G, 2.242G and 2.251G in providing ancillary techniques for the identification then estimation of unknown materials.

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 distributions; 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. (vii) 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 B.Sc. (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 Computing

Algorithms, programmes and computers. Computer solution of several numerical and non-numerical problems using FORTRAN or PL/1. Debugging and verification of programmes. Data representation, organization and characteristics of computers. Computability.

TEXTBOOK

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, macroroutines, programme segmentation and linkage, libraries, input/output routines, buffering and overlapped processing.

TEXTBOOKS
Booth, T. L. *Digital Networks and Computer Systems.* Wiley.
Gear, C. W. *Computer Organisation and Programming.* McGraw-Hill.

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.

TEXTBOOK
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.

TEXTBOOK
Gass, S. I. *Linear Programming.* McGraw-Hill.

6.602D Programming Languages

History of programming languages. Language description. Backus-Naur form notation. Syntax and semantics. Classification and comparison of high-level languages. Compiling and interpreting. Bootstrapping.

TEXTBOOKS
No set text.

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. *Reading Exercises in Engineering Drawing.* Nelson.

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. Physiology of vertebrate animals. Human biology and variation. The biology of micro-organisms. Evolution. Anatomy and histology of selected animals. 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.

REQUIREMENTS FOR PRACTICAL WORK

A list of equipment required for practical work will be 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. *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

CSIRO. *The Australian Environment.* Melbourne U.P.
Strahler, A. N. *Physical Geography.* Wiley International.
Twidale, C. R. *Geomorphology.* Nelson Paperback.

Part II. *Economic Geography:* The geographic problems of scale and distance. The relevance of theory and quantitative methods. Patterns and structures of systems of agriculture, manufacturing and tertiary production in under-developed and advanced societies. Origins and functioning of the settlement network of central places and connecting routes. Includes an urban field tutorial of one day.

Laboratory classes will consist of the application of statistical methods to areal and point data.

TEXTBOOKS

Cole, J. P. & King, C. A. M. *Quantitative Geography*. Wiley.
Morrill, R. L. *The Spatial Organisation of Society*. Wadsworth.

Practical classes throughout the year introduce the use of maps and diagrams, air photographs and geographical statistics. The approximate cost to students is about $4.00 for field tutorials and about $8.00 for the required drawing equipment and a topographic map.

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—25.112 Geoscience II.

Third year*—25.003/1, 25.003/2 and 25.003/3 Geology III, Parts I, II and III (as for the Applied Geology degree course).

In addition, students in this course may take a second Geology subject in their third year, 25.013 Geology III (Supplemen-subject in their third year, 25.013 Geology III (Supplementary)†. This course will consist of one major section covering aspects of Geology of Fuels, Geomorphology, Structural Geology, Physical Oceanography, Geochemistry and Geophysics, and a second section comprising *either:* Clay Mineralogy and Mineragraphy; *or:* Stratigraphy and Palaeontology.

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.

*25.113 Geoscience III will replace the present subjects in 1973.
†1972 only.

The Honours course will consist 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 will cover the Honours work in the fourth year of the course. Part-time students will be required to commence their field thesis work at the end of the sixth year of their course and advanced laboratory assignments will be done in the eighth year along with the further work necessary to complete the field thesis work.

Students seeking to do Honours in Geology will have to 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. 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. Identifica-

tion 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

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.

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, macroscopic-mesoscopic structures, stereographic projection for studies of mesoscopic structures, structural-analysis of folded rocks, faults and joints. Introduction to microscopic structures-petrofabrics. Experimental structural geology. Practical: stereographic applications. Wulff net, Schmidt net. Introduction to structural analysis, fault problems.

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 I

Moore, R. C., Lalicker, C. G. & Fischer, A. G. *Invertebrate Fossils.* McGraw-Hill, 1952.

Sedimentary Environments and Stratigraphy I

Dunbar, C. O. & Rodgers, J. *Principles of Stratigraphy.* Wiley, 1957.
Brown, D. A., Campbell, K. S. W. & Crook, K. A. W. *Geological Evolution of Australia and New Zealand.* Pergamon, 1968.

25.003A Mineralogy, Petrology and Stratigraphy

Stratigraphy and Sedimentation: Advanced stratigraphic principles and techniques. Evolution and geosynclines and intracratonic basins. Regional stratigraphy and basin analysis. The sedimentational and tectonic history of selected geological provinces in Australia. The theory of continental drift and its stratigraphic implications.

Mineralogy: Optical theory of biaxial crystals, optical dispersion. An introduction to the theory of the Universal Stage. Selected topics in crystal chemistry. The nature of X-ray diffraction, theory and interpretation of X-ray powder and single crystal photographs. Practical: Determination of optical constants, use of immersion media for refractive index determination. Use of Universal Stage. Construction of a simple crystal structure model. Preparation and interpretation of X-ray powder and single crystal photographs.

Petrology: Sedimentary Petrology — The influence of transportation, deposition and diagenesis on the composition, texture and structure of the sedimentary rocks. Chemical weathering. The classification of detrital sediments. The non-clastic sediments. *Igneous Petrology:* Magma types and differentiation trends. *Metamorphic Petrology:* Metamorphic zones and metamorphic facies. Practical: Micro-petrography. Techniques of sedimentary petrology.

TEXTBOOKS

Stratigraphy II

Krumbein, W. C. & Sloss, L. L. *Stratigraphy and Sedimentation.* 2nd ed. Freeman, 1963.

Mineralogy

As for 25.002 Mineralogy, *plus:*

Azaroff, L. V. & Donabue, R. J. *Laboratory Experiments in X-ray Crystallography.* McGraw-Hill, 1969.

Zussman, J. ed. *Physical Methods in Determinative Mineralogy.* Academic, 1967.

Petrology II

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.

25.003B Geophysics, Stratigraphic Palaeontology, Structural Geology, Economic Geology

Geophysics: Physics, shape, structure and constitution of the earth; geotectonics, seismology, gravity, geodesy, geothermy, geomagnetism, palaeomagnetism, geoelectricity, aeronomy and geochronology. Practical work includes a one-day field tutorial.

Palaeontology: Applications of palaeontology to stratigraphy (geochronology and palaeoecology). Vertebrate palaeontology.

Structural Geology: Diastrophic and non-diastrophic deformations and dislocations; structures associated with igneous rocks; alpine style tectonics. Geotectonics. An introduction to structural analysis. Practical: Advanced structural mapping; structural problems, including use of the stereographic net.

Economic Geology: Principles and theories of ore deposition; ore magmas—synmagmatic, epimagmatic and post-magmatic processes. Submarine exhalative deposits. Sedimentary biogenetic deposits. Alluvial and residual deposits. Non-metallic ores. Practical: Macroscopic study of ores and country rock. Study of ores and associated rocks in thin and polished section.

Field work: To be held during the year. This includes a geological survey camp which will be held before the first term, and ten days of field instruction. Attendance is compulsory.

TEXTBOOKS

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.

Stratigraphical Palaeontology

Colbert, E. H. *Evolution of the Vertebrates*. Wiley.
Von Koenigswald, G. H. R. *The Evolution of Man*. Univ. of Michigan, 1962.

Structural Geology

Hills, E. S. *Elements of Structural Geology*. Methuen, 1963.
Phillips, F. C. *Use of Stereographic Projection in Structural Geology*. Arnold, 1960.

Economic Geology

Park, C. F. & MacDiarmid, R. A. *Ore Deposits*. Freeman, 1964.

25.013 Geology III (Supplementary)

Consists of section (*a*) and two components of section (*b*) approved by the Head of School.

Section (a)

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.

Photogeology: The principles of photogeology and photo-interpretation of laboratory work to illustrate the lecture course.

Geophysics: The theory, interpretation and practice of geophysical methods in exploration. Seismic, electrical, electromagnetic, gravity, magnetic, radioactive and well logging. Applications in hydrology, engineering, petroleum and mining geophysics. Laboratory requirements include conducting model experiments illustrating the different field methods.

Coal: Origin and distribution of coals. Coal type and coal rank. Petrology of coal and coal analyses.

Oil: Occurrence of oil. Recovery techniques and reservoir assessment.

Geochemistry: The geochemical distribution of elements and the geochemical cycle. Isotope geology. Mineral thermodynamics and phase equilibria. Meteorites. Geochemical prospecting. The clay minerals and their properties. Surface chemistry of clays. Chemical weathering. The geochemistry of the common rock-farming elements.

Section (b)

Mineragraphy: Reflected light optics orthoscopic and conoscopic, measurement of optical parameters in reflected light, microhardness and reflectivity-photometric and photoelectric measurements. Methods of ore mineral identification in reflected light. Microparagenesis and ore textures. Phase equilibrium studies. Laboratory: Mineragraphic preparations, polishing methods. Measurement of optical properties. Mineralogical and textural features of selected suites of ore minerals.

Stratigraphy and Sedimentology: Detailed study of the sedimentological features of deltaic, shallow marine and aeolian sediments, and of turbidites. Environmental analysis of sedimentary sequences. Methods of sediment analysis and sediment parameters. Laboratory flume experiments. Photogeology. Stratigraphic maps. Selected stratigraphic topics.

Palaeontology: Micropalaeontology—the morphology, taxonomy and stratigraphical distribution of the principal groups of microfossils. Practical work: Study and description of foraminifera, ostracoda, conodonts and plant microfossils, also certain examples of megafossils from the invertebrate phyla. Micropalaeontological techniques.

Structural Analysis: The geometric analysis, on all scales, of the fabric of metmorphic tectonites; the kinematic and dynamic inferences that may be made. Strain markers and the problems associated with strain analysis. Genesis of selected fabric elements (including preferred crystal lattice orientations) based on experimental work. Practical work: Geometric analysis of hand specimens; elucidation of the geometric properties of superposed fabric elements; interpretation and presentation of structural data, leading to the construction of orthographic block diagrams. The universal stage as a tool in microscopic analysis. Field work: Approximately ten days will be spent on field tutorials.

TEXTBOOKS

Section (a)

Oceanography

Pickard, G. L. *Descriptive Physical Oceanography*. Pergamon, 1964.

Geophysics II

Dobrin, M. B. *Introduction to Geophysical Prospecting.* McGraw-Hill, 1960.
Parasnis, D. S. *Principles of Applied Geophysics.* Methuen, 1962.

Coal

Raistrick, H. & Marshall, C. E. *The Nature and Origin of Coal and Coal Seams.* E.U.P., 1952.

Oil

Levorsen, A. I. *Petroleum Geology.* Freeman, 1954.

Geochemistry

Ahrens, L. H. *Distribution of the Elements in Our Planet.* McGraw-Hill, 1965.
Fyfe, W. S. *Geochemistry of Solids.* McGraw-Hill, 1964.
Loughnan, F. C. *Chemical Weathering of Silicate Minerals.* American Elsevier.
Mason, B. *Principles of Geochemistry.* 2nd ed. Wiley.
Siegel, S. *Nonparametric Statistics for the Behavioural Sciences.* McGraw-Hill, 1956.
Zussman, J. ed. *Physical Methods in Determinative Mineralogy.* Academic, 1967.

Section (b)

Mineragraphy

Edwards, A. B. *Textures of the Ore Minerals.* 2nd ed. Aus. I.M.M., 1954.
Hallimond, A. F. *1953 Manual of the Polarizing Microscope.* Cooke.
Uytenbogaardt, W. *Tables for Microscopic Identification of Ore Minerals.* Princeton U.P.

Stratigraphy III

See list for Stratigraphy II (25.003).

Micropalaeontology

Glaessner, M. F. *Principles of Micro-palaeontology.* M.U.P., 1955. Hafner, 1963.

Structural Analysis

Turner, F. J. & Weiss, L. E. *Structural Analysis of Metamorphic Tectonites.* McGraw-Hill, 1963.

25.014 Geology IV

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

A course in population genetics theory is being 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 nonoverlapping 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 equilibria 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.

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 consists of the application of mathematical techniques to the study of nature. In Australian universities different fields of study are emphasized but in each case the study of nature and natural laws is the main purpose, the mathematical technique being the means to this end. 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. The Department has provision for this full course.

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 where 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 has been designed for the student who intends to complete only the first year in mathematics or chemistry, but whose specialized studies require knowledge of certain mathematical tools such as calculus, matrices, probability, etc. Students in Wool and Pastoral Sciences, Optometry and Applied Psychology will find this course valuable.

Students who select this course should weigh seriously the implications of their choice because no further mathematics units are normally available. However, a student with a meritorious performance in 10.021 may be permitted to proceed to any of 10.311, 10.311T and 10.031.

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 co-requisites. 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 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:

10.211 Applied Mathematics II, Unit A;
10.111 Pure Mathematics II, Units A, B, C;
10.112 Pure Mathematics III, Units A, B, C, D, E.
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 Units A, B and C of 10.211 Applied Mathematics II, together with Units A and B of 10.111 Pure Mathematics II. In third year the student should take Units A, B, C and D of 10.212 Applied Mathematics III. 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 units in 10.112 Pure Mathematics III in third year, he should take the Units 10.111A and 10.111B of Pure Mathematics II and 10.211A of Applied Mathematics II, passes in which will qualify him to enter level III Units in Pure Mathematics; he should also take complementary units in accordance with Faculty rules. In third year he should take the four units A, B, C and D of 10.312 of Theory and Statistics III, together with at least three level III Mathematics units (Pure or Applied); he should also take complementary units in accordance with Faculty rules.

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 10.121 Higher Pure Mathematics II, Units A, B and D and 10.221 Higher Applied Mathematics II, Unit A. In third year he should attempt 10.122 Higher Pure Mathematics III, Units A, C, D and F.

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 10.221 Higher Applied Mathematics II, Units A, B and C, 10.121 Higher Pure Mathematics II, Units A and B, and 1.122 Higher Physics II, Unit C. Students intending to take mathematical physics options in later years of Applied Mathematics should also take at least one other unit of Higher Physics II.

In third year the student should attempt four units of 10.222 Higher Applied Mathematics III, including Units A and C, one of Units B and F and one of Units D and E; and at least one unit of 10.122 Higher Pure Mathematics III.

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, Units A and B of either 10.111 Pure Mathematics II or 10.121 Higher Pure Mathematics and Unit A of either 10.211 Applied Mathematics II or 10.221 Higher Applied Mathematics II.

In third year he should take 10.322 Higher Theory of Statistics III, Units A, B, C and D, 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 passed in 10.321 Higher Theory of Statistics II, 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, 10.311T, 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 24th January to 18th February, 1972. 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 reponsibility 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 $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.

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.
Thomas, G. B. *Calculus and Analytic Geometry.* 4th ed. Addison-Wesley.

10.011 Higher Mathematics I

Calculus, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

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.

10.021 Mathematics IT

Calculus, analysis, analytic geometry, algebra, probability theory, elementary computing.

TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming.* Prentice-Hall.
Calculus. To be advised.
Notes on Sets, Probability, Matrices and Vectors. N.S.W.U.P.

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

Kreyszig, E. *Advanced Engineering Mathematics.* Wiley.

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.

TEXTBOOK

Kreyszig, E. *Advanced Engineering Mathematics.* Wiley.

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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.

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

Gass, H. *Linear Programming.* I.S.E. McGraw-Hill.
Tropper, A. M. *Linear Algebra.* Nelson. Paperback.

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

Churchill, R. V. *Complex Variables and Applications.* I.S.E. McGraw-Hill.
Hilton, P. J. *Partial Derivatives.* Routledge.
Purcell, E. J. *Calculus with Analytic Geometry.* Appleton-Century-Crofts.

10.111C Pure Mathematics II—Abstract Algebra

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

Dean, R. A. *Elements of Abstract Algebra.* Wiley.
Gans, D. *Transformations and Geometrics.* Appleton-Century-Crofts.

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.

10.121B Higher Pure Mathematics II—Analysis

Analytic functions, Laurent and Taylor series, calculus of residues, evaluation of real integrals, analytic continuation, infinite products, entire functions, the Weierstrass factorization theorem, mittag leffler expansions, conformal mapping, elliptic functions.

TEXTBOOK

Ahlfors, L. V. *Complex Analysis.* I.S.E. McGraw-Hill.

10.121D Higher Pure Mathematics II—Real Variable Theory

Topology of metric spaces, functions over metric spaces, analysis in n-dimension. The Riemann integral, Lebesgue measure, L^2 spaces, Fourier series.

TEXTBOOK
Goldberg, R. R. *Methods of Real Analysis.* Blaisdell.

10.112A Pure Mathematics III—Algebra

Rings, fields, groups.

TEXTBOOKS
Davenport, H. *The Higher Arithmetic.* Hutchinson.
Dean, R. A. *Elements of Abstract Algebra.* Wiley.
Griffin, H. *Elementary Theory of Numbers.* McGraw-Hill.

10.112B Pure Mathematics III—Functional Analysis

Elementary treatment of operators in Hilbert space.

TEXTBOOK
Berberian, S. K. *Introduction to Hilbert Space.* O.U.P., 1961.

10.112C Pure Mathematics III—Differential Geometry

Curves and surfaces in space. Differential forms. Curvature.

TEXTBOOK
O'Neill, B. *Elementary Differential Geometry.* Academic.

10.112D Pure Mathematics III—Set Theory

Cardinal and ordinal numbers. Elementary topology of surfaces.

TEXTBOOKS
Blackett, D. W. *Elementary Topology: Combinatorial and Algebraic Approach.* Academic, 1967.
Halmos, P. R. *Naive Set Theory.* Van Nostrand.

10.112E Pure Mathematics III—Analysis

Further complex analysis and ordinary differential equations.

TEXTBOOKS
Churchill, R. V. *Complex Variables and Applications.* I.S.E. McGraw-Hill.
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.

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
Birkhoff, G. & Rota, G. *Ordinary Differential Equations.* Blaisdell.
Singer, I. M. & Thorpe, J. A. *Lecture Notes on Elementary Topology.* Scott, Foresman, 1967.

10.122D Higher Pure Mathematics III—Number Theory and Logic

Elementary number theory, mathematical logic, axioms of set theory, algebraic number theory.

TEXTBOOKS
Hardy, G. H. & Wright, E. M. *Introduction to the Theory of Numbers.* O.U.P.
Pollard, H. *The Theory of Algebraic Numbers.* Carus Math. Monograph No. 9.

10.122F Higher Pure Mathematics III—Topology and Integration

Topological spaces, separation axioms, measure theory, Fubini's theorem, absolute continuity.

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
Bowman, F. *Introduction to Bessel Functions.* Dover.
Sneddon, I. N. *Fourier Series.* Routledge.
Spiegel, M. R. *Theory and Problems of Vector Analysis.* Schaum.

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
Symon, K. R. *Mechanics.* Addison-Wesley.

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.

TEXTBOOKS
Queen, N. M. *Vector Analysis.* McGraw-Hill, 1967.
Stephenson, G. *An Introduction to Partial Differential Equations for Science Students.* Longmans. Paperback.

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.

10.221C Higher Applied Mathematics II (Hydrodynamics)

As for 10.211C but in greater depth.

TEXTBOOK
No set text.

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.

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
Fung, Y. C. *A First Course in Continuum Mechanics.* Prentice-Hall.

10.212C Applied Mathematics III—Maxwell's Equations

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, electromagnetic potentials, radiation, vector wave equation, solutions, cavity resonators, waveguides.

TEXTBOOK
Cheston, W. B. *Elementary Theory of Electric and Magnetic Fields.* Wiley, 1964.

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.

TEXTBOOK
Rabenstein, A. L. *Introduction to Ordinary Differential Equations.* Academic.

10.222A Higher Applied Mathematics III—Numerical Analysis

As for 10.212A but in greater depth.

TEXTBOOK
Conte, S. D. *Elementary Numerical Analysis.* McGraw-Hill.

10.222B Higher Applied Mathematics III—Continuum Mechanics

As for 10.212B but in greater depth.

TEXTBOOK
Fung, Y. C. *A First Course in Continuum Mechanics.* Prentice-Hall.

10.222C Higher Applied Mathematics III—Maxwell's Equations and Special Relativity

Maxwell's equations: as for 10.212C, but in greater depth, and including Maxwell stress tensor, electromagnetic momentum, and radiation pressure. 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.

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.

TEXTBOOK
No set text.

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.

TEXTBOOK
No set text.

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.

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
Bross, I. D. J. *Design for Decision.* Macmillan.
Huff, D. *How to Lie with Statistics.* Gollancz.
Moroney, M. J. *Facts from Figures.* Pelican.

TEXTBOOKS
Hogg, R. V. & Craig, A. T. *Introduction to Mathematical Statistics.* 3rd ed. Collier-Macmillan.
Statistical Tables.

10.311T Statistics

Subject matter same as 10.331.

TEXTBOOKS
Freund, J. E. *Mathematical Statistics.* 2nd ed. Prentice-Hall.
Statistical Tables.

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.

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.

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.

TEXTBOOK
No set text.

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.

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
No set text.

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.

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.

10.322C Higher Theory of Statistics III

As for 10.312C but in greater depth.

TEXTBOOK
As for 10.312C.

10.322D Higher Theory of Statistics III

As for 10.312D but in greater depth.

TEXTBOOK
Lamperti, J. *Probability.* Benjamin.

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.
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.
Wetherill, G. B. *Sequential Methods in Statistics.* Methuen.

10.331 Statistics

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.

TEXTBOOKS
As for 10.311T.

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 substances 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, 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 Higher Microorganisms (44.102C)—alternatively Mycology (43.102D) given in the School of Botany—General Applied Microbiology (44.102D), Medical Microbiology (44.102E), Immunology (44.102F) and Fermentation Technology (42.102, in the School of Biological 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 Basic General Microbiology (44.102A), Basic General Microbiology (44.102B), Immunology (44.102F) and Higher Microorganisms (44.102C, alternatively Mycology 43.102D). 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 62.

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
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 44.102 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 Micro-organisms

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: Mycology (43.102D) as alternative to this unit. (See entry under Botany).

TEXTBOOKS

To be advised by the School.

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., Dulbeco, 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.

TEXTBOOK

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.

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 and having no prerequisite apart from Introductory Philosophy A and B, are:

Predicate Logic;
Descartes;
British Empiricism;
Greek Philosophy: Thales to Plato;
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.

Note on Prerequisites

"Introductory Philosophy A and B" is equivalent to "Philosophy I".

Where "Predicate Logic" is shown as a prerequisite it may be regarded as equivalent to the Logic unit of Philosophy II (in courses up to 1970).

Where "British Empiricism" is shown as a prerequisite it may be regarded as equivalent to the British Empiricism unit of Philosophy II (in courses up to 1970).

In other cases, students wishing to substitute an old course as prerequisite should consult the School.

Introductory Philosophy A (Session 1)

A first course for students new to the subject. The course divides into three parts. 1. *Plato:* An introduction to ethics by way of some dialogues of Plato. 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.
Flew, A. *Body, Mind and Death.* Macmillan.
Hamblin, C. L. *Elementary Formal Logic—A Programmed Course.* Hicks Smith and University Paperbacks.
Hume, D. *On Human Nature and the Understanding.* Flew, A. ed. Collier.
Plato. *Protagoras and Meno.* Guthrie, W. K. C. trans. Penguin Classics.
Vlastos, G. ed. *The Philosophy of Socrates.* Macmillan.

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 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:* 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:*
Kalish, D. & Montague, R. *Logic: Techniques of Formal Reasoning.* Harcourt, Brace & World.
Plato. *The Last Days of Socrates.* Tredennick, H. trans. Penguin Classics.

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.

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.

British Empiricism (Session 1)

Prerequisite: Introductory Philosophy A and B.

A survey of the empiricist tradition with special concentration on Berkeley and Hume.

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.

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.

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.

Foundations of Mathematics (Session 2)

Prerequisite: 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, Anti-

nomies of naive set theory, Logicism, Intuitionism, Formalism, Gödel's Incompleteness result.

TEXTBOOK

Wilder, R. S. *An Introduction to the Foundations of Mathematics.* Wiley.

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.

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

Ayer, A. J. ed. *Logical Positivism.* Macmillan.

Russell, B. *Logic and Knowledge.* ed. Mash, R. S. Allen & Unwin.

Wittgenstein, L. *Tractatus Logico-Philosophicus.* Pears, D. F. & McGuinness, B. F. trans. Routledge.

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.

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.

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.

Existentialism (Session 2)

Prerequisite: Descartes.

Sartre's account of man-in-the-world. Sartre's ontology, his use of a phenomenological method and his ethics.

TEXTBOOKS
Sartre, J. P. *Being and Nothingness.* Methuen.
Manser, A. *Sartre, A Philosophic Study.* Athlone Press.

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, Theaetetus, Sophist and Statesman.* Everyman.

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*. Wiener, 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.

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.

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 1.113 A, 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 pre-requisites 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		
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

		Level	No. Units
	FIRST YEAR		
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

		Level	No. Units
	FIRST YEAR		
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

* 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.

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 and magnetostatics in vacuum and in dielectrics. Magnetic materials. Maxwell's equations and simple applications.

TEXTBOOK

Whitmer, R. M. *Electromagnetics.* 2nd ed. Prentice-Hall, 1962.

1.112B Modern Physics

Special relativity. Quantum theory. Schrödinger wave equation and simple applications. Atomic and nuclear physics. Nuclear reactions.

TEXTBOOK
Beiser, A. *Perspectives of Modern Physics.* Rev. ed. McGraw-Hill, 1969.

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.

TEXTBOOKS
Crawford, P. S. *Waves.* McGraw-Hill, 1968.
Sears, F. W. *Thermodynamics, the Kinetic Theory of Gases and Statistical Mechanics.* Addison-Wesley.

1.122A Electromagnetism

Further electrostatics. Poisson's and Laplace's equations. Ferromagnetism. 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.
Zemansky, M. W. *Heat and Thermodynamics.* 5th ed. McGraw-Hill, 1969.

(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, semi-conductor and insulators; energy level diagrams.

TEXTBOOK
Wert, C. A. & Thomsen, R. M. *Physics of Solids.* I.S.E. McGraw-Hill.

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 laser light; 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

No set text.

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 multipole 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

Crystallography, 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.
Transistor Manual. General Electric Co. 1972 *or* 1971.
Russell, G. J. & Mann, K. *Alternating Current Circuit Theory.* N.S.W.U.P.

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

TEXTBOOK

Van der Ziel, A. *Introduction to Electronic Circuits.* Allyn & Bacon, 1969.

(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.

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 in Physics

A course designed to provide an integrated view of the fundamental physical phenomena and the major theories that arise from them and have shaped Physics as a discipline.

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
Blakemore, J. S. *Solid State Physics*. Saunders, 1969.
Adler, R. B., Smith, A. C. & Longini, L. D. *Introduction to Semiconductor Physics*. Wiley, 1964.
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
TEXTBOOK
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.

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 66.

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
To be advised.

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 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 62-63.

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*. O.U.P., 1967.

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. Obligatory field camp.

TEXTBOOKS
Saunders, J. T. & Minton, 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.

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 Smiths 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.

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.

TEXTBOOK

Manning, A. *An Introduction to Animal Behaviour.* Arnold, 1967.

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.* Macmillan, 1968.

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

Frye, B. E. *Hormonal Control of Vertebrates.* Macmillan, 1967.
Gilchrist, F. G. *A Survey of Embryology.* McGraw-Hill, 1968.
Nalbandov, A. V. *Reproductive Physiology.* Freeman, 1964.

45.102E 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 the exogenous and endogenous contributions to invertebrate behaviour.

TEXTBOOK

Marler, P., & Hamilton, W. J. *Mechanisms of Animal Behaviour.* Wiley, 1965.

45.102F Invertebrate Physiology

A phylogenetic 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; and the embryonic and evolutionary aspects of modes of larval development.

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.

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.

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.

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.

NOTES

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					