



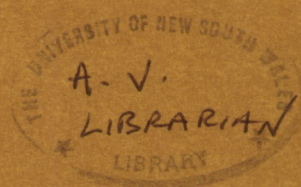
The University of New South Wales

# Sciences

Board of Studies in Science  
and Mathematics

Faculty of Biological Sciences

Faculty of Science



1988  
Faculty Handbook







**The University of New South Wales**  
PO Box 1 Kensington NSW Australia 2033 Phone 697 2222

# Sciences

Board of Studies in Science  
and Mathematics

Faculty of Biological and Behavioural Sciences

Faculty of Science

# 1988 Faculty Handbook

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Information in this Handbook has been brought up to date as at 8 September 1987, but may be amended without notice by the University Council.

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## Session Dates

1988

1989

### Session 1

Session Begins	Monday	7 March	Monday	27 February
Mid-Session Recess				
Last Day of Class	Friday	13 May	Thursday	23 March
Classes Resume	Monday	23 May	Monday	3 April
Last Day of Session	Friday	17 June	Thursday	8 June
Examinations Begin	Monday	27 June	Thursday	15 June
Examinations End	Wednesday	13 July	Friday	30 June

### Session 2

Session Begins	Monday	1 August	Monday	24 July
Mid-Session Recess				
Last Day of Classes	Friday	26 August	Friday	22 September
Classes Resume	Monday	5 September	Tuesday	3 October
Last Day of Session	Friday	11 November	Wednesday	1 November
Examinations Begin	Monday	21 November	Wednesday	8 November
Examinations End	Friday	9 December	Friday	24 November

Vacation Weeks	16-22 May	27 March — 2 April
Common to Australian Universities	11-17 July	3-9 July
	29 Aug — 4 September	25 September — 1 October

### 1988

22 April	Last day for students to discontinue without failure subjects which extend over Session 1 only
12 August	Last day for students to discontinue without failure subjects which extend over the whole academic year
23 September	Last day for students to discontinue without failure subjects which extend over Session 2 only

## Faculty of Biological and Behavioural Sciences\*

### Staff

*Comprises First Year Biology Teaching Unit, Schools of Biochemistry, Botany, Microbiology, Psychology and Zoology, Department of Biotechnology.*

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Vacant

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### Tutor

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 Chong Seng Soon, BSc BEng(Hons) *Syd.*

**Administrative Assistant**

Jennifer Lyn Todd

---

**School of Mathematics**


---

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Viliam Teodor Buchwald, BSc *Manc.*, MSc PhD *Lond.*, FIMA

**Professor of Applied Mathematics**

Roger Hamilton James Grimshaw, MSc *Auck.*, PhD *Camb.*

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Gavin Brown, MA *St.And.*, PhD *N'cle.(U.K.)*, FAA  
 Michael George Cowling, BSc *A.N.U.* PhD *Flin.*

**Professor of Statistics**

Abraham Michael Hasofer, BEE *Faruk*, BEc PhD *Tas.*, MIEAust

**Associate Professor and Director of First Year Studies**

Angus Henry Low, MSc DipEd *Syd.*, PhD *N.S.W.*

**Senior Tutors**

Geoffrey John Coombs, MSc *Monash*, PhD *Edin.*  
 Donald Sidney Craig, BSc *Qld.*  
 Milan Pahor, BSc *W'gong.*

**Tutors**

David Byron, PhD *N.S.W.*  
 Ann Margaret Cowling, BSc *Melb.*  
 Lisa Veronica Maloney, BSc Hons *Qld.*  
 Jennifer Judith Randall, MSc *Witw.*  
 Tony Peter Van Ravenstein, BMATH PhD *W'gong.*  
 Derek Noel Ward, BSc DipEd *N.S.W.*

**Senior Systems Analyst**

Veronica Paul, BSc *Wales*, DipEd *N.E.*

**Analyst Programmer**

Michael Gerberg, BSc(Hons) *N.S.W.*

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**Department of Pure Mathematics**
**Associate Professor**

John Frederick Price, MSc *Melb.*, PhD *A.N.U.*

**Senior Lecturers**

Peter Windeyer Donovan, BA *Syd.*, DPhil *Oxf.*  
 Anthony Haynes Dooley, BSc PhD *A.N.U.*  
 Mary Ruth Freislich, BA *Witw.*, MA MEd *N.S.W.*  
 Jack David Gray, BA *Syd.*, PhD *N.S.W.*  
 Michael David Hirschhorn, BSc *Syd.*, MSc *Edin.*, PhD *N.S.W.*  
 David Christopher Hunt, BSc *Syd.*, MSc PhD *Warw.*  
 Ezzat Sami Noussair, BEng BSc *Cairo*, PhD *Br. Col.*  
 Iain Raeburn, BSc *Edin.*, PhD *Utah*  
 John St Alban Sandiford, MSc *Syd.*  
 Colin Eric Sutherland, BSc *Cant.*, PhD *Calif.*  
 David Graham Tacon, BSc *N'cle.(N.S.W.)*, PhD *A.N.U.*  
 Dennis William Trenerry, BSc PhD *Adel.*

**Lecturers**

Charles Dixon Cox, BSc DipEd *Qld.*  
 Shaun Anthony Requa Disney, BA BSc *Adel.*, DPhil *Oxf.*  
 Rodney Kelvin James, BSc PhD *Syd.*

**Senior Tutor**

James William Franklin, MA *Syd.*, PhD *Warw.*

**Emeritus Professor**

George Szekeres, DiplChemEng *Bud.*, Hon.DSc *N.S.W.*, FAA, MHAS

**Research Associate**

David Charles Wilson, MA, PhD *Syd.*

**Honorary Associates**

John Harold Loxton, MSc *Melb.*, PhD *Camb.*  
 Alf van der Poorten, BA BSc PhD MBA *N.S.W.*

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**Department of Applied Mathematics**
**Associate Professors**

Michael Leslie Banner, BE MEngSc *Syd.*, PhD *Johns H.*  
 William Eric Smith, MSc *Syd.*, and *Oxf.*, PhD *N.S.W.*, MInstP, MAIP

## Senior Lecturers

Peter James Blennerhassett, BE *W.Aust.*, PhD *Lond.*  
Brian James Burn, MSc *Otago*, PhD *Camb.*  
William Dennis McKee, BSc *Adel.*, MSc *Flin.*, PhD *Camb.*  
Jason Harry Falla Middleton, BSc PhD *Monash*  
Elvin James Moore, MSc *W.Aust.*, PhD *Harv.*  
Richard Wyndham O'Brien, BE *N.S.W.*, PhD *Camb.*  
Alexander Hugh Opie, BSc DipEd *Melb.*, PhD *Monash*, FAIP  
Kok-Lay Teo, BSc *Sing.*, MASC PhD *Ott.*, MIEEE, AMIEE

## Lecturers

David Charles Guiney, BSc PhD *Adel.*  
Douglas Edward Mackenzie, BSc *Tas.*, FIMA, MACE  
John Francis Falla Middleton, BSc PhD *Monash*  
John Michael Murray, MSc *N.S.W.*, PhD, *Wash.*  
David Alan Mustard, BSc *Syd.*, MSc *N.S.W.*  
Robert Spencer Womersley, BSc *Adel.*, MSc PhD *Dundee*

## Senior Tutor

Albert Tatar Daoud, BSc *R'dg.*, PhD *N.S.W.*, FlinstP

## Visiting Fellow

Andrew Michael Moore, BSc *Lond.*, DPhil *Oxf.*

## Research Associates

Linda Walsh, BSc PhD *Manc.*

## Research Fellow

Dave Broutman, BA *Calif.*, PhD *Scripps*

## Professional Officers (Oceanography Group)

Gregory John Nippard, BSc *Syd.*  
Drew Robert Whitehouse, BSc *Qld.*

## Honorary Associates

Commodore Daniel James McKeegan, BSc *Syd.*, MSc PhD *N.S.W.*, RAN  
(Ret)  
Simon Jacques Prokhovnik, BA MSc *Melb.*

## Honorary Visiting Fellow

John Taylor, MSc PhD *Lond.*

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## Department of Statistics

### Associate Professor

Clyde Arnold McGilchrist, BSc BEd *Qld.*, MSc PhD *N.S.W.*

### Senior Lecturers

Peter John Cooke, BSc MSc *N.E.*, MS PhD *Stan.*  
John Anthony Eccleston, BSc *Syd.*, MSc *Manc.*, PhD *C'nell.*  
Manohar Khanderao Vagholkar, MSc *Bom.*, DIC PhD *Lond.*  
Gillian Ziona Stein, BSc *Cape T.*, MSc *S.A.*, PhD *Cape T.*

## Lecturers

Ronald Bruce Davis, BSc *Syd.*, MSc *N.S.W.*, DipEd *N.E.*  
Marek Musiela, MMath *Wroclaw*, PhD *Polish Acad. Sc.*, DSc *Grenoble*

## Professional Officer

Rhonda Gock, BSc MStats *N.S.W.*

## Honorary Associates

James Bartram Douglas, BSc MA DipEd *Melb.*  
Geoffrey Kennedy Eagleson, BSc PhD *Syd.*

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## School of Optometry

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### Professor of Optometry and Head of School

Hermann Barry Collin, BSc MAppSc PhD *Melb.*, LOsc V.C.O., FAAO

### Associate Professor

Brien Anthony Holden, BAppSc *Melb.*, PhD *City*, LOsc V.C.O. FAAO

### Senior Lecturers

John Andrew Alexander, MSc PhD *N.S.W.*, ASTC, FIO, FAAO  
David Philip Crewther, MSc *Melb.*, PhD *Cal. Tech.*  
Stephen John Dain, BSc PhD *City*, FBCO, FAAO, FVCO MIEAust  
Daniel James O'Leary, BSc *City*, MSc PhD *Wales*, FBOA, FSMC

### Lecturers

Philip James Anderton, BOptom BSc PhD *N.S.W.*,  
MScOptom *Melb.*  
Graham Leslie Dick, MSc *N.S.W.*, ASTC, FIO  
Angela Kathleen McCarthy, MSc *N.S.W.*, ASTC, FIO  
David Cecil Pye, MOptom *N.S.W.*

### Tutors

Donald Keith Martin, BOptom PhD *N.S.W.*  
Colleen Marie Reilly, BOptom *N.S.W.*

### Instructor

Ian William Robinson

### Administrative Assistant

Yvonne Margaret Bartels, BA *Monash*

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## Cornea and Lens Research Unit

### Director

Associate Professor Brien Anthony Holden

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## School of Physics

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**Associate Professor and Head of School**

John Charles Kelly, BSc *Syd.*, PhD *R'dg.*, DSc *N.S.W.*, CPhys, FInstP, FAIP, MAmPS

**Professor of Experimental Physics**

Hiroshi Julian Goldsmid, BSc PhD DSc *Lond.*, FAIP

**Professor of Experimental Physics**

Kenneth Norman Robert Taylor, BSc PhD *Birm.*

**Professor of Theoretical Physics and Head of Department of Theoretical Physics**

Heinrich Hora, DiplPhys *Halle*, DrRerNat *Jena*, DSc *N.S.W.*, FInstP, FAIP

**Professor**

Hans Gerard Leonard Coster, MSc PhD *Syd.*, MInstP, MAIP

**Professor and Head of Department of Condensed Matter Physics**

Dan Haneman, DSc *Syd.*, PhD *R'dg.*, FAIP, ARACI

**Professor of Physics and Head of Department of Astrophysics and Optics**

John William Vanstan Storey, BSc *LaT.*, PhD *Monash*

**Senior Lecturer and Executive Assistant to Head of School**

John Robert Hanscomb, BSc *Qld.*, MSc PhD *N.S.W.*, MAIP  
GradInstP

**Director of First Year Studies**

Graeme John Russell

**Principal Tutor**

Paul Michael O'Halloran, BA *Macq.*, MEd *N.S.W.*

**Senior Tutors**

Ian Richard Dunn, BSc BA *Melb.*, MIEEE  
Edward Peter Eyland, BSc MPhys *N.S.W.*, BD *Lond.*  
Marlene Noella Read, BSc PhD *N.S.W.*

**Tutors**

Jaan Ferdinand Jouke Boersma, MSc *Tas.*  
Gail Patricia Box, BSc PhD *N'cle. (N.S.W.)*  
Paul Westley Brooks, BSc *Adel.*  
Phillip John Clark, BSc *N.S.W.*  
Michael Philip Goldsworthy, MSc *N.S.W.*  
Joseph Khachan, BSc *N.S.W.*  
Christopher John Russell, BSc *N.S.W.*  
Sophia Sakellis, DipPhysics *Patras*, MSc *N.S.W.*  
Perry Robert Wiles, BSc *N.S.W.*

**Professional Officers**

Peter Robert Barker, BSc PhD *Monash*  
Jack William Cochrane, BAppSc *Canberra C.A.E.*, MPhys *N.S.W.*  
Gordon Robert Keen, BSc BE *Cant.*  
Patrick Thomas McMillan, BSc DipEd *Syd.*  
Barry Perczuk, BSc PhD *Monash*  
John McLarem Tann, BAppSc *Melb.*  
Jeremy Karl Walter, BSc *Lond.*

**Honorary Associates**

John Stuart Dryden, MSc *Melb.*, PhD DIC *Lond.*, FAIP  
Patrick Kelly, MA PhD ScD *Camb.*, FAIP, MInstP

**Honorary Visiting Fellows**

Victor Kastalsky, BSc PhD *N.S.W.*, ASTC, MInstP, MAIP  
Roderick Ian Sutherland, BSc *LaT.*, DipEd PhD *N.S.W.*  
Stephen George Szirmai, BSc PhD *N.S.W.*

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## Department of Applied Physics

**Associate Professor**

David Henry Morton, MA *Oxf.*, FInstP, FAIP

**Senior Lecturers**

John Ian Dunlop, BSc PhD *N.S.W.*, MAIP, MAAS  
Erik Harting, BSc PhD *N.S.W.*, ASTC, MAIP  
Victor Raymond Howes, BSc PhD *Lond.*  
Kenneth Reid Vost, BSc *Glas.*, MSc PhD *N.S.W.*, AMAusIMM

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## Department of Astrophysics and Optics

**Senior Lecturers**

Zdenek Kviz, DipPhys *Brno*, CSerRerNatDr *Charles*, PhD *Prague*  
Peter Mitchell, BSc PhD *Adel.*, MAIP  
George Lange Paul, MSc *Syd.*, PhD *Edin.*  
Betty Louise Turtle, BSc *Adel.*, PhD *A.N.U.*

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## Department of Biophysics

**Senior Lecturer and Head of Department of Biophysics**

James Martin Pope, MSc *Brist.*, DPhil *Sus.*, AInstP

**Associate Professor**

Veronica Jean James, BA BSc *Qld.*, PhD *N.S.W.*, MAIP

**Senior Lecturers**

Raymond Gary Simons, BSc *Syd.*, MSc *Tel Aviv*, PhD *N.S.W.*  
John Robert Smith, BSc *Syd.*, PhD *N.S.W.*, MAIP  
Joseph Albert Wolfe, BSc *Qld.*, PhD *A.N.U.*

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## Department of Condensed Matter Physics

### Associate Professor

Graham James Bowden, BSc DipAdvStudSc PhD *Manc.*

Graeme John Russell, BSc PhD *N.S.W.*, MInstP, GradAIP

### Senior Lecturers

Robert Louis Dalglish, BSc PhD *N.S.W.*

Peter Russell Elliston, BSc *Melb.*, PhD *Monash*

Michael Gal, MSc PhD *E.L.Bud.*

Leslie Beven Harris, BSc *Lond.*, BA DipEd *Durh.*, PhD *N.S.W.*, CEng, FIM, FInstP

David John Miller, BSc PhD *N.S.W.*, DipEd *Syd.*, MAIP, MAmPS, MAAPT

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## Department of Theoretical Physics

### Associate Professors

David Neilson, BSc *Melb.*, MS PhD *N.Y. State*

Jaan Oitmaa, BSc PhD *N.S.W.*, FAIP, MAmPS

### Senior Lecturer

Michael Allister Box, BSc *Monash*, PhD *Syd.*, GradAInstP

Christopher John Hamer, MSc *Melb.*, PhD *Calif. Inst. Tech.*, DipCompSc *Canberra*

Robert John Stening, MSc *Syd.*, PhD *Qld.*, DipTertEd *N.E.*, FRMetS

### Lecturer

John Richard Shepanski, MSc *Syd.*, MAIP, MAmPS

## Board of Studies in Science and Mathematics

*The Board of Studies in Science and Mathematics includes all members of the Faculty of Biological and Behavioural Sciences and the Faculty of Science, and some members of specific schools in other faculties contributing to the Science and Mathematics Course: Applied Geology, Chemical Engineering and Industrial Chemistry, Geography, Metallurgy (Applied Science); Philosophy, Science and Technology Studies (Arts); Accountancy, Economics (Commerce); Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Surveying (Engineering); Anatomy, Community Medicine, Physiology and Pharmacology (Medicine); Education (Professional Studies); and the Centre for Liberal and General Studies.*

### Dean

Professor A. J. Wicken

### Chairman

Professor H. J. Goldsmid

### Co-ordinator of Studies in Science and Mathematics

Dr B. J. Burn

### Administrative Assistant

Karenne May Irvine, BA *N.S.W.*

## Introduction to the Sciences Handbook

This handbook has been designed to assist understanding of the academic activities of three inter-related groups within the university, namely the Board of Studies in Science and Mathematics, the Faculty of Biological and Behavioural Sciences and the Faculty of Science. The Board is responsible for the undergraduate studies of students majoring in disciplines associated with the two faculties and several schools from other faculties. The regulations governing the award of the degree of Bachelor of Science form a substantial part of the handbook. Other parts include details of the Science component of the combined degrees, Science/Law, Science/Commerce, Science/Civil Engineering, Science/Electrical Engineering, Science/Aeronautical Engineering, Science/Industrial Engineering, Science/Mechanical Engineering, Science/Naval Architecture, Science/Medicine, Science/Optomety, and of the two concurrent courses in Mathematics Education and Science Education.

Several specialist courses of study, also leading to the award of the degree of Bachelor of Science, are offered by the two faculties and the regulations covering these are given under the separate faculty sections. In addition the two faculties make available facilities to proceed to higher degrees and the conditions under which these awards are made are listed under the sections devoted to graduate study.

In the last part of the handbook there are brief statements of the syllabuses for units prescribed in the various regulations.

## Faculty Information

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### Some People Who Can Help You

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If you require advice about enrolment, degree requirements, progression within courses or any other general matters related to the Board, contact one of the following:

Ms K. Irvine, Administrative Assistant

Dr. B. J. Burn, Co-ordinator of Studies in Science and Mathematics  
Room L-G06G, Biological Sciences Building

For information regarding particular courses advice may be obtained from staff members listed in the **introduction** to each of the sections related to the Board, the Faculty of Biological and Behavioural Sciences and the Faculty of Science, later in this handbook.

**Important:** As changes may be made to information provided in this handbook, students should frequently consult the noticeboard of the Board of Studies in Science and Mathematics and the official noticeboards of the University.

### Enrolment Procedures

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- **Faculty of Biological and Behavioural Sciences**
  - **Faculty of Science**
  - **Board of Studies in Science and Mathematics**
- 

All students re-enrolling in 1988 or enrolling in graduate courses should obtain a copy of the free booklet **Enrolment Procedures 1988** available from Course Administration Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

The subject timetable for the Science and Mathematics Course (Course 3970) is available in late October/early November from the Science and Mathematics Course Office, Room L-G06G, Biological Sciences Building. All re-enrolling students should collect one of these timetables along with a preliminary enrolment form (SM88). The preliminary enrolment form is to be completed and returned to the Science and Mathematics Office by the end of the first week in January.

### Sciences Library Facilities

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Although any of the University Libraries may meet specific needs, staff and students of the Faculty of Biological and Behavioural Sciences are served mainly by the Biomedical Library and the undergraduate collection while those of the Faculty of Science are served mainly by the Physical Sciences Library. The undergraduate collection and services are useful to students from both faculties.



### The Biomedical Library

The Biomedical Library provides library services for staff and students from the Faculties of Medicine and Biological and Behavioural Sciences, and from the Schools of Biological Technologies, Health Administration and Fibre Science and Technology. It is closely associated with the libraries of the teaching hospitals of the University.

The Biomedical Library is located on Levels 2, 3 and 4 of the Mathews Building Annexe and is connected to the other Special Libraries via a link through the undergraduate collection.

Professional staff are available at the Reader Assistance Unit on Level 2 to provide reference services and to assist in the use of the catalogues. Instructional classes in the use of the library and in specific subject material can be arranged.

Computerized literature searches and interlibrary loans are also available.

Biomedical Librarian

Monica Davis

### The Physical Sciences Library

This library, situated on Levels 6 and 7 of the Library tower, caters for the information needs of staff, graduate students and undergraduate students in the pure and applied sciences, engineering and architecture. Details of the books, serials and microforms in the Physical Sciences Library are included in the microfiche monograph and serials catalogues, and the items themselves are identified by the prefix 'P'.

Serials with the prefix 'PJ' are not for loan but self-service photocopying facilities are available on Level 7.

This Library provides reference, reader assistance and reader education services and also, where appropriate, inter-library loan and literature-searching services.

Trained staff are always available on Level 7 to assist readers with their enquiries.

Physical Sciences Librarian

Marian Bate

### Undergraduate Services

- **The undergraduate collection** caters for the needs of students in Years 1 and 2 and other groups where large numbers require mass teaching. Levels 3 and 4.
- **The Open Reserve Section** houses books and other materials which are required reading. Level 2.
- **The Audio Visual Section** contains cassette tapes, mainly of lectures and other spoken word material. The section has wired study carrels and cassette players for student use. Level 3
- **The Reader Education program** provides orientation tours and introductory library research method lectures to students.

Union. There are numerous religious, social and cultural clubs and also many sporting clubs which are affiliated with the Sports Association.

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

### The Psychological Society

The Psychological Society aims to provide activities both educational and social for students of psychology, and, more generally, to act as an intermediary body between students of different years, and staff.

The Society organizes a variety of activities including staff-student functions, informal discussions, film showings, and occasional talks and seminars. An activities fee enables the Society to meet any of the finances needed to support its functions.

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## Statistical Society of Australia: New South Wales Branch

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The Branch offers student membership to undergraduates who are following a recognized course of study which includes Statistics. The subscription for a student member is \$15 per annum with a \$4 rebate if paid before 1 March.

The Branch holds about four general meetings each year at the end of which two talks, one theoretical and the other applied, are given on the one topic. The Branch conducts a Research Section, and membership of this group is open to members of the Branch free of charge. Each year the Branch also conducts a symposium for the study and discussion of particular statistical techniques or of statistical methods in a specialized field; symposia are open to members at reduced rates.

Members of the Branch receive *The Australian Journal of Statistics*, which is published three times a year by the Statistical Society of Australia, together with the Society's *Newsletter*.

Applications and requests for further information should be sent to the Hon. Secretary, Dr S. H. Huxham, School of Mathematical Sciences, N.S.W.I.T., P.O. Box 123, Broadway, NSW 2006.

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## Students Clubs and Societies

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Students have the opportunity of joining a wide range of clubs and societies. Many of these are affiliated with the Students'



**Undergraduate Study:  
Faculty of Science**

## Board of Studies In Science and Mathematics

# Introduction

The Science and Mathematics Course (3970) leads to the Bachelor of Science Degree on the completion of a three year program or a four year program chosen from specific programs approved by the Board of Studies in Science and Mathematics.

The Board of Studies in Science and Mathematics offers a wide choice of programs each designed to meet specific aims and objectives. Most programs are identified with a particular School or discipline but some are multi-disciplinary.

All students in the Science and Mathematics Course must enrol in two units of first year Mathematics; either Mathematics I or Higher Mathematics I or General Mathematics. Care must be taken in making the choice as, in general, General Mathematics considerably limits the choice of units in following years.

Most Schools and Departments do not offer a full range of Level III units in the evening. Those concerned are marked below with ‡.

Students seeking *general advice* should contact the Board of Studies in Science and Mathematics Office (Room L-G06G, Biological Sciences Building, map reference D25) and for *advice in specific disciplines* should contact the representative of the relevant School as listed below:

First Year Biology Unit.....	Dr B. Fox
‡ School of Anatomy.....	Dr M.S. Smith
‡ Department of Applied Geology.....	Mr G. J. Baldwin
	Dr G. R. Taylor
‡ School of Biochemistry.....	Associate Professor P.J. Schofield
‡ School of Biological Science	
— Botany.....	Dr R.S. Vickery
— Zoology.....	Dr P.I. Dixon
‡ Department of Biotechnology.....	Associate Professor N. W. Dunn
‡ School of Chemistry.....	Dr D. S. Alderdice
	Dr T.J.V. Findlay (Year 1)
	Associate Professor M. A. Long (Year 2)
	Dr. P. R. Haddad (Year 4)
‡ School of Community Medicine.....	Dr A. E. Stark
‡ School of Electrical Engineering	
and Computer Science.....	Dr P. W. Baker

‡	School of Geography .....	Dr J. Dodson
‡	School of Mathematics .....	Associate Professor A. H. Low (Year 1)
		Miss M. Potter
‡	Marine Science .....	Dr P. Dixon
	School of Mechanical and Industrial Engineering .....	Associate Professor E. J. Hahn
‡	School of Microbiology .....	Dr I. Couperwhite
‡	School of Philosophy .....	Dr P.A. Cam
‡	School of Physics .....	Dr G. J. Russell (Year 1)
		Dr J. R. Hanscomb
‡	School of Physiology and Pharmacology .....	Dr B. S. Nail or
		Associate Professor M. J. Rowe
‡	School of Psychology .....	Professor B. J. Gillam
		Mr T. J. Clulow
‡	School of Science and Technology Studies .....	Dr D. Miller

**Board of  
Studies in  
Science  
and  
Mathematics**

The Board of Studies in Science and Mathematics includes all members of the Faculty of Biological and Behavioural Sciences\* and the Faculty of Science\* and some members of specific Schools in other faculties contributing to the Science and Mathematics Course: Chemical Engineering and Industrial Chemistry, Geography, Mines (Applied Science); Science and Technology Studies, Philosophy (Arts); Accountancy, Economics (Commerce); Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Surveying (Engineering); Anatomy, Community Medicine, Physiology and Pharmacology (Medicine); Education (Professional Studies); and the Centre for Liberal and General Studies.

The Dean is the Dean of the Faculty of Biological and Behavioural Sciences, Professor A. J. Wicken.

The Chairman is Professor H. J. Goldsmid.

The Co-ordinator of Studies in Science and Mathematics is Dr B. J. Burn. The Administrative Assistant is Ms K. Irvine.

‡See test of **Introduction**, on previous page.

\*See **Staff**, listed later in this handbook.

### Board of Studies in Science and Mathematics

## 3970 Science and Mathematics Course

The Science and Mathematics Course, which leads to the Bachelor of Science degree, is administered by the Board of Studies in Science and Mathematics and offers a wide choice of programs, each designed to meet specific aims and objectives. Most programs are identified with a particular school or discipline but some are multi-disciplinary.

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### Aims of the Science and Mathematics Course

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The main aims of the Science and Mathematics Course, diverse and not necessarily exclusive, may be summarized as providing opportunities to students to prepare themselves for careers in:

- research
- technology
- science and mathematics education
- areas of management or public policy involving the use of science or mathematics.

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### Objectives of the Science and Mathematics Course

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The important general objectives of most programs in the Science and Mathematics Course are:

1. To develop and sustain an interest in and knowledge of Science and Mathematics.
2. To develop a working knowledge of scientific methods of investigation and a favourable attitude towards them.
3. To encourage curiosity and creative imagination and an appreciation of the role of speculation in the selection and solution of problems, the construction of hypotheses, and the design of experiments.
4. To develop an appreciation of scientific criteria and a concern for objectivity and precision.
5. To develop confidence and skill in formulating problems and in treating both qualitative and quantitative data.
6. To develop the ability and disposition to think logically, to communicate clearly by written and oral means, and to read critically and with understanding.
7. To develop the habit of seeking and recognizing relationships between phenomena, principles, theories, conceptual frameworks and problems.
8. To promote understanding of the significance of science, technology, economics and social factors in modern society, and of the contributions they can make in improving humans' material conditions and in widening their imaginative horizons and their understanding of the universe.
9. To provide opportunities for the development of students' motivations and social maturity, and an awareness of their own capabilities in relation to a choice of career which will be fruitful to themselves and to society.

There is a wide range of programs in single and multi-disciplinary areas leading to a three year degree or a four year degree.

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## The Structure of the Science and Mathematics Course

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The Science and Mathematics Course consists of a number of individual programs, based on units ranked as Level I, Level II, Level II/III, Level III and Level IV with a unit size varying from 56-84 hours.

The terms Levels I, II, III do not necessarily refer to the years in which the unit must be studied. Units at the various levels may be taken in other years provided the prerequisites are met. Level II/III units have only Level I prerequisites.

The Bachelor of Science degree is awarded on completion of

- a three year program

or

- a four year program

chosen from specific programs approved by the Board of Studies in Science and Mathematics.

The time specified is a minimum time required for completion of the degree. It may be taken over a longer period of time.

- A student must select and be enrolled in one of the prescribed programs.
- A student may not undertake more than 8 Science units in any one year unless approval is given by the Co-ordinator or the Dean of the Board of Studies in Science and Mathematics.
- With the exception of quota restricted programs and with approval of the Co-ordinator of Studies, a student may change from one selected program to another. A written application to make the change, together with details of any optional units selected in the new program, must be lodged at the office of the Board of Studies in Science and Mathematics, Room L-G06G (Biological Sciences Building, map reference D25).
- The programs listed are made up of a sequence of units. Where a choice of units is indicated within a program care must be taken to satisfy the requirements, such as prerequisites and co-requisites.
- 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 towards the degree qualification together with the unit which excludes it. In exceptional circumstances, on the recommendation of the head of the appropriate school, the Board of Studies in Science and Mathematics may waive or vary a particular prerequisite, co-requisite or exclusion.

- A single major is a program specifying only 4 Level III units in a discipline.
- A double major is a program specifying 4 Level III units of each of 2 disciplines or 8 Level III units in a single discipline.
- Upon sufficient cause being shown in a particular case or cases, the Board of Studies in Science and Mathematics may vary any of these rules.

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## The three year program

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The three year program leading to the award of the pass degree consists of:

1. at least 23 units at Level I, II, II/III, III as specified in an individual program with the following requirements:

- (1) *not less than eight nor more than ten* units may be from Level I;
- (2) two of the Level I units must be 10.001 Mathematics I, 10.011 Higher Mathematics I or 10.021B and 10.021C;
- (3) *not less than four* units from Level III or as specified individual programs.

2. General Studies electives as specified in an individual program.

- In order to graduate a student must pass all the units specified in the program of his/her choice.

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## The four year program

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The four year program, leading to an Honours Class I, II/1, II/2, III or pass degree consists of:

1. at least 23 units at Level I, II, II/III, III as specified in an individual program, with the following requirements:

- (1) *not less than eight nor more than ten* units may be from Level I;
- (2) two of the Level I units must be 10.001 Mathematics I, 10.011 Higher Mathematics I or 10.021B and 10.021C.
- (3) *not less than eight* units from Level III or as specified in an individual program.

2. 1. an approved honours program offered by one or more schools;

or

2. at least 10 units at Level IV as specified in an individual program.

For Entry to Year 4 students are required:

1. to have completed Years 1, 2 and 3 of the specific program and to have satisfied prerequisite requirements as specified in Table 3;
  2. to seek the guidance of the appropriate head of school at an early stage of study to ensure that the program being followed is best suited to lead to the Year 4 honours program;
  3. to have completed relevant subjects normally with better than passing grades;
  4. to have the approval of the appropriate Head of School at the end of Year 3.
- In order to graduate a student must pass all the units specified in the program of his/her choice.

A person on whom the pass degree of Bachelor of Science of the University has been conferred may be admitted by the Board of Studies in Science and Mathematics, on the recommendation of the relevant Heads of Schools, to candidature for an honours degree conversion program with credit for all units completed, if during his or her studies for the pass degree, he or she has satisfied the prerequisites for proceeding to honours level laid down by the School or Schools concerned.

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## General Studies Requirement

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The University requires that undergraduate students undertake a structured program in General Studies as an integral part of studies for their degree.

Among its objectives, the General Studies program provides the opportunity for students to address some of the key questions they will face as persons, citizens and professionals.

A new General Education program, administered by the Centre for Liberal and General Studies, was introduced in 1988.

The program requires students to undertake studies in three areas:

1. An introduction in non-specialist terms to an understanding of the environments in which humans function.
2. An introduction to, and a critical reflection upon, the cultural bases of knowledge, belief, language, identity and purpose.
3. An introduction to the development, design and responsible management of the systems over which human beings exercise some influence and control.

Subjects in categories 1 and 2 are in preparation. The exact form of category 3 is still being decided and should be clearly defined by the end of 1988. This could involve, however, a slight subsequent change to the structure of the later years of degree programs.

There are differing requirements for students commencing before and from 1988:

**Students who commenced their undergraduate program before 1988.**

Students must complete a program of General Studies in accordance with the requirements in effect when they commenced their degree program. Students yet to complete their General Studies requirement may select subjects from any of the three categories of the new program.

**Students commencing their undergraduate program in 1988 and following.**

Students must complete a program of subjects selected from each of the three categories of study in accordance with the rules defined in the General Studies Handbook and in sequences specified in the requirements for individual courses.

Further information may be obtained from the office of the Centre for Liberal and General Studies, Room G56, Morven Brown Building, and the General Studies Handbook.

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## Workload

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The expected maximum workload for students devoting most of their time to this course is four science units per session. This can only be exceeded in exceptional circumstances by students with a good academic record and requires the permission of the Co-ordinator of Studies.

Students with external commitments, such as part-time employment, in excess of ten hours per week, should take fewer units. External commitments are not to be taken into consideration in relation to such matters as extensions of time for written work or failure to attend examinations, which may, for some subjects, be scheduled on Saturday mornings.

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## Rules governing admission to the Science and Mathematics Course with advanced standing

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Any person who makes application to enrol in the Science and Mathematics Course (Course 3970) or in a combined degree course which includes the Science degree course administered by the Board of Studies in Science and Mathematics may be admitted to the course of study leading to such degree with such standing on the basis of previous attainment as may be determined by the Board of Studies in Science and Mathematics provided that:

(1) Where students transfer from another tertiary institution, such students shall not in general be granted standing in the course which is superior to that which they have enjoyed at the institution from which they transferred.

(2) The standing granted by the Board of Studies in Science and Mathematics in the case of any application based upon any degree(s) or other award held by applicants, should not be such as will permit the applicants to qualify for the science degree, without completing the course of instruction and passing exam-



inations in at least those subjects comprising the latter half of the Science and Mathematics course, so that where such a program of study would involve the applicants in repeating courses of instruction in which the Board of Studies in Science and Mathematics deems the applicants to have already qualified, the Board may prescribe an alternative program of studies in lieu thereof.

(3) The standing granted by the Board of Studies in Science and Mathematics in the case of applications based on partial completion of the requirement for any degree or other award of another institution shall not be such that it will permit the applicants to qualify for the award of the science and mathematics degree by satisfactory completion of the program of study deemed by the Board to be less than that required for students in full time attendance in the final year of the Science and Mathematics Course (Course 3970).

(4) The standing granted by the Board of Studies in Science and Mathematics in the case of applications based upon the partial completion of the requirements for any degree or award of the University may be such as to give full credit in the Science and Mathematics Course (Course 3970) for work done in the course from which the students transfer.

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## Programs

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**Students are advised that it is not possible to complete their studies by attendance at evening classes alone.**

Each program has a four-digit identifying number.

Most programs have been set out as Years 1, 2, 3 and 4 for the four year program and in these cases Years 1, 2 and 3 comprise a three year program. A few programs are set out as Years 1, 2 and 3 and lead to the pass degree only.

Students wishing to take a double major are warned that due to timetabling difficulties it may take longer than three years to complete degree requirements.

To progress through a program a student must meet all the prerequisites and co-requisites as detailed in Tables 1, 2 and 3.

The range of programs has been designed to cover a wide variety of needs in the various areas of science and mathematics:

Anatomy	<i>see program 7000</i>
Biochemistry	<i>see program 4100</i>
Biology	Biology is taught in Year 1 as a single discipline but in later years as specific subjects: biotechnology, biochemistry, botany, genetics, microbiology and zoology.
Biotechnology	<i>see program 4200</i>
Botany	<i>see program 4300</i>
Chemistry	<i>see programs 0200, 0205</i>

Community Medicine	<i>units available in some programs (the identifying number is 79)</i>
Computer Science	<i>see program 0600</i>
Genetics	<i>see program 6840</i>
Geography	<i>see program 2700</i>
Geology	<i>see programs 2500, 2503</i>
Information Systems	<i>see program 1400</i>
Marine Science	<i>see programs 6831, 6832, 6833, 6834</i>
Mathematics	<i>see program 1000, 1006, 1061, 6810</i>
Microbiology	<i>see program 4400</i>
Pharmacology	<i>see program 7300</i>
Philosophy	<i>see program 5200</i>
Physics	<i>see programs 0100, 0161, 2503</i>
Physiology	<i>see program 7300</i>
Psychology	<i>see program 1200</i>
Science and Technology Studies	<i>see program 6200</i>
Zoology	<i>see program 4500</i>

In addition to Course 3970 programs are also included for Courses 3611 (Science/Aeronautical Engineering), 3661 (Science/Industrial Engineering), 3681 (Science/Mechanical Engineering), 3701 (Science/Naval Architecture), 3725 (Science/Electrical Engineering), 3730 (Science/Civil Engineering), 3820 (Science/Medicine), 3951 (Science/Optomety), 4070 (Mathematics/Education), 4080 (Science/Education), 4770 (Science/Law).

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## Physics

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The study programs offered by the School reflect the importance of Physics in science and technology at both the fundamental and at the applied levels. Thus within the Board of Studies in Science and Mathematics, professional training in Physics is provided by programs 0100 and 0161 while in areas such as Engineering a number of courses are available in which Physics is combined as a major study.

The features are summarized in the following table:

Professional Training in Physics in other Courses	
Physics	
Program	Courses
0100 Physics	3170 Textile Physics
<i>Including:</i>	
Theoretical Physics	3611 Aeronautical Engineering with Physics
Applied Physics	3661 Industrial Engineering with Physics
Biophysics	
Physics/Geology	3681 Mechanical Engineering with Physics

0161 Physics/Computer Science	3701 Naval Architecture with Physics
	3725 Electrical Engineering with Physics
	3730 Civil Engineering with Physics and Mathematics
	4770 Law with Physics
	5801 Education with Physics

## Professional Training

Program 0161 (Physics/Computer Science) has been carefully structured to include not only the basic units of Physics but also those Mathematics and Computer Science units necessary to meet the specific aims of the program. Only minor variations from this program can be considered.

On the other hand, program 0100 (Physics) offers greater flexibility in the choice of units particularly for the student who intends to take out the BSc degree at Pass level after 3 years. Also, for those students who intend to proceed further, Honours may be taken in either Physics, Theoretical Physics, Applied Physics, Physics/Geology or Biophysics.

Sample programs of study and guidance as to the choice of units can be obtained from the School. The following information relating to program (0100) should be particularly noted:

## Program 0100

1. It is suggested that the units chosen in Year 1 might comprise 6.611, 1.061, 2.121, 2.131.
2. Students wishing to proceed to Year 4 (Honours) must complete at least 7 Level III units. These will normally be taken from the Physics units on offer (unless the student is specializing in Biophysics or in Geology) and include at least *one* of 1.0533, 1.0543, 1.133, 1.763 for students majoring in Physics or in Applied Physics.
3. For the study of Applied Physics certain Level III units are strongly recommended. These are units of a more applied nature eg 1.133 Electronics.
4. For the study of Theoretical Physics, additional mathematics units are specified. Thus in Year 2 students should include unit 10.111A (or 10.121A) and in Year 3, unit 10.212D (or 10.222D). Certain Level III units of a theoretical nature, eg 1.1133 are also strongly recommended.
5. Arrangements exist to enable a joint major in Physics/Geology. Students are expected to include 2 units of Geology in Year 2 and 4 units of Geology in Year 3. The possibility of joint majors in other subjects (eg Mathematics or Chemistry) exists.
6. For the study of Biophysics, students are required to take Chemistry and Biology units in Year 1 and Biochemistry in Year 2 in addition to Physics units.
7. In addition to the above there are other areas of study of major interest. Thus an introduction to Astrophysics and Optics is available to students choosing the elective units 1.1633, 1.713, 1.763, 1.773 and the study of Condensed Matter (Solid State) Physics may be furthered by the inclusion of elective units such as 1.3133 and 1.3143.

8. In certain circumstances unit 1.002 may be deferred to Year 3.

Subject descriptions of the units may be found in another section of this handbook. As is to be expected, several of the elective units mentioned above reflect the research interests of the various Departments of this School. These are at present five in number: Applied Physics, Astrophysics and Optics, Biophysics, Condensed Matter Physics, Theoretical Physics.

## Physics in other Courses

The previous page lists those courses which have been arranged with other schools. Several of these can lead to honours in Physics (eg 3725, 5801) so it must not be thought that the only avenue to specialization in Physics is via the professional programs 0100, etc.

Students should also bear in mind that prerequisites and co-requisites can be waived in certain cases, eg when it is judged that an equivalent study has been undertaken in some other combinations of units. The possibility also exists of relaxing the requirements of programs to allow a student to select a unit in which he or she has a special interest but which is not a recommended one in the program.

## 0100 Physics\*\*

General Studies: see Contents

### Year 1

1.001

10.001 or 10.011\*

Choose 4 Level I units from:\*\*†

1. Table 1 and/or
2. Table 2 for program 0100

*Physics  
Mathematics*

### Year 2

1.002†, 1.012, 1.022, 1.032

10.1113\*, 10.1114\*, 10.2111\*, 10.2112\*

Choose 2 units from:\*\*

1. Table 1 and/or
  2. Table 2 for program 0100
- 1 General Studies elective

### Year 3

1.0133, 1.0143†, 1.023, 1.0333, 1.0343†, 1.043

Choose at least 3 units from:\*\*

1. Table 1 and/or
  2. Table 2 for program 0100
- 1 General Studies elective

Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units.

### Year 4 (Honours)

Choose one of 1.104, 1.304, 1.504, 1.604, 68.430

\*Students are encouraged to select Higher Level Mathematics units where applicable.  
 \*\*Students should read carefully the above description relating to program 0100 and seek advice from the School of Physics regarding the choice of units. An incorrect choice of units could exclude a student from the study of certain areas of Physics and/or prevent the combination of Physics with other disciplines.  
 †Students with a special interest in Biophysics may replace unit 1.002 with unit 2.102B and units 1.0143 and 1.0343 with the Biophysics units 1.1433 and 1.1533 provided 2.121, 2.131, 17.031 and 17.041 are completed in Year 1 and 41.101 is taken in Year 2.

**0161****Physics/Computer Science**

General Studies: see contents

**Year 1††**

1.001, 1.061  
6.611

10.001 or 10.011\*

Choose 2 Level I units from Table 1\*\*

*Physics*  
*Computing*  
*Mathematics*

**Year 2**

1.012, 1.022, 1.032

6.621, 6.641

10.1113\*, 10.1114\*, 10.2111\*, 10.2113\*

Choose 1 unit from 1.062, 6.631†, 10.111A\*

1 *General Studies elective*

**Year 3**

1.002, 1.0133, 1.0333

Choose 2 further Level III Physics units

Choose 1 Level III Computer Science unit

Choose 2 unit from:\*\*

1. 1.062, 6.631†, 10.212A\*, 10.212D\*, 10.262A

2. Level III Physics units

3. Level III Computer Science units

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 6 Level III units.

**Year 4 (Honours)\*\***

Choose one of 1.104, 1.304, 1.504

\*See footnote to program 0100.

\*\*Students intending to proceed to Year 4 are required to choose appropriate units. This choice is determined by the requirements of program 0100. Students are required to consult the School of Physics.

†The unit 6.631 must be taken in Year 2 or Year 3, but students should bear in mind that this unit is a prerequisite for 6.632 and 6.613.

††Quota restrictions apply to most Level III Computer Science units. Students wishing to take these units should in Year 1 apply for entry to the Computing quota. Advice should be obtained from the office of the Board of Studies in Science and Mathematics.

**Chemistry**

The School is divided into four departments (Physical, Organic, Inorganic and Nuclear, and Analytical) and a First Year Teaching unit. Each department contributes to first year teaching and offers specialty courses in its own area for the Science and Mathematics programs, and servicing to other faculties.

The study program 0200 offered by the School of Chemistry provides both a basic scientific education and a professional training in chemistry. Fundamental, applied, environmental and industrial aspects of chemistry are included. The program allows the study of chemistry to be combined with the study of another discipline, for example, physics, biochemistry, mathematics or computer sciences, by suitable choice of units.

Suitable choice of units makes it possible to study chemistry as a co-major with another branch of science (eg geology, biochemistry, computer science, biotechnology, physiology) to an advanced level. A combination of Level III chemistry and mathematics units provides a useful basis for specialization in aspects of physical or theoretical chemistry whilst a combination of Level III chemistry and geology units is suitable for those who wish to specialize later in geochemistry. Level III chemistry and physiology units could form the basis of specialized studies of body chemistry.

Students wishing to undertake the maximum number of chemistry units should follow Program 0205 Pure and Applied Chemistry. This involves 14 chemistry units and is referred to as a double major in terms of the Science and Mathematics course. It is designed for specialization in chemistry and should be selected by students who wish to devote their studies at Level III entirely to chemical topics.

The Chemistry programs are open to all students who have satisfied the requirement for entry into the Science and Mathematics course. However, those who have not studied sufficient science at school (see prerequisites under subject number) may be required to study a special introductory unit (2.111) before enrolling in the Level I Chemistry units (2.121, 2.131, 2.141) specified. The Level I subject 2.141 is designed specifically for students intending to major in Chemistry. It covers the same material, at a similar level to that in 2.121 and 2.131, but is a full year subject and the order of treatment of the topics is different. The Chemistry programs have a first year of study which includes chemistry, physics and mathematics, in common with many other programs, and an elective. It is in the choice of this elective that special care has to be given as an incorrect choice could exclude the combination of chemistry with another selected discipline at Level II or III, (eg omission of biology units would preclude taking biochemistry at Level II). Advice from the course advisors should be sought on this point.

The Chemistry programs lead to study at the Honours level (Level IV) and to graduate studies in chemistry. The usual introduction to research in Chemistry is in Level IV and at this level the student devotes the major part of the time to research under the direction of a member of staff as supervisor. A proportion of the time is taken up with formal course work. The Honours year (or its equivalent in qualifying studies) may be followed by a higher research degree. Further information about graduate courses is included in this handbook and in a booklet: *School of Chemistry Research Activities*.

**Geophysics**

See program 2503

**Recommended Double Majors**

Physics/Geology

## 0200 Chemistry\*\*

General Studies: *see Contents*

### Year 1

1.001  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B  
and 10.021C  
Choose 2 Level units from Table 1

*Physics*  
*Chemistry*  
*Mathematics*

### Year 2\*

2.102A, 2.102B, 2.102C, 2.102D  
Choose 3 units from Table 1  
2 *General Studies electives*

### Year 3

Choose 4 Level III Chemistry units of which at least 3 are from:  
2.103A, 2.103B, 2.103C, 2.103D  
Choose 4 units from Table 1

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

### Year 4 (Honours)

2.004

\*Students wishing to do a co-major of Chemistry with Geology or Biotechnology may apply for a variation of the specified units to the Programs Committee of the Board of Studies in Science and Mathematics.

\*\*Students should read carefully the above descriptions relating to programs 0200 and 0205 and seek advice from the School of Chemistry regarding the choice of units.

## 0205 Pure and Applied Chemistry\*\*

General Studies: *see Contents*

### Year 1

1.001  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B  
and 10.021C  
Choose 2 Level I units from Table 1

*Physics*  
*Chemistry*  
*Mathematics*

### Year 2

2.102A, 2.102B, 2.102C, 2.102D  
Choose 3 units from Table 1  
2 *General Studies Electives*

### Year 3

2.103A, 2.103B, 2.103C, 2.103D  
Choose 4 Level III Chemistry units

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

### Year 4 (Honours)

2.004

\*\*Student should read carefully the above descriptions relating to programs 0200 and 0205 and seek advice from the School of Chemistry regarding the choice of units.

## Recommended Double Majors

Chemistry/Biochemistry  
Chemistry/Biotechnology  
Chemistry/Computer Science  
Chemistry/Geology  
Chemistry/Mathematics  
Chemistry/Physics  
Chemistry/Physiology

## Computer Science

Computer Science involves the study of the design, construction and uses of computer systems. It is concerned with the representation of data and data structures in computer systems and the design of algorithms for automatic manipulation of this information by programming languages and machine systems. It is very much concerned with the design and development of hardware and software tools by which computer applications may be developed, but not so much with the applications themselves. At the University of New South Wales, particular emphasis is given to comprehension of the basic principles behind computing tools, operating systems, compilers and translators, and computer hardware.

Graduates who major in Computer Science frequently find employment where the requirement is for an expert knowledge of computer systems rather than extensive experience in a particular application area. Potential employers include the computer manufacturers, consulting companies, specialist companies marketing computer hardware and software services, and many large organizations with major computing establishments.

All Science students with the appropriate Mathematics prerequisites have entry into all Year 1 and Year 2 Computer Science units. Resources limit the number of students who may enter most Year 3 Computer Science units but other subjects are proposed which will allow computer applications majors to complete an appropriate course of study.

Entry to a Computer Science major is *either* by direct selection at university entry *or* by competitive entry at the end of Year 1 or Year 2. Students who wish to compete at the end of their first year for a place in Computer Science (program 0600 — Computer Science), enrol in their first year in program 6806. Students in program 6806 may also have the alternative of entering program 1400 (Information Systems) at the end of their first year. Acceptance into programs 0600 or 1400 is based on academic performance in Year 1 or Year 2.

Science/Law students may enrol directly into Year 1 of the Course 4770 Computer Science program. To progress into Year 2 of this program, these students must, at the end of Year 1, compete with students in Course 3970.

Students majoring in other disciplines may undertake all Level I and Level II and one of the Level III Computer Science units and thus undertake a substantial amount of Computing. Programs available are Physics/Computer Science (0161) and Mathematics with Computer Science (1061). Students with very good academic records may be able to enrol in further Computer Science units by special permission from the Head of the Department of Computer Science.

There are many ways to study Computer Science and computer applications at this University, apart from the Science and Mathematics Course. Students may major in Computer Science as part of the 5 year combined degree programs in Electrical Engineering, Aeronautical Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture which leads to the award of the two degrees of BE and BSc (see under Courses 3725, 3611, 3661, 3681 and 3701 respectively and the Faculty of Engineering Handbook).

Students may also major in Computer Science in the combined Science/Law degree course. A major sequence in Computer Science is also available in the Bachelor of Arts course (see the Faculty of Arts Handbook). Other courses and subjects which include computing and computing applications are available in other Schools, for example students may major in Computers and Information Systems in the Bachelor of Commerce degree course: see the Faculty of Commerce Handbook.

## 0600

### Computer Science\*

General Studies: *see Contents*

#### Year 1\*

6.611

10.001 or 10.011

Choose 5 Level 1 units from:\*\*

1. Table 1 *and/or*

2. The BA course *and/or*

3. Table 2 for program 0600

*Computing  
Mathematics*

#### Year 2

6.621, 6.631, 6.641

Choose 5 units from:\*\*

1. Table 1 *and/or*

2. The BA course *and/or*

3. Table 2 for program 0600

1 *General Studies elective*

#### Year 3

Choose 4 Level III Computer Science units

Choose 3 units from:\*\*

1. Table 1 *and/or*

2. The BA course *and/or*

3. Table 2 for program 0600

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units including 6.613, 6.632, 6.642 & 6.643.

## Year 4 (Honours)

6.606

\*In Year 1 students who have not gained direct entry to this program must enrol in program 6806. Enrolment in Year 2 is based on academic performance in Year 1.

\*\*The program may include up to 8 units other than Computer Science units that are not in Table 1. Subjects chosen from the BA degree course are restricted to those offered by the following schools: Economics, English, French, German, History, Political Science, Russian, Sociology, Spanish and Latin American Studies and Theatre Studies. Science and Technology Studies subjects are available in Table 1. Upper Level subjects from the School of Economics are restricted to all those in Economic History plus 15.062, 15.072, 15.263 and 15.273. (6 BA degree credit points at Level I or 4 credit points at Upper Level are equivalent to 1 unit).

## Computer Science/Physics

See program 0161 Physics/Computer Science

## Computer Science/Mathematics/ Statistics

See program 1061 Mathematics or Statistics/Computer Science

## See also

1400 Information Systems

## Mathematics

The School is divided into Departments of Pure Mathematics, Applied Mathematics and Statistics. The School provides courses at the Pass and Honours levels based on the above departments and in specified interdisciplinary programs such as Mathematics of Management. There is considerable overlap of interests and interaction between the departments; students in general will take units from more than one department.

Pure Mathematics is concerned with the whole structure of mathematics. Research focuses on the creation of new mathematical systems and the finer analysis of partially understood fields. Problems of mathematics come from many sources of science and industry but the pure mathematician is more concerned with the problems themselves than with the sources from which they arise. Courses in the Department of Pure Mathematics are designed to provide the necessary equipment for those

who intend to use mathematics in any way, to give basic familiarity with the fundamental language of modern science and technology and to develop appreciation for and insight into one of our major cultural achievements.

Applied Mathematics is concerned with the development of mathematics and mathematical models for understanding scientific phenomena, for the solution of technical and industrial problems, and for use in the social, economic and management sciences. Problems originate not only from the physical and engineering sciences, but also from such diverse areas as the biological sciences, computer science, the communication industry and commerce. Courses in Applied Mathematics are designed to provide basic mathematical and computational skills needed for a wide range of applications, to develop the capability to construct, analyse, and interpret mathematical models, and to encourage enthusiasm for the role of the mathematician in a variety of contexts.

The major research interests of the Department of Applied Mathematics are:

1. Optimization control theory and operations research, with applications in a wide range of areas.
2. Numerical analysis and mathematical computing.
3. Nonlinear dynamical systems.
4. Fluid dynamics, with a special interest in oceanographic and environmental applications.

The Department of Applied Mathematics offers training to graduate research level in each of these areas.

Statistics is the science and art of using factual material for modelling and inference. Its mathematical foundations are in the theory of probability and it deals with how to estimate and make decisions using knowledge which is uncertain or observational material which is subject to error. There is a rich interplay of ideas between the theory of statistics and fields such as engineering, medicine and biological and behavioural sciences where statistical problems constantly arise. The department has strong interest in the areas of applied statistics, stochastic processes, biometry, inference, design of experiments, sequential analysis, discrete distributions, nonparametrics and statistical computing.

## Programs of study

### Program 1000 (Mathematics)

Within this program it is possible to major in Pure Mathematics, Applied Mathematics or to undertake a General Mathematics major with a mixture of Pure and Applied Mathematics and possibly some Statistics; it is also possible by extending the program to four years to undertake Honours in Pure Mathematics or Applied Mathematics. Students wishing to major or undertake Honours in Statistics should consult program 1006.

### Pure Mathematics major

Any completed 1000 program will be deemed to be a major in Pure Mathematics if it has included the equivalent of four units made up of units and half units listed in Table 1 as Pure Mathematics Level III or Higher Pure Mathematics Level III.

It is strongly recommended that students choose, among the many optional mathematics units, those which are appropriate to their interest. In particular, 10.081 in Year 1 is recommended. Furthermore:

1. Pure Mathematics units relevant to the mathematical aspects of Computer Science are 10.1115 and 10.1116 in Year 2, and 10.1123 and 10.1521 in Year 3.
2. Pure Mathematics units relevant to mathematics teaching are 10.1111, 10.1112, 10.1121, 10.1124, 10.1127 and 10.1128 in Year 3, or their higher equivalents.
3. Pure Mathematics units relevant to the applications of mathematics in physics or engineering are 10.1125, 10.1126, 10.1128, 10.1522 and 10.1523 in Year 3.

Pure Mathematics Department staff will be happy to advise students on choices of units appropriate to their study goals.

### Pure Mathematics Honours

Honours in Pure Mathematics is obtained by completing 10.123, for which the normal prerequisites are at least three Pure Mathematics III units (total value) at the Higher Level. However, students with a credit average in at least four Level III Mathematics units may also be considered for entry into Pure Mathematics 4. Usually, students doing Honours in Pure Mathematics do Higher level courses from Year 1 onwards.

Pure Mathematics Department staff will be happy to advise students on choices of units appropriate to their study goals.

### Applied Mathematics major

Any completed 1000 program will be deemed to be a major in Applied Mathematics if it has included four units (total value) of units and half units listed in Table 1 as Level III Applied Mathematics (or their higher equivalent). When selecting optional units in program 1000, the following choice of mathematics courses (or their higher equivalent) are strongly recommended.

Year 2: At least two of 10.2113, 10.2115, 10.2116.

Year 3: At least three of 10.212A, 10.212B, 10.212D, 10.212L, 10.212M, 10.212N, 10.222C.

In addition, Applied Mathematics students are expected to select relevant units from other disciplines according to the particular applications of mathematics in which they are interested. The following choices are recommended in first year.

1. Applied mathematics for physical and engineering sciences or for theoretical oceanography and fluid mechanics: *either* 1.001 or appropriate level I Engineering units.
2. Applied mathematics for economic or management sciences: 14.501, 14.511, 15.001, 15.011. Note that if 14.501 and 14.511 are chosen then all four must be taken in first year and permission must be obtained through the Board of Studies office as there is a quota. For further details see program 6810.
3. Applied mathematics for social or biological sciences, choose at least two of the following groups:

- a. 17.031 and 17.041,
- b. 12.100,
- c. 1.001,

d. 2.141 or both 2.121 and 2.131.

4. Applied mathematics for computational methods or computer science: 6.611, 10.081.

Applied Mathematics Department staff will be happy to advise students on choices of units appropriate to their study goals.

### Applied Mathematics Honours

A student interested in taking an Honours degree in Applied Mathematics is advised to enrol in 10.011 in first year and complete at least one Level II and three Level III Higher Applied Mathematics units (total value). However, students who have obtained a credit average in at least four Level III Mathematics units (total value) may also be considered for entry into 10.223 Applied Mathematics 4.

Students are advised to select optional units according to the recommendations above for an Applied Mathematics major. Students should obtain a copy of recommended programs for Applied Mathematics from the School of Mathematics office before entering Year 2, and they are strongly encouraged to consult a staff member in Applied Mathematics regarding appropriate courses of study.

### Program 1006 (Statistics)

#### Statistics Major

The completed 3 year program 1006 (Statistics) will be deemed to be a major in Statistics.

#### Statistics Honours

Honours in Statistics are obtained by completing 10.323, the prerequisite for which is the completion of 3 years of program 1006 (Statistics) with all corresponding Higher Statistics Level II and Level III units preferably all Higher Mathematics Level I, II and III units.

**Program 1061 (Mathematics or Statistics/Computer Science)** will be of particular interest to students who wish to combine a Mathematics (or Statistics) major with a substantial amount of computing.

**Program 6810 (Mathematics of Management)** includes subjects given by the Schools of Accountancy and of Economics. There has been an increasing trend towards more use of mathematics, and the use of more advanced mathematics, in scientific management. This program is intended to train mathematicians with an interest in the application of mathematics to management science. The mathematics content is very solid indeed, amounting to a full mathematics degree. A student completing this course with a good record is eligible for entry to the Master of Commerce graduate degree program in the School of Accountancy. If appropriate subjects are selected, then this degree (MCom), which may be awarded by part-time study, qualifies the graduate for provisional membership of the

Australian Society of Accountants; full membership is then granted after appropriate experience.

### Mathematics/Computer Science

See Computer Science/Mathematics

### 1000

#### Mathematics\*\*\*

General Studies: *see Contents*

Students intending to proceed to the Honours year should take Higher Mathematics subjects throughout.

#### Year 1

10.001 or 10.011

*Mathematics*

Choose 6 Level I units from:\*

1. Table 1 *and/or*
2. The BA course *and/or*
3. Table 2 for program 1000

#### Year 2

10.111A, 10.1113, 10.1114, 10.2111, 10.2112

Choose 1 further Level II or III Mathematics unit

Choose 4 units from:\*

1. Table 1 *and/or*
  2. The BA course *and/or*
  3. Table 2 for program 1000
- 1 *General Studies elective*

#### Year 3

Choose 4 Level III Mathematics units (not 10.312F or 10.262A)

Choose 3 units from:\*

1. Table 1 *and/or*
  2. The BA course *and/or*
  3. Table 2 for program 1000
- 1 *General Studies elective*

*Students proposing to proceed to Year 4 (Honours) must complete 6 Level III units.\*\**

#### Year 4 (Honours)

10.123 or 10.223\*

\*Not more than 8 units of this program may be from subjects not in Table 1. The BA degree subjects are limited to those offered by the following schools: Economics, English, French, German, History, Political Science, Russian, Sociology, Spanish and Latin American Studies and Theatre Studies. Science and Technology Studies and Philosophy subjects are available in Table 1. Upper Level subjects from the School of Economics are restricted to all those in Economic History plus 15.062, 15.072, 15.263 and 15.273. (6 BA credit points at Level I or 4 credit points at Upper Level are equivalent to 1 unit.)

\*\*Students proposing to take Honours in Pure or Applied Mathematics are advised to include at least three units of Level III Higher Mathematics units (total value) from the relevant department. However, students who have obtained a credit average in at least four Level III Mathematics units may also be considered for entry into Mathematics Honours.

\*\*\*Students should read carefully the above description relating to program 1000 and seek advice from the School of Mathematics regarding the choice of units.

## 1006

### Statistics

General Studies: *see contents*

Students intending to proceed to the Honours year should take Higher Mathematics subjects throughout.

#### Year 1††

10.001 *or* 10.011 *Mathematics*

Choose 6 units from:\*

1. Table 1 *and/or*
2. The BA course *and/or*
3. Table 2 for program 1000

#### Year 2

10.111A, 10.1113, 10.1114, 10.2112, 10.311A, 10.311B, 10.3111, 10.3112

Choose 2½ units from:\*

1. Table 1 *and/or*
2. The BA course *and/or*
3. Table 2 for program 1000

1 *General Studies elective*

#### Year 3

Choose 4 units from 10.312A, 10.312C, 10.322D, 10.312F, 10.3121, 10.3122, 10.3123, 10.3124

Choose 3 Level III Mathematics *and/or* Computer Science units  
1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 4 Higher Level III Statistics units including 10.3225.

#### Year 4 (Honours)

10.323

\*See footnote to program 0100.

††See footnote to program 0161.

## 1061

### Mathematics or Statistics/Computer Science

General Studies: *see Contents*

Students intending to proceed to the Honours year should take Higher Mathematics subjects throughout.

#### Year 1††

6.611 *Computing*

10.001 *or* 10.011 *Mathematics*

Choose 5 Level I units from:

1. Table 1 *and/or*
2. The BA course *and/or*
3. Table 2 for program 1000

#### Year 2

10.111A, 10.1113, 10.1114, 10.2112

6.621, 6.641

*Either*

a. 10.2111, 10.261A, 10.331 (*or* 10.311A *and* 10.311B)  
If required choose 1 further unit from:

1. 6.631 *or*
2. Mathematics *or*
3. 14.602

*or*

b. 10.311A, 10.311B, 10.3111, 10.3112,

½ unit from Table 1

1 *General Studies elective*

#### Year 3

Continue the strand chosen in Year 2:

*Either*

a. 6.646

10.262A

3 Level III Mathematics units

2 units from Table 1

*or*

b. 5 Level III Statistics units including 10.312F

1 Computer Science unit

1 unit from Table 1

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units including 10.3225.

#### Year 4 (Honours)

10.123\* *or* 10.223\* *or* 10.323\*

\*The requirements for entry to the Honours year are as for programs 1000 and 1006.

††See footnote to program 0161.

### Mathematics/Marine Science (Physical Oceanography)

See program 6831

### Recommended Double Majors

Mathematics or Statistics/Computer Science  
Mathematics/Geology

### Psychology

Modern psychology is both a basic discipline and a field of professional practice. As a science, psychology is concerned with the study of both the more complex forms of behaviour, and associated mental processes. It seeks to understand the basic psychological processes such as learning, memory, perception



and motivation; the biological basis of behaviour; the development and decline of behavioural capacities from infancy to old age; individual differences in behaviour; social influences on behaviour; and the collective behaviour of social groups. In addition, disorders of behaviour form an important part of the subject matter of psychology.

Program 1200 in the Science and Mathematics course leads to a major in Psychology after 3 years and to Honours after 4 years. Choice of support subjects will depend upon which facet of Psychology is of interest to the student. Suitable supporting subjects range from Anatomy, Physiology, Genetics of Behaviour to History and Philosophy of Science and Philosophy. If necessary students may contact the School for advice.

There is also a four year full-time professional science degree course (Course 3431) which is described in detail later in this handbook (see Faculty of Biological and Behavioural Sciences).

Students who wish to obtain qualifications that will allow them to practise psychology need to complete one of the above four year honours programs. The present minimum qualifications for membership of the Australian Psychological Society (the professional body of Australian psychologists) require a degree (with a major in psychology) and a fourth year of study of psychology, followed either by further graduate study or two years of supervised experience in some practical field of psychology. A professional qualification in psychology may lead to careers in research, teaching and applied fields such as personnel selection and management, vocational guidance, advertising and clinical practice.

## 1200 Psychology

General Studies: *see Contents*

### Year 1

10.001 or 10.011 or both 10.021B & 10.021C *Mathematics*  
12.100 *Psychology*

Choose 4 Level I units from:

1. Table 1 *and/or*
2. Table 2 for program 1200

### Year 2\*

12.200

Choose 2 units from:

12.201, 12.202, 12.204, 12.205

Choose 5 units from Table 1 (no more than 1 from Level II Psychology)

1 *General Studies elective*

### Year 3\*

Choose 4 Level III Psychology units

Choose 3 units from Table 1

1 *General Studies elective*

### Year 4 (Honours)

12.403 or 12.404

\*Students intending to proceed to honours in Psychology must take 12.200, 12.201 and 12.202 in Year 2, together with 4 other units from Table 1 (a total of 7 units in Year 2). In Year 3 students must take 8 Level III Psychology units including 12.300 and 12.305 from Group A for 12.404 in Year 4. Additionally, students intending to take 12.403

in Year 4 are required to also include 12.301 from Group B.

## Recommended Double Majors

Psychology/Anatomy  
Psychology/Physiology

## Information Systems

Information Systems is concerned with information systems analysis and design, data management, computer processing, edp audit, management information systems and applied expert systems within business and government organisations. There is a growing maturity in the discipline as the underlying theory and associated principles become better understood and as advanced information processing techniques emerge. In many respects the development of the knowledge base which forms the discipline parallels developments in computing technology as new opportunities become apparent for the solution of information processing problems. Hence, information systems is concerned with the way in which computer systems are used within organisations — mainly business and government. There is a high degree of complementarity between the roles of Computer Science and the discipline of Information Systems. The program is intended to develop students' conceptual and practical skills in the discipline. After an introductory first year students study systems design, database, communications and commercial programming in parallel with computer science, mathematics and management accounting units. An honours year is available for well qualified students. This specializes in advanced information systems and data management topics.

## 1400 Information Systems

General Studies: *see Contents*

### Year 1\*

6.611

10.001 or 10.011

Choose 5 Level I units from:

1. Table 1 *and/or*
2. Table 2 for program 1400

### Year 2

6.621, 6.641

14.501, 14.511, 14.602, 14.603

10.331 or 10.311A

Choose 1 unit from:

1. Table 1 *or*
2. Table 2 for program 1400

1 *General Studies elective*

*Computing*  
*Mathematics*

### Year 3

14.522, 14.605, 14.607, 14.608

Choose 3 units including at least one at Level III from:

1. Table 1 *and/or*
2. Table 2 for program 1400 *and/or*
3. 14.611

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 6 Level III units.

### Year 4 (Honours)

14.794, 14.853, 14.857, 14.886, 14.887, 14.891

If 14.611 has not previously been taken this unit should replace 14.857.

\*In Year 1 students must enrol in program 6806. Enrolment in Year 2 is based on academic performance in Year 1.

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## Geology and Geophysics

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Programs in Geology and Geophysics are offered to the Board of Studies in Science and Mathematics by the Department of Applied Geology in the School of Mines. The School is part of the Faculty of Applied Science and the Department of Applied Geology is dedicated to teaching and research in resource geology as well as in the fundamentals of the science.

Geology is the study of the nature and evolution of the earth. It is concerned with the composition and modes of formation and deformation of the igneous, sedimentary and metamorphosed rocks and concentrations of minerals that comprise the earth's crust and interior. Geology enquires into the essential controls on the development and distribution of such rocks and minerals in space and geologic time. Likewise it is concerned with the nature, distribution, and evolution of life forms through time. Resource geology is concerned with the application of all geological knowledge to the location and extraction of mineral and energy deposits, and to engineering and environmental tasks, ie activities that are fundamental to the well-being of modern society. Thus geology has an applied, professional function as well as being a scientific discipline.

Geophysics employs sophisticated instrumentation in order to construct physical earth models and is a companion discipline to Geology.

### Program for Professional Geology

After June 1986, the Australasian Institute of Mining and Metallurgy requires that its corporate members, including professional geologists, shall have completed a four year course. Students wishing to enter the geology profession should preferably undertake the four year Course 3000 Applied Geology in the Faculty of Applied Science that is specifically designed to meet the needs of a professional geologist. However, an identical course of study is available in the Science Faculty program

2500 by taking the three year program with a double major in Applied Geology and by achieving a standard that enables progression to the Year 4 program and graduation with Honours. Training of a professional geologist demands a thorough understanding of basic geological principles; accordingly, in the early part of the course students receive instruction in fundamental geological subjects. As with other science based disciplines, appropriate standards in Physics, Chemistry and Mathematics are also required. As the course progresses, increasing emphasis is placed on practical applications of geological principles to mineral and energy exploration and development and to engineering and environmental geology. Mineral and energy exploration techniques including geochemical and geophysical methods are also studied. Year 4 is divided between a core of advanced geological topics, and one strand chosen from mineral resources, sedimentary basin resources, engineering and environmental geology, or geophysics. Session 2 of Year 4 is devoted to a specialized research project.

### Geophysics

Professional geophysicists work closely with geologists and, appropriately, studies of both disciplines are undertaken in the one school. Fundamental and applied geophysics are taught to geology students in program 2500 (and Course 3000), but students who intend to become professional geophysicists should take program 2503.

### Single Major in Geology

Because Geology is a natural companion to other sciences, such as Chemistry (in Geochemistry), Botany and Zoology (in Palaeontology) and Geography, and of widespread interest to science in general, program 2500 is organized so that a single major in Geology may be acquired. Selected students who have completed such studies may undertake an honours degree that includes geology with another science should consult the Department of Applied Geology about recommended programs. Those who are specifically interested in combining Geology with Zoology and/or Botany should carefully read the following section.

### Geology with Zoology and Botany

Geology and the Biological Sciences meet in a common field of study (Palaeontology) concerned with the evolution and environmental controls on the growth of ancient life forms. Palaeontologists may have an applied function, providing geologists with essential information about the relative ages and depositional environments of sedimentary rocks, particularly the strata with a potential to yield fossil fuels. Students intending to pursue this combination should take the subjects designated in footnote (\*) to program 2500.

### Geology in Marine Science

Students interested in marine sciences should consider program 6833 which is concerned with geological aspects of the marine environment.

Programs in Geology are also offered in the Combined Science/Civil Engineering course 3730, the Science Education course 4080 and the Combined Science/Law Course 4770.

## 2500 Geology

General Studies: *see Contents*

### Year 1

1.001\*  
2.141 or both 2.121 and 2.131  
10.001 or 10.011 or both 10.021B & 10.021C  
25.110, 25.120

*Physics*  
*Chemistry*  
*Mathematics*  
*Geology*

### Year 2

25.211, 25.212, 25.221  
Choose at least 4½\* units from:  
1. 25.223, 25.2261 (compulsory for Double Major) and  
2. Table 1 other than units offered by Applied Geology  
1 General Studies elective

### Year 3

25.311, 25.312  
Choose at least 2 Applied Geology units from:  
25.314, 25.3162, 25.321, 25.324, 25.325, 25.3261, 25.3271,  
25.333  
(Double Majors in Applied Geology must take all of these subjects)  
Choose further units from Table 1 to give a total of 23 for the complete program\*  
1 General Studies elective

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

### Year 4 (Honours)

25.435

\*Carefully read the description of program 2500 and seek advice from the Department of Applied Geology about the choice of units. Students following a combination of Applied Geology with Zoology and/or Botany are permitted in Year 1 to substitute the two Biology units, 17.031 & 17.041, for 1.001. In Year 2 they should take 43.111, 45.101, 45.201, 45.301 and 1 unit chosen from 17.012, 43.131 and 43.112; in Year 3 25.324, either 25.321 or 25.325, 45.302 and 2 units chosen from 43.152, either 43.112, 43.172, 45.112, 45.121, 45.402.

## 2503 Geophysics

General Studies: *see Contents*

### Year 1

1.001  
2.141 or both 2.121 and 2.131  
10.001 or 10.011  
25.110, 25.120

*Physics*  
*Chemistry*  
*Mathematics*  
*Geology*

### Year 2

1.002, 1.012, 1.022, 1.032  
10.2111, 10.2112  
25.5212, 25.223, 25.2261  
2 General Studies electives

### Year 3

25.3162, 25.333, 25.9311, 25.9312,

25.9313, 25.9314, 25.9321

Choose 2 units from Level III Physics

Choose 2 units from:

1. Table 1 and/or
2. Table 2 for program 2503

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

### Year 4 (Honours)

25.435

## Recommended Double Majors

Geology/Botany and Zoology  
Geology/Chemistry  
Geology/Geography  
Geology/Mathematics  
Geology/Physics

## Geography

Geography is the scientific study of variations from place to place on the earth's surface. It provides an analytical framework for understanding and investigating many of society's pressing problems such as the use and management of scarce resources, the impact of environmental hazards on human activities, soil erosion and conservation, land use conflicts, and the spatial organization of human affairs.

Program 2700 comprises a three-year structured sequence of substantive subjects in physical and human Geography, with particular emphasis on studies of the natural environment, as well as a grounding in basic analytical skills and techniques (eg statistical methods and computing, remote sensing and air photo interpretation, field and laboratory techniques) required for problem-solving and application. Because of its essentially interdisciplinary nature, a training in Geography is increasingly recognized as a relevant qualification for employment in a wide range of planning and conservation-related fields.

Considerable flexibility exists in program 2700 for students to combine subjects in Geography with those from cognate disciplines to suit individual interests and career aspirations. Studies in Geography with a co-major in other sciences, especially Geology and Botany, are encouraged. Details of particular courses of study and subject combinations offered within the program are available from the School Office.

## 2700

### Geography

General Studies: *see Contents*

### Year 1

10.001 or 10.011 or both 10.021B *Mathematics*  
and 10.021C  
27.819 and either 27.818 or both 27.010 *Geography*  
and 27.030

Choose further Level I units from Table 1 to make a total of 8

### Year 2

Choose 3 Level II Geography units  
Choose 5 units from Table 1  
1 *General Studies elective*

### Year 3

Choose 4 Level III Geography units  
Choose 3 units from Table 1  
1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units and must have completed 27.050.

### Year 4 (Honours)

27.844

## Recommended Double Majors

Geography/Botany  
Geography/Geology

## Biochemistry

Biochemistry is at the foundation of the biological sciences and is concerned with an understanding of life processes, especially with regard to molecular aspects of living organisms. Initially the approaches of chemistry were applied to biological systems but now Biochemistry has achieved its own techniques, approaches and body of knowledge and its ideas pervade the whole of biology. It, however, retains a molecular basis and is an ideal study for those interested in understanding and appreciating biological processes at the molecular rather than descriptive level. Biochemistry also represents a fundamental component of medical science and has an important role in many aspects of modern medicine.

Study of Biochemistry begins at Level II (41.101 Biochemistry) building on a base of Level I Chemistry and Biology. The material in this double unit introduces the basic concepts of the subject, describes biological molecules, and their interconversions in cells and tissues, the relationship between the structures and functions of enzymes, other proteins, hormones and biological membranes.

At Level III, further units are offered which cover various aspects of Biochemistry. These include 41.102 Biochemistry of Macromolecules (a double unit) and 41.112 Human Biochemistry, 41.122 Cellular Biochemistry and Control, 41.132 Molecular Biology of Higher Organisms, and 41.142

Biochemistry and Genetic Engineering of Plants.

In Year 4, the Honours Course in Biochemistry (41.103 Biochemistry Honours) offers the opportunity for those students who have obtained above average results to carry out a research project under supervision and to receive training in the latest research techniques.

## Program 4100 Biochemistry

The program outlined below leads to a single major in Biochemistry and also provides for a considerable choice of units offered by other Schools. It can be used as a framework to lead to co-majors with other disciplines, for example, microbiology, chemistry, physiology, biotechnology, zoology, botany or anatomy; other co-majors are possible. In arranging co-majors, the programs of the two relevant Schools should be consulted, especially if there is a possibility of proceeding to Year 4 (Honours). Program 4100 also can be followed to achieve a single major in biochemistry supported by one or two minor sequences — for example biochemistry with some chemistry and some microbiology or biochemistry with some physiology and some anatomy. The program also permits 5 Level III units of biochemistry to be taken rather than the minimum of 4 units. All of these combinations can serve as prerequisites for an Honours Year in biochemistry provided that passes are obtained in a total of 8 Level III units including above average results in Biochemistry.

## 4100 Biochemistry

General Studies: *see Contents*

### Year 1

2.141 or both 2.121 and 2.131  
10.001 or 10.011 or both 10.021B  
and 10.021C  
17.031, 17.041  
Choose 2 Level 1 units from Table 1\*

*Chemistry*  
*Mathematics*  
  
*Biology*

### Year 2

2.102B or 2.102D  
41.101  
Choose 4 or 5 units from Table 1†  
1 *General Studies elective*

### Year 3

41.102  
Choose at least 2 units from: 41.112, 41.122, 41.132, 41.142  
Choose further units from Table 1 to give a total of 23 for the complete program  
1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

### Year 4 (Honours)

41.103

\*Recommended are units offered by the School of Physics and the Department of Computer Science. Also recommended is 68.451.  
†Students are recommended to take both 2.102B and 2.102D.

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## Recommended Double Majors

Biochemistry/Biotechnology  
 Biochemistry/Botany  
 Biochemistry/Chemistry  
 Biochemistry/Microbiology  
 Biochemistry/Physiology  
 Biochemistry/Zoology

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## Biotechnology

Biotechnology employs a body of multidisciplinary expertise directed towards the utilization and recycling of natural resources by controlled biological action, usually in a reactor. Its study provides an appreciation of the capabilities of biological systems and the skills required to maximize these capabilities on the industrial scale. Particular attention is given to: the selection of the appropriate systems and their maximization by genetic and/or enzyme tailoring; the design of biological reactors and their ancillary equipment; optimization and control of the processes. It is by these means that products are manufactured at ensured standards of quality. The products include certain foods and beverages, baker's yeast, antibiotics, steroids, vaccines, enzymes, amino acids, nucleotides, vitamins, organic acids, alcohols, metals, plant growth regulators and insecticides. Specific mammalian proteins, such as insulin and growth hormone, are also produced by micro-organisms which have been genetically engineered to contain the appropriate mammalian gene.

Students wishing to undertake training in biotechnology may do so by combining such training with a major in another relevant discipline, preferably biochemistry, microbiology or chemistry. The fourth (Honours) year includes further formal training as well as research in biotechnology.

Alternatively, students with no previous training in biotechnology may undertake the biotechnology honours year, provided they have the necessary background training in biochemistry and microbiology; in such cases the Level III biotechnology units constitute the formal component.

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### 4200

#### Biotechnology

General Studies: *see Contents*

##### Year 1

2.141 or both 2.121 and 2.131  
 10.001 or 10.011 or both 10.021B  
 and 10.021C  
 17.031, 17.041

Choose 2 Level 1 units from Table 1

*Chemistry  
 Mathematics*

*Biology*

##### Year 2

41.101

Choose at least one of: 42.101, 44.101

Choose additional units from Table 1 to make a total of 7  
 2 *General Studies electives*

##### Year 3

42.102A, 42.102B

Choose 4 Level III units from a single discipline\* in Table 1

Choose 2 units from Table 1

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

##### Year 4 (Honours)

42.103

\*Recommended disciplines are Biochemistry, Chemistry, Microbiology.

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## Recommended Double Majors

Biotechnology/Biochemistry  
 Biotechnology/Chemistry  
 Biotechnology/Microbiology

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## Botany

Botany is concerned with all aspects of the structure and function of both green and non-green plants and the relation of plants to their environments. The major aspects of the subject range from plant anatomy and morphology through physiology, ecology, taxonomy and palynology to mycology and plant pathology. The applications of these studies are particularly relevant in the fields of agriculture, horticulture, forestry, conservation and related environmental sciences.

Botany may be taken as a major or a minor study in the Science and Mathematics Course (3970).

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### 4300

#### Botany

General Studies: *see Contents*

##### Year 1

2.141 or both 2.121 and 2.131  
 10.001 or 10.011 or both 10.021B  
 and 10.021C

*Chemistry  
 Mathematics*

17.031, 17.041

Choose 2 Level I units from Table 1

## Year 2

43.111

Choose at least one of the following: 17.012, 43.131, 43.121

Choose additional units from Table 1 to make a total of 8

1 *General Studies elective*

## Year 3

Choose 4 Level III Botany units

Choose 3 units from Table 1

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units.

## Year 4 (Honours)

43.103

*Biology*

General Studies: *see Contents*

## Year 1

2.1341 or both 2.121 and 2.131

10.001 or 10.011 or both 10.021B

and 10.021C

17.031, 17.041

Choose 2 Level 1 units from Table 1

## Year 2

41.101

44.101, 44.121

Choose 4 units from Table 1

1 *General Studies elective*

## Year 3

44.102, 44.112

Choose 3 units from Table 1

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

## Year 4 (Honours)

44.103

\*1. Those students interested in a specialist career in Microbiology should also choose 44.122 and 44.132 in Year 3. Students wishing to include 44.122 Immunology in their program are strongly advised to take 70.011A History in Year 2. 2. Many students combine a major in Microbiology with a major in Biochemistry or Biotechnology. 3. Students should note that Mycology is an aspect of Microbiology which is taught in the School of Botany in units 43.131 and 43.132. 4. The subject 45.101 Biometry is recommended as a useful elective. In particular, students interested in environmental microbiology or in a research career in any area are strongly advised to take this subject.

## Recommended Double Majors

Botany/Biochemistry

Botany/Geography

Botany and Zoology/Geology

Botany/Microbiology

Botany/Zoology

## Recommended Double Majors

Microbiology/Biochemistry

Microbiology/Biotechnology

Microbiology/Botany

## Microbiology

The discipline of microbiology encompasses the scientific study of the smallest forms of life, namely bacteria, viruses, algae, fungi and protozoa. Microorganisms are probably best known as agents of disease in man, in other animals and in plants. Other microorganisms cause food spoilage, as well as serious deterioration in textiles and structural materials. Not all microorganisms are harmful. We depend on microorganisms for the recycling of organic wastes, for the maintenance of soil fertility, and for the production of foods, beverages, pharmaceuticals (especially antibiotics), and other industrially important materials.

The program in Microbiology requires students to take basic courses in Chemistry, Mathematics and Biology in Year 1, as well as 41.101 Biochemistry in Year 2.

4400

**Microbiology\***

## Zoology

Zoology is built on the foundation of the first year units Biology A and B, Mathematics and Chemistry.

In their second year all Zoology students study Biometry, Invertebrate Zoology, Vertebrate Zoology and either General Ecology or Introductory Genetics or both. Students must also complete two Level II units of either Biochemistry or Chemistry or Mathematics or Physics. Other units are then chosen to make a total of seven or eight for the year. The areas from which these units are chosen will depend mainly on the student's interests. Examples of some of the units which are often chosen are Flowering Plants, Introductory Microbiology, Control Mechanisms, Organic Chemistry, Analytical Chemistry, Physiology and Mathematics. The choice of optional units is important because it determines which units may be included in the third year.

*Chemistry*

*Mathematics*

*Biology*

Students are urged to seek advice from the school's student advisors at the end of Year 1 and 2.

A major in Zoology requires the study of at least 4 Level III Zoology units, three of which must be selected from Evolutionary Theory, Insects, Comparative Physiology and Animal Behaviour. The choice of other units in third year depends on students' interests. For instance those interested in Entomology would probably include Economic Zoology amongst their units; those interested in Ecology might include Population & Community Ecology, Marine Ecology and Vertebrate Zoogeography & Evolution; those interested in Animal Physiology would probably include Ecological Physiology. The additional units may be either chosen from those offered by the School of Zoology or by other schools. In all, seven or eight units are studied in third year to make a total of at least 23 units, as required by the regulations of the Science and Mathematics Course.

It is possible to study other disciplines as a co-major with Zoology eg Botany, Biochemistry, Mathematics, Marine Science, Anatomy, Physiology, Geography, Geology. In general, students completing a co-major with Zoology must satisfy the requirements of the Zoology program but some minor variations may be permitted when students include 4 Level III units from both Zoology and the co-major discipline. Students should consult the School about these prior to enrolment in Year 2.

For students who achieve above average results in their studies a fourth year (Honours) is available. The Honours year is made up of formal course work on Concepts in Biology plus a research project.

## 4500

### Zoology

General Studies: *see Contents*

#### Year 1

2.141 or both 2.121 and 2.131  
10.001 or 10.011 or both 10.021B  
and 10.021C  
17.031, 17.041  
Choose 2 Level I units from Table 1

*Chemistry  
Mathematics*

*Biology*

#### Year 2

17.012 and/or 45.601  
45.101, 45.201, 45.301  
Choose 2 units from Table 1 from 1 of the following schools:  
Biochemistry, Chemistry, Physics, Mathematics  
Choose 1 or 2 units from Table 1 to give a total of 8  
1 *General Studies elective*

#### Year 3

Choose 3 units from 45.121, 45.122, 45.402 and either 45.132 or 45.142  
Choose 1 further Level III Zoology unit  
Choose 3 units from Table 1  
1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units

#### Year 4 (Honours)

45.103

## Recommended Double Majors

Zoology/Anatomy  
Zoology/Biochemistry  
Zoology/Botany  
Zoology and Botany/Geology  
Zoology/Mathematics  
Zoology/Physiology

## Philosophy

Philosophy is a wide-ranging discipline, catering for a great diversity of interests, for instance, in science, reasoning, persons, and social issues, and encouraging critical and imaginative thought about the foundations of other subjects. Apart from providing considerable choices for students majoring in Philosophy, the diversity of Upper Level subjects makes it possible for students majoring in other disciplines to select subjects complementing their main interest.

### First Enrolment in Philosophy

There are two Level I subjects:

52.103 Introductory Philosophy A (Session 1)  
52.104 Introductory Philosophy B (Session 2).

Each of these has one unit value. They can be taken separately, and a student can gain Level II status in Philosophy (ie qualify to enrol in Upper Level subjects) by passing in only one. However, students enrolling in one normally enrol in both, and students wishing to major in Philosophy must do so.

### Value of Upper Level Subjects in Philosophy

With the exception of two subjects which each count as one science unit, all Level II/III subjects in Philosophy are half units, of which three together can be counted as two science units.

### Major in Philosophy

Students majoring in Philosophy must take the equivalent of two Level II/III units in Year 2, and the equivalent of four Level II/III units in Year 3.

### Level II/III

Some Level II/III subjects deal with particular philosophical topics; others can be taken in sequence to give more sustained treatments of larger areas. Students may select freely among these, subject to stipulations regarding prerequisites. They are welcome to seek advice and further information from the School.

In certain circumstances the prerequisite specified for units or half-units may be waived; for example, in the case of students who have already studied similar material, or who wish to take isolated units or half-units relevant to another discipline. Students who feel they have a case for a concession of this kind should consult the School.

**5200****Philosophy**

General Studies: *see Contents*

**Year 1**

10.001 or 10.011 or both 10.021B  
and 10.021C

52.103, 52.104

Choose 4 Level I Units from Table 1

*Mathematics*

*Philosophy*

**Year 2**

Choose 2 Philosophy units\*

Choose 6 units from Table 1

1 General Studies elective

**Year 3**

Choose 4 Philosophy units\*

Choose 3 units from Table 1

1 General Studies elective

\*Due to the extra library work required in the preparation of essays, a combination of 3 half unit Philosophy subjects count as the equivalent of 2 Science units.

**Science and Technology Studies**

Students may take units within the School leading to the award of the BSc degree at pass or honours level.

Some students may wish to take a small number of subjects, where their programs allow sufficient flexibility, as complements to their usual experimentally-based science subjects.

Broadly speaking, students wishing to make their careers in areas related to S & T studies (for example, museum work, science journalism, tertiary teaching, government administration, etc) will need to pursue their studies at graduate level, but there are some career opportunities for those who have bachelor degrees only.

The School offers course-work programs leading to the degrees of Master of Science and Society and Master of Cognitive Science. Research degrees at the Master and Doctoral level may also be undertaken. Interested students should enquire at the School.

**The Pass Degree**

The program offered by the School gives students a wide range of options from which to choose in studying the historical, philosophical and social aspects of science and technology. Students intending to complete the pass degree are required to take eight S & T units, of which three are prescribed and five are elective. The remaining units in this program may be chosen from those listed in Table 1, which allows sufficient flexibility for the completion of a second major in a scientific discipline, if this

is desired. Students wishing to enquire about such a double major within program 6200 are invited to contact the School and the relevant second School for further information.

While S & T Studies units may be combined in a variety of ways, they generally fall into two main areas, concerned on the one hand with the History and Philosophy of Science, and on the other hand with Social Studies of Science and Technology. Some individual units, however, offer significant coverage of both areas and fit naturally into either one. Students who wish to concentrate in the History and Philosophy of Science or in Social Studies of Science and Technology may use the following list as a guide to recommended groupings of S & T units in these two areas.

**History and Philosophy of Science****1. Level I units**

62.102I, 62.104I

**2. Level II/III units**

62.201U, 62.202U, 62.205U, 62.207U,  
62.208U, 62.209U, 62.210U, 62.211U,  
62.214U, 62.215U, 62.216U, 62.217U,  
62.218U, 62.219U.

**3. Level III units**

62.300U, 62.300I, 62.300S.

**Social Studies of Science and Technology****1. Level I units**

62.101I

**2. Level II/III units**

62.201U, 62.203U, 62.204U, 62.205U,  
62.206U, 62.210U, 62.212U, 62.213U,  
62.219U.

**3. Level III units**

62.300U

**The Honours Degree**

Students intending to proceed to an honours degree in S & T studies complete the first three years of program 6200 with marks that result in an average of Credit or better in the eight S & T units included. The three-year program leading to honours entry offers sufficient scope for the completion of a second major in a scientific field, if this is desired. All students intending to complete an honours degree within program 6200 are invited to contact the School and the relevant second School for further information regarding combined major sequences.

**Scientia**

The Scientia Society gives students enrolled in S & T units an opportunity to meet one another informally, to discuss their interests in Science and Technology Studies, to hear visiting speakers and to enjoy a number of social events throughout the year. In addition, as a student organisation within the School, Scientia provides a means for undergraduates and graduates to express their views on matters of School policy and planning. Notices of Scientia activities are posted on a bulletin board near the School office (Morven Brown room 241) and all students enrolled in S & T units are welcome to attend.

**6200****Science and Technology Studies**



General Studies: *see Contents*

#### Year 1

10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
62.101I or 62.102I or 62.104I *S & T Studies*  
Choose 5 Level I units from Table 1

#### Year 2

62.201U, 62.202U  
Choose 1 additional S & T unit  
Choose 5 units from Table 1  
1 *General Studies elective\**

#### Year 3

Choose 4 S & T units\*  
Choose 3 units from Table 1  
1 *General Studies elective\**  
Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units.

#### Year 4 (Honours)

62.400H

\*26.251, and 26.2506 may not be included in this program.

### Recommended Double Majors

Science and Technology Studies/Anatomy  
Science and Technology Studies/Botany  
Science and Technology Studies/Geology  
Science and Technology Studies/Zoology

## Board of Studies in Science and Mathematics

### 6801 For Anatomy Programs

General studies: *see Contents*

#### Year 1

10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
17.031, 17.041 *Biology*  
Choose 4 appropriate Level I units from Table 1

Enrolment in Year 2 of program 7000 is based on academic performance in Year 1. Students should select the units specified in the program they wish to pursue in Year 2.

Students may obtain advice from the Office of the Board of Studies in Science and Mathematics in the Biological Sciences Building.

### 6806 For Computer Science Programs

General studies: *see Contents*

#### Year 1

10.001 or 10.011 *Mathematics*  
6.611 *Computing*  
Choose 5 units from Table 1

In Year 1 students must enrol in program 6806. Enrolment in Year 2 of program 0600 and 1400 is based on academic performance in Year 1. Students may obtain advice from the office of the Board of Studies in Science and Mathematics in the Biological Sciences Building.

### 6810 Mathematics of Management\*†

General studies: *see Contents*

#### Year 1

10.001 or 10.011\*\* *Mathematics*  
14.501, 14.511 *Accounting*  
15.001, 15.011 *Economics*  
Choose 2 Level I units from:  
1. Table 1 or  
2. Table 2 for program 6810

#### Year 2

10.111A, 10.1113, 10.1114, 10.2111, 10.2112  
10.2113, 10.2115, 10.311A or 10.331  
14.522, 14.602  
Choose 1 unit from: 14.542, 14.603, 14.613.  
1 *General Studies elective*

#### Year 3

Choose 2 units from: 10.212A, 10.412D, 10.212L, 10.212M, 10.311B, 10.312A, 10.3321, 10.3322.  
Choose 2 further Level III Mathematics units  
Choose 2 units from one of the strands:  
1. 14.563, 14.583  
2. 14.605, 14.607, 14.608  
3. 14.614, 14.615  
Choose 1 unit from:  
1. Table 1 or  
2. Table 2 for program 6810  
1 *General Studies elective*

\*Enrolment in this program requires the approval of the Chairman of the Board of Studies in Science and Mathematics and the head of the School of Accountancy.

\*\*Throughout this program Mathematics subjects can be replaced by the corresponding Higher Mathematics subject.

†For details see preamble to Mathematics programs.

### 6817 For Biological Sciences Programs

#### Year 1

2.141 or both 2.121 and 2.131 *Chemistry*

*Dr. Dickson*  
2137

10.001 or 10.011 or both 10.021B Mathematics  
and 10.021C  
17.031, 17.041 Biology  
Choose 2 Level I units from Table 1

In Year 2 students would transfer to a program administered by the Board of Studies in Science and Mathematics and should obtain advice from the Office of the Board of Studies in Science and Mathematics in the Biological Sciences Building or from the Office of the School in which they intend to major.

In 1989 the Faculty of Biological and Behavioural Sciences will introduce a compulsory common core in Level II consisting of four unit equivalents: as follows: Principles of Biochemistry, Molecular Biology, Introductory Genetics, and Biological Function and Evolution.

The core will be compulsory for all students majoring in other than Psychology programs that are offered totally within the Faculty of Biological and Behavioural Sciences (in particular 4100 Biochemistry, 4200 Biotechnology, 4300 Botany, 4400 Microbiology and 4500 Zoology). The changes are being made in order to avoid duplication of effort (eg between biochemistry, microbiology and genetics) and to present basic material covering a broad spectrum of biological science in a more cohesive manner.

Individual units within the core will be available to students in other programs and will be prescribed in such program as 6832 Marine Science (Biological Oceanography) and 6840 Genetics as well as for interfaculty double majors (eg Biochemistry/Anatomy, Biochemistry/Physiology, Biochemistry/Chemistry and Botany/Geography).

In addition, at Level II, from 1989, optional single units in Biostatistics, Ecology, Microbiology, Botany, and Zoology will be available to supplement the core units in various programs.

Full details of these new units and recommended program structures will be made available to students enrolled in program 6817 during Session 2 of 1988.

## Marine Science

The Marine Science programs are designed to provide opportunities for students to specialize in selected areas of marine science, yet ensure that they receive an adequate exposure to other pertinent disciplines within this broad field. The programs have been constructed from subjects currently available in the faculties of Science, Biological Sciences and Applied Science. Introductory Marine Science is a subject common to all these programs, and unique to them, having been designed for Marine Science programs.

All students in the Marine Science programs must select *one* major sequence from the following options: 6831 Physical Oceanography; 6832 Biological Oceanography, 6833 Earth Sci-

ence Oceanography and 6834 Environmental Chemistry. In addition, all students must select *two* minor sequences from the Physical, Biological, Earth Science, and Chemical minor sequences offered. A minor sequence in the same area as that selected for the major sequence is excluded.

*Physical Oceanography* includes units of basic and advanced Mathematics and Physics, as well as units in 10.292A Oceanography and 10.212B Fluid Mechanics.

*Biological Oceanography* includes basic Mathematics, Chemistry and Biology as well as advanced courses in 43.111 Flowering Plants, 45.201 Invertebrate Zoology, 43.172 Phycology and Marine Botany, 45.112 Marine Ecology and 44.101 Introductory Microbiology. Further options include 17.012 General Ecology, 10.331 Statistics and 41.101 Biochemistry.

*Earth Science Oceanography* consists of basic Geology and Mathematics, and advanced units in Geology and Geography leading to 25.631 Marine Geology, 25.632 Estuarine Geology, 25.6341 Marine Mineral Deposits and Resources, 25.6342 Exploration & Seismic Methods and 25.622 Hydrological and Coastal Surveying.

*Environmental Chemistry* includes basic Chemistry and Mathematics, and 2.002A Physical Chemistry, 2.002D Analytical Chemistry, 2.043A Environmental Chemistry and 2.003D Instrumental Analysis.

All programs offer some optional units to allow students a degree of freedom of choice of subjects. A fourth (Honours) year in Marine Science is available in all programs.

### 6831

#### Marine Science (Physical Oceanography)

General studies: *see Contents*

##### Year 1

1.001

1.041 or 6.611

10.001 or 10.011

Choose 2 units from 1 of the strands:

1. 2.141 or both 2.121 and 2.131 or

2. 17.031, 17.041 or

3. 25.110, 25.120

10.081 or choose 1 further unit from the above strands

*Physics*  
*Computing*  
*Mathematics*

*Chemistry*  
*Biology*  
*Geology*

##### Year 2

10.1113, 10.1114, 10.2111, 10.2112

1.002

68.302

10.2115 or 10.2215, 10.2116 or 10.2216

Continue the strand chosen in Year 1:

1. 2.102A or

2. at least 1 unit from: 17.012, 45.152, 43.111 or

3. 25.621

Choose 2 additional units from Table 1 to give a total of 8  
1 General Studies elective

##### Year 3

10.212N

10.292A  
10.212D or 10.222D  
10.212B or 10.222B  
10.2922  
68.313

Choose 2½ units from: 1.022, 1.032, 1.3533, 1.062, 1.133, 10.212A, 10.262A, 10.292A, 10.2921, 25.6342, 45.112 or 25.631 or 25.632 or 2.043A or 43.172 or 25.635

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units

#### Year 4 (Honours)

68.304

### 6832 Marine Science (Biological Oceanography)

General Studies: *see Contents*

#### Year 1

2.141 or both 2.121 and 2.131 *Chemistry*  
10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
17.031, 17.041 *Biology*

Choose 2 units from 1 of the strands:

1. 1.001 or 1.021 or *Physics*
2. 25.110, 25.120 *Geology*

#### Year 2

2.102A  
43.111  
44.101  
41.101 or 45.201  
68.302

Choose 1 unit from the subjects related to the strand chosen in Year 1:

1. 10.031 or 10.331 or 10.301 or
2. 25.622

Choose units from: 17.012, 41.101, 44.121, 45.101, 45.201, 45.301 to given a total of 8

1 *General Studies elective*

#### Year 3

43.172  
45.112

Choose 2 Level III units from Table 1 which may include the subjects corresponding to the strand chosen in Years 1 and 2:

1. 68.313, 10.032 or
2. 25.632

Choose 3 units from Table 1

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

#### Year 4 (Honours)

68.304

### 6833

### Marine Science (Earth Science Oceanography)

General Studies: *see Contents*

#### Year 1

10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
25.110, 25.120 *Geology*

Choose 4 units from 2 of the strands:

1. 1.001 or 1.021 and/or *Physics*
2. 17.031, 17.041 and/or *Biology*
3. 2.141 or both 2.121 and 2.131 *Chemistry*

#### Year 2

68.302  
25.621, 25.622

Continue both of the strands chosen in Year 1:

1. 10.031 or 10.331 or 10.301 and/or
2. At least 1 unit from: 17.012, 43.111, 45.201 and/or
3. 2.102A

Choose additional units from Table 1 to give a total of 8

1 *General Studies elective*

#### Year 3

25.631, 25.632, 25.6341, 25.6342

Choose 3 Level III units from Table 1 which may include the subjects corresponding to the strands chosen in Years 1 and 2:

1. 68.313, 10.032 and/or
2. 43.172, 45.112 and/or
3. 2.123E

Choose 1 unit from Table 1

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

#### Year 4 (Honours)

68.304

### 6834

### Marine Science (Environmental Chemistry)

General Studies: *see Contents*

#### Year 1

2.141 or both 2.121 and 2.131 *Chemistry*  
10.001 or 10.011 *Mathematics*

Choose 4 units from 2 of the strands:

1. 1.001 and/or *Physics*
2. 17.031, 17.041 and/or *Biology*
3. 25.110, 25.120 *Geology*

## Year 2

2.102A, 2.102D  
68.302

Continue both of the strands chosen in Year 1:

1. 10.031 or 10.331 and/or
2. At least 1 unit from: 17.012, 43.111, 45.201 and/or
3. 25.622

Choose additional units from Table 1 to give a total of 8  
1 General Studies elective

## Year 3

2.123E, 2.103D

Choose 2 Level III units from Table 1 which may include the subjects corresponding to the strands chosen in Years 1 and 2:

1. 68.313, 10.032 and/or
2. 43.172, 45.112 and/or
3. None

Choose 3 units from Table 1  
1 General Studies elective

Students proposing to proceed to Year 4 (Honours) must complete 8 Level III units.

## Year 4 (Honours)

68.304

General Studies: see Contents

## Year 1

2.141 or both 2.121 and 2.131 *Chemistry*  
10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
17.031, 17.041 *Biology*

Choose 2 Level I units from Table 1

## Year 2

41.101

44.101

45.601

Choose 1 unit from: 43.111, 43.131, 44.121, 45.201, 45.301, 45.402

Choose 1 unit from: 10.331, 45.101

Choose 2 further units from one of the following groups:

1. 2.102B, 44.121 or 42.101
2. 6.611; 17.012; 68.601 or 9.801
3. 43.111 or 43.131; 45.201 or 45.402; 45.301 or 9.801; 62.104; 68.601

2 General Studies electives

## Year 3

Choose 8 units from: 6.621, 6.646, 9.802, 9.811, 41.102, 41.132, 41.142, 42.102A, 42.102C, 43.112, 44.102, 44.122, 45.121, 68.602, 79.201, 79.202, 79.302.

Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units.

## Year 4 (Honours)

68.404

# Genetics

The Genetics program is designed to provide students with a firm foundation of genetical knowledge and also to give them experience in pertinent related areas.

Because the subject matter of Genetics ranges from the structure of viruses to the co-evolution of populations, students are encouraged to choose between three sequences: molecular and microbial, population and ecological, and classical and organismal. The three groups of subjects in second year correspond to these sequences; the combination of subjects chosen then will determine the choices available in Year 3.

The choice of Year 1 subjects available include Physics, Psychology, Geography, and units in the laboratory applications of computers. Experience with laboratory computers is an asset in many areas of genetics, and 68.451 is therefore strongly recommended as a year 1 subject.

Entry into a fourth (Honours) year is available, for above-average students, upon application to the Genetics Program Committee.

## 6840 Genetics

# Anatomy

Entry to Anatomy programs is limited to a quota of approximately 60. Students in Year 1 must enrol in Program 6801, and apply in October for entry to Anatomy the following year. Selection is determined by academic merit, based on a weighted aggregate of marks obtained in Year 1. Allowance is made for the relative difficulty of first year units in Mathematics and Physics, the more difficult subjects being given a greater weight. Introductory Chemistry is included in the aggregate even though not counting for a degree. The quota does not apply to the Science/Medicine course (course 3820).

Anatomy subjects are, in general, only available to students who have been admitted to the Anatomy quota. However, students in programs 4400 (Microbiology-Immunology strand) and 6840 (Genetics) may take 70.011A, 70.011C, 70.304, and 70.3041.

Students enrolled in programs for which Anatomy or Histology is relevant (eg Biochemistry, Physiology, Psychology) and who wish to study one or more Anatomy units should consult the Head of School.

A major in Anatomy may suitably be combined with a major in Biochemistry (70.304 or 70.3041 recommended), Physiology

or Psychology. Owing to timetabling difficulties, the double major with Biochemistry may be impossible to complete in the minimum time.

72.301 Basic and Applied Pathology may be counted as a Level III Anatomy unit.

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## 7000 Anatomy

General Studies: *see Contents*

### Year 1\*

10.001 or 10.011 or both 10.021B and 10.021C *Mathematics*  
17.031, 17.041 *Biology*

Choose 4 Level I units from Table 1

Apply for entry to the Anatomy quota for following year

### Year 2

70.011A, 70.011C

Choose 5 or 6 units from:

1. Table 1 *and/or*

2. Anatomy units in Table 2 (70.011B is recommended)

1 *General Studies elective*

### Year 3

Choose at least 4 Level III Anatomy units (may include 72.301)  
Choose further units from Table 1 to give a total of 23 for the complete program

1 *General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 6 Level III units.

### Year 4 (Honours)

70.013

\*In Year 1 students must enrol in program 6801. Enrolment in Year 2 is based on academic performance in Year 1.

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## Recommended Double Majors

Anatomy/Biochemistry

Anatomy/Physiology

Anatomy/Psychology

Anatomy/Zoology

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## Physiology and Pharmacology

Physiology, the study of the processes and mechanisms which serve and control the various functions of the body, begins at the second year level with the full year subject Physiology 1 (the core subject for students who intend to proceed to the study of Physiology at a higher level).

Prior to commencing these subjects, students are required to have satisfactorily completed Level I courses in Mathematics, Cell Biology and Chemistry, as a background in these subjects is considered essential to an understanding of how the body functions. Students intending to major in Physiology should note Physiology 2 prerequisites.

Physiology 2 is a major (third year level) subject in Physiology and in this subject various systems of the body are treated in considerable detail. Progression to this full year subject normally requires the satisfactory completion of Physiology 1 and the Level II Biochemistry subject. Physiology 2 provides the 4 units at third year level required for a degree with a single major in Physiology. Alternatively it may be undertaken concurrently with a Level III subject offered by other schools in allied disciplines, such as Chemistry, Psychology, Zoology, Biochemistry or Anatomy, to form a program leading to the award of a degree with a double major. Students who wish to take Physiology as a major subject should follow Strand 1. of the program 7300.

The School also offers the third year level subject Pharmacology, which includes a study of the uptake, distribution and excretion of drugs within the body, and of mechanisms by which drugs, and various endogenous chemicals, alter body function. This 2 unit subject is normally taken concurrently with Physiology 2, or with Level III Biochemistry or Chemistry subjects. Pharmacology is also a full year subject. Students who wish to form a major subject with Pharmacology should follow Strand 2.

Physiology 2 and Pharmacology are the most advanced undergraduate courses offered by the School which are conducted by way of formal lectures, tutorials and laboratory practical classes. Selected students who have satisfactorily completed one of these subjects may be permitted to enrol in a further year of study of either Physiology or Pharmacology which normally leads to their being awarded their degree with Honours.

The Honours year program, as presently conducted in this School, requires the student to complete a full year research project on a specific topic under the supervision of a member of staff, and to submit a thesis based on this work. The level of honours awarded is determined on the basis of the thesis, and on course work activities such as the preparation of literature reviews, and participation in seminar programs.

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## 7300 Physiology and Pharmacology

General Studies: *see Contents*

### Year 1

2.141 or both 2.121 and 2.131

10.001 or 10.011 or both 10.021B and 10.021C *Chemistry*  
17.031, 17.041 *Mathematics*  
*Biology*

Choose 2 Level I Units from Table 1

### Year 2\*

73.111

*Either*

1. 41.101

*or*

2. Choose 3 Level II units (should normally include prerequisite subjects for one of the Pharmacology co-requisite subjects shown for year 3)

Choose 4 units from Table 1

1 *General Studies elective*

**Year 3**

Continue the strand chosen in Year 2:

*Either*

**1.** 73.012

*or*

**2.** 73.022

*and either*

2 Level III Chemistry units

*or*

41.102 *and* 41.122

*or*

73.012

Choose further units from Table 1 to give a total of 23 for the complete program.

*1 General Studies elective*

Students proposing to proceed to Year 4 (Honours) must complete 7 Level III units.

**Year 4 (Honours)**

73.013 *or* 73.023

\*For an explanation of the division into strands 1. and 2. refer to the preamble.

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**Recommended Double Majors**

Physiology/Anatomy  
Physiology/Biochemistry  
Physiology/Chemistry  
Physiology/Psychology  
Physiology/Zoology

Undergraduate Study  
Board of Studies in Science and Mathematics  
Faculty of Engineering

## 3611 Combined Science/ Aeronautical Engineering Course

## 3661 Combined Science/ Industrial Engineering Course

## 3681 Combined Science/ Mechanical Engineering Course

## 3701 Combined Science/ Naval Architecture Course

These combined courses of five years full time study enable a student in the School of Mechanical and Industrial Engineering to qualify for the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). The courses enable such combined degree students to major in the areas of computer science, materials science, mathematics, physics or statistics in addition to studying their chosen engineering speciality. The course is administered by the Faculty of Engineering.

All students who are accepted into the first year 'science/arts compatible' course in the School of Mechanical and Industrial Engineering may enrol directly into these combined degree courses. Continued enrolment in Year 2 requires a pass at first attempt in all subjects of Year 1 and students who fail to achieve this will automatically be disenrolled from these courses and be enrolled in their respective engineering programs (3610, 3660, 3680 or 3700). Alternatively, students may transfer into Year 2 of these courses, provided they have obtained a clear pass in the Year 1 'science/arts compatible' course.

Normally, students enrolled in these BE BSc courses will be awarded their degrees at the conclusion of five years study. However, it is possible for students to take out the Science degree prior to the Engineering degree provided they have: **1.** completed the requirements for Years 1, 2 and 3, **2.** completed the General Studies requirements for the Science degree, and **3.** obtained approval from the Board of Studies in Science and Mathematics.

Students may also undertake an additional honours year in Science and Mathematics and automatically re-enter the combined Science/Engineering course without having to re-apply for admission. To undertake such an honours year in Science and Mathematics, permission is to be obtained, at the end of Year

3, both from the head of the School in which the honours year is to be undertaken and from the Head of the School of Mechanical and Industrial Engineering.

Students who commence the course and do not complete the Engineering component may take out a BSc degree on completion of one of the approved programs in the Science and Mathematics course. Similarly, students not wishing to complete the BSc degree course may revert to their respective Engineering programs 3610, 3660, 3680 or 3700 with appropriate credit for subjects satisfactorily completed.

Having completed the first three years as outlined below, students in Years 4 and 5 do Year 3 and Year 4 of their respective Engineering programs 3610, 3660, 3680 or 3700, except that significant repetition of subject material is not allowed. Instead, students are required to substitute either an appropriate Technical Elective or an appropriate Level II or III subject from Table 1 or Table 2, or in exceptional circumstances, some other equivalent subject with the permission of the School of Mechanical and Industrial Engineering. For more details of these combined courses, refer to the Faculty of Engineering Handbook.

### Year 1

1.001  
2.951 **3.** (or 2.121)  
5.0011, 5.0012, 5.030, 5.0303, 5.061, 5.0721, 5.421  
10.001 (or 10.011)

### Year 2

5.0201, 5.300, 5.422 **5.**  
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114  
(or 10.1214)  
10.2111 (or 10.2211), 10.2112 (or 10.2212)  
Choose 4 units from Table 2 for course 3681 **2.**

*For later Years, see overleaf*

Courses 3611/3661/3681/3701 continued

### Year 3

5.043, 5.122, 5.620, 5.626

Choose 5 units from Table 2 for course 3681 **2**.

1 General Studies elective **6**.

### Years 4 and 5

Years 3 and 4 respective Engineering programs 3610, 3660, 3680, 3700

Subject selections which satisfy the specific requirements for the various majors are summarized below. Provided co-and prerequisites are satisfied, there is scope for some subjects to be taken either in Year 2 or Year 3.

## Computer Science Majors <sup>13</sup>.

### Year 2

5.0201, 5.300, 5.422

6.621, 6.631 <sup>7</sup>, 6.641

10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.331 (or 10.351)

### Year 3

1.002 or 1.012 or 1.022 or 2.102A

5.043, 5.122, 5.620, 5.626

4 Level III units from Table 1 and Table 2 offerings of School of Electrical Engineering and Computer Science for course 3681 **8**.

1 General Studies elective **6**.

## Materials Science Majors

### Year 2

2.102A

4.412A, 4.422B, 4.432, 4.642 **9**.

5.0201, 5.300, 5.4221

and either Option 1.:

2.102B, 2.131

4.732 or 4.742 (recommended)

10.022

or Option 2.:

10.111A (or 10.121A) 10.1113 (or 10.1213), 10.2111 (or 10.2211), 10.2112 (or 10.2212)

1 unit from <sup>10</sup>.: 1.022, 1.982, 2.131, 4.732, 4.742, 10.1114 (or 10.1214)

### Year 3

4.634

5.043, 5.122, 5.620, 5.626

10.331 or 10.351

1 General Studies elective **6**.

and either Option 1.:

4.413, 4.713, 4.433C, 4.443, 4.453

48.403

or Option 2.:

3½ appropriate Level II or III units from Schools of Physics, Chemistry or Materials Science and Engineering offerings in Table 1 or in Table 2 for course 3681 **14**.

## Mathematics Majors

### Year 2

Same Year 2 as for Computer Science or Materials Science (3 units of Level II mathematics option) or Physics or Statistics majors

or

1.002 or 1.012 or 1.022 or 2.002A

5.0201, 5.300, 5.422

10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212)

3 units from 10.1115, 10.1116, 10.2113 (or 10.2213), 10.2115 (or 10.2215), 10.4112 (or 10.4212), 10.4111 (or 10.4211) or from any other appropriate Level II units from Table 1 or Table 2 for course 3681.

### Year 3

5.043, 5.122, 5.620, 5.626

10.331 or 10.351<sup>12</sup>.

4 Level III units from School of Mathematics offerings in Table 1

1 General Studies elective **6**.

## Physics Majors

### Year 2

1.002, 1.012, 1.022, 1.032

5.0201, 5.300, 5.422

10.111A, (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212)

### Year 3

1.0133<sup>11</sup>, 1.023, 1.0333<sup>11</sup>, 1.043 <sup>11</sup>.

1 Level III unit from School of Physics offerings in Table 1

5.043, 5.122, 5.620, 5.626

10.331 or 10.351

1 General Studies elective **6**.

## Statistics Majors

### Year 2

1.002 or 1.012 or 1.022 or 2.102A

5.0201, 5.300, 5.422

10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.311A (or 10.321A), 10.311B (or 10.321B), 10.3111 (or 10.3211), 10.3112 (or 10.3212)

### Year 3

5.043, 5.122, 5.620, 5.626

4 Level III units from Statistics offerings in Table 1

1 Level II or III unit from School of Mathematics or Physics offerings in Table 1

1 General Studies elective **6**.

For Notes, see overleaf



**Notes**

1. Students planning to take higher level Computer Science subjects should also take 6.611 Computing I or 8.1120 Computing. Other students may seek permission to take some appropriate alternative subject.
2. The following considerations pertain to the choice of optional units in Year 2 and 3:
  - (1) They include no more than 1 Level I unit.
  - (2) They include at least 4 Level III units which satisfy the relevant major requirements.
  - (3) They include no more than 1 unit from Schools other than Chemistry, Electrical Engineering and Computer Science, Mathematics, Materials Science and Engineering and Physics.
  - (4) They include at least 1 Level II unit from the Schools of Chemistry or Physics.
  - (5) They include 10.331 Statistics SS, 10.351 Statistics SM; or 10.311B Basic Inference.
  - (6) 4.732 Mechanical Properties of Materials and 4.642 Metallurgical Engineering 1D are both deemed to have ½ unit values.
3. Students are recommended to choose 2.951 unless they wish to pursue studies requiring 2.121. The prerequisites of 2.121 and 2.131 for 2.102A Physical Chemistry may be waived on application to the Head of the School of Chemistry. Materials Science Option 1 majors must choose 2.121.
4. Materials Science majors may omit 10.1114 Complex Analysis or substitute 10.022 Engineering Mathematics 2 for the mathematics subjects. The balance of the units must then be made up from units from the Schools of Chemistry, Materials Science and Engineering or Physics offerings in Table 1 or Table 2 for course 3681.
5. If 4.412A, 4.422B and 4.432. Physical Metallurgy 1A, 1B and 1C respectively, are taken, students should take 5.4221 instead of 5.422.
6. Anticipated. Actual General Studies requirements correspond to whatever is required in Year 2 of the normal Mechanical and Industrial Engineering degree course.
7. Students intending to major in Computing Science and planning to take 6.647 Business Information Systems may substitute 14.501 Accounting and Financial Management 1A instead of 6.631 Computing 2B.
8. 6.646 Computer Applications is excluded for students in course 3661 who should substitute a Level III unit from Table 2 offerings of School of Electrical Engineering and Computer Science.
9. Provided 5.4221 is taken concurrently with 4.642, the prerequisite requirement of 4.732 for 4.642 is assumed to be satisfied.
10. Materials Science majors who took 2.121 Chemistry 1A in Year 1 must take 2.131 Chemistry 1B. Those who took 2.951 Chemistry 1ME and wish to keep open the option of majoring in mathematics should include 10.1114 (or 10.1214) Complex Analysis in their selection; otherwise they are advised to select 1.022 Modern Physics or 1.982 Solid State Physics.
11. Under special circumstances, and with permission of the School of Physics, a student may substitute alternative Physics Level III offerings of equivalent unit value.
12. Students who followed the Year 2 for Computer Science majors should substitute 1.002 or 1.012 or 1.022 or 2.102A; those that followed the Year 2 for Statistics majors should substitute 1 Level II or III unit from the Schools of Physics or Mathematics offerings in Table 1.
13. Quota restrictions apply to certain Computer Science Level III units and application must be made in writing to the Head of the School of Electrical Engineering and Computer Science before the end of Session 2 in the preceding year. Prospective Computer Science majors should aim for a creditable academic attainment (65%) over Years 1 and 2.
14. These must include either 4.413, Physical Metallurgy 2A, 4.433C, 4.443 and 4.453, Physical Metallurgy 2C inclusive and 4.713 X-ray Diffraction and Electron Microscopy together with either 2.003A Physical Chemistry or 1.023 Statistical Mechanics (for which the prerequisite of 1.012 is waived provided students have passed 2.002A).

**Undergraduate Study  
Board of Studies in Science and Mathematics  
and the Faculty of Engineering**

## **3725 Combined Science/ Electrical Engineering Course**

Students in Electrical Engineering who maintain a creditable performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. Students wishing to enrol in a combined course may do so only on the recommendation of the Head of School of Electrical Engineering and Computer Science and with the approval of the Faculty of Engineering and the Board of Studies in Science and Mathematics. Students wishing to enrol in, transfer into, or continue in a combined course shall have complied with all the requirements for prerequisite study, sequencing and academic attainment ie an overall creditable performance (65%) including adequate performance in the subjects relevant to the intended majoring area.

Students who commence a course but subsequently do not wish to proceed with both areas of study, or who fail to maintain a creditable performance, revert to a single degree program with appropriate credit for subjects completed. Austudy support is available for the five years of the combined degree programs.

Students may transfer from course 3640 into a combined course after partially completing the requirements for either degree provided suitable subjects have been studied. However, the time taken to complete the program can be seriously affected by the choice of subjects. Thus, students considering course 3725 should contact the Electrical Engineering School before completing their Year 2 enrolment. Application for transfer to a combined course must be made in writing to the Head of School by 8 January 1988.

Having completed Years 1 and 2 of course 3640 students in their third year complete a specific course of study consisting of four Level III Science units chosen from related disciplines, the appropriate General Studies electives and no less than four other Level II or Level III units, and otherwise accords with the rules of course 3970 leading to a major in Computer Science, Mathematics or Physics.

Students wishing to gain a degree at honours level in Science as part of their combined degree program shall meet all the relevant requirements of the Board of Studies in Science and Mathematics and of the School concerned. Such students may enrol for the honours year only on the recommendation of the Head of the School of Electrical Engineering and Computer Science and with the approval of the Head of the appropriate Science School, the Faculty of Engineering and the Board of Studies in Science and Mathematics. Austudy support is available for the six years of the combined degree programs including honours level Science.

In Years 4 and 5 the students do Year 3 and 4 of course 3640. Depending on the program followed in their year of Science they may have already completed parts of the normal third and fourth year programs of the Electrical Engineering course, and they will be required to omit these from their program and to include an equivalent amount of other subjects chosen with the approval of the Head of the School.

### **Year 1**

1.961  
2.121  
5.0011  
5.0016  
6.010  
6.611  
10.001

*1 General Studies elective*

### **Year 2†**

1.972, 1.982  
6.021A, 6.021B, 6.021C, 6.021D, 6.021E  
10.111A, 10.113, 10.114, 10.2111, 10.2112

*1 General Studies elective*

### **Year 3†\***

*Either*

Computer Science

1 *General Studies elective*

Choose at least 8 Level II or Level III units including at least 4 Computer Science units at Level III, the balance to be chosen from Level III Computer Science units and other Level II or Level III units in Table 1 or Table 2 for program 0600\*\*

*or*

Mathematics

1 *General Studies elective*

Choose at least 5 Mathematics units, 4 of which are Level III

Choose at least 3 Level II or Level III units from Table 1 or Table 2 for program 1000

*or*

Physics

1 *General Studies elective*

Choose 7 Level II or Level III units from Table 1 of which four must be Level III Physics units, chosen to include 1.0133, 1.0143, 1.023 and 1.0333

### **Year 4**

Year 3 of Electrical Engineering course, modified as required by Head of School

### **Year 5**

Year 4 of Electrical Engineering course

†Students intending to major in Computer Science should include 6.641 in their Year 2 enrolment. Students intending to major in Physics are required to take unit 1.992 in Year 2.

\*For Year 3 refer to course 3970 and to this Handbook.

\*\*For this strand only the Level I unit, 14.501 Accounting and Financial Management 1A may be taken in place of one of the other Level II or Level III units. Students should note that this subject is a prerequisite for the Level III unit, 6.647 Business Information Systems.

**Undergraduate Study  
Board of Studies In Science and Mathematics  
and the Faculty of Engineering**

## 3730 Programs in the Combined Science/ Civil Engineering Course

For details of the combined Science/Civil Engineering Course refer to the Faculty of Engineering Handbook.

Approval may be given to change the programs listed below to allow for timetabling and the student's academic interests. For any changes to subjects in italic print you should consult the Science and Mathematics Course Office, Room L-G06G, Biological Science Building.

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### Geography and Environmental Chemistry

#### Year 1

1.981\*  
2.121  
8.1110, 8.1120, 8.1130, 8.1140  
8.1210, 8.1410, 8.1610  
10.001  
25.5112

#### Year 2

2.102A, 2.102C, 2.102D, 2.131  
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430  
10.022  
27.010, 27.030  
1 General Studies elective

#### Year 3

2.043A  
8.2220, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440  
Two of the following: 27.133††, 27.243††, 27.253††, 27.183††, 29.441, 29.491  
2 General Studies electives

#### Year 4

8.2120, 8.2310, 8.3210, 8.3220, 8.3230, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610, 8.3620, 8.3640  
27.193, 27.175, 27.176  
At least 1½ units chosen from:  
27.133††, 27.143††, 27.153††, 27.183††, 27.862, 27.863

#### Year 5

Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher  
8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4520, 8.4620  
Two of the following subjects:  
8.4210, 8.4310, 8.4410, 8.4510, 8.4610

**Note:** All material not in italic typeface relates to the BE degree component of this combined course.

\*See footnotes at end of Course outline.

††These subjects are offered in pairs in alternate years. The two subjects offered in Year 3 are therefore excluded from those available in Year 4.

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### Physics with Mathematics

#### Year 1

1.001  
2.991\*\*  
8.1110, 8.1120, 8.1130, 8.1140  
8.1210, 8.1410, 8.1610  
10.001  
25.5112

#### Year 2

1.012, 1.022, 1.032  
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430  
10.1113, 10.1114, 10.2111, 10.2112  
10.381  
1½ General Studies electives

Continued overleaf

**Year 3**

1.002, 1.023, 1.043  
 8.2220, 8.2310, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440  
 10.111A†  
 29.441, 29.491

**Year 4**

1.0333  
 8.2120, 8.3210, 8.3220, 8.3230, 8.3310, 8.3320, 8.3510, 8.3610,  
 8.3620, 8.3630, 8.3640  
 1 General Studies elective  
*Choose 2 Level II or Level III Mathematics units from Table 1 in the Sciences Handbook.*  
*Choose 1 unit from:*  
 1.133, 1.0533, 1.0133, 1.0143

**Year 5**

8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4520,  
 8.4620  
*Choose two of the following subjects:*  
 8.4210, 8.4310, 8.4410, 8.4510, 8.4610  
 ½ General Studies elective  
*Choose 1 unit from Table 1 in the Sciences Handbook at Level II or higher*

**Note:** All material not in italic typeface refers to the BE degree component of this combined course.  
 \*\*See footnotes at end of Course outline.

**Year 5**

8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4520,  
 8.4620  
 1 General Studies elective  
*Choose 1 unit from Table 1 in the Sciences Handbook at Level II or higher*  
*Two of the following subjects:*  
 8.4210, 8.4310, 8.4410, 8.4510, 8.4610

**Footnotes to Course 3730 Programs**

*Note:* All material not in italics typeface refers to the BE degree component of this combined course.

\*Students are advised to attempt 1.981 Physics 1CE but if timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics I.

\*\*Students who have not satisfied the chemistry prerequisite for 2.991 Chemistry 1CE are required to take 2.111 Introductory Chemistry in Session 1 and 2.991 in Session 2.  
 †Students are encouraged to select higher level mathematics units where applicable.

**Computing with some Mathematics****Year 1**

1.981\*  
 2.991\*\*  
 8.1110, 8.1120, 8.1130, 8.1140  
 8.1210, 8.1410, 8.1610  
 10.001  
 25.5112

**Year 2**

6.621, 6.631, 6.641  
 8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430  
 10.111A†  
 10.1113†  
 10.1114†  
 10.331  
 1 General Studies elective

**Year 3**

6.642, 6.643  
 8.2120, 8.2220, 8.2310, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430,  
 8.3440, 8.3640  
 10.2111†  
 10.2112†  
 29.441, 29.491  
*Choose ½ Level II or Level III Mathematics unit from Table 1 of the Sciences Handbook*

**Year 4**

6.646  
 8.2310, 8.3220, 8.3230, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610,  
 8.3620, 8.3630  
 1 General Studies elective  
*Choose three units, at least one of which is a Computer Science unit, from 6.613, 6.632, 6.633 or Level II or Level III Mathematics units from Table I in the Sciences Handbook*

**Undergraduate Study  
Board of Studies in Science and Mathematics  
and the Faculty of Medicine**

# 3820 Combined Science and Medicine Course (BSc MB BS)

A limited number of places (up to 16) are available in this course, and these are open only to students who have been accepted into the Faculty of Medicine.

For further details refer to the Faculty of Medicine Handbook. Below are programs for Years 1, 2 and 3 and the optional honours Year only; subsequent years (3, 4 and 5 of the Medical Course) are detailed in the Faculty of Medicine Handbook. Students must major in either Anatomy, Biochemistry, Physiology, Psychology, or any two of these, as well as satisfactorily completing a core course. Students majoring in Biochemistry must decide accordingly before enrolment in Year 2; other majors can be decided before enrolment in Year 3. Subjects chosen each year must be approved by the Course Controller prior to enrolment.

## Year 1

1.001 or 1.021  
2.121 & 2.131, or 2.141  
10.001 or 10.011 or both 10.021B & 10.021C  
17.031, 17.041  
1 General Studies elective

## Year 2

41.101\*  
70.011A, 70.011C  
73.111  
80.014\*\*  
1 General Studies elective††

**Note:** Students not majoring in Anatomy commonly take an additional Anatomy unit in Session 2. This may be either 70.012B, 70.011A, or 70.304 (listed in approximate order of likely usefulness).

## Year 3

There are 10 options, as set forth immediately below. The columns represent the primary choice (major in Anatomy, Biochemistry or Physiology); the rows represent the secondary choices (single or double major). Elective units may be selected from Table 1 and/or from the Anatomy units in Table 2.

	Anatomy Major	Biochemistry Major*	Physiology Major
Core Units	General Studies elective 80.014** 4 Level III Anatomy units†	General Studies elective 80.014** 41.102 41.112 and 41.122 or 41.132	General Studies elective 80.014** 73.012
Single Major	together with: 73.012F 3 Elective units	together with: 2 Level III Anatomy units† 73.012F 1 Elective unit	together with: 2 Level III Anatomy units† 2 Elective units
Double Major with Anatomy	3 Level III Anatomy units† (makes total of 7)	4 Level III Anatomy units†	4 Level III Anatomy units†
Double Major with Biochemistry	41.102 41.121 and 41.122 or 41.132	(double major not available)	41.102 41.121 and 41.122 or 41.132
Double Major with Physiology	73.012	73.012	(double major not available)

## Year 4

Students may join Year 3 of the Medical Course, or apply to take Honours and proceed to the Medical Course the following year. For honours courses, see Table 3.

\*Students majoring in Biochemistry should take 2.102B Organic Chemistry.

\*\*80.014 Human Behaviour is taken in either Years 2 or 3.

†For Anatomy units see Table 2.

††Enrolment in General Studies may be deferred until later years but two electives must be satisfactorily completed for a BSc degree, and three electives for the MB BS degrees. Students must complete these requirements during the first three years, before entering the Medical Course, otherwise there will be timetabling difficulties.

**Undergraduate Study  
Board of Studies in Science and Mathematics  
and the Faculty of Commerce**

# **3995**

## **Combined Science/ Commerce Course**

### **Finance and Mathematics**

For details of the Combined Science/Commerce Course refer to the Faculty of Commerce Handbook.

**Undergraduate Study  
Board of Studies in Science and Mathematics  
and the Faculty of Professional Studies**

## **4070 Mathematics Education Course**

## **4080 Science Education Course**

### **4070 Mathematics Education Course**

**Bachelor of Science Diploma in Education  
BSc DipEd**

The Mathematics Education Course is a concurrent course leading to the award of the qualification BSc DipEd and is designed primarily to prepare students for entry into the teaching profession as teachers of mathematics in secondary schools.

An important feature of the course is that students take education subjects along with mathematics subjects in second, third and fourth years. The Mathematics component is based on programs offered in the Science and Mathematics course. Students may proceed to honours level in either mathematics or in education.

No new enrolments have been accepted into this course as of 1987. Students already enrolled in the course may continue with their studies until completion of requirements for the award. The following arrangements apply:

1. Students in this course (4070) who have completed the Science component should enrol in the Year 4 Education program in 1988. Those who have not quite completed the Science component should discuss their 1988 enrolment with an appropriate member of the School of Education.

2. All other pass degree students in this course should enrol in 1988 with a view to completing the Science component of the course. The Education component will be available only in the first year of the course after completion of all or most of the Science component.

For additional details about the Mathematics Education course in its current form, refer to the following information in the Program Section.

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### **Objectives of the Course**

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The objectives of the Mathematics components broadly aim: to develop a comprehensive knowledge and interest in mathematical techniques and problem solving, to develop an ability to reason mathematically and to present mathematical reasoning clearly and persuasively, and to ensure the student's understanding of the applications of mathematics.

Objectives related to the education component seek: to develop skills in teaching mathematics, to provide an understanding of the major disciplines which contribute to educational theory, to develop a knowledge of the latest innovations in educational practice and theory and to clarify the methodologies and curriculum materials relevant to secondary mathematics teaching.

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### **Honours and Pass Degree Requirements**

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The course is offered at both pass and honours levels.

1. The pass course requires successful completion of a four-year program.

2. The honours course requires successful completion of a five-year program in which the fifth year is devoted to an approved honours program in one of the following options.

Pure Mathematics, Applied Mathematics, Mathematical Statistics, or Education\*.

The grades in this program are Honours Class I, II/1, II/2 and III.



Students who wish to proceed to the honours year should apply in writing to the Head of the School of Education. A letter of acceptance from the Head of the School in which they wish to study during the honours year should be included with this application.

\*Students proceeding to the honours year in Education must have completed the Advanced Education subjects in Year 4 in addition to those Education subjects prescribed for the degree at pass level.

## Components of the Course

The Mathematics Education Course consists of Mathematics, Education and General Studies components.

### 1. Mathematics Component

Alternative programs are available to students in the course in 1988. The programs consist of units ranked as Level I, Level II, Level II/III, Level III and Level IV. These units vary from 56 to 84 hours in duration. The terms Levels I, II and III do not necessarily refer to the years in which the unit must be studied. Units at the various levels may be taken in other years provided the prerequisites are met. Level II/III units have only Level I prerequisites.

Students should select one of the following programs or one of the programs available in the Science and Mathematics course (3970) which will allow them to major in mathematics.

#### 5811 The Mathematics and Science Program

The pass course requires at least 23 units in addition to Education and General Studies subjects.

or

#### 5812 The Mathematics and Liberal Studies Program

The pass course requires at least 24 units in addition to Education subjects.

For both programs the selection of units is subject to the requirements listed below:

(1) Not less than 8 units, nor more than 10 units selected from Level I. Except with the approval of the Head of the School of Mathematics and the Director of Science Teacher Courses, not more than 2 Level I units may be taken in any one discipline other than Mathematics.

(2) The following subjects or their higher equivalents shall be included:

10.001, 10.111A, 10.1113, 10.1114, 10.2111, 10.2112.

(3) Subjects amounting to at least 2 full units chosen from:

10.1111, 10.1112, 10.1121, 10.1123, 10.1127, 10.1128, provided that a student may substitute for any of the above units such higher units as are deemed equivalent (for the purposes of satisfying this rule) by a professor of Pure Mathematics.

(4) Not less than 2 units from the following:

10.1127, 10.2113, 10.2115, 10.212L, 10.212M, 10.331, 10.311A, 10.311B, 10.3111, 10.3112, 10.312A, 10.312B, 10.312C, 10.312D, 10.312E, 10.2116, 10.292A, provided that a student may substitute for any of the above units such higher units as are deemed equivalent (for the purposes of satisfying this rule) by the Head of the School of Mathematics.

(5) Not less than 8 Level II or Level III Mathematics units from Table 1 (see below) and of these not less than four shall be Level III units of which only one may be Level II/III.

(6) For the award of honours the student must complete 10 units as specified in an individual program and must meet prerequisite requirements set out in Table 3 (see below).

(7) In order to graduate a student must pass all the units specified in the program of his/her choice.

Students in the second and third years of the course should choose a program available in the Science and Mathematics course (3970) which will allow them to major in Mathematics.

### 2. Education Component

The Education component is one of the major sequences in the course. It consists of subjects grouped as follows:

Theory of Education	58.702,	58.703,	58.704
Mathematics Curriculum and Instruction	58.742,	58.743,	58.744
Teaching Practice	58.712	58.713,	58.714
Honours		58.793,	58.794
		58.795,	58.799

From 1988 all Mathematics Education students enrolled in the pass degree course should enrol, in their fourth year, in the subjects

58.013 Theory of Education;

58.014 Curriculum and Instruction and

58.015 Teaching Experience

Successful completion of these will be considered to fulfil the requirements of the pass Education subjects in the course.

Students wishing to undertake honours in Education should successfully complete, in addition to the pass subjects, 58.793 and 58.794 in the fourth year, and 58.795 and 58.799 in the fifth year of the course.

### 3. General Studies Component

(1) The General Studies component involves 56 hours in the pass course.

(2) In the Mathematics and Liberal Studies Program the Liberal Studies subjects provide the General Studies component.

## Enrolment Requirements

1. No new student shall be enrolled in the first year of the Mathematics Education course (4070) in 1988. Students proceeding to all but the fourth year of the course should be enrolled in one of the Mathematics Education programs or one of the Mathematics programs for Science and Mathematics (3970) and, where appropriate, general studies. Fourth year students in 1988 must be enrolled in the Education program.

2. A student may with the approval of the Director of Science Teachers' Courses, and in consultation with the Head of the School of Mathematics, change from one selected Mathematics program to another. A written application to make the change must be lodged, including details of optional units selected in the new program, at the Science Education Office, Room 41, Building G2, Western Campus.

3. A student must take care to satisfy the requirements of sequences of units such as prerequisites and co-requisites. A prerequisite subject is one which must be completed prior to enrolment in the subject for which it is prescribed. A co-requisite subject is one which must either be completed successfully before or be studied concurrently with the subject for which it is prescribed. In exceptional circumstances, on the recommendation of the Head of the School of Mathematics, the particular prerequisite or co-requisite may be waived by the Director of Science Teachers' Courses.

## Programs

The course taken by each student has three component programs:

### 1. Education Program

Students enrolled in the pass course in 1988 and 1989 will study education only in the fourth year of their course. Students enrolled in the education honours course will also study education in their fifth year. In 1988 the subjects available are as follows:

Year	Subject†	Hours/week*
4	58.013	7.5
	58.014	6.7
	58.015	††
Honours in Education		
4	58.793	1
	58.794	1
5	58.795	4
	58.799	

†for details see the information about the Education component

\*for 20 weeks

††for 8 weeks

### 2. General Studies Program

(1) For students electing the Mathematics and Science Program or a mathematics program from the Science and Mathematics course (3970):

The equivalent of 56 hours of General Studies should be completed.

(2) For students electing the Mathematics and Liberal Studies Program:

No specific General Studies subjects are required.

### 3. Mathematics Program

Students should choose a program available in the Science and Mathematics course (3970) which will allow them to major in mathematics or one of the following programs.

## 5811

### Mathematics and Science

#### Year 1

10.001 or 10.011

Choose 6 units from:

Table 1 &/or

The BA course\*† &/or

Table 2† for program 5811 except 14.501

#### Year 2

10.111A or 10.121A, 10.113 or 10.1213, 10.1114 or 10.1214, 10.2111 or 10.2211, 10.2112 or 10.2212

Choose 5 units from:

Table 1 &/or

The BA course\*† &/or

Table 2x for program 5811

#### Year 3

Choose 4 Level III units from Table 1

Choose a further Level II or III Mathematics unit if needed to make up the required 8

Choose 2 or 3 units from:

Table 1 &/or

The BA course\*† &/or

Table 2† for program 5811

#### Year 4

Education subjects

#### Year 5

10.123 or 10.223 or 10.323

\*Up to 5 units of this program may be replaced by subjects offered in the BA degree course (6 credit points at Level I, or 4 credit points at Upper Level are equivalent to 1 unit). The BA degree subjects are limited to those offered by the following schools: Economics, English, French, German, History, Political Science, Russian, Sociology, Spanish and Latin American Studies and Theatre Studies. Upper Level subjects from the School of Economics are restricted to all those in Economic History plus 15.062, 15.072, 15.263 and 15.273.

†Not more than 8 units that are not in Table 1 may be taken without the approval of the Director of Science Teacher Courses.

## 5812

### Mathematics and Liberal Studies

#### Year 1

10.011 or 10.001

Choose 4-6 units from:

Table 1† &/or

Table BA course\*

#### Year 2

10.111A or 10.121A, 10.1113 or 10.1213, 10.1114 or 10.1214, 10.2111 or 10.2211, 10.2112 or 10.2212

Choose 5 units from:

Table 1† &/or

The BA course\*

### Year 3

Choose 4 Level III units from Table 1  
Choose a further Level II or III Mathematics unit if needed to make up the required 8  
Choose 2 or 3 units from:  
Table 1† &/or  
The BA course\*

### Year 4

Education subjects

### Year 5

10.123 or 10.223 or 10.323

†Units in Geography, Science and Technology Studies and Philosophy shall be those from the BA degree course.

\*At least 6 units of this program must come from subjects offered in the BA degree course (6 credit points at Level I, or 4 credit points at Upper Level are equivalent to 1 unit). The BA degree subjects are limited to those offered by the following Schools: Drama, Economics, English, French, Geography, German, History, History and Philosophy of Science, Philosophy, Political Science, Russian, Sociology, Spanish and Latin American Studies. Upper Level subjects from the School of Economics are restricted to all those in Economic history plus 15.062, 15.072, 15.263 and 15.273.

## 4080 Science Education Degree Course

### Bachelor of Science Diploma in Education BSc DipEd

The Science Education Course is a concurrent course leading to the award of the qualifications BSc DipEd and is designed primarily to prepare students for entry into the teaching profession as teachers of science in secondary schools.

An important feature of the course is that students take education subjects along with science subjects in second, third and fourth years. The science component is based on programs offered in the Science and Mathematics Course. Students may proceed to honours in a science or in education. One of the science units is a Science and Technology Studies subject. This is included to give students an understanding of the nature of science and of its relationship to society, which is especially important to prospective teachers of science.

No new enrolments have been accepted into this course as of 1987. Students already enrolled in the course may continue with their studies until completion of requirements for the award. The following arrangements apply:

1. Students in this course (4080) who have completed the Science component should enrol in the Year 4 Education program in 1988. Those who have not quite completed the Science component should discuss their 1988 enrolment with an appropriate member of the School of Education.

2. All other pass degree students registered in this course should enrol in 1988 with a view to completing the Science component of the course. The Education component will be available only in the fourth year of the course after completion of all or most of the Science component.

For additional information about the Science Education course in its concurrent form, refer to the following information in the Program Section.

Students enrolling in this course must seek advice from the Director of Science Teachers' Courses, Room 41, Building G2, Western Campus or at the enrolment centre.

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## Objectives of the Course

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The objectives of the course are those of the Science and Mathematics Course (3970) together with others which are essential for a course which is designed to prepare science teachers.

In summary, the objectives of the Science and Mathematics Course broadly aim to develop a working knowledge of scientific methods of investigation and to promote an understanding of the significance of science, technology, economics and sociological factors in modern society. The objectives seek to develop in the student the ability and disposition to think logically, to communicate clearly by written and oral means and to read critically. Students are encouraged to develop the habit of seeking and recognizing relationships between phenomena, principles, theories, conceptual frameworks and problems.

The education component of the course seeks to provide a knowledge of theories of education and the latest innovations in educational practice and theory, and the development of skills in teaching science.

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## Honours and Pass Degree Requirements

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There are both pass and honours programs available in the course leading to the award of the qualifications Bachelor of Science and Diploma in Education (BSc DipEd).

1. The pass course requires successful completion of a four-year program.
2. The honours course requires successful completion of a five-year program in which the fifth year is devoted to an approved honours program in one of the following disciplines:

Physics, Chemistry, Geology, Biochemistry, Biotechnology, Botany, Microbiology, Zoology, Education\*, Physiology.

The grades in this program shall be Honours Class I, II/1, II/2 and III.

Students who wish to proceed to the honours year should apply in writing to the Head of School of Education. A letter of acceptance from the Head of the School in which they wish to study during the honours year should be included with this application.

\*Students proceeding to the honours year in Education must have completed the Advanced Education subjects in Year 4 in addition to those Education subjects prescribed for the degree at pass level.

## Components of the Course

The Science Education course consists of Science, Education and General Studies components.

### 1. Science Component

The Science component is based on the prescribed programs from the Science and Mathematics course (3970) and should normally be completed in the first three years of the course. The Science programs in the Science Education course are composed of units ranked as Level I, Level II, Level II/III, Level III, and Level IV, such units varying from 56 to 84 hours. The terms Levels I, II and III do not necessarily refer to the years in which the unit must be studied. Units at the various levels may be taken in other years provided the prerequisites are met. Level II/III units have only Level I prerequisites. For the pass course the science component requires at least 23 units with the following requirements:

- (1) There shall be ten units from Level I and these must come from the following subjects: 1.001 (or 1.021 for biological science programs from the Science and Mathematics Course), 2.121, 2.131, 10.001 or 10.011 or 10.021B and 10.021C, 17.031, 17.041, 25.110, 25.120.
- (2) Not less than four units from Level III. For purposes of this clause Level II/III units are counted as Level III units.
- (3) Not less than two units beyond Level I in science disciplines in any of the teaching areas physics, chemistry, (including biochemistry), biology and geology other than that of the student's major. In special circumstances this requirement may be waived with the permission of the Director of Science Teachers' Courses or as specified in individual programs.
- (4) One unit shall be a Science and Technology Studies subject selected from a list of subjects approved by the Director of Science Teachers' Courses. In special circumstances this requirement may be waived with the permission of the Director of Science Teachers' Courses or as specified in individual programs.
- (5) For the honours program with honours in a science discipline there shall be at least six Level III units and students must meet prerequisite requirements set out in Table 3.
- (6) For the award of honours in a science discipline the student must complete at least ten Level IV units as specified in an individual program.
- (7) In order to graduate a student must pass all the units specified in the program of his/her choice.

### 2. Education Component

The Education Component is one of the major sequences in the course. It consists of subjects grouped as follows:

Theory of Education	58.702,	58.703,	58.704
Science Curriculum and Instruction	58.732,	58.733,	58.734
Teaching Practice	58.712,	58.713,	58.714
		58.793,	58.794
Honours	58.795,	58.799	

From 1988 all Science Education students enrolled in the pass course should enrol, in their fourth year, in the subjects.

58.013 Theory of Education  
58.014 Curriculum and Instruction  
58.015 Teaching Experience

and successful completion of these will be considered to fulfil the requirements of the pass Education subjects in the course.

Students wishing to undertake honours in Education should successfully complete, in addition to the pass subjects, 58.793 and 58.794 in the fourth year, and 58.794 and 58.799 in their fifth year of the course.

### 3. General Studies Component

The General Studies component involves 56 hours in the pass course, which is made up of two half electives or their equivalent. The distribution of the two half electives may be varied to suit the programs of individual students.

## Enrolment Requirements

1. No new student shall be enrolled in the first year of the Science Education course (4080) in 1988. Students proceeding to all but the fourth year of the course should be enrolled in one of the Science Education programs listed below, and general studies. Fourth year students in 1988 must be enrolled in the Education program.
2. A student may, with approval of the Director of Science Teachers' Courses, change from one selected Science program to another. A written application to make the change must be lodged, including details of any optional units selected in the new program, at the Science Education Office, Room 41, Building G2, Western Campus.
3. The allowed specific programs are made up of sequences of units. Where a choice is indicated care must be taken to satisfy the requirements such as prerequisites and co-requisites.
4. A prerequisite subject is one which must be completed prior to enrolment in the subject for which it is prescribed. A co-requisite subject is one which must either be completed successfully before or be studied concurrently with the subject for which it is prescribed. An excluded subject is one which cannot be counted together with the subject which excludes it towards the degree of qualification. In exceptional circumstances, on the recommendation of the head of the appropriate school, the particular prerequisite or co-requisite may be waived by the Director of Science Teachers' Courses.

5. Students lacking the HSC prerequisites for 1.001 Physics 1 and/or 2.121 Chemistry 1A may satisfy prerequisites by completing the respective introductory subjects 1.021 Introductory Physics for Health and Life Scientists or 2.111 Introductory Chemistry. Students requiring 10.001 Mathematics 1 for Physics programs may satisfy prerequisites by completing 10.021B where appropriate. Under these circumstances these introductory subjects are not counted among the units required for the degree course.

## Programs

The Course followed by a particular student has three component programs.

### 1. Education Program

Students enrolled in the pass course in 1988 and 1989 will study education only in the fourth year of their course. Students enrolled in the education honours course will also study education in their fifth year. In 1988 the subjects available are as follows:

Year	Subject*	Hours/week*
4	58.013	7.5
	58.014	9.2
	58.015	††
Honours in Education		
4	58.793	1
	58.794	1
5	58.795	4
	58.799	

†see the information about the Education component.

\*for 20 weeks

††for 8 weeks

### 2. General Studies Program

The equivalent of 56 hours of General Studies should be completed.

### 3. Science Program

Each Science program listed below is available to students in the fourth year of the course and is based on a program in the Science and Mathematics Course. Each one has an identifying number. The Science Education programs have 58 as the first two digits of the identifying number.

Students in the second and third years of the course should choose the science program in the Science and Mathematics Course which is appropriate to their major area of study.

## 5801†† Physics

### Year 1

1.001

2.121 & 2.131, or 2.141

10.001 or 10.011†

17.031, 17.041

or

25.110, 25.120

### Year 2

1.002, 1.012, 1.022, 1.032

10.1113†, 10.1114†

10.2111†, 10.2112†

17.031, 17.041

or

25.110, 25.120

### Year 3

1.0133, 1.0143, 1.023, 1.0333, 1.0343, 1.043

Choose 1 Science and Technology Studies unit

Choose 2 units from Table 1\*†

Students proposing to proceed to Year 5 (Honours) year must take 6 Level III units

### Year 4

Education subjects.

### Year 5 (Honours)

Choose one of 1.104, 1.304 or 1.504

\*Units available for choice from Table 1 in this program are those from schools other than Mechanical and Industrial Engineering, Electrical Engineering, Mathematics, Psychology, Geography, Philosophy.

†Students are encouraged to select Higher level Mathematics units where applicable.

††Students should read carefully the notes accompanying program 0100 Physics and seek advice from the School of Physics regarding choice of units. For students proceeding to Year 5 consideration is given in Year 4 to students wishing to include further units of Mathematics.

## 5820 Chemistry

### Year 1

1.001

2.141 or both 2.121 and 2.131

10.001 or 10.011 or both 10.021B & 10.021C

17.031, 17.041

or

25.110, 25.120

### Year 2

2.102A, 2.102B, 2.102C, 2.102D

17.031, 17.041

or

25.110, 25.120

Choose 1 Science & Technology Studies unit

Choose 1 unit from: Table 1\*

## Year 3

Choose 4 Level III Chemistry units  
Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 7 Level III units

## Year 4

Education subjects

## Year 5

2.004

\*See this footnote to program 5801.

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## 5825 Geology

### Year 1

1.001  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B & 10.021C  
25.110, 25.120

### Year 2

17.031, 17.041  
25.211, 25.212, 25.221  
Choose 1 Science & Technology Studies unit  
Choose 2 units from Table 1\*

### Year 3

25.311, 25.312 Choose 2 Level III Geology units  
Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 7 Level III units

### Year 4

Education subjects

### Year 5 (Honours)

25.434

\*See this footnote to program 5801.

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## 5841 Biochemistry

### Year 1

1.001 or 1.021  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B & 10.021C  
17.031, 17.041

## Year 2

2.102B  
25.110, 25.120  
41.101

Choose 1 Science and Technology Studies unit  
Choose 1 unit from Table 1\*

## Year 3

41.102 Choose at least 2 units from:  
41.122, 41.132  
Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must complete 7 Level III units

## Year 4

Education subjects

## Year 5 (Honours)

41.103

\*See this footnote to program 5801.

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## 5843 Botany

### Year 1

1.001 or 1.021  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B & 10.021C  
17.031, 17.041

### Year 2

25.110, 25.120  
43.111  
Choose 1 Science & Technology Studies unit  
Choose 4 units from Table 1\*

### Year 3

Choose 4 Level III Botany units  
Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 7 Level III units

### Year 4

Education subjects

### Year 5 (Honours)

43.103

\*See this footnote to program 5801.

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## 5844 Microbiology

### Year 1

1.001 or 1.021  
2.121 and 2.131, or 2.141  
10.001 or 10.011 or both 10.021B & 10.021C  
17.031, 17.041

## Year 2

25.110, 25.120

41.101

44.101, 44.121

Choose 1 Science and Technology Studies unit

Choose 1 unit from Table 1\*

## Year 3

44.102, 44.122

Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 7 Level III units

## Year 4

Education subjects

## Year 5 (Honours)

44.103

\*See this footnote to program 5801.

## 5873

### Physiology

#### Year 1

1.001 *or* 1.021

2.121 *and* 2.131, *or* 2.141

10.001 *or* 10.011 *or both* 10.021B & 10.021C

17.031, 17.041

#### Year 2

25.110, 25.120

41.101

73.111

Choose 1 Science and Technology Studies unit

#### Year 3

73.012 Choose 3 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 7 Level III units

#### Year 4

Education subjects

#### Year 5 (Honours)

73.013

\*See this footnote to program 5801.

## 5845

### Zoology

#### Year 1

1.001 *or* 1.021

2.121 *and* 2.131, *or* 2.141

10.001, *or* 10.011 *or both* 10.021B & 10.021C

17.031, 17.041

#### Year 2

25.110, 25.120

45.101, 45.201, 45.301

Choose 1 Science and Technology Studies unit

Choose 2 Level II units of Biochemistry, Chemistry, Physics or Mathematics

#### Year 3

Choose 3 units from 45.121, 45.122, 45.142, 45.402

Choose 1 further Zoology unit

Choose 1 Science and Technology Studies unit

Choose 2 units from Table 1\*

Students proposing to proceed to Year 5 (Honours) must take 6 Level III units

#### Year 4

Education subjects

#### Year 5 (Honours)

45.103

\*See this footnote to program 5801.

**Undergraduate Study  
Board of Studies In Science and Mathematics  
and the Faculty of Law**

## **4770 Programs in the Combined Science/Law Course**

For details of the combined Science/Law Course refer to the Faculty of Law Handbook.

Below is a course description for Years 1, 2 and 3 only. Years 4 and 5 are detailed in the Faculty of Law Handbook.

The reference to Science units in the following course description must meet the following requirements:

**1.** The Science units must be selected such that they lead to a major in a Science discipline and be compatible with the compulsory subjects specified in nominated program from Course 3970 (see Contents for details).

**2.** The maximum number of Level I units, viz 8, is not exceeded.

### **Year 1**

90.112, 90.741  
6 Level I Science units

### **Year 2**

90.141, 90.161  
6 Science units

### **Year 3**

90.216, 90.301, 90.621  
6 Science units



**Units offered by the  
Board of Studies in Science and Mathematics**

# Table 1

## Information Key

The following is the key to the information supplied about each subject in the table below: F (Full year, ie both sessions); S1 (Session 1); S2 (Session 2); SS (single session, ie *one* only); I, II, III (Levels, I, II, III); Hpw (Hours per week); C (Credit).

## Physics

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
<b>Physics Level 1</b>								
1.001	Physics 1	I	2	F	6	See Subject Descriptions later in this Handbook	10.021C, or 10.001, or 10.011	
1.021	Introductory Physics 1† (For Health and Life Scientists)	I	2	F	6		10.021B and 10.021C or 10.001 or 10.011	
1.041	Laboratory Computers in Physical Science	I	1	S1 or S2	6	As for 1.001	10.001 and 1.021 or 1.001	Programs 0600, 6806
1.061	Computer Applications in Experimental Science 1	I	1	S2	6	6.611	1.001 or 10.001 or 10.011	1.041 1.042
<b>Physics Level II*</b>								
1.002	Mechanics, Waves and Optics	II	1	S1	4	1.001, 10.001	10.2111	10.4111, 10.4211, 1.992

**Physics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
1.012	Electromagnetism and Thermal Physics	II	1	S2	4	1.001, 10.001	10.2111	1.972, 1.992
1.022	Modern Physics	II	1	F	2	1.001, 10.001	10.2112	1.9322, 1.982
1.032	Laboratory	II	1	F	3	1.001, 10.001		1.9222
1.0522	Methods in Mathematical Physics	II	½	S2	2	1.001, 10.001	10.2111, 10.2112, 10.1113	
1.062	Computer Applications in Experimental Science 2	II	1	S1	5	1.061		1.042
1.9222	Electronics	II	½	S1	3	1.021		1.032
1.9322	Introduction to Solids	II	½	S2	3	1.021		1.022 4.402 4.412
1.9422	Introduction to Physics of Measurement	II	½	S1	3	1.001		1.042

**Physics Level III\***

1.0133	Quantum Mechanics	III	½	S1	2	1.022, 10.2112		2.023A, 10.222F
1.0143	Nuclear Physics	III	½	S2	2		1.0133	
1.023	Statistical Mechanics and Solid State Physics	III	1	S1	4	1.012, 1.022, 10.2112		
1.0333	Electromagnetism	III	½	S1	2	1.012, 10.2111, 10.2112		10.222C
1.0343	Advanced Optics	III	½	S2	2		1.002	
1.043	Experimental Physics A	III	1	F	4	1.032		
1.0533	Experimental Physics B1	III	½	S1	4	1.032		
1.0543	Experimental Physics B2	III	½	S2	4	1.032		
1.1133	Advanced Quantum Mechanics	III	½	S2	2		1.0133	2.023A 10.222F
1.133	Electronics	III	1	S1	6	1.032 or 1.9222		
1.1433	Biophysics	III	½	S1	3	1.012, 1.022		
1.1533	Biophysical Techniques	III	½	S2	3	1.012, 1.022, 1.032		
1.1633	Astrophysics	III	½	S2	2	1.022		
1.3033	Mechanical Properties of Materials	III	½	S1	2		1.023	4.403

**Physics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
1.3133	Physics of Solid State Devices	III	½	S2	2		1.023	
1.3143	Topics in Condensed Matter Physics	III	½	S2	2		1.023	
1.3533	Marine Acoustics	III	½	S2††	2			
1.5133	Classical Mechanics and Field Theory	III	½	S1	2	1.002 (or 10.4111) 10.1113, 10.2111 10.2112		
1.5233	Electrodynamics	III	½	S2	2	1.022, 10.1113 10.2111, 10.2112	1.0333	10.222C
1.5333	Radiation and Matter	III	½	S2	2	1.012, 1.022 10.2111, 10.2112	1.0133 or 10.222F or 2.023A 1.0333 (or 10.222C)	
1.5433	Plasmas and Laser Fusion	III	½	S1	2	1.012, 1.022		
1.5533	General Relativity	III	½	S2	2	1.012, 1.022 10.1113, 10.2111 10.2112		
1.713**	Advanced Laser and Optical Applications	III	1	F	2		1.002	
1.763**	Laser and Optical Technology Laboratory 1	III	1	F	4	1.032		
1.773**	Laser and Optical Technology Laboratory 2	III	1	F	4		1.763	

†For students who enrol in and successfully complete the subjects 1.021 Introductory Physics (2 units) and 1.001 Physics (2 units) the total unit value of the combined subjects will be counted as 3 units.

\*Where mathematics units are specified as prerequisites or as co-requisites, the higher levels of such units are acceptable and preferable. Similarly Physics 1.001 is acceptable in place of 1.021. Students are also advised that other units may be acceptable equivalent prerequisites or co-requisites to those listed, eg Unit 1.982 of course 3640 may be acceptable in place of 1.022. Enquiry should be made to the School of Physics.

\*\*Students wishing to enrol in units 1.713, 1.763 or 1.773 without the stated prerequisites or co-requisites should enquire from the School of Physics as to the suitability of their previous studies.

†††Not offered in 1988.

**Chemistry**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
2.121	Chemistry 1A	I	1	S1 or S2	6	See Subject Descriptions later in this Handbook		2.141
2.131	Chemistry 1B	I	1	S1 or S2	6	See Subject Descriptions later in this Handbook		2.141

**Chemistry (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
2.141	Chemistry 1M†	I	2	F	6	See Subject Descriptions later in this Handbook		2.121, 2.131
2.102A	Physical Chemistry	II	1	S1 or S2	6	2.121 and 2.131, or 2.141, 10.001 or 10.011 or 10.021B & 10.021C		2.002A
2.102B	Organic Chemistry	II	1	F or S2	6	2.131 or 2.141		2.002B
2.102C	Inorganic Chemistry and Structure	II	1	S1 or S2	6	2.121 & 2.131, or 2.141		2.042C
2.102D	Chemical and Spectroscopic Analysis	II	1	S1 or S2	6	2.121 & 2.131, or 2.141 10.001 or 10.011 or 10.021B & 10.021C		2.002D, 2.003H
2.103A	Physical Chemistry	III	1	S1	6	1.001, 2.102A, 2.102C		2.013A
2.103B	Organic Chemistry	III	1	S1	6	2.102B		2.003B
2.103C	Inorganic Chemistry	III	1	S1	6	2.102C		2.003C
2.103D	Analytical Chemistry	III	1	S1	6	2.102D		2.003D
2.113A	Kinetics and Mechanism of Chemical Change	III	1	S2	6	2.103A		2.053A
2.113B	Synthetic Organic Chemistry	III	1	S2	6	2.103B		2.013B
2.113C	Advanced Inorganic Chemistry	III	1	S2	6	2.102C	2.103C	2.013C
2.113D	Advanced Instrumental Analysis	III	1	S2	6	2.102D	2.103D	2.013D
2.113E	Nuclear & Radiation Chemistry	III	1	S2	6	2.102A or 2.102B or 2.102C or 2.102D		2.003E
2.123A	Biophysical and Interfacial Chemistry	III	1	S2	6	2.102A		2.033A
2.123B	Biological Organic Chemistry	III	1	S2	6	2.103B		2.023B
2.123E	Environmental Chemistry	III	1	S2	6	2.102A, 2.102D		2.043A
2.133B	Applied Organic Chemistry	III	1	S2	6	2.102B	2.103B	2.003L
2.1813	Quantum Chemistry and Symmetry	III	½	S2	3	2.102C, 10.111A or 10.031		2.023A
2.1823	Computers in Chemistry	III	½	S2	3	2.102A, 2.102D		
2.1833	Molecular Structure Determination	III	½	S2	3	2.102C, 2.102D		
2.1843	Organometallic Chemistry	III	½	S2	3	2.102B, 2.102C		2.003M

†Students majoring in Chemistry may take 2.141 in lieu of 2.121 and 2.131.

**Mechanical and Industrial Engineering**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
5.0011, 5.0012	Engineering M	I	1	S1 <i>or</i> S2	6	See Subject Descriptions later in this Handbook		5.006
5.0016	Introductory Engineering Design and Drawing Practice	I	½	S1	3			5.0012 5.030 5.0300 5.0302 5.010
5.0302	Engineering Drawing Descriptive Geometry	I	½	S1 <i>or</i> S2	4			5.0016 5.030 5.0300

**Electrical Engineering and Computer Science**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
6.611	Computing 1	I	1	S1	6	HSC Mathematics as for 10.001	10.001 <i>or</i> 10.011	1.041* 6.600 6.620 6.021D
6.621	Computing 2A	II	1	S1 <i>or</i> S2	5	6.611** 10.001 <i>or</i> 10.011		6.620 6.021D
6.631	Computing 2B	II	1	S1 <i>or</i> S2	5	6.621** <i>or</i> 6.620** <i>or</i> 6.021D**		6.021E
6.641	Computing 2C	II	1	S1 <i>or</i> S2	5	6.621** <i>or</i> 6.620** <i>or</i> 6.021D**		
6.646	Computer Applications	III	1	S1	5	6.620** <i>or</i> 6.621** <i>or</i> 6.021D** 10.331 <i>or</i> both 10.311A and 10.311B <i>or</i> equivalent.		6.622

\*Excluded for students in programs 0600, 6806.

\*\*Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.

## Mathematics

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
10.001	Mathematics 1	I	2	F	6	See <b>Subject Descriptions</b> later in this Handbook		10.011 10.021B 10.021C
10.011	Higher Mathematics 1	I	2	F	6	See <b>Subject Descriptions</b> later in this Handbook		10.001 10.021B 10.021C
10.021B	General Mathematics 1B	I	1	S1	6	See <b>Subject Descriptions</b> later in this Handbook		10.001 10.011
10.021C	General Mathematics 1C	I	1	S2	6	10.021B		10.001 10.011
10.081	Discrete Mathematics	I	1	S2	6	As for 10.001	10.001 or 10.011	
10.031‡	Mathematics	II	1	F	2	10.001 or 10.021C (CR)		‡
10.032§	Mathematics	III	1	F	2	10.031		§

## Pure Mathematics

### Pure Mathematics Level II

10.111A	Linear Algebra	II	1	F	2½	10.001 or 10.011		10.121A
10.1113	Multivariable Calculus	II	½	S1 or S2	2½	10.001 or 10.011		10.1213
10.1114	Complex Analysis	II	½	S1 or S2	2½	10.001 or 10.011		10.1214
10.1115	Finite Mathematics A	II	½	S1	2	10.001 or 10.011		
10.1116	Finite Mathematics B	II	½	S2	2	10.1115 (or any other level II Mathematics half unit)		

### Higher Pure Mathematics Level II††

10.121A	Algebra	II	1	F	2½	10.011 or 10.001 DN		10.111A 10.1111
10.1213	Multivariable Calculus	II	½	S1	2½	10.011 or 10.001 DN		10.1113
10.1214	Complex Analysis	II	½	S2	2½	10.1213		10.1114

‡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 or Applied Mathematics are taken, 10.032 Mathematics will not be counted except that 10.292A may be taken with 10.032.

**Mathematics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
<b>Pure Mathematics Level III***</b>								
10.1111	Group Theory	III	½	S1	2	***		10.121A
10.1112	Geometry	III	½	S2	2	***		10.1424
10.1121	Number Theory	III	½	SS	2	***		10.1421
10.1123	Logic and Computability	III	½	SS	2	***		
10.1124	Combinatorial Topology	III	½	SS	2	***		
10.1125	Ordinary Differential Equations	III	½	S1	2	10.111A		10.1425
10.1126	Partial Differential Equations	III	½	S2	2	10.1113, 10.1114 ***	10.1125	10.1426
10.1127	History of Mathematics	III	½	S2	2	***		
10.1128	Foundations of Calculus	III	½	S1	2	***		10.122B
10.1521	Combinatorics and its Applications	III	½	SS	2	***		
10.1522	Differential Geometry	III	½	SS	2	10.1113 ***		10.1325
10.1523	Functional Analysis and Applications	III	½	SS	2	10.111A 10.2112 ***	*	10.122B
<b>Higher Pure Mathematics Level III†††</b>								
10.122B	Real Analysis and Functional Analysis	III	1	F	2	10.121A or 10.111A DN 10.1213 or 10.1113 DN †††		10.1128 10.1523
10.1321	Rings and fields	III	½	S1†	2	10.121A or 10.111A DN †††		
10.1322	Galois Theory	III	½	S2†	2	†††	10.1321	
10.1323	Complex Analysis	III	½	S1††	2	10.1214 or 10.1114 DN †††	†	
10.1324	Integration and Fourier Analysis	III	½	S2†		†††	10.122B	
10.1325	Differential Geometry	III	½	S1†	2	10.121A or 10.111A DN 10.1213 or 10.1113 DN †††		10.1522
10.1326	Calculus on Manifolds	III	½	S2†	2	†††	10.1325	
10.1421	Number theory	III	½	S1††	2	†††		10.1121
10.1422	Groups and Representations	III	½	S2††	2	10.121A or both 10.111A DN and 10.1111 DN †††		
10.1423	Topology	III	½	S1†	2	10.1213 or 10.1113 DN †††		

## Mathematics (continued)

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
10.1424	Geometry	III	½	S2††	2	10.121A <i>or</i> <i>both</i> 10.111A DN and 10.1111 DN †††		10.1112
10.1425	Ordinary Differential Equations	III	½	S1††	2	10.121A <i>or</i> 10.111A DN † 10.1213 <i>or</i> 10.1113 DN †††		10.1125
10.1426	Partial Differential Equations	III	½	S2††	2	†††	10.1425	10.1126

### Applied Mathematics Level II

10.2111	Vector Calculus	II	½	S1 <i>or</i> S2	2½	10.001 <i>or</i> 10.011		10.2211
10.2112	Mathematical Methods for Differential Equations	II	½	S1 <i>or</i> S2	2½	10.001 <i>or</i> 10.011		10.2212
10.2113	Linear Programming	II	½	S1 <i>or</i> S2	2	10.001 <i>or</i> 10.011	10.111A <i>or</i> 10.121A	10.2213
10.2115	Discrete-Time Systems	II	½	S1 <i>or</i> S2	2	10.001 <i>or</i> 10.011	10.111A <i>or</i> 10.121A	10.2215
10.2116	Continuous-Time Systems	II	½	S2	2	10.001 <i>or</i> 10.011		10.2216
10.261A	Mathematical Computing	II	1	S1	4	10.001 <i>or</i> 10.011		

### Higher Applied Mathematics Level II

10.2211	Vector Analysis	II	½	S1	2½	10.011 <i>or</i> 10.001 CR		10.2111
10.2212	Mathematical Methods for Differential Equations	II	½	S2	2½	10.011 <i>or</i> 10.001 CR		10.2112
10.2213	Linear Programming	II	½	S1 <i>or</i> S2	2	10.011 <i>or</i> 10.001 CR	10.111A <i>or</i> 10.121A	10.2113
10.2215	Discrete-Time Systems	II	½	S1 <i>or</i> S2	2	10.011 <i>or</i> 10.001 CR	10.111A <i>or</i> 10.121A	10.2115
10.2216	Continuous-Time Systems	II	½	S2	2	10.011 <i>or</i> 10.001 CR		10.2116

\*10.1128 is highly recommended.

†10.122B is highly recommended.

††1. Admission to Higher Pure Mathematics 2 traditionally requires completion of 10.011 Higher Mathematics 1; students who gain good grades in Year 1 may be allowed to take Higher Pure Mathematics 2 units subject to the approval of the Head of Department. 10.081 Discrete Mathematics is also advised.

2. Students majoring in Physics who wish to take Higher Pure Mathematics 2 should attempt 10.121A, 10.1213, 10.1214, either 10.2211 or 10.2111 and either 10.2212 or 10.2112.

3. Students considering doing Higher Pure Mathematics in years III or IV should take 10.121A, 10.1213, 10.1214 and 10.2211 or 10.2111, and 10.2212 or 10.2112; 10.1115 and 10.1116 Finite Mathematics A and B are also advised.

\*\*\*Normal prerequisites for attempting Level III Pure Mathematics units are at least two Level II Mathematics units, including any course prerequisites. For any listed prerequisite or co-requisite unit, an appropriate higher unit may be substituted.

†††Students wishing to enrol in Level III Higher Pure Mathematics units should consult with the Department before enrolling. Normal prerequisites for attempting Level III Higher Pure Mathematics units are at least two Level II Mathematics units, including any course prerequisites, at an average of distinction level, or their higher equivalents. Subject to the approval of the Head of Department, these may be relaxed.

‡These subjects are to be offered in odd numbered years.

‡‡These subjects are to be offered in even numbered years.



**Mathematics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
<b>Applied Mathematics Level III</b>								
10.212A	Numerical Analysis	III	1	S1	4	10.2112, 10.111A		10.222A
10.212B	Fluid Dynamics	III	1	S1	4	10.2111, 10.2112		10.222B 10.422A
10.212D	Mathematical Methods	III	1	S2	4	10.2112, 10.111A, 10.1113, 10.1114		10.0331 10.033 10.222D 10.412D 10.422D 10.4331 10.2921
10.212L	Optimization Methods	III	1	S2	4	10.111A, <i>and</i> 10.2111 <i>or</i> 10.1113		10.222L
10.212M	Optimal Control	III	1	S1	4	10.1113 <i>and</i> 10.1114 10.111A		10.222M
10.212N	Dynamical Systems	III	1	S2	4	10.111A, 10.2112, 10.1125		10.222N
10.262A	Mathematical Software	III	1	S2	4	10.2112, 10.111A, <i>and either</i> 6.621 <i>or</i> 10.211E <i>or</i> 10.261A <i>or</i> equivalent		10.612
10.292A	Oceanography	III	1	S1	4	10.2111, 10.2112 <i>or</i> 10.031 1.001		10.412A
10.2921	Transform Methods	III	½	S1	2	10.1113, 10.1114, 10.2112 <i>or</i> equivalent		10.0331 10.033 10.212D 10.222D 10.412D 10.422D 10.4331
10.2922	Applied Time Series Analysis	III	½	S2	2	10.2112 <i>or</i> 10.031 <i>or</i> 10.022	10.331 <i>or</i> equivalent, 10.2921 <i>or</i> 10.212D <i>or</i> equivalent	10.4129

## Mathematics (continued)

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
<b>Higher Applied Mathematics Level III</b>								
10.222A	Numerical Analysis	III	1	S1	4	10.2212 or 10.2112 CR, 10.121A or 10.111A CR		10.212A
10.222B	Fluid Dynamics	III	1	S1	4	10.2211 or 10.2111 CR, 10.2212 or 10.2112 CR		10.212B 10.422A
10.222C	Maxwell's Equations and Special Relativity	III	1	S2	4	10.2211 or 10.2111 CR, 10.2212 or 10.2112 CR, 10.1214 or 10.1114 CR, 1.001		1.033 1.0333
10.222D	Mathematical Methods	III	1	S2	4	10.2212 or 10.2112 CR, 10.121A or 10.111A CR, 10.1213 or 10.1113 CR, 10.1214 or 10.1114 CR		10.0331 10.033 10.212D 10.412D 10.422D 10.4331 10.2921
10.222L	Optimization Methods	III	1	S2	4	10.121A or 10.111A CR, 10.2211 or 10.2111 CR, 10.1213 or 10.1113 CR		10.212L
10.222M	Optimal Control	III	1	S1	4	10.1213 or 10.1113 CR, 10.1214 or 10.1114 CR, 10.121A or 10.111A CR		10.212M
10.222N	Dynamical Systems	III	1	S2	4	10.121A or 10.111A CR, 10.1425 or 10.1125 CR, 10.2212 or 10.2112 CR		10.212N
<b>Statistics</b>								
<b>Theory of Statistics Level II</b>								
10.311A†	Probability and Random Variables	II	1	S1†	4	10.001 or 10.011 or 10.021C (CR)		10.321A 10.331 10.301 45.101

**Mathematics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
10.311B	Basic Inference	II/III	1	S2	4	10.311A		10.321B 10.331 10.301 45.101
10.3111	Statistical Computing and Simulation	II	½	S1	2	10.001 <i>or</i> 10.011 <i>or</i> 10.021C (CR)	10.311A	
10.3112	Nonparametric Statistical Inference	II	½	S2	2	10.311A	10.311B	
10.331	Statistics SS	II	1	F	2	10.001 <i>or</i> 10.021C (CR)		10.311A 10.311B 10.321A 10.321B 10.301 45.101

**Higher Theory of Statistics Level II**

10.321A	Probability and Random Variables	II	1	S1	4	10.001 <i>or</i> 10.011		10.311A 10.331 10.301 45.101
10.321B	Basic Inference	II/III	1	S2	4	10.321A		10.311B 10.331 10.301 45.101
10.3211	Statistical Computing and Simulation	II	½	S1	2	10.001 <i>or</i> 10.011	10.321A	
10.3212	Nonparametric Statistical Inference	II	½	S2	2	10.321A	10.321B	

**Theory of Statistics Level III\*\***

10.312A	Stochastic Processes	III	1	S1	4	10.311A, 10.111A, 10.1113		10.322A
10.312C	Linear Models	III	1	S1	4	10.311B, 10.111A, 10.1113		10.322C
10.312F	Statistical Computation	III	1	SS	4	10.311B <i>or</i> 10.321B, 10.3111 <i>or</i> 10.3211.		
10.3121	Sample Survey Theory	III	½	S1	2	10.311B		10.3321
10.3122	Design and Analysis of Experiments	III	½	S2	2	10.311B 10.312C		10.3222
10.3123	Statistical Inference	III	½	SS	2	10.311B		10.3223

**Mathematics (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
10.3124	Nonparametric Methods	III	½	SS	2	10.311B 10.3112		10.3224
10.3321	Regression Analysis and Experimental Design	III	½	S1	2	10.331 <i>or</i> 10.311B <i>or</i> 10.321B		10.3122 10.3222
10.3322	Applied Stochastic Processes	III	½	S2	2	10.331 <i>or</i> 10.311A <i>or</i> 10.321A		10.312A 10.322A
<b>Higher Theory of Statistics Level III</b>								
10.322A	Stochastic Processes	III	1	S1	4½	10.111A, 10.1113, 10.321A		10.312A
10.322C	Linear Models	III	1	S1	4½	10.321B, 10.111A, 10.1113		10.312C
10.322D	Probability Theory	III	1	S2	4	10.321A, 10.111A, 10.1113		
10.3221	Sample Survey Theory	III	½	S1	2	10.321B		10.3121
10.3222	Design and Analysis of Experiments	III	½	S2	2	10.321B 10.322C		10.3122
10.3223	Statistical Inference	III	½	S2	2	10.321B		10.3123
10.3224	Nonparametric Methods	III	½	S2	2	10.321B 10.3212		10.3124
10.3225	Statistics Project	III	½	F				

††For any listed unit an appropriate higher unit may be substituted.

† Plus any two Level III Pure Mathematics, Applied Mathematics, Theoretical Mechanics or Computer Science units. It is sufficient to take 10.312B (10.322B) in the same year.

\*\*For a student taking four of the higher units 10.322A, 10.322C, 10.322D, 10.3321, 10.3322, 10.3223, 10.3224, 10.312F is required to take 10.3225.

‡The evening course 10.311A will, subject to a sufficient enrolment, run at 2 hours per week throughout the year.

\*At least four units from 10.322A, 10.322C, 10.3221, 10.3222, 10.3223, 10.3224, 10.322D, 10.312F.

**Psychology**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
<b>Psychology Level I</b>								
12.100	Psychology 1	I	2	F	5			
<b>Psychology Level II See Notes</b>								
12.200	Research Methods 2	II	1	F	3	12.100*		
12.201	Biological Basis of Psychology 2	II	1	S1	4	12.100*		

**Psychology (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
12.202	Social and Cognitive Psychology 2	II	1	S2	4	12.100*		
12.204	Human Relations 2	II	1	S1	4	12.100*		
12.205	Individual Differences 2	II	1	S2	4	12.100*		
<b>Psychology Level III: Group A</b> See Notes								
12.300	Research Methods 3A	III	1	S1	4	12.200		
12.305	Learning and Behaviour 3	III	1	S1 or S2	4	12.200 and 12.201		
<b>Psychology Level III: Group B</b> See Notes								
12.301	Research Methods 3B	III	1	S2	4	12.200 and 12.300		
12.304	Personality and Individual Differences 3	III	1	S1	4	2 Psychology Level II subjects		
12.310	Physiological Psychology 3	III	1	S2	4	12.200 and 12.201		
12.311	Perception 3	III	1	S2	4	12.200 and 12.201		
12.312	Language and Cognition 3	III	1	S1	4	12.200 and 12.202		
12.314	Motivation and Emotion 3	III	1	S1	4	12.200 and 12.201		
12.315	Theories of Associative Learning 3	III	1	S2	4	12.305		
12.316	Psychophysiology 3	III	1	S1	4	12.200 and 12.201		
12.320	Social Psychology 3	III	1	S1	4	12.200 and 12.202		
12.321	Developmental Psychology 3	III	1	S2	4	12.200 and 12.202		
12.322	Abnormal Psychology 3	III	1	S1	4	12.200 and 12.201		
12.324	Experimental Psychopathology 3	III	1	S2	4	12.322		
12.325	Social Behaviour 3	III	1	S2	4	12.200 and 12.202		
12.330	Psychological Assessment 3	III	1	S1	4	12.200, and 1 other Psychology level II subject	12.203	

## Psychology (continued)

No.	Name	Level	Unit Value	When Offered	HpW	Prerequisites	Co-requisites	Excluded
12.331	Counselling Psychology 3	III	1	S1	4	2 Psychology Level II subjects		
12.332	Behavioural Change 3	III	1	Not offered 1988	4	12.200 and 12.201		
12.333	Ergonomics 3	III	1	S1	4	12.200		
12.334	Behaviour in Organizations 3	III	1	S1 or S2	4	2 Psychology Level II subjects		
12.335	Behavioural Evaluation and Assessment 3	III	1	S2	4	12.200		
12.340	Special Topic 3	III	1	S1	4	12.200 and 12.202		

\*Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.

### Notes:

1. A student may not enrol in more than four Level II Psychology units.
2. A student may not enrol in more than three Level III Psychology units unless 12.200 Research Methods 2 has been passed.
3. A student may not enrol in more than six Level III Psychology units unless 12.300 Research Methods 3A has been passed.
4. A major in Psychology is 12.100, two Psychology Level II units, including 12.200 and four Psychology Level III units.
5. A student may not enrol in more than three Psychology Level III units selected from 12.304 Personality and Individual Differences 3, 12.322 Abnormal Psychology 3, 12.324 Experimental Psychopathology 3, 12.331 Counselling Psychology 3, and 12.335 Behavioural Evaluation and Assessment 3.
6. A student may not enrol in more than two Psychology Level III units selected from 12.320 Social Psychology 3, 12.325 Social Behaviour 3 and 12.334 Behaviour in Organizations 3.
7. A student may not enrol in more than eight Level III Psychology units in course **3970**.

## Biological Sciences

No.	Name	Level	Unit Value	When Offered	HpW	Prerequisites	Co-requisites	Excluded
17.031	Biology A	I	1	S1	6	See Subject Descriptions later in this Handbook		
17.041	Biology B*	I	1	S2	6	17.031		17.021
17.012	General Ecology	II	1	S2	6	17.031 and 17.041		

\*Students with percentile range 65-100 in HSC Examination 4 unit Science with Biology, or 2 unit Biology may apply to enrol in 45.201 or 45.301 in lieu of 17.041 after completion of 17.031. Students are selected by the Head of School for enrolment in these units. If successful, students will have met the prerequisite requirement of 17.041 Biology B for all units.

## Applied Geology

No.	Name	Level	Unit Value	When Offered	HpW	Prerequisites	Co-requisites	Excluded
25.110	Earth Materials and Processes**	I	1	S1	6	See Subject Descriptions later in this Handbook		
25.120	Earth Environments and Dynamics****	I	1	S2	6	25.110		

**Applied Geology (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
25.211	Earth Materials 1**	II	1	S1	6	25.120		
25.221	Earth Materials 2****	II	1	S2	6	25.211		
25.212	Earth Environments 1‡	II	1	S1	6	25.120		
25.223	Earth Physics**	II	1	S2	6	25.110		
25.2261	Mathematical Geology 1	II	½	S2	3	25.120		
25.621	Marine Geology 1**	II	1	F	3	25.601 or 25.110 and 25.120		††
25.622	Hydrological and Coastal Surveying‡	II/III	1	F	3			††
25.311	Earth Materials 3	III	1	S1	6	25.221		
25.321	Earth Materials 4****	III	1	S2	6	25.221		
25.312	Earth Environments 2‡‡	III	1	S1	6	25.212†††		
25.314	Mineral and Energy Resources 1***	III	1	S1	6	25.221		
25.3162	Mathematical Geology 2	III	½	S1	3	25.2261		
25.324	Mineral and Energy Resources 2****	III	1	S2	6	25.212 or 25.5212		
25.325	Engineering and Environmental Geology***	III	1	S2	6			
25.3261	Geochemical Analytical Techniques	III	½	S1	2	25.311		
25.3271	Advanced Structural Geology****	III	½	S2	2	25.221		
25.333	Exploration Geophysics***	III	1	F	3S1 2S2	25.120		
25.6342	Exploration and Seismic Methods*	III	½	S2	3			25.634, 25.9321
25.9311	Gravity and Magnetic Methods*	III	½	S1	3	1.001 10.001		
25.9312	Seismic Methods*	III	½	S1	3	1.001 10.001		
25.9313	Electrical Methods*	III	½	S1	3	1.001 10.001		

Field tutorials are an essential part of the subject, and are held during weekends and/or recesses. Dates and costs are available during the first week of the subject. Attendance is compulsory.

\*Field work of up to 1 day.

\*\*Field work of up to 2 days.

\*\*\*Field work of up to 3 days.

\*\*\*\*Field work of up to 4 days.

‡Field work of up to 5 days.

‡‡Field work of up to 8 days.

††Not available for programs 2500, 2503 nor in Geology program of Course 4770, nor in Geology with some Mathematics program of Course 3730.

†††It is desirable that students taking 25.312 should also have taken 25.223.

## Geography

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
27.010	Land Studies	I	1	S1	4			27.801, 27.301, 27.818, 27.811, 27.828, 27.111.
27.030	Environmental Processes	I	1	S2	4			27.818, 27.111.
27.818	Australian Environment and Human Response**	I	1	S1	4			27.010, 27.030, 27.801, 27.111
27.819	Technology and Regional Change*	I	1	S2	4			27.802, 27.302
27.050	Geographical Data Analysis	II	1	F	4	27.111 or both 27.010 and 27.030		27.813, 27.884
27.175	Introduction to Remote Sensing	II	1	S1	4	See Subject Descriptions later in this Handbook		27.1711
27.193	Environmental Impact Assessment	III	S2	4				
27.813	Geographic Methods***	II	1	S2	4	27.111 or both 27.010 and 27.030 or 27.818 and 27.819 or 27.801 and 27.802		27.050, 27.2813
27.828	Australian Natural Environments***	II	1	S2	4	27.010 and 27.030, or 27.818 or 27.801		27.811, 27.111, 27.010, 27.030
27.829	Australian Social Environments***	II	1	S1	4	27.819 or 27.802/302		27.010, 27.030, 27.812, 27.312
27.133	Pedology†	III	1	S2‡	5	27.111 or 27.030 or any 2 units from: 2.111, 2.121, 2.131, 2.141 or 27.828 or 27.811 (or 25.012 or 25.022)		
27.143	Biogeography†	III	1	S1	5	27.111, or 27.010 and 27.030, or 17.031 and 17.041, or 27.811, or 27.828		



**Geography (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
27.153	Climatology	III	1	S1‡	5	1.001, or 27.828, or 25.110 and 25.120, or 17.031 and 17.041†, or 27.010 and 27.030, or 27.811		
27.176	Remote Sensing Applications	III	1	S1‡	4	27.1711 or 27.175		27.1712
27.183	Geomorphology†	III	1	S2‡	5	25.110 and 25.120, or 27.828, or 27.111, or 27.010 and 27.030 or 27.811,		27.860
27.432	Computer Mapping and Display	III	1	S1	4	See Subject Descriptions later in this Handbook		
27.652	Geographic Information Systems	III	1	S1	4	27.432 or 10.021B and 10.021C, or 10.001, or 10.011		
27.753	Social Welfare and Urban Development	III	1	S2§	4	27.829 or 27.812		
27.824	Spatial Population Analysis	III	1	S2	4	27.829 or 27.812		27.834
27.825	Urban Activity Systems	III	1	S1	4	27.829 or 27.812		27.835
27.826	Urban and Regional Development	III	1	S2	4	27.829 or 27.812		27.836
27.862	Australian Environment and Natural Resources**	III	1	S1 Not offered in 1988	4**	27.010 and 27.030, or 27.828 or 27.829 or 27.811 or 27.812, or 27.010 and 27.030		27.872
27.863	Ecosystems and Man**	III	1	S2	4**	27.010 and 27.030, or 27.828 or 27.829 or 27.811 or 27.812		27.363, 27.873
27.884	Advanced Geographic Methods	III	1	S1	4	27.813, or 27.2813 and 27.2814		27.880, 27.050
27.883	Special Topic	III	1	S1 or S2	4	See Subject Descriptions later in this Handbook		

\*A field excursion, equivalent to 8 tutorial hours, is a compulsory part of the subject.

\*\*Two field tutorials, equivalent to 16 tutorial hours, are compulsory.

\*\*\*Three days fieldwork, equivalent to 24 tutorial hours, is compulsory.

†Up to 5 days fieldwork, equivalent to 40 tutorial hours, is compulsory.

‡Offered in alternate years.

§Offered subject to availability of staff.

## Surveying

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
29.1010	Surveying 1*	I	1½	S1	5			
29.2010	Surveying 2*	I		S2	4	29.1010		

\*These two subjects must be taken together in the one year.

## Biochemistry

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
41.101	Biochemistry	II	2	F	6	17.041†, 2.121† & 2.131†, or 2.141†		2.003J
41.102	Biochemistry of Macromolecules	III	2	S1	12	41.101, 2.102B or 2.102D		41.102A
41.112	Human Biochemistry	III	1	S2	6	41.101		
41.122	Cellular Biochemistry	III	1	S2	6	41.101		41.102B
41.132	Molecular Biology	III	1	S2	6	41.101		41.102E
41.142	Biochemistry and Genetic Engineering of Plants	III	1	S2	6	41.101		

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

†Terminating pass not acceptable

## Biotechnology

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
42.101	Introduction to Biotechnology	II	1	S2	6	2.121 & 2.131, or 2.141, 17.041, 10.001 or 10.011 or 10.021B and 10.021C		
42.102A	Biotechnology A	III	1	S1	6	41.101† 42.101† or 44.101†		
42.102B	Biotechnology B	III	1	S2	6	42.102A†		
42.102C	Microbial Genetics	III	1	S1	6	41.101 or 44.101		43.102

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

†Pass Conceded (PC) or Terminating Pass (PT) awarded prior to Session 2, 1983 is not acceptable.

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**Botany**


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No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
17.012	General Ecology					See under <b>Biological Sciences</b>		
43.111	Flowering Plants	II	1	S1	6	17.031 and 17.041		
43.121	Environmental Physiology	II	1	S2	6	17.031, 17.041, 2.141 or 2.121 and 2.131		43.122
43.131	Fungi and Man	II	1	S1	6	17.031 and 17.041		
43.112	Taxonomy and Systematics	III	1	S1	6	43.111		
43.132	Mycology-Plant Pathology	III	1	S2	6	43.131***		
43.142	Environmental Botany	III	1	S1	6	17.031 and 17.041		
43.152	Plant Community Ecology	III	1	S2	6	43.111 & 17.012 or 27.111		
43.172	Phycology and Marine Botany	III	1	S2	6	43.111		
43.192	Ultrastructure	III	1	S2	6	43.111 or 43.121 or 41.101 or 44.101 or 45.201 or 45.301		43.182

\*\*\*A student may apply to the School for variation of the prerequisites.

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**Microbiology†**


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No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
44.101	Introductory Microbiology	II	1	S1	6	17.031 and 17.041		
44.121	Microbiology 1	II	1	S2	6	44.101	41.101	
44.102	General Microbiology	III	2	S1	12	44.101, 44.121‡, 41.101		
44.112	Applied Microbiology	III	2	S2	12	44.102		
44.122	Immunology	III	1	S2	6	17.031 and 17.041, 41.101		
44.132	Virology	III	1	S2	6	44.102		

†All units available only during the daytime.

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

‡Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.

## Zoology

No.	Name	Level	Unit Value	When Offered	HpW	Prerequisites	Co-requisites	Excluded
17.012	General Ecology					See under Biological Sciences		
45.101	Biometry	II	1	S2	6	17.031 and 17.041		10.311A, 10.321A, 10.331
45.201	Invertebrate Zoology	II	1	S2	6	17.031 and 17.041		
45.301	Vertebrate Zoology	II	1	S1	6	17.031 and 17.041		
45.601	Introductory Genetics	II	1	S2	6	17.031 and 17.041, 2.131 or 2.141		
45.112	Marine Ecology§	III	1	S1	6	17.031 and 17.041, 45.201 or 25.621 or 2.102D		
45.121	Evolutionary Theory	III	1	S1	6	17.031 and 17.041		
45.122	Animal Behaviour	III	1	S2	6	45.101† and (45.201 or 45.301)		
45.132	Ecological Physiology	III	1	S2	6	45.201 or 45.301		
45.142	Comparative Physiology	III	1	S1	6	45.201 or 45.301		
45.152	Population and Community Ecology	III	1	S1	6	17.041 and 10.001 or 10.011 or 10.021C		
45.302	Vertebrate Zoogeography and Evolution	III	1	S2	6	45.301		
45.402	Entomology	III	1	S1	6	17.031, 17.041, 45.201		
45.422	Economic Zoology	III	1	S2	6	45.201 or 45.402		

**Note:** A student will not be admitted to Level III Zoology units without special permission of the Head of School, unless Chemistry 2.121 and 2.131, or 2.141, has been completed.

Students who wish to complete a major in the School of Zoology must take Biometry 45.101 and at least two Level II units from one of the following Schools: Biochemistry, or Chemistry, or Physics, or Mathematics, except as detailed in an approved program.

†Level III courses conducted by the School of Zoology are available only during the daytime.

§Students intending to enrol in this unit should register with the School of Zoology for the February field trip by 13 January.

‡One of: 10.331A; 10.321A; 10.331 may be substituted for 45.101 with special permission of the Head of School.

## Philosophy‡

No.	Name	Level	Unit Value	When Offered	HpW	Prerequisites	Co-requisites	Excluded
52.103	Introductory Philosophy A	I	1	S1	4			
52.104	Introductory Philosophy B	I	1	S2	4			
52.2001	The Nature of Mind	II/III	½	S1	2	Level II status in Philosophy**		
52.2002	Contemporary Philosophy of Mind	II/III	½	S1	2	Level II status in Philosophy**		

**Philosophy (continued)**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
52.2003	Issues in the Philosophy of Psychology	II/III	½	S2	2	52.2001 or 52.2002		
52.2010	Reasoning Skills	II/III	½	S1 or S2	2	Any Level I Subject		52.233
52.2022	Body, Mind Knowledge and Freedom	II/III	½	S1	2	Level 2 Status in Philosophy		52.2020
52.220	Logic	II/III	1	S2	3	Any Level I Subject		52.2030 52.2031
52.2024	Reasons and the Passions: Descartes, Spinoza and Hume	II/III	½	S2	2	Level 2 Status in Philosophy		52.2021
52.2025	Images	II/III	½	S2	2	Level 2 Status in Philosophy		
52.2040	Greek Philosophy: Thales to Plato	II/III	½	S2	2	Level II Status in Philosophy**		52.183
52.2050	Classical Political Philosophy	II/III	½	S1	2	Level II Status in Philosophy**		52.182, 52.203
52.2060	Sartre	II/III	½	S1	2	Level II Status in Philosophy**		52.213
52.2130	British Empiricism	II/III	½	S2	2	Level II Status in Philosophy**		52.173
52.2140	Scientific Method	II/III	½	S1	2	Level II Status in Philosophy**		52.193
52.2150	Philosophy of Law	II/III	½	S2 Not offered in 1988	2	Level II Status in Philosophy**		52.105
52.219	Philosophical Foundations of Marx's Thought	II/III	1	S2	3	Level II Status in Philosophy**		52.373
52.2170	Hume	II/III	½	S1	2	Level II Status in Philosophy**		52.563, 52.152
52.2220	The Ethics of Plato and Aristotle	II/III	½	S1	2	Level II Status in Philosophy**		52.5231
52.2230	Theories in Moral Philosophy	II/III	½	S2 Not offered in 1988	2	Level II Status in Philosophy**		52.5232
52.2240	Philosophical Study of Woman	II/III	½	S1	2	Level II Status in Philosophy**		52.283
52.2250	Plato's Theory of Forms	II/III	½	Not offered in 1988	2	Level II Status in Philosophy**		52.483
52.2260	Aesthetics	II/III	½	S2	2	Level II Status in Philosophy**		52.273
52.2270	Social and Political Philosophy	II/III	½	Not offered in 1988	2	Level II Status in Philosophy**		52.513
52.2330	Psychoanalysis — Freud and Lacan	II/III	½	S2	2	Level II Status in Philosophy**		52.573
52.2360	Theories, Values and Education	II/III	½	S2	2	Level II Status in Philosophy**		52.583
52.2371	Plato's Later Dialogues	II/III	½	Not offered in 1988	2	52.2250 or 52.483*		52.293
52.2980	Seminar A	II/III	½	S2	2	Level II Status in Philosophy**		52.423

## Philosophy (continued)

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
52.2990	Reading Option A	II/III	½	S1 or S2	2	Level II Status in Philosophy**		52.413
52.3010	Seminar B	II/III	½	S1	2	Level II Status in Philosophy**		52.433
52.3020	Seminar C	II/III	½	S2	2	Level II Status in Philosophy**		52.443
52.3030	Reading Option B	II/III	½	S1 or S2	2	Level II Status in Philosophy**		52.453

\*In exceptional circumstances a student may apply to the School for variation of the prerequisite or co-requisite.

\*\*Level II status in Philosophy consists in 1. being in second or later year of university study, and 2. having taken and passed at least one Level I Philosophy unit. If the unit is composed of two half-units, these must have been passed in the same session. The prerequisite may be waived in certain cases by the School.

‡Due to the extra library work required in the preparation of essays a combination of three half-unit Philosophy subjects count as the equivalent of two Science units.

## Science and Technology Studies

Students undertaking subjects in Science and Technology Studies are required to supplement the class contact hours by study in the Library.

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
62.101I	Science, Technology and Social Change†	I	1	S1	3			†, 62.110
62.102I	Man, Megalith and Cosmos†	I	1	S1	3			†, 62.111
62.104I	The Seventeenth Century Intellectual Revolution†	I	1	S2	3			62.012, 62.211
62.201U	Materials Machines and Men	II/III	1	S2	3	A pass in four Level I units from Table 1		26.564, 26.251, 62.253, 62.022
62.202U	The Scientific Theory	II/III	1	S2	3			62.032
62.203U	Scientific Knowledge and Political Power	II/III	1	S1	3			62.052
62.204U	The Social System of Science	II/III	1	S2	3			62.062
62.205U	Historical Origins of the American Scientific Estate	II/III	1	S1	3			62.072
62.206U	Science, Technology and Developing Countries	II/III	1	S1	3			62.082
62.207U	The Discovery of Time	II/III	1	S1	3			62.103

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**Science and Technology Studies**


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No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
62.208U	The Darwinian Revolution	II/III	1	S1	2	A pass in 4 level I units from Table 1		62.104
62.209U	Mind, Mechanism and Life	II/III	1	S1	3			62.043, 62.106
62.210U	The History of Medical Theory and Practice	II/III	1	S1	3			62.043, 26.568, 26.2506, 62.273, 62.309, 62.109
62.211U	Relations Between Science and the Arts	II/III	1	S1	3			
62.212U	The New Biotechnologies and their Social Context	II/III	1	S2	3	62.101I, or by permission of the Head of School for 3rd and 4th Year students in the biological sciences		62.245
62.213U	Technological Development in Twentieth Century Australia	II/III	1	S2	3	62.101I		62.246
62.214U	Man, Woman and Deity	II/III	1	S2	3	A pass in four Level I units from Table 1		62.285
62.215U	The Arch of Knowledge: Philosophy and Methodology of Science to 1800	II/III	1	S1	2	A pass in four Level I units from Table 1		62.013, 62.551
62.216U	Philosophy and Methodology of Science	II/III	1	S2	2	62.215U <i>or</i> by permission of Head of School		62.013, 62.552
62.217U	Computers, Brains and Minds: Foundations of the Cognitive Sciences	II/III	1	S2	3	As for 62.201U		62.554
62.218U	Language and Minds: The Impact of Chomsky's Revolution in Linguistics and Philosophy	II/III	1	S1	3	As for 62.201U		62.570
62.219U	Knowledge and Belief in the Sciences	II/III	1	F	2	Completion of 3S&T units with an average of credit or better, or by permission of Head of School		26.222
62.300U	Research Methods in History and Philosophy of Science	III	1	S1	1½	Completion of 3 S&T units with an average of Credit or better, or by permission of Head of School		62.105
62.300I	Philosophical Problems in Evolutionary Biology	III	½	S1	2	62.202U <i>or</i> 62.208U		
62.3005	Issues in the Philosophy of Science	III	½	S2	2	As for 62.300U		

†Note: only two Level 1 units may be counted towards Course 3970.

## Board of Studies in Science and Mathematics

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
68.302	Introductory Marine Science	II	1	S1	4			25.601
68.313	Physical Oceanography	III	1	S2	4	10.001 or 10.011 and 1.001		
68.601	Genetics of Behaviour 1	II	1	S1	5	17.031		79.402
68.602	Genetics of Behaviour 2	III	1	S2	5	79.402 or 68.601		79.403
68.451	Biological Laboratory Computing	I	1	S2	6	As for 10.021B		1.041 and Programs 0600, 6806

## Pathology

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
72.301	Basic and Applied Pathology	III	1	F	3	70.011A 70.011C 73.111 or equivalent		

## Physiology and Pharmacology

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
73.111	Physiology 1*	II	2	F	6	2.121 and 2.131, or 2.141, 10.001 or 10.011 or 10.021B and 10.021C, 17.041		
73.012	Physiology 2	III	4	F	12	73.111, 41.101		
73.012A	Membrane Biology	III	1	S1	6	Normally as for 73.012, but may be studied only with permission of Head of School		
73.012B	Neurophysiology	III	1	S1	6			
73.012C	Organ Physiology	III	2	S2	12			
73.022	Pharmacology	III	2	F	6	73.111	73.012 or 41.102 and 41.122 or 2 Level III Chemistry units	

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.

\*Students intending to major in Physiology should note Physiology 2 prerequisites.



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**Community Medicine**


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No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded
79.201	Population Genetics	III	1	S1	5	See † below		
79.202	Human Genetic Analysis	III	1	S2	5	See * below		
79.302	Biochemical Genetics of Man	III	1	S1	6	41.101, 45.601 (or their equivalents)		

†One unit of statistical methods, or theory, as approved by the Head of School.

\*A unit of genetics and a unit of statistical methods, or theory, as approved by the Head of School.

**Course 3970**

**Units available in specific programs and double degree courses**

**Table 2**

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded	Specific Programs
1.982	Solid State Physics (Electrical Engineering)	II	1	S1	½	1.001, 10.001	10.2111, 10.2112	1.022	Course 3681
2.111	Introductory Chemistry*	I	1	S1	6				0100, 1200, 2700
2.951	Chemistry 1 ME	I	1	S1	6	As for 2.121		2.121, 2.131, 2.141	Course 3681
2.991	Chemistry for Civil Engineers	I	1	S2	6	As for 2.121		2.121, 2.131, 2.141	Course 3730
4.412A	Physical Metallurgy 1A	II	1	S1	6	2.102A†, 4.732			Course 3681
4.413	Physical Metallurgy 2A	III	½	S1	2½	4.412A (Unit 1)			Course 3681
4.422B	Physical Metallurgy 1B	II	½	S2	2	—			Course 3681
4.432	Physical Metallurgy 1C	II	½	S2	4	4.412A			Course 3681
4.433C	Physical Metallurgy 2C	III	½	S2	4	4.412A			Course 3681
4.443	Physical Metallurgy 2D	III	½	S2	4	4.432			Course 3681
4.453	Physical Metallurgy 2E	III	½	S2	2½	4.432			Course 3681
4.642	Metallurgical Engineering 1D	II	½	S2	4	4.732			Course 3681
4.643	Metallurgical Engineering 2D	III	½	S1	2	4.412A, 4.732			Course 3681
4.713	X-ray Diffraction and Electron Microscopy	III	½	S2	4	4.412A			Course 3681
4.732	Mechanical Properties of Materials	II	½	S2	4	5.0011	4.412A		Course 3681
4.742	Physics of Materials	II	½	S2	3	1.001 or 1.011			Course 3681
5.0201	Engineering Dynamics 1A	I	½	S1 or S2	3	5.010			Course 3681
5.0721	Computing 1	I	½	S1	3		10.001	10.211E	Course 3681
5.300	Engineering Dynamics 1B	II	½	S2	2	1.001, 5.020 or 5.0201, 10.001			Course 3681
5.421	Mechanics of Solids 1	I	½	S2	3	5.010 or 5.0011			Course 3681
5.4220	Mechanics of Solids 2	II	1½	F	4½	5.020 or 5.421 or 8.171, 10.001		4.402, 4.442, 5.4221	Course 3681

Table 2: Board of Studies in Science and Mathematics (Units offered)

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded	Specific Programs
5.4221	Mechanics of Solids 2/ Materials	II	1½	F	3½	5.020 or 5.421 or 8.171, 10.001	4.402 or 4.422	5.4220	Course 3681
5.620	Fluid Mechanics 1	II	††	F	2	1.001, 5.0011,			Course 3681
5.626	Thermodynamics 1	II	††	F	2	10.001			Course 3681
6.010	Electrical Engineering	I	1	S2	6	Electrical and magnetism section of 1.001			0100, 0600, 1000
6.021A	Basic Circuit Theory	II	½	S1 or S2	4	6.010, 1.001, 10.001			0600
6.021C	Electronics	II	½	S1 or S2	4	6.021A, 1.982 or equiv.			0600
6.613	Computer Organization and Design**	III	1	S2	5	6.631*** or 6.021E***, 6.021D*** or 6.620*** or 6.621***		6.0318	0600 or in the Computer Science Quota. Courses 3611, 3661, 3681, 3701, 3725, 3730, 4770
6.632	Operating Systems**	III	1	S1	5	6.631*** or 6.021E***, 6.641***		6.672	
6.633	Data Bases and Networks**	III	1	S2	5	6.641***		6.622, 14.607, 14.608	
6.642	Design and Analysis of Algorithms**	III	1	S1	5	6.641***			
6.643	Compiling Techniques and Programming Languages**	III	1	S1	5	6.641***		6.672	
6.647	Business Information Systems**	III	1	S2	5	6.641*** 14.501 or 14.001		14.605, 14.611	
8.2410	Mechanics of Solids 1	I	½	SS	3	5.0011		5.020, 5.421	Course 3681
8.1120	Computing	I	½	SS	3			6.611	Course 3681
9.801	Genetics 1	II	1	F	3				6840
9.811	Biostatistics 1	III	1	S1	4	10.301 or 45.101			6840
9.802	Genetics 2	III	1	F	4	9.801			6840
10.022	Engineering Mathematics 2	II	1	F	4	10.001			Courses 3681, 3730
10.301	Statistics SA	II	1	F	2	10.001 or 10.021C CR			6832, 6833
10.351	Statistics SM	II	1	F	2	10.001		10.331, 10.311A, 10.311B, 10.321A, 10.321B	Course 3681
14.501	Accounting and Financial Management 1A****†††	I	1	S1	4½				0600, 1000, 5811, 1400, 6810 Course 3681
14.511	Accounting and Financial Management 1B	I	1	S2	4½	14.501			0600, 1000, 5811, 1400, 6810
14.522	Accounting and Financial Management 2A	II	1	S1	4½	14.511			0600, 1000, 5811, 1400, 6810
14.542	Accounting and Financial Management 2B	II	1	S2	4½	14.511			0600, 1000, 5811, 6810

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded	Specific Programs
14.563	Accounting and Financial Management 3A	III	1	S1	4½	14.542			6810
14.573	Accounting and Financial Management 3A (Honours)	III	1	S1	6	14.542			6810
14.583	Accounting and Financial Management 3B (Honours)	III	1	S2	4½	14.522			1400, 6810
14.593	Accounting and Financial Management 3B (Honours)	III	1	S2	6	14.522			6810
14.602	Computer Information Systems 1	II	1	S1	3	See Subject Descriptions later in this Handbook			0600, 1000, 6810, 5811, 1400
14.603	Computer Information Systems 2	II	1	S2	3	14.602			0600, 1000, 6810, 5811, 1400
14.605	Information Systems Implementation	III	1	S2	3	14.603		6.647	0600, 1400
14.607	Distributed Computer Systems	III	1	S2	3	14.603		6.633	0600, 1400, 6810
14.608	Database Systems	III	1	S1	3	14.603		6.633	0600, 1400, 6810
14.611	Information Systems Development	III	1	S1	3	14.603 and approval from Head of Department of Information Systems		6.647	0600, 6810
14.613	Business Finance 2A	II	1	S1	3				6810
14.614	Business Finance 2B	III	1	S2	3	14.613			0600, 6810
14.615	Business Finance 3	III	1	S1	3	14.614			0600, 6810
14.774	Legal Environment of Commerce	I	1	S2	3	See Subject Descriptions later in this Handbook			6810
15.001	Microeconomics 1	I	1	S1 or S2	3½	See Subject Descriptions later in this handbook			0600, 1000, 1400, 6810
15.002	Microeconomics 2	II	1	S1	4	15.011 plus 15.401 or 15.411 or 10.001 or 10.011		15.072	0600, 1000, 6810, 5811
15.003	Macroeconomics 3	III	1	S2	4	15.042 or 15.052	15.412		0600
15.011	Macroeconomics 1	I	1	S1 or S2	3½	15.001			0600, 1000, 6810, 1400
15.042	Macroeconomics 2	II	1	S2	4	15.002 plus 15.401 or 15.411 or 10.001 or 10.011	15.421	15.062	0600, 1000, 6810, 5811
15.062	Applied Macroeconomics 2	II	1	S1 or S2	4	15.011		15.042	6810
15.072	Applied Microeconomics 2	II	1	S1 or S2	4	15.011		15.002	6810
15.143	Microeconomics 3	III	1	S1	4	15.002	15.412		0600, 1000

Table 2: Board of Studies in Science and Mathematics (units offered)

No.	Name	Level	Unit Value	When Offered	Hpw	Prerequisites	Co-requisites	Excluded	Specific Programs
15.901	Australia in the International Economy in the Twentieth Century	I	1	S1 or S2	3½	See Subject Descriptions later in this Handbook			6810
15.902	Management Strategy and Business Development	I	1	S2	3½	See Subject Descriptions later in this Handbook			6810
25.5212	Sedimentology	II	½	S1	2	25.120		25.212	2503
25.5313	Stratigraphy	III	½	S1	2	25.5212		25.312	2503
25.631	Marine Geology 2	III	1	F	3	25.621			6833, 6870
25.632	Estuarine Geology†	III	1	S1	3				6832, 6833, 6870
25.6341	Marine Mineral Deposits	III	½	S1	3	25.621	25.631		6833, 6870
25.9314	Geological Applications	III	½	S1	4	25.120			2503
25.9321	Geophysical and Geological Applications	III	½	S2	3	25.120		25.6342	2503
48.024	Chemical Engineering Principles 1 2	II	1	F	3S1 2S2	1.001, 10.001			1000, 5811
48.038	Chemical Engineering Principles 2	III	1	F	4S1 2S2	48.024			1000, 5811
48.403	Polymer Science	III	1	F	3	2.102A, 2.102B, 10.031, 10.301	10.331		Course 3681
70.011A	Histology 1	II	1	F	3	17.041, 17.031***	70.011C		§§ 7000 or in the Anatomy Quota. Courses 4770 (Anatomy)
70.011B	Mammalian Embryology	III	1	F	3		70.011A, 70.011C		
70.011C	Introductory Anatomy	II	1	S1	6	17.041, 17.031***			
70.012B	Visceral Anatomy	III	1	S2	6	70.011C***			
70.012C	Neuroanatomy 1	III	1	S1	6	70.011A*** 70.011C***			
70.304	Histology 2	III	1	S2	6	70.011A***		70.3041§	
70.305	Neuroanatomy 2	III	1	S2	3	70.012C			
70.306	Functional Anatomy 1	III	1	S1	6	70.011C***			
70.307	Functional Anatomy 2	III	1	S2	6	70.306***			
70.3041	Histological and Histochemical Techniques†††	III	½	S2	3	17.031***, 17.041*** and any 1 of 41.101, 45.301 or 70.011A***		70.304§	
73.012F	Clinical Physiology	III	1	F	3	73.111, 41.101, 2.102B, 70.011A, 70.011C, 80.014			Course 3820
80.014	Human Behaviour	II	1	F	3				Course 3820
90.112	Legal System-Tort			F	4				Course 4770
90.141	Contracts			F	4				Course 4770
90.161	Criminal Law			F	4				Course 4770
90.216	Administrative Law			S1 or S2	4				Course 4770
90.301	Property and Equity			F	4				Course 4770
90.621	Law, Lawyers and Society			S1 or S2	4				Course 4770
90.741	Legal Research and Writing 1			F	2				Course 4770

\*Students who have passed 2.121 may not subsequently enrol in 2.111. Students meeting the 2.121 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Once students enrol in 2.111 they must pass 2.111 before they can proceed to 2.121 or 2.131. Students may not count more than two Level I Chemistry units towards BSc degree requirements.

\*\*In exceptional circumstances the Head of School may give permission for students outside the specified programs to undertake one of these subjects.

\*\*\*Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable.

\*\*\*\*Not available in Year 1 of programs 0600, 1000, 5811, 1400.

†This unit must be taken in Session 1.

††The combination of 5.620 and 5.626 is worth 1½ units.

†††May be counted in Courses 3611, 3661, 3681 and 3701 in special circumstances only.

‡Excluded by 25.211.

††††May not be offered in 1988 if insufficient enrolments.

§70.304 and 70.3041 are mutually exclusive (see Subject Descriptions later in this handbook).

§§Anatomy units may be counted as Table 1 units in any program on obtaining special permission of the Head of the School of Anatomy.

**Course 3970**  
**Level IV units offered by**  
**the Board of Studies in**  
**Science and Mathematics**

## Table 3

A student planning to complete a program involving any unit/units from this table must seek the approval of the Head of the School in which the unit is taught.

No.	Name	Level	Unit Value	When Offered	Prerequisites in Years 1, 2, 3 or 4	Number of Level III Units Required
1.104	Physics 4 (Honours)	IV	10	F	Program 0100 Program 0161 Program 5801	7 6 6
1.304	Applied Physics 4 (Honours)	IV	10	F	Program 0100 Program 0161 Program 5801	7 6 6
1.504	Theoretical Physics 4 (Honours)	IV	10	F	Program 0100s Program 0161 Program 5801	7 6 6
1.604	Biophysics 4 (Honours)	IV	10	F	Program 0100	6
2.004	Chemistry 4	IV	10	F	4 Level III Chemistry units Program 5820	8 7
6.606	Computer Science 4	IV	10	F	6.613, 6.632, 6.642, 6.643	8
10.123	Pure Mathematics Honours	IV	10	F	Program 1000 *Program 5811 or 5812	* *
10.223	Applied Mathematics Honours	IV	10	F	Program 1000 Program 5811 or 5812 Program 6810	6 6* 6*
10.323	Theory of Statistics Honours	IV	10	F	Program 1006 *Program 5811 or 5812	* 7
12.403	Psychology 4 (Thesis)	IV	10	F	Program 1200	8
12.404	Psychology 4	IV	10	F	Program 1200	8

**Table 3: Level IV units offered by the Board of Studies in Science and Mathematics**

No.	Name	Level	Unit Value	When Offered	Prerequisites in Years 1, 2, 3 or 4	Number of Level III Units Required
14.794	Honours Thesis	IV	10	F	Program 1400	6
14.853	Advanced Systems Management	IV				
14.857	Operations Research for Management 1	IV				
14.886	Research Topics in Information Systems 1	IV				
14.887	Research Topics in Information Systems 2	IV				
14.891	Decision Support Systems	IV				
25.435	Geology 4 Honours	IV	10	F	Programs 2500, 2503 Program 5825	8 7
27.844	Geography 4	IV	10	F	Program 2700 27.050	8
41.103	Biochemistry 4	IV	10	F	4 Level III Biochemistry units Program 5841	8 7
42.103	Biotechnology 4	IV	10	F	4 Level III units in a discipline, or disciplines, related to Biotechnology	8
43.103	Botany	IV	10	F	4 Level III Botany units or a closely related discipline Program 5843	7 7
44.103	Microbiology Honours	IV	10	F	44.102, 44.112 Program 5844	8 7
45.103	Zoology 4	IV	10	F	4 Level III Zoology units Program 5845	8 7
62.400H	Science and Technology Studies Honours	IV	10	F	Program 6200	7
68.304	Marine Science 4	IV	10	F	Program 6831, 6832, 6833 or 6834	8
68.404	Genetics 4	IV	10	F	Program 6840	7
68.430	Combined Geology Physics Honours	IV	10	F	Program 0100	8

No.	Name	Level	Unit Value	When Offered	Prerequisites in Years 1, 2, 3 or 4	Number of Level III Units Required
70.013	Anatomy 4	IV	10	F	4 Level III Anatomy units	6
72.304	Pathology Honours	IV	10	F	72.301	6
73.013	Physiology 4	IV	10	F	4 Level III Physiology units Program 5873	7 7
73.023	Pharmacology	IV	10	F	Program 7300(b)	7
79.014	Human Genetics	IV	10	F	At least 3 of the following: 41.102, 42.102C, 44.122, 45.121, 79.201, 79.202, 79.302, 68.403	8

\*Some Higher Mathematics units should normally be included at Levels II and III in order to enter Level IV Mathematics. Students should discuss their Year 3 program in Department concerned.

§Students entering 1.504 from the 0100 program should have demonstrated adequate mathematical ability.

oField work of up to 7 days duration is a compulsory part of the subject.



**Undergraduate Study:  
Faculty of Biological and  
Behavioural Sciences**



## Faculty of Biological and Behavioural Sciences

# Introduction

The Schools of the Faculty of Biological and Behavioural Sciences contribute programs to the Science and Mathematics Course 3970 and the Faculty supervises the undergraduate course in Psychology 3431). The Schools of the Faculty also offer facilities for students to proceed to the award of a Graduate Diploma in Biochemical Engineering (5320); Graduate Diploma in Biotechnology (5340); to masters degrees in Biological Technology (8260) and in Psychology (8250 and 8255); and to the award of masters degrees by research and the award of the degree of Doctor of Philosophy.

Students requiring advice about the undergraduate course should contact  
School of Psychology ..... Professor B.J. Gillam  
Mr T.J. Clulow

Student requiring advice about graduate studies should check details later in this handbook and also enquire from the Head of the appropriate School.

Faculty of Biological and Behavioural Sciences

# Course Outline 3431

**3431**

**Psychology Degree Course  
— Full-time Course**

**Bachelor of Science (Psychology)  
BSc(Psychol)**

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

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

In the fourth year, students undertake a program of study which includes courses in the major areas of general psychology and in a number of applied fields. In addition, each student must complete either a research thesis or a group research project.

Details of the qualifications required for admission to the Psychology Course leading to the award of BSc(Psychol), the course requirements for Pass and Honours at graduation and rules governing admission with advanced standing are given below.

## Rules governing the Psychology Course

**1.** Applicants for admission to the Course must be matriculated to this University; and also have satisfied either the entrance requirements for 10.001 Mathematics 1 or 10.021B General Mathematics 1B and 10.021C General Mathematics 1C or for 17.031 Biology A and 17.041 Biology B.

**2.** (1) In order to qualify for admission to the award of degree of BSc(Psychol) under these regulations a candidate must attend classes and satisfy the examiners in the following subjects:

(a) *Each of:*

- 12.100 Psychology 1
- 12.200 Research Methods 2
- 12.201 Biological Basis of Psychology 2
- 12.202 Social and Cognitive Psychology 2
- 12.203 Psychology 2A

A total of 8 Level III units of Psychology including 12.300 and 12.305 from Group A (see Table 1). Additionally, students intending to take the thesis alternative in Psychology Level IV Honours are required to include 12.301 Research Methods 3B from Group B (see Table 1).

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

*and either*

12.400 Psychology 4 (Thesis — Course 3431) or 12.401 Psychology 4 (Course 3431) leading to the award of the degree of Bachelor of Science (Psychology).

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

(i) that they shall include *at least* one of:

- 10.001 Mathematics 1 or
- 10.021B General Mathematics 1B and 10.021C General Mathematics 1C

*or*

- 17.031 Biology A and
- 17.041 Biology B.

(They may include both the above alternatives.)

(ii) that they shall include *at least* one of:

- 53.001 Introduction to Sociology *or*
- 15.001 Microeconomics 1 and 15.011 Macroeconomics 1 *or* Political Science 1 (select two of 54.1003 Australian Political Institutions, 54.1004 Government in the Modern World, 54.1005 A History of Political Thought and 54.1006 The Australian Political System) *or*
- 52.103 Introductory Philosophy A and 52.104 Introductory Philosophy B.

*or*

with the approval of the Head of the School of Psychology, one other Arts 1 subject.

(iii) that they shall include at least one subject (two Science and Mathematics Level II units or twelve Arts Upper Level credit points are equivalent to one Level II subject) which together with the subject meeting the requirements of (i) or (ii) immediately above constitutes a recognized sequence of two courses.

Examples of recognized sequences are:

- 10.001 Mathematics 1, followed by two Mathematics Level II units (chosen from 10.111A, 10.1113, 10.1114, 10.2111 and 10.2112) or by both of 10.311A Probability and Random Variables and 10.311B Basic Inference;
- 17.031 Biology A and 17.041 Biology B followed by two Level II units chosen from the following units according to the regulations of the Board of Studies in Science and Mathematics:
  - 41.101 Biochemistry (equivalent to 2 units)
  - 45.101 Biometry
  - 45.201 Invertebrate Zoology
  - 45.301 Vertebrate Zoology
  - 68.601 Genetics of Behaviour 1
  - 68.602 Genetics of Behaviour 2
  - 73.111 Physiology 1 (equivalent to 2 units)
- 53.001 Introduction to Sociology followed by twelve credit points value of Sociology Upper Level subjects
  - 15.001 Microeconomics 1 and 15.011 Macroeconomics 1 followed by twelve credit points value of Economics Upper Level subjects
  - Political Science 1 followed by twelve credit points value of Political Science Upper Level subjects
  - 52.103 Introductory Philosophy A and 52.104 Introductory Philosophy B followed by twelve credit points value of Philosophy Upper Level subjects.

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

(3) 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.

### 3. 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 for a statement of subject prerequisites and/or co-requisites.

4. The degree of BSc(Psychol) will be awarded at either Pass level or with Honours, after a minimum of four years of full-time study.

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## Rules governing admission to the Psychology Course with advanced standing

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1. Graduates of the University of New South Wales may be admitted to the Psychology Course leading to the award of the degree of BSc(Psychol) with exemption from no more than five subjects or their unit equivalents that they have completed. No more than two Psychology subjects may be included in these exemptions.

2. Undergraduates of the University of New South Wales who transfer from another course to the Psychology Course may be admitted to the Psychology Course with exemption in no more than seven Psychology Course subjects or their unit equivalents.

3. Graduates or undergraduates of other universities may be admitted to the Psychology Course with advanced standing.

4. Students admitted under Rule 3 who have satisfied the examiners in subjects of the same title or subject matter as those permissible in the Psychology 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.

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## Recommended Psychology Course patterns

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

1. a solid core of psychology to equip the psychologist-in-training with psychological theory, skill in experimentation and psychological techniques;

2. supporting studies in mathematics and/or biology (a minimum of one such course is compulsory);

3. supporting studies in the social sciences (a minimum of one such course is compulsory); and

4. the special needs, interests and academic or vocational background of individual students.

For these reasons, 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 pattern of supporting subjects in consultation with the Head of the School or his representative before completing enrolment.

In *Year 1*, students must take four subjects which include 12.100, either Biology 1 or a first-year Mathematics, one of Economics 1, Sociology 1, Philosophy 1 or Political Science 1 or one other Arts 1 subject, and a fourth subject. (It should be noted that the University has arranged these subjects so that there is no clash of timetables. If other subjects are taken, care must be taken to check that there is no timetable clash in the program that is chosen.)

In *Year 2* students take 12.200, 12.201, 12.202, 12.203, a second-year follow on subject from one of the non-Psychology subjects completed in Year 1, and one other Level I, II or III non-Psychology subject. Eight Level III units of Psychology are taken in *Year 3*, while *Year 4* consists of either 12.400 or 12.401 only.

Some examples of patterns, based on different supporting subjects are suggested below:

## Compulsory Psychology Subjects

**Year 1**  
12.100

**Year 2**  
12.200, 12.201, 12.202, 12.203

**Year 3**  
8 Psychology Level III units including 12.300 and 12.305 from Group A. Additionally, if intending to take the thesis alternative in Psychology 4 12.301 must be taken from Group B.

**Year 4**  
*Either* 12.400 *or* 12.401

## With Pure Mathematics or Statistics as the main supporting subject

**Year 1**  
10.001 Mathematics 1  
A Level I Social Science subject, *and*  
One other Level I subject

**Year 2**  
*Either* two units of Level II Pure and Applied Mathematics, *or* 10.311A and 10.311B Theory of Statistics Level II, *and*  
One other Level I or II subject

## With Biochemistry or Physiology as the main supporting subject

**Year 1**  
2.121 Chemistry 1A and 2.131 Chemistry 1B  
*Either* 10.001 Mathematics 1, *or* 10.021B General Mathematics 1B and 10.021C General Mathematics 1C, *and*  
17.031 Biology A and 17.041 Biology B

**Year 2**  
A Level I Social Science subject, *and*  
*Either* 41.101 Biochemistry,  
*or* 73.111 Physiology 1

## With Zoology or Genetics as the main supporting subject

**Year 1**  
10.001 Mathematics 1, *or* 10.021B General Mathematics 1B and 10.021 General Mathematics 1C  
17.031 Biology A and 17.041 Biology B, *and*  
A Level I Social Science subject

**Year 2**  
*Either* 45.101 Biometry, 45.201 Invertebrate Zoology, 45.301 Vertebrate Zoology and one other unit for Zoology, *or* 68.601 Genetics of Behaviour 1, 68.602 Genetics of Behaviour 2 and two other units of Genetics

## With Social Sciences as the main supporting subject

**Year 1**  
10.001 Mathematics 1, *or* 10.021B General Mathematics 1B and 10.021C General Mathematics 1C, *or*  
17.031 Biology A and 17.041 Biology B  
A Level I Social Science subject, *and*  
One other Level I subject

**Year 2**  
An Upper Level Social Sciences subject, *and*  
One other Level I or II subject

**Notes:** 1. For details of Psychology units, and Science and Mathematics units, including pre- and co-requisites, refer to Table 1 of the Science and Mathematics Course details set out earlier in this handbook.

2. For details of Social Science (Arts) subjects, including pre- and co-requisites, refer to the Faculty of Arts Handbook.



**Undergraduate Study:  
Board of Studies in  
Science and Mathematics**





## Faculty of Science

## Introduction

The Schools of the Faculty of Science contribute programs to the Science and Mathematics Course (3970) and the Faculty supervises the undergraduate courses in Optometry (3950) and the graduate diploma course Food and Drug Analysis (5510). The Schools of the Faculty also offer facilities for students to proceed to masters degrees in Chemistry (8770), Mathematics (8740), Optometry (8760), Physics (8730), Statistics (8750) and Master of Science and Society (8780), to the award of masters degrees by research and to the award of the degree of Doctor of Philosophy.

Students requiring information about the undergraduate course should contact the representative of the appropriate School:

School of Chemistry .....	Dr D. S. Alderdice
School of Optometry .....	Dr J. A. Alexander

Students requiring information about the graduate studies which are available should seek advice from:

Graduate Diploma in Food and Drug Analysis .....	Associate Professor G. Crank
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or

in the case of masters and doctors degrees from:

School of Chemistry .....	Professor P.S. Clezy
School of Mathematics .....	Associate Professor W.E. Smith
School of Optometry .....	Professor H.B. Collin
School of Physics .....	Professor H.G.L. Coster

## Faculty of Science

# Course Outlines

## Optometry

### 3950 Optometry Course

The School provides a four year full-time course in Optometry leading to the award of the degree of Bachelor of Optometry, at either the Pass or Honours level. The first year of the course involves a study in the fundamental sciences of physics, chemistry, mathematics and 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 eligible for selection 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.

### 3950 Optometry — Full-time Course

#### Bachelor of Optometry BOptom

Year 1	Hours per week
1.021 Introductory Physics 1 or	
1.001 Physics 1	6
2.121 Chemistry 1A and	
2.131 Chemistry 1B or	6
2.141 Chemistry 1M	
10.001 Mathematics 1 or	
10.011 Higher Mathematics 1 or	
10.021B General Mathematics 1B and	6
10.021C General Mathematics 1C	
17.031 Biology A and	
17.041 Biology B	6
	<u>24</u>

In special cases, students who do not meet the prerequisites for admission to 2.121 Chemistry 1A may be enrolled in 2.111 Introductory Chemistry in Session 1, 2.121 Chemistry 1A in Session 2 and be permitted to carry 2.131 Chemistry 1B into Session 1 of Year 2.

#### Year 2

Full Year	S1	S2
31.851 Optics	8	4
31.852 Visual Optics	2	3
31.853 Measurement of Light and Colour	—	2
31.821 Anatomy and Physiology of the Eye and Visual System	6	7
73.011A Principles of Physiology	6	6
General Studies Elective	2	2
	<u>24</u>	<u>24</u>

#### Year 3

12.100 Psychology	5
31.861 Optometry A	6
31.862 Diagnosis and Management of Ocular Disease	5½
31.863 Theory of Spectacle Lenses and Optical Instruments	1½
31.864 Clinical Methods	5
Two General Studies Electives	4
	<u>27</u>

#### Year 4

12.741 Psychology (Optometry)	2
31.871 Optometry B	6
31.841 Clinical Optometry	16
71.001 Principles of Medicine for Optometry Students	1
	<u>25</u>

## **3951 Combined Science/Optometry Course**

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### **Conditions for the combined course leading to the award of the degrees of BSc BOptom in the Faculty of Science**

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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 award of the two degrees 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 and Mathematics Course regulations.

The units submitted for the award of 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, ie a person may be admitted under these rules if he or she has met all requirements for a first degree which has not yet been conferred and admission under these rules shall be no bar to the subsequent award of the first degree.

## Undergraduate Study

# Subject Descriptions

## Identification of Subjects by Number

A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.
2. Each subject number is unique and is not used for more than one subject title.
3. Subject numbers which have not been used for some time are not used for new subject titles.
4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The **identifying numerical prefixes** for each subject authority are set out on the following page.

**Servicing Subjects** are those taught by a school or department outside its own faculty. Their subject descriptions are published in the handbook of the faculty which originates the subject and are also published in the handbook of the Faculty in which the subject is taught.

## HSC Exam Prerequisites

Subjects which require prerequisites for enrolment in terms of the HSC Examination percentile range, refer to the **1978 and subsequent Examinations**.

Candidates for enrolment who obtained the HSC in previous years or hold other high school matriculation should check with the appropriate school on what matriculation status is required for admission to a subject.

### Information Key

The following is the key to the information which may be supplied about each subject:

**S1** Session 1, **S2** Session 2

**F** Session 1 *plus* Session 2, ie full year

**S1** or **S2** Session 1 or Session 2, ie choice of either session

**SS** single session, but which session taught is not known at time of publication

**CCH** class contact hours

**L** Lecture, followed by hours per week

**T** Laboratory/Tutorial, followed by hours per week

**hpw** hours per week

**C** Credit point value

**CR** Credit

**DN** Distinction

**HD** High Distinction

School, Department etc	Faculty	Page
*Subjects also offered for courses in this handbook		
<b>1 School of Physics</b>	<b>Science</b>	
<b>2 School of Chemistry</b>	<b>Science</b>	
3 School of Chemical and Industrial Engineering (New Course)	Applied Science	
4 School of Materials Science and Engineering	Applied Science	
5 School of Mechanical and Industrial Engineering	Engineering	
6 School of Electrical Engineering and Computer Science	Engineering	
7 School of Mines (Mineral Processing and Extractive Metallurgy and Mining Engineering)	Applied Science	
8 School of Civil Engineering	Engineering	
9 School of Fibre Science and Technology (Wool Science)	Applied Science	
<b>10 School of Mathematics</b>	<b>Science</b>	
11 School of Architecture	Architecture	
<b>12 School of Psychology</b>	<b>Biological and Behavioural Sciences</b>	
13 School of Fibre Science and Technology (Textile Technology)	Applied Science	
14 School of Accountancy	Commerce	
15 School of Economics*	Commerce	
16 School of Health Administration	Professional Studies	
<b>17 Faculty of Biological and Behavioural Sciences</b>	<b>Biological and Behavioural Sciences</b>	
18 School of Mechanical and Industrial Engineering (Industrial Engineering)	Engineering	
21 Department of Industrial Arts	Architecture	
23 School of Nuclear Engineering	Engineering	
25 School of Mines (Applied Geology)	Applied Science	
26 Department of General Studies	Board of Studies in General Education	
27 School Geography	Applied Science	
28 School of Marketing	Commerce	
29 School of Surveying	Engineering	
30 Organizational Behaviour*	Commerce	
<b>31 School of Optometry</b>	<b>Science</b>	
32 Centre for Biomedical Engineering	Engineering	
34 Faculty of Arts	Arts	
35 School of Building	Architecture	
36 School of Town Planning	Architecture	
37 School of Landscape Architecture	Architecture	
38 School of Biological Technologies (Food Science)	Applied Science	
39 Graduate School of the Built Environment	Architecture	
40 Professorial Board		
<b>41 School of Biochemistry</b>	<b>Biological and Behavioural Sciences</b>	

School, Department etc	Faculty	Page
*Subject also offered for courses in this handbook		
42 School of Biological Technologies (Biotechnology)*	Applied Sciences	
<b>44 School of Microbiology</b>	<b>Biological and Behavioural Sciences</b>	
<b>45 School of Biological Science</b>	<b>Biological and Behavioural Sciences</b>	
46 Faculty of Applied Science	Applied Science	
47 Centre for Safety Science	Engineering	
48 School of Chemical Engineering and Industrial Chemistry* (Old course)	Applied Science	
49 School of Biological Technologies	Applied Science	
50 School of English	Arts	
51 School of History	Arts	
52 School of Philosophy	Arts	
53 School of Sociology*	Arts	
54 School of Political Science	Arts	
55 School of Librarianship	Professional Studies	
56 School of French	Arts	
57 School of Theatre Studies	Arts	
58 School of Education	Professional Studies	
59 Department of Russian Studies	Arts	
60 Faculty of Arts	Arts	
61 Department of Music	Arts	
62 School of Science and Technology Studies	Arts	
63 School of Social Work	Professional Studies	
64 School of German Studies	Arts	
65 School of Spanish and Latin American Studies	Arts	
66 Subjects Available from Other Universities		
<b>67 Faculty of Science</b>	<b>Science</b>	
<b>68 Board of Studies in Science and Mathematics</b>	<b>Board of Studies in Science and Mathematics</b>	
70 School of Anatomy	Medicine	
71 School of Medicine	Medicine	
72 School of Pathology	Medicine	
73 School of Physiology and Pharmacology*	Medicine	
74 School of Surgery	Medicine	
75 School of Obstetrics and Gynaecology	Medicine	
76 School of Paediatrics	Medicine	
77 School of Psychiatry	Medicine	
78 School of Medical Education	Medicine	
79 School of Community Medicine	Medicine	
80 Faculty of Medicine	Medicine	
81 Medicine/Science/Biological Sciences	Medicine	
85 Australian Graduate School of Management	AGSM	
90 Faculty of Law	Law	
97 Faculty of Engineering	Engineering	

## Physics

### Physics Level I Units

#### 1.001 Physics 1

F L3T3

*Prerequisites:*

	HSC Exam Score Range Required
2 unit Mathematics* or	67.100
3 unit Mathematics or	1.50
4 unit Mathematics and	1.100 or (for 1.001 only) 10.021B
2 unit Science (Physics) or	57-100
2 unit Science (Chemistry) or	60-100
3 unit Science or	
4 unit Science or	31-100

1.021

*Co-requisite:* 10.021C or 10.001 or 10.011.

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertial mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, application of Kirchhoff's laws to AC and DC circuits. Uniform circular motion, Kepler's laws and rotational mechanics. Properties of matter: solids, liquids, gases. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization.

#### 1.021 Introductory Physics 1

(For Health and Life Scientists)

F L3T3

*Prerequisites:* None. *Co-requisites:* 10.021A and 10.021B, 10.021B and 10.021C, or 10.001 or 10.011.

Principally for students majoring in the life and health sciences disciplines. Topics at an introductory level.

The methods of physics, describing motion, the dynamics of a particle, conservation of energy, kinetic theory of gases, properties of liquids, vibrations and waves, electricity and conduction in solids, ions and ionic conduction, magnetism and electromagnetic induction, alternating current, atomic nature of matter, X-rays, the nucleus and radio-activity, geometrical optics, optical instruments, wave optics, microscopes and their uses.

#### 1.041 Laboratory Computers in Physical Sciences

S1 or S2 L2T4

*Prerequisites:* As for 1.001. *Co-requisite:* 10.001, and 1.021 or 1.001 or 1.011. *Excluded:* Programs 0601, 0610 and 0611, 6806.

Fundamentals of binary logic, binary arithmetic, arithmetic operations as logical algorithms. Electronic logic devices, principles of computer operation, microprocessors and microcomputer architecture. Machine language and BASIC programming in microcomputers. Fundamentals of real world interfacing techniques, flow of data and control across the interface. Mathematical modelling of the real world in BASIC, iteration and

simulation techniques, laboratory experiments collecting real world data via an interface and analysing it in the microcomputer. The developing role of the laboratory computer in scientific research.

#### 1.061 Computer Applications in Experimental Science 1

S2 L2T4

*Prerequisites:* 6.611. *Co-requisite:* 1.001, 10.001 or 10.011. *Excluded:* 1.041, 1.042.

Review of binary logic variables, arithmetic operations as logical algorithms on binary variables, computer architecture and machine language instruction sets. Microprocessor and microcomputer architecture; Apple II microcomputer architecture, disc operating system, graphics, languages. Computer modelling of real physical systems iterative techniques. Fundamentals of interfacing, data and control flow across the interface. Transducers, encoding. Data collection techniques used in experimental sciences. Laboratory experiments involving direct data collection via-interfaces, data reduction and comparison with computer models. The developing role of the laboratory computer in experimental science.

### Physics Level II Units

#### 1.002 Mechanics, Waves and Optics

S1 L3T1

*Prerequisites:* 1.001 or 1.011, 10.001 or 10.011. *Co-requisite:* 10.2111. *Excluded:* 1.992, 10.4111, 10.4211.

Harmonic motion, systems of particles, central force problems, Lagrange's equations, coupled oscillations, travelling waves, pulses, energy and momentum transfer, polarization, birefringence, interference, thin films, gratings, lasers, holography, fibre optics, Faraday effect, photoelasticity.

#### 1.012 Electromagnetism and Thermal Physics S2 L3T1

*Prerequisites:* 1.001 or 1.011, 10.001 or 10.011. *Co-requisite:* 10.2111. *Excluded:* 1.972, 1.992.

Electric field strength and potential, Gauss' law, Poisson's and Laplace's equations, capacitance, dielectrics and polarization, magnetism, electro-magnetic induction, Maxwell's equations, electromagnetic waves. Laws of thermodynamics, kinetic theory, microscopic processes, entropy, solid state defects, Helmholtz and Gibbs functions, Maxwell's relations, phase diagrams, chemical and electrochemical potential.

#### 1.022 Modern Physics

FL½T½

*Prerequisites:* 1.001 or 1.011, 10.001 or 10.011. *Co-requisite:* 10.2112. *Excluded:* 1.9322, 1.982.

Special theory of relativity: time dilation, length contraction, simultaneity, Lorentz transformations, energy and mass. Photon properties, de Broglie relations, Uncertainty principle, operators in quantum mechanics, postulates of quantum mechanics, potential wells, steps and barriers, harmonic oscillator, H atom, angular momentum, magnetic moment, electron spin, nuclear spin. Atomic and molecular spectra, lasers, quantum statistics,

free electron model of a metal, band theory; nuclear size, density, mass; nuclear models, fission and fusion, nuclear forces.

### 1.032 Laboratory

F T3

*Prerequisites:* 1.001 or 1.011, 10.001. *Excluded:* 1.9222.

Alternating current circuits, complex impedance, resonance, mutual inductance, introductory electronics, diode and characteristics and circuits, power supplies, transistor characteristics, single stage and coupled amplifiers, experiments using AC circuits. Experimental investigations in a choice of areas including radioactivity, spectroscopy, properties of materials, Hall effect, nuclear magnetic resonance, photography, vacuum systems.

### 1.0522 Methods in Mathematical Physics S1 L1½T½

*Prerequisites:* 1.001, and 10.001 or 10.011. *Co-requisites:* 10.2111 or 10.2211 and 10.2112 or 10.2212.

Not offered in 1987.

Differential and integral equations in physics. Fourier series and transform. Distributions (statistics, quantum mechanics). Legendre and Laguerre polynomials (hydrogen atom). Orthogonal functions. Integral equations, infinite matrices. Potential equation, Green's Theorem and functions. Waves, group velocity.

### 1.062 Computer Applications in Experimental Science 2 S1 L2T3

*Prerequisite:* 1.061 *Excluded:* 1.042.

Interface between computer and experiment, programmed and interrupt interaction, direct and dual port memory access concepts, hardware, software and timing restraints. Real-world variables, transducers and conversion to binary representation, converters and counters, signals and noise. Data collection, reduction and storage as digital matrices. Numerical modelling, analysis and elementary control of a system.

### 1.9222 Electronics S1 L1T2

*Prerequisites:* 1.001 or 1.002 or 1.021. *Excluded:* 1.032.

The application of electronics to other disciplines. Includes: principles of circuit theory and analogue computing; amplifiers, their specification and application, transducers; electronic instrumentation; industrial data acquisition.

### 1.9322 Introduction to Solids S2 L2T1

*Prerequisites:* 1.001 or 1.011 or 1.021. *Excluded:* 1.022, 4.402, 4.412.

Introductory quantum mechanics and atomic physics; crystal structure; point and line defects, introductory band theory; conductors, semi-conductor and insulators; energy level diagrams.

### 1.9422 Introduction to Physics of Measurement S1 L1½T1½

*Prerequisites:* 1.001 or 1.011. *Excluded:* 1.042.

Resolution: accuracy and sensitivity of instruments, errors of observation; experimental design; transducers; thermometry; electrical noise; servo systems, mechanical design of apparatus; optical instruments optical fibres; photometry; calorimetry;

analogue to digital conversion and digital instruments; measurement of very large and very small quantities.

## Physics Level III Units

### 1.0133 Quantum Mechanics S1 L1½T½

*Prerequisites:* 1.022, 10.2112. *Excluded:* 2.023A, 10.222F.

Revision of basic concepts, harmonic oscillator systems, spherically symmetric systems, angular momentum, H atom, first-order perturbation theory, identical particles, Exclusion Principle, atomic structure, spin-orbit coupling, Helium atom, introductory quantum theory of molecules.

### 1.0143 Nuclear Physics S2 L1½T½

*Co-requisite:* 1.0133.

Nuclear shell model; theory of beta decay; the deuteron, nucleon-nucleon scattering; theories of nuclear reactions, resonances; mesons and strange particles, elementary particle properties and interactions; symmetries and quark models; strong and weak interactions.

### 1.023 Statistical Mechanics and Solid State Physics S1 L3T1

*Prerequisites:* 1.012, 1.022, 10.2112.

Canonical distribution, paramagnetism, Einstein solid, ideal gas, equipartition, grand canonical ensemble, chemical potential, phase equilibria, Fermi and Bose statistics, Bose condensation, blackbody radiation. Crystal structure, bonding, lattice dynamics, phonons, free-electron models of metals, band theory, point defects, dislocations.

### 1.0333 Electromagnetism S1 L1½T½

*Prerequisites:* 1.012, 10.2111, 10.2112. *Excluded:* 10.222C.

Electromagnetic fields; Maxwell's equations, Poynting theorem, electromagnetic potentials, electromagnetic waves. Reflection and transmission, Fresnel equations, waveguides, radiation fields, dipoles and antenna theory.

### 1.0343 Advanced Optics S2 L1½T½

*Co-requisite:* 1.002.

Fresnel and Fraunhofer diffraction, Fourier transforms, filtering, coherence length and time, stellar interferometers, laser theory, non-linear optics.

### 1.043 Experimental Physics A F T4

*Prerequisite:* 1.032.

Basic experimental techniques and analysis of results in the following areas: electricity, magnetism, diffraction optics (including X-ray and electron diffraction, solid state physics, nuclear physics, atomic physics and spectroscopy, vacuum systems).

### 1.0533 Experimental Physics B1 S1 T4

*Prerequisite:* 1.032.

Selected experiments and projects. Advanced experimental techniques and open ended projects in the areas covered in

**1.043 Experimental Physics A** together with projects involving electron and nuclear magnetic resonances, low temperature physics and super-conductivity. Fourier optics, holography.

**1.0543 Experimental Physics B2 S2 T4**

*Prerequisite:* 1.032.

As for 1.0533 Experimental Physics B1.

**1.1133 Advanced Quantum Mechanics S2 L1½T ½**

*Co-requisite:* 1.1033. *Excluded:* 2.023A, 10.222F.

Formal structure, matrix formalism, relativistic quantum mechanics, spin, scattering theory, Born approximation, phase shifts, many particle systems, occupation number formalism.

**1.133 Electronics S1 L2T4**

*Prerequisites:* 1.9222 or 1.032.

Review of AC theory. Transistors. Operational amplifiers. Voltage regulators, constant current sources, switching power supplies. Field effect transistors, noise and drift. Digital electronics. Frequency dependent networks, active and passive filters, digital filters, oscillators. Communication and storage of information. Analogue-digital conversion. Transducers.

**1.1433 Biophysics S1 L2T1**

*Prerequisites:* 1.012, 1.022.

Thermodynamics in biology, electrochemical potentials, Donnan equilibrium, irreversible processes, diffusion and applications to biological systems. Membrane potentials. Nernst potential, Goldman and Nernst-Planck equation, generalized approach. Active transport. Membrane structure. The nerve impulse, activation and inactivation, Hodgkin and Huxley equations. Muscle, contractile process, thermodynamics. Ecological ensemble theory, global thermodynamics interaction of species, ecological associations.

**1.1533 Biophysical Techniques S2 L2T1**

*Prerequisites:* 1.012, 1.022, 1.032.

Theory and application of physical techniques of relevance to the study of biological systems. Techniques considered may include optical and electron microscopy X-ray and neutron diffraction, magnetic resonance, lasers, light scattering, calorimetry, fluorescence, electrochemical techniques and electrophysiological methods and dielectric measurements.

**1.1633 Astrophysics S2 L1½T½**

*Prerequisites:* 1.022.

Stellar radiation, spectra classification. Hertzsprung-Russell diagrams, determination of stellar masses and radii. Equations of stellar structure, energy sources in stars, nuclear reaction cycles energy transport, equations of state, degeneracy, opacity. Properties of main sequence stars, stellar evolution, structure of red giants and white dwarfs. The solar atmosphere.

**1.3033 Mechanical Properties of Materials**

**S1 L1½T½**

*Co-requisite:* 1.023. *Excluded:* 4.403.

Properties of materials in relation to their structure: atomic and molecular structure of solids; elasticity, inelasticity, long-range (rubber) elasticity, viscoelasticity; plasticity; brittle fracture; viscosity and surface tension of liquids; adhesion; friction and lubrication.

**1.3133 Physics of Solid State Devices S2 L1½T½**

*Prerequisite:* 1.023.

Review of electronic structure in semiconductors; p-n junctions; bipolar and field effect transistors including formation, characteristics and electrical breakdown. Optical devices including light emitting diodes and junction lasers. Integrated circuit structures.

**1.3143 Topics in Condensed Matter Physics S2 L1½T½**

*Prerequisite:* 1.023.

Superconductivity, Meissner-Ochsenfeld effect, entropy, thermodynamics and relevant theories, Josephson junctions. Amorphous materials, preparation, magnetic properties, bandgaps, dangling bonds and ESR, mobility edge, solar cells. Polymers, structure, bonding, relaxation phenomena, electrical breakdown, liquid crystals.

**1.3533 Marine Acoustics S2 L1½T½**

Wave theory: general wave equation for fluids, viscoelastic media and solids. Travelling and standing wave solutions. Wave guides: fluid and solid wave guides, ray and mode theories. Sound transmission in the ocean and application of reflection and refraction theory, scattering and diffraction effects.

**1.5133 Classical Mechanics and Field Theory S1 L1½T½**

*Prerequisites:* 1.002 or 10.411B, 10.1113, 10.2111, 10.2112.

Lagrange's equations and applications, variational principles, Hamiltonian formulation, canonical transformations, Poisson brackets, Hamilton-Jacobi equation, continuous systems and fields.

**1.5233 Electrodynamics S2 L1½T½**

*Prerequisites:* 1.022, 10.1113, 10.2111, 10.2112. *Co-requisite:* 1.0333. *Excluded:* 10.222C.

Special relativity, covariant formulation of electrodynamics, stress tensor, radiation from moving charges, Lienard-Wiechert potentials, synchrotron radiation, bremsstrahlung, electro-magnetic mass, radiative damping, multipole expansion for fields, scattering.

**1.5333 Radiation and Matter S2 L1½T½**

*Prerequisites:* 1.012, 1.022, 10.2111, 10.2112. *Co-requisites:* 1.0133 or 10.222F or 2.023A; 1.0333 or 10.222C.

The interaction of electromagnetic radiation with matter. Black-body radiation; Einstein coefficients. Dipole radiation; shape and



broadening of spectral lines. Quantum mechanical transition probabilities. Propagation and dispersion of radiation. Scattering theory. Radiative transfer.

### 1.5433 Plasmas and Laser Fusion

**S1 L1½T½**

*Prerequisites:* 1.012, 1.022.

Microscopic and macroscopic descriptions of plasma, electromagnetic waves in plasma, stress tensor, ponderomotive force, laser-plasma interactions, momentum transfer and instabilities, non-linear force, self-focussing mechanisms, laser induced nuclear fusion, theoretical and experimental progress and prospects.

### 1.5533 General Relativity

**S2 L1½T½**

*Prerequisites:* 1.012, 1.022, 10.1113, 10.2111, 10.2112. *Excluded:* 1.523.

Relativistic kinematics and dynamics, tensors and tensor operations, Christoffel symbols, formulation of general relativity, curvature of space, geodesics, gravitational field equations, Schwarzschild solution, tests of the theory, astrophysical and cosmological implications.

### 1.713 Advanced Laser and Optical Applications

**F L1½T½**

*Co-requisite:* 1.002. *See also Table 1.*

Laser operation, characteristics, theory, design of such types as gas, ion, molecular, excimer and dye lasers. Filter design, multiple beam interference, etalon use, dielectric mirror design. Modulators, theory and application, electro and acousto optic phenomena. Detectors, types, basic theory and design. Solid state and vacuum tube systems. Non-linear optics, theory and applications. A design study and case history of a typical optical system. Materials processing fundamentals. Laser safety.

### 1.763 Laser and Optical Technology Laboratory 1

**F L½T3½**

*Prerequisite:* 1.032. *See also Table 1.*

Aims to make students conversant with the techniques employed in advanced laser technology and to become familiar with the various components used in such applications. Includes: a study of advanced optical techniques including the construction, operation and characterization of various types of laser; preparation and investigation of optical, electro-optical and other related devices in terms of their basic behaviour and with respect to applications in complex optical systems; a small lecture content on a variety of topics to laser applications and including safety aspects.

### 1.773 Laser and Optical Technology Laboratory 2

**F T4**

*Co-requisite:* 1.763. *See also Table 1.*

This laboratory unit extends the work of the 1.763 unit in providing further experience with advanced optical systems. Students visit external establishments where lasers are being used for commercial purposes and are involved with experimental tasks related to these high technology applications. Session 2, each student is required to complete a design study and assembly

of an advanced optical system selected to answer a specific problem appropriate to the subject.

## Physics Level IV Subjects

All Physics honours subjects consist of lecture topics and project work. Some of the lecture topics of which quantum mechanics, statistical mechanics and solid state physics are examples, are taken by all students. Other topics which are considered particularly relevant to the type of honours chosen are also prescribed. The actual list of topics in this second category varies from time to time and is partly influenced by student numbers and interest. Examples of such topics are given below under each honours subject heading. The project work forms a very significant part of each unit. Usually two projects are undertaken during the year of study.

Students whose academic records are satisfactory are invited to enrol in the honours year. Full details of lecture topics and projects are then supplied. The approval of the Head of School is required for each program of study.

### 1.104 Physics 4 (Honours)

Examples of specific lecture topics which may be offered include: astronomy, additional topics in solid state physics, lasers, biophysics.

### 1.304 Applied Physics (Honours)

Examples of specific lecture topics which may be offered include: physical principles of instrumentation, applied solid state physics, physics of materials.

### 1.504 Theoretical Physics 4 (Honours)

Examples of specific lecture topics which may be offered include: quantum theory of solids, plasma theory, quantum electrodynamics.

### 1.604 Biophysics 4 (Honours)

Biophysics, statistical mechanics and solid state physics are examples of prescribed topics. Additional lecture topics may be selected from those on offer in other Physics honours units and from Biochemistry and Physiology.

## Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subject see the Faculty of Arts Handbook.

### 1.901 Astronomy

**S1 or S2 L2T2**

Involves an overview of Astronomy, from the solar system to the galaxies. Includes an exploration of the solar system, to indicate the advances that have been made, particularly and most recently with space probes, in our understanding of planetary systems. The characteristics of stars discussed along with their use in establishing an understanding of stellar evolution. The treatment of galaxies includes consideration of the nature of our

galaxy and its relation to other external systems, concluding with a brief discussion of aspects of observational cosmology. Discussion of such recent topics as black holes, pulsars, quasars.

For further information regarding the following subject see the Faculty of Architecture Handbook.

**1.931 Physics 1 (Building) S2 L4T2**

*4 credit points; compulsory. Prerequisites: nil.*

Mechanics of solids; kinematics. Newton's Law of motion, work and energy. Atomistic description of mechanical properties of matter. Atomic structure of matter. Elasticity. Plasticity: dislocations, fracture, viscosity. Electrostatics, electromagnetism and DC circuits: Coulomb's Law. Electric field. Electric potential. Capacitance. Electrical energy sources. Conductors. Resistivity. Atomic view of conduction. EMF. Kirchoff's Laws. Magnetic induction. Torque on a coil in magnetic field. Moving coil meter. Wheatstone's bridge. Potentiometer. Faraday's Law. Transient circuits.

Wave motion, heat light and sound: simple harmonic motion. Wave motion. Interference. Doppler effect. Energy transfer. Heat, heat capacity. Joule's equivalent. Thermometry. Convection. Conduction. Radiation. Black body. Emission. Absorption. Light. Electro-magnetic spectrum. Huygens' Principle. Curved mirrors. Lenses. Dispersion. Interference. Polarization. Photometry. Colorimetry Sound. Longitudinal waves. Overtones. Intensity levels. Decibels. Quality of sound.

For further information regarding the following subjects see the Faculty of Engineering Handbook.

**1.951 Physics 1 (Mechanical Engineering) F L2Ts**

*Prerequisites: As for 1.001 Physics 1.*

For students in the School of Mechanical and Industrial Engineering.

Physical properties of solids, liquids and gases: microscopic theory of elasticity, friction, fracture in solids, viscosity in liquids and kinetic theory of gases. Dynamics of solids and fluids: Newton's laws, energy conservation, fluid mechanics. Compressional waves: acoustics. Thermostatic properties of matter: concepts of thermodynamics, thermal properties of liquids and solids. Electric fields and currents: electrostatics, direct-current circuits. Electromagnetism: magnetic forces and fields, electromagnetic induction. Non-steady electric currents, transients in RC, LR and LC circuits, alternating-current circuits. Optics: geometric optics, optional instruments, interference and diffraction, polarization.

**1.961 Physics 1 (Electrical Engineering) F L3T3**

*Prerequisite: As for 1.001 Physics 1.*

For students in the School of Electrical Engineering.

Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, electromagnetic induction, transient currents. Vectors motion in one dimension, motion in a plane, particle dynamics, work and energy, the conservation of energy, conservation of linear momentum, collisions, rotational kinematics, rotational dynamics, simple harmonic motion, gravitation. Temperature, heat and

the first law of thermodynamics, kinetic theory of gases. Waves in elastic media, sound waves, geometrical optics, interference, diffraction, gratings and spectra, polarization.

**1.971 Physics 1 (Surveying) F L3T3**

*Prerequisite: As for 1.001. Physics 1.*

For students in the School of Surveying.

Aims and nature of physics, linear and rotational mechanics, hydrostatics, elasticity, gravitation, temperature, electricity and magnetism, wave motion, optical instruments, interference and diffraction, lasers and atomic clocks. The importance in surveying of precise frequency, time, speed and distance measurements.

**1.981 Physics 1 (Civil Engineering) S1 L2T2 and S2 L2T1**

*Prerequisite: As for 1.001 Physics 1.*

For students in the School of Civil Engineering.

Aims of physics and its relation to civil engineering. Mechanical concepts, properties of matter, atomic structure, elasticity, plasticity, fracture of solids; surface tension and viscosity of fluids, electrical and magnetic forces, electromagnetism, DC and AC circuits, digital electronics. Simple harmonic motion and its relation to wave motion. Acoustic and mechanical waves, attenuation, velocity of propagation. Elastic moduli. Non-destructive testing, instrumentation, techniques and theory. Emphasis on the physics involved in non-destructive testing and the aspects of vibration important to civil engineering.

**1.962 Physics of Measurement (Surveying) S1 L1T2**

*Prerequisite: 1.971.*

For students in the School of Surveying.

Resolution, accuracy and sensitivity of instruments. Errors of observation and their treatment. Experimental design. Displacement transducers. Transducers for other mechanical quantities. Thermometry. Electrical noise. Dynamic response of measuring systems. Servo-systems. Mechanical design of apparatus. Microscopes, telescopes and other optical instruments. Lenses, optical fibres and other optical components. Photometry. Colorimetry. Measurements under adverse ambient conditions. Analogue-to-digital conversion. Digital instruments. Measurements of very large and very small quantities.

**1.972 Electromagnetism (Electrical Engineering) S1 or S2 L2T2**

*Prerequisite: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112. Excluded: 1.012.*

Electrostatics in vacuum, electrostatics in dielectrics, electric currents, magnetostatics in vacuum, magnetic scalar potential, magnetostatics in magnetic media, time varying fields, Maxwell's equations.

**1.982 Solid State Physics (Electrical Engineering) S1 or S2 L2½T2**

*Prerequisite: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.211, 10.2112. Excluded: 1.022, 1.9322.*

The concepts of waves and particles, introductory quantum mechanics, atomic structure, optical spectra and atomic struc-

ture, structural properties of solids, band theory and its applications, uniform electronic semiconductors in equilibrium, excess carriers in semiconductors.

### 1.992 Mechanics and Thermal Physics (Electrical Engineering)

**F L1½T½**

*Prerequisite:* 1.961, 10.001 or 10.011. *Co-requisites:* 10.2111. *Excluded:* 1.002, 1.012.

Particle mechanics, harmonic motion, central force problems, systems of particles, Lagrange's equations with applications, coupled oscillations, wave equation. Thermodynamic laws, entropy, kinetic theory, M-B distribution, microscopic processes, Maxwell's relations, chemical potential, phase diagrams, multicomponent systems, electrochemical potential, statistics of defects in solids.

## Chemistry

### Chemistry Level I Units

#### 2.111 Introductory Chemistry

**S1 L2T4**

*Prerequisite:* Nil.

**Note:** Students who have passed 2.121 or 2.131 may not enrol in 2.111 or 2.141. Students meeting the 2.121 or 2.141 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Students who enrol in 2.111 must pass 2.111 before they can proceed to 2.121 or 2.131 or 2.141.

Classification of matter and the language of chemistry. The gas laws and the ideal gas equation, gas mixtures and partial pressure. The structure of atoms, cations and anions, chemical bonding, properties of ionic and covalent compounds. The periodic classification of elements, oxides, hydrides, halides and selected elements. Acids, bases, salts, neutralization. Stoichiometry, the mole concept. Electron transfer reactions. Qualitative treatment of reversibility and chemical equilibrium, the pH scale. Introduction to the diversity of carbon compounds.

#### 2.121 Chemistry 1A

**S1 or S2 L2T4**

*Prerequisites:*

	HSC Exam Score Range Required
2 unit Mathematics* or	67-100
3 unit Mathematics or	1-50
4 unit Mathematics	1-100
and	
2 unit Science (Physics) or	53-100
2 unit Science (Chemistry) or	53-100
4 unit Science or	1-50
3 unit Science or	90-150
2.111	

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Stoichiometry and solution stoichiometry. Properties of gases; kinetic molecular theory. Thermochemistry. Atomic structure, electron configurations and the periodic table. Types of chemical bonds, electronegativity, molecular geometry. Periodicity of physical and chemical properties of common representative elements and compounds. Liquids and solids, changes of state, phase diagrams. Types of solids. Solutions and their properties. Colloids. Facts and theories about reaction kinetics.

**Note:** Students who have passed 2.121 or 2.131 may not enrol in 2.111 or 2.141. Students meeting the 2.121 or 2.141 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Students who enrol in 2.111 must pass 2.111 before they can proceed to 2.121 or 2.131 or 2.141.

#### 2.131 Chemistry 1B

**S1 or S2 L2T4**

*Prerequisite:* 2.121.

Chemical equilibrium, equilibrium constants, quantitative calculations applied to acid-base and solubility equilibria; buffers, titrations, chemical analysis. Oxidation and reduction reactions, electrode potentials. Chemical thermodynamics, entropy, free energy. Chemistry of carbon compounds, stereoisomerism; alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives, amines.

**Note:** Students who have passed 2.111 may be permitted to enrol in 2.131 on application to the Head of the School of Chemistry.

#### 2.141 Chemistry 1M

**F L2T4**

*Prerequisites:*

	HSC Exam Score Range Required
2 unit Mathematics*	67-100
3 unit Mathematics	1-50
4 unit Mathematics	1-100
and	
2 unit Science (Chemistry) or	60-100
4 unit Science or	1-50
3 unit Science	90-150
or	
2.111	

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

**Note:** As for **Note** 2.121 Chemistry 1A.

The syllabus is an integrated one of 2.121 and 2.131 (see above). Students majoring in Chemistry may take 2.141 in lieu of 2.121 and 2.131.

### Chemistry Level II Units

#### 2.102A Physical Chemistry

**S1 or S2 L3T3**

*Prerequisites:* 2.121 and 2.131, or 2.141, and 10.011 or 10.001 or 10.021B and 10.021C. *Excluded* 2.002A.

Thermodynamics: first, second and third laws of thermodynamics; statistical mechanical treatment of thermodynamic

properties; applications of thermodynamics: chemical equilibria, phase equilibria, solutions of nonelectrolytes and electrolytes, electrochemical cells. Kinetics: order and molecularity; effect of temperature on reaction rates: elementary reaction rate theory. Surface chemistry and colloids: adsorption, properties of dispersions; macromolecules and association colloids.

## 2.102B Organic Chemistry F or S2 L3T3

*Prerequisite:* 2.131 or 2.141. *Excluded:* 2.002B

Discussion of the major types of organic reaction mechanisms (eg addition, substitution, elimination, free-radical, molecular rearrangement) within context of important functional groups (eg aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, halides, organometallic compounds, alcohols, phenols, aldehydes, ketones, ethers, carboxylic acids and their derivatives, nitro compounds, amines and sulfonic acids). Introduction to application of spectroscopic methods to structure determination.

## 2.102C Inorganic Chemistry and Structure S1 or S2 L3T3

*Prerequisites:* 2.121 and 2.131, or 2.141. *Excluded:* 2.042C.

Fundamentals of spectroscopy as experimental basis for theories of electronic structures of atoms and molecules. Concepts and consequences of quantum theory. Molecular orbitals. Ligand field theory, magnetochemistry. Geometrical structure and chemical bonding, molecular and non-molecular structures, molecular symmetry, ionic covalent and metallic bonds. Occurrence, preparation, properties and reactions of compounds of the *p*-block elements, of transition metals and of post-transition metals. Principles of co-ordination chemistry. Thermodynamics applied to inorganic systems in solid and solution phases.

## 2.102D Chemical and Spectroscopic Analysis S1 or S2 L3T3

*Prerequisites:* 2.121 and 2.131, or 2.141; and 10.011 or 10.001 or 10.021B and 10.021C. *Excluded:* 2.002D and 2.003H.

General procedures in analytical science, accuracy, propagation of errors, precision. Analytical reaction chemistry, titrimetric, and gravimetric, analysis. Solvent extraction. Electroanalytical methods. Chromatography. Instrumental aspects of all major spectroscopic methods. Optical spectroscopy, nuclear magnetic and electron spin resonances, mass spectrometry. Sample handling.

## Chemistry Level III Core Units

### 2.103A Physical Chemistry S1 L3T3

*Prerequisites:* 1.001, 2.102A and 2.102C. *Excluded:* 2.013A.

*States of matter:* gases, liquids, solutions and solids. Equations of state. Intermolecular forces and condensed phases. Gas kinetic theory and distribution of molecular energy. Statistical thermodynamics and prediction of properties of simple gases, liquids and solids. Structure and properties of liquids, solutions and solids. *Molecular energies and spectra.* Quantum properties of

radiation and molecules. Molecular vibration (harmonic and anharmonic). Infrared and Raman spectra of gases. Molecular rotation. Rotational structure in molecular spectra. Intensity distributions in molecular spectra. Applications of molecular spectroscopy.

### 2.103B Organic Chemistry S1 L3T3

*Prerequisite:* 2.102B. *Excluded:* 2.003B.

*Heterocyclic Chemistry:* synthesis and reactions of the following heteroaromatic systems; pyridine, quinoline, isoquinoline, pyrimidine, pyrrole, furan, thiophene, indole, imidazole; examples of naturally occurring alkaloids where relevant. *Alicyclic Chemistry:* stereochemistry of alicyclic systems; classical and non-classical strain in cyclic systems; stereochemistry and conformation of monocyclic and polycyclic compounds; synthesis, reactions and rearrangement of monocyclic compounds including stereochemical selectivity; transannular reactions in medium rings; synthesis and reactions of fused and bridged polycyclic systems; examples of steroids and terpenes where relevant. *Structure Determination:* application of spectroscopic methods (eg nuclear magnetic resonance, mass spectroscopy) to determination of organic structures.

### 2.103C Inorganic Chemistry S1 L2T4

*Prerequisite:* 2.102C. *Excluded:* 2.003C.

*Transition metal chemistry:* bonding theory; energies and population of *d*-orbitals and their correlations with stereochemistry, thermodynamic properties, spin states; theory and applications of magnetism; theory and applications of electronic spectra; stabilities of metal complexes; stabilisation of oxidation states; metal carbonyls; descriptive chemistry of transition metals; special characteristics of second and third transition series metals; *Lanthanide elements:* lanthanide contraction and its consequences: electronic configurations and oxidation states; spectral and magnetic properties; stabilities of complexes; separation. *p-block elements:* the inert pair effect; bonding, structure, and reactivity of representative compounds; halogen chemistry.

### 2.103D Analytical Chemistry S1 L2T4

*Prerequisite:* 2.102D. *Excluded:* 2.003D.

Instrument design, theory and operating principles for the following instrumental areas: electrochemical, atomic and molecular spectroscopy, chromatography, mass spectrometry, automated analysis, thermal analysis.

## Chemistry Level III Elective Units

### 2.113A Kinetics and Mechanism of Chemical Change S2 L3T3

*Prerequisite:* 2.103A. *Excluded:* 2.053A.

Molecular collision dynamics, reactions in molecular beams, energy disposal and equilibration in chemical reactions gas phase energy transfer. Mechanisms and kinetic applications of lasers. Theories of bimolecular and unimolecular gas reactions, potential energy surfaces. Free radical reactions, chain reactions, explosions, mechanisms in pyrolysis and oxidation of hydrocarbons, polymerisation reactions, catalytic mechanisms.

Experimental methods for studying fast reactions. Reactions in solution: structure—reactivity relationships.

### 2.113B Synthetic Organic Chemistry S2 L2T4

*Prerequisite:* 2.103B. *Excluded:* 2.013B.

*Synthetic methods.* Modern functional group transformations with particular reference to positional and stereochemical control; organometallic and carbonionic reagents. *Pericyclic reactions and photochemistry.* Electrocyclic sigmatropic reactions, Diels-Alder and related cycloadditions. Woodward-Hoffman rules, ring formation and cleavage. *Synthetic strategy.* Principles of planning or organic synthesis; disconnection approach to representative syntheses of compounds of theoretical and biological interest; use of protecting groups.

### 2.113C Advanced Inorganic Chemistry S2 L2T4

*Prerequisites:* 2.102C. *Co-requisite:* 2.103C. *Excluded:* 2.013C.

*Spectroscopy and magnetism of transition metal compounds;* applications of infrared, electronic and Moessbauer spectra; magnetic properties of polynuclear complexes. *Pericyclic reactions and photochemistry.* Electrocyclic sigmatropic reactions, Diels-Alder and related cycloadditions. Woodward-Hoffman rules, ring formation and cleavage. *Synthetic strategy.* Principles of planning or organic synthesis; disconnection approach to representative syntheses of compounds of theoretical and biological interest; use of protecting groups.

### 2.113D Advanced Instrument Analysis S2 L2T4

*Prerequisite:* 2.102D. *Co-requisite:* 2.103D. *Excluded:* 2.013D.

Advanced approaches to problem solving in analytical science using modern instrumental techniques and microcomputers for the analysis of complex organic, biological, inorganic and environmental materials. Sample selection procedures; extraction and recovery of major, minor, trace and ultra-trace constituents; origins, identification and elimination of interference effects. Selection and optimisation of instrumental parameters; theory of separation strategies for identification and quantitative determinations. Networking of computer-controlled workstations for laboratory automation and management.

### 2.113E Nuclear and Radiation Chemistry S2 L2T4

*Prerequisite:* 2.102A or 2.102B or 2.102C or 2.102D. *Excluded:* 2.003E.

Radioactivity, isotopes, fundamental atomic particles, nuclear structure and properties. Properties of nuclear radiations, their interaction with matter and their detection and measurement. Nuclear instrumentation. Factors to be considered when making radioactive measurements. Radioactive decay equation, half-life and radioactive equilibrium situations. Nuclear reactions initiated by neutrons. Effect of nuclear radiation on matter, ionisation, free radical formation, effect on living cells, contamination and radiation hazards, factors affecting radiotoxicity, shielding and inverse square law calculations. Applications of isotopes as tracers and radiation sources factors associated with selection and application. Radioactive dating methods. The chemistry of the reactor fuel cycle.

### 2.123A Biophysical and Interfacial Chemistry S2 L3T3

*Prerequisite:* 2.102A. *Excluded:* 2.033A.

Interplay of interfacial, colloidal and macromolecular science. Physical properties of macromolecules. Determination of molecular size from gel permeation chromatography, diffusion, sedimentation, viscometry, osmometry and light scattering. *Spectroscopic properties:* circular dichroism, optical rotary dispersion and X-ray diffraction; conformation of macromolecules; Helix/random coil transitions. The use of modern spectroscopic techniques in surface chemistry including low energy electron diffraction, Auger electron, UV and X-ray photo-electron spectroscopy; electron energy loss, ion scattering and secondary ion emission at the gas/solid interface. Surface free energy and related thermodynamic concepts applied to the study of solutes at interfaces; wetting behaviour, capillarity, detergency, mineral flotation, micelles and bio-physical membranes. Adsorption and its significance in resulting biological and synthetic catalytic processes.

### 2.123B Biological Organic Chemistry S2 L2T4

*Prerequisite:* 2.103B. *Excluded:* 2.023B.

Interdisciplinary aspects of selected classes of organic compounds of biological significance. *Natural polymers:* Synthesis and properties of proteins, poly-saccharides, nucleic acids. *Pharmacological chemistry:* Discussion of structural and synthetic aspects of several selected drugs; structure-activity relationships, metabolism, methods of analysis. *Herbicides, fungicides, pesticides.* Synthesis, degradation and mode of action of selected compounds.

### 2.123E Environmental Chemistry S2 L3T3

*Prerequisites:* 2.102A and 2.102D. *Excluded:* 2.043A.

Physico-chemical aspects of the environment. Factors affecting the chemistry of rivers, estuaries, oceans, surface and sub-surface water. Photolysis reactions in the atmosphere, primary and secondary pollutants. Distribution of elements, nutrient elements, carbon and oxygen in ecological systems (chemical models of these cycles). Analysis of naturally occurring species and pollutants. Requirements, validation and performance monitoring of standard analytical procedures.

### 2.133B Applied Organic Chemistry S2 L2T4

*Prerequisite:* 2.102B. *Co-requisite:* 2.103B. *Excluded:* 2.003L.

Discussion at advanced level of the chemistry of selected commercially important groups of organic materials with emphasis on reaction mechanisms and model systems. *Polymerization processes and synthetic polymers:* Thermal and oxidative polymerization, treatment of initiators, chain transfer agents, retarders; sulfur-olefin reactions. *Pigments and dyestuffs:* Basis of colour in organic compounds, azo, carbonyl, cationic dyes, colour photography; synthetic and natural pigments, eg phthalocyanines, carotenes, flavones, anthocyanins; fluorescent whiteners. *Oxidation and reduction processes:* Oxidation of allylic compounds, phenols, sulfur compounds etc; catalytic dehydrogenation and hydrogenation; hydride and dissolving metal reductions.

## 2.1813 Quantum Chemistry and Symmetry

S2 L1½T1½

*Prerequisites:* 2.102C, and 10.111A or 10.031. *Excluded:* 2.023A.

Principles of quantum mechanics. Eigenvalue-eigenfunction problem and its representation by matrix algebra; approximate methods for quantum mechanical calculations. Molecular orbital theories (eg Huckel, *ab initio*; SCF) and properties derivable therefrom; choice of basis functions. Group theory. Symmetry operations. Reducible and irreducible representations; applications of character tables eg direct products, selection rules. Correlation diagrams for chemical reactions, and for bonding. Applications to vibrational spectroscopy.

## 2.1823 Computers in Chemistry

S2 L1T2

*Prerequisites:* 2.102A and 2.102D.

Computing techniques introduced through specific chemical applications; simple and complex equilibria, rate equations, analysis of multicomponent mixtures, instrumental calibration curves. Treatment of transient signals. Specific case studies selected from spectroscopy, chromatography, and electrochemistry. Chemical databases and the literature, spectroscopic databases.

## 2.1833 Molecular Structure Determination

S2 L1½T1½

*Prerequisites:* 2.102C and 2.102D.

The theory and practice of **1.** crystal structure determination by x-ray diffraction. **2.** multinuclear NMR spectroscopy, and **3.** mass spectrometry, in the determination of molecular structure. Experimental requirements and procedures; instrumentation. Interpretation of results; applications to contemporary chemical systems; examples from current research problems. Databases and computing. Evaluation of complementary information from these techniques about molecular structure, chemical bonding, and chemical reactivity.

## 2.1843 Organometallic Chemistry

S2 L1T2

*Prerequisites:* 2.102B and 2.102C. *Excluded:* 2.003M.

Preparation, structure and reactions of transition metal and main group organometallic compounds; metal vapour syntheses. Structure and bonding of ligands; ligand stabilisation and activation; novel effects of ligand bulk and geometry. Catalytic applications of organometallic compounds.

## Chemistry Level IV Unit

### 2.004 Chemistry Honours

An honours program consisting of selected series of lectures on advanced topics in Chemistry and a research project.

Students intending to seek admission to this program should consult the School re selection of units in the earlier years and apply to the Head of the School for consideration for admission at the end of Year 3 (or completion of requirements for the pass degree).

## Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subjects see the Faculty of Applied Science and Engineering Handbooks.

## 2.003J Fundamentals of Biological and Agricultural Chemistry

S1 L2T4

*Prerequisites:* 2.121 and 2.131, or 2.141. *Excluded:* 2.013L, 41.101.

Aspects of the chemical and physical properties of materials important in biological systems. Methods of separation, of purification and estimation, and correlations of structure with reactivity. Methods of separation and identification, such as gel permeation, discussed as appropriate to each topic. Significance of isomerism in biological systems, optical and geometrical, absolute configuration. Amino acids, peptides and introduction to protein structure. Relevant properties, acid/base properties, pK values, zwitterion, isoelectric points. Simple peptide synthesis. Treatment of carbohydrates, establishment of structures, reactivity. Chemistry of monosaccharides, disaccharides and polysaccharides. Methods of analysis, chemical and physicochemical. Fats, correlation of properties with saturated and unsaturated fatty acid composition. Structural chemistry of fatty acids. Reaction of unsaturated fatty acids, urea complexes. Detergents. Trace elements in biological systems. Chemistry of common heterocyclic systems with emphasis on molecules of biological importance.

## 2.043L Chemistry and Enzymology of Foods

F L2T4

*Prerequisite:* 2.102B. *Excluded:* 2.003J, 2.043L.

The chemistry of food constituents at an advanced level and the relationship between the chemistry and enzymology associated with the origin and handling of foodstuffs. Treatment of the stability of constituents, changes in colour and texture occurring during processing and storage. Methods of assessment, chemical and physical. General classification of constituents, role of free and combined water. Fixed oils and fats, rancidity of enzymic and autoxidative origin, antioxidants — natural and synthetic — theories on mechanisms of action, carbohydrates, reactivity, role in brewing processes, carbohydrate polymers, starch structure, enzymic susceptibility and mode of action, estimations, enzymic degradation and enzymic browning, reactions and stability of natural pigments, vitamins, preservatives.

## 2.030 Organic Chemistry

S1 L2T4

*Prerequisite:* 2.102B.

The spectroscopic identification of organic compounds, free radical chemistry and electro-organic processes, various aspects of the organic industrial processes such as industrial synthesis based on petrochemicals, and organometallic reactions of industrial interest. Selected topics from the dyestuff, pharmaceutical and agricultural industries discussing syntheses and reactions including degradation.

## 2.951 Chemistry 1ME

S1 L3T3

*Prerequisite:* As for 2.121.

A treatment of chemistry which illustrates the application of the principles of chemistry to problems of concern to mechanical engineers. Topics: chemistry of materials, thermochemistry, chemical kinetics and equilibrium, radioactivity and nuclear power, electrochemistry and corrosion of metals. Introduction to

organic chemistry, structure and properties of polymers, fuels and lubricants. Surface chemistry.

## 2.991 Chemistry 1CE

**S2 L3T3**

*Prerequisites:* As for 2.121.

Atomic and molecular structure and bonding. Chemical equilibrium. Rates of reactions. Thermochemistry. Ionic equilibria. Metals, electro-chemistry and corrosion. Colloids and clays. Colligative properties of solutions. Organic chemistry, polymers. Applications of chemical principles to engineering.

For further information regarding the following subject see the Faculty of Medicine Handbook.

## 81.002 Chemistry and Biochemistry for Medical Students

*Prerequisites:*

2 unit Science (Chemistry) or

4 unit Science or

3 unit Science

HSC Exam  
Score Range  
Required

53-100

1-50

90-150

Conjoint subject with the School of Biochemistry.

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# Materials Science and Engineering

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## 4.413 Physical Metallurgy 2A

**S1 L1 T1½**

*Prerequisite:* 4.412A.

Metallography of non-ferrous alloys. Structure/property relationships in non-ferrous alloys. Hardening mechanisms. Metallography and properties of copper, aluminium, nickel, magnesium, lead, tin and titanium base alloys.

**4.423**

## 4.433C Physical Metallurgy 2C

**S1 L2½T1½**

*Prerequisite:* 4.412A.

Theory of plasticity of metals. Introduction to dislocation theory and its application to mechanical properties of alloys. Strengthening mechanisms, creep, fracture, grain size dependence of strength. Introduction to generation of deformation and recrystallization textures. Measurements of age-hardening, activation energy of strain ageing.

**4.442**

## 4.443 Physical Metallurgy 2D

**S2 L2T2**

*Prerequisite:* 4.432.

Diffusion in the solid state, Kirkendall effect, mechanisms. Fick's laws, solutions. Grain boundary, surface and dislocation pipe diffusion. Precipitation, nucleation and growth of isolated precipitates. Co-operative precipitation, pearlite, discontinuous precipitation. Proposed laws governing growth rates, maximum velocity, maximum rate of entropy production. Hardenability. Effect of alloying elements on pearlite growth rates. Grossman and Jominy tests, calculation of depth of hardening. Development of stresses during quenching, retained stress, distortion, quench cracking.

## 4.453 Physical Metallurgy 2E

**S2 L1T1½**

*Prerequisite:* 4.432.

Alloy steels. Ternary equilibria involving iron and carbon. Metallography and properties of alloy steels. Effect of alloying elements on austenite formation and decomposition under equilibrium and non-equilibrium conditions. Heat treatment of alloy steels. Metallography and properties of alloy cast irons.

## 4.633 Metallurgical Engineering 2C

**F L2T1½**

*Prerequisites:* 10.001 or 10.011.

Mathematical methods. **1.** 10.301 Statistics SA (see Engineering Handbook) **2.** Numerical methods. Finite difference and finite element techniques and their application to metallurgical phenomena involving diffusional transport, elasticity and plasticity.

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# Mechanical and Industrial Engineering

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**5.006**

**5.0011 Engineering Mechanics 1**

**S1 or S2 L2T2**

**5.300**

*Prerequisite:*

*HSC Score*

*Either*

2 unit Science (Physics) or 53-100

3 unit Science or 90-150

4 unit Science (multistrand) 1-50

*or*

2 unit Industrial Arts

(Engineering Science) or 53-100

3 unit Industrial Arts

(Engineering Science) 1-50

*Excluded:* 5.010, 5.0101, 5.0201.

**Note:** Students who wish to enrol in this subject in courses other than the full-time courses in Aeronautical Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture can make up for the lack of the prerequisite by work taken in Physics in the first half of the first year.

Equilibrium. Friction. Systems of multforce members, co-planar and three-dimensional. Mass centre; centroid. Fluid statics. Plane particle kinematics: rectilinear, curvilinear and relative motion. Plane particle kinetics: equations of motion; work, power, energy; impulse, momentum, impact.

**5.0012 Introductory Engineering Design and Materials Science**

**S1 or S2 L2 T0**

*Excluded:* 5.0016, 5.010.

*Introduction to engineering design:* Engineering method, problem identification, creative thinking, mathematical modelling; computer-aided design; materials and processes; communication of ideas; the place of engineering in society.

*Introduction to materials science:* Structure and properties of main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

**5.0201**

**5.030**

**5.0721 Computing**

**S1 or S2 L2T1**

*Co-requisite:* 10.001 or 10.011.

Introduction to digital computing equipment. Flow charting. Expressions. Conditions. Input and output. Program testing. Text editing. Programming language used is Fortran 77.

**5.421 Mechanics of Solids 1**

**S1 or S2 L2T1**

*Co-requisite:* 5.010 or 5.0011.

Stress and strain. Bars under axial loading. Stresses and deformation due to bending. Strain energy. Flexibility and stiffness. Stress and deformation due to torsion. Helical springs.

**5.4220 Mechanics of Solids 2**

**½S1S2L1½T2**

*Prerequisites:* 5.421 or 8.171, 10.001 or 10.011. *Excluded:* 5.422, 5.4221.

Statics of frames and machines. Unsymmetrical bending. Analysis of stress; analysis of strain; generalized Hooke's Law. Thin-walled pressure vessels. Combined loads. Theories of failure. Stress concentrations and fatigue. Shear stress in beams; shear centre. Stability and buckling of columns.

**5.4221 Mechanics of Solids 2**

**F L1½T2**

Intended for Materials Science Majors in combined BE BSc degree course.

*Prerequisites:* 5.421 or 8.171, 10.001 or 10.011. *Excluded:* 5.422, 5.4220, 5.4222.

Mechanical properties of materials: tensile and compressive behaviour; hardness; testing machines. Statics of frames and machines. Unsymmetrical bending. Analysis of stress; analysis of strain; generalized Hooke's Law. Thin-walled pressure vessels. Combined loads. Theories of failure. Stress concentrations and fatigue. Fatigue of biaxial and triaxial systems. Shear stress in beams; shear centre. Stability and buckling of columns.

**5.620 Fluid Mechanics 1**

**F L1T1**

*Prerequisites:* 1.001 or 1.951, 5.010, 10.001 or 10.011. *Co-requisite:* 5.300. *Excluded:* 5.622.

Units. Fluid properties; fluid statics. Flow fields; unsteady and compressible flow. Bernoulli's equation. Momentum equations. Ideal flow. Flow measurement. Dimensional analysis: similitude; dimensionless numbers; methods of analysis. Steady one dimensional flow in ducts: laminar and turbulent; pressure loss; friction factor; losses in bends and fittings. Elementary boundary layer flow; skin friction and drag. Pumps and turbines.

**5.621G Gasdynamics 1**

**C2**

*Excluded:* 5.653, 5.811.

One dimensional steady flow: isentropic channel flow, normal shock waves, supersonic wind tunnels and diffusers. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles, airfoils. One dimensional unsteady flow: moving waves, reflections, explosions in ducts, shock tubes; method of characteristics, internal flows, piston and valve effects.



## Electrical Engineering and Computer Science

### 6.010 Electrical Engineering 1 S2 L3T3

*Prerequisite:* Electricity and magnetism section of 1.961.

Passive electrical components. Electric circuit concepts and relationship to field theory. Kirchhoff's laws. Node and mesh analysis of resistive networks. Network theorems. Controlled sources. Transient conditions. Sources of periodic signals. Sinusoidal steady state operation. Concepts of impedance, resonance, bandwidth and filtering. Power in DC and AC circuits. Circuit models of diodes and transistors. Transistor switching. Combinational logic principles and circuits. Diode and transistor logic implementations. Sequential logic circuit elements: monostable, bistable and astable circuits.

### 6.021A Circuit Theory 1 S1 or S2 L2T2

*Prerequisites:* 1.961 or equivalent, 6.010, 10.001.

Lumped modelling concepts used in circuit theory and their relationship to observed physical properties and behaviour. Linear circuit elements. Kirchhoff's laws. Resistive network topology and systematic derivation of network equations using node and loop methods. Network theorems. Exponentials and first order transients. Sinusoidal steady state operation including phasors, impedance and admittance concepts and systematic circuit equations. Power relations and second order systems response. Resonance, Q factor and bandwidth. Three phase circuits. Controlled sources and two port analysis.

### 6.021C Electronics 1 S1 or S2 L2T2

*Prerequisite:* 1.982, 6.021A (one of these to be passed, the other to be attempted at an acceptable level and to be repeated concurrently).

Principles of operation and low-frequency characteristics of PN diodes, bipolar and field effect transistors, thyristors and various optoelectronic devices. Transistor low-frequency small-signal equivalent circuits. Design and analysis of low frequency Class A transistor amplifiers. Temperature effects. Device ratings and use of data sheets.

### 6.606 Computing Science Honours

### 6.611 Computing 1 S1 or S2 L3T3

*Prerequisite:* As for 10.001. *Co-requisite:* 10.001 or 10.001 or 10.011. *Excluded:* 6.600, 6.620.

Introduction to programming: design and correctness of algorithms and data structures; programming in a high-level algorithmic language which provides simple, high level program control and data structuring facilities. Problem solving: basic ideas of problem solving; introduction to abstract structures used for computing solutions to problems. Introduction to propositional logic, computing machinery, computer arithmetic, artificial intelligence, and operating systems.

### 6.613 Computer Organization and Design SS L3T2

*Prerequisites:* 6.631 or 6.021E, 6.021E, 6.021D or 6.620 or 6.621 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects). *Excluded:* 6.0318.

Bussing structures (asynchronous and synchronous); input/output organization; polling, interrupt and DMA control; parallel and serial device and processor communication and interfacing. Memory organization; CPU and control unit design. Microprocessor case studies.

### 6.621 Computing 2A S1 or S2 L3T2

*Prerequisites:* 6.611, 10.001 or 10.011. *Excluded:* 6.620, 6.021D.

For those students who intend to take further subjects in computer science.

Expansion and development of material introduced in 6.611 Computing 1. Systematic program development: introduction to programming language semantics, reasoning about programs, program derivation, abstract programs, realization of abstract programs (conversion from abstract to concrete). Practice in programming in a high-level programming language. Data-structures arrays, lists, sets, trees; recursive programming. Introduction to computer organization: a simple machine architecture. Introduction to operating systems.

### 6.631 Computing 2B S1 or S2 L3T2

*Prerequisite:* 6.620 or 6.621 or 6.021D, *Excluded:* 6.021E.

*Assembler programming:* programming in a low level machine oriented language in order to illustrate the mapping of higher level language constructs onto a typical machine and the interaction between operating systems and devices. *Digital Logic Design:* Boolean algebra and logic gates, simplification of Boolean functions, combinational logic, medium scale integration building blocks, clocked sequential circuits, registers and memory, computer arithmetic.

### 6.632 Operating Systems SS L2T3

*Prerequisites:* 6.631 or 6.021E, 6.641. *Excluded:* 6.672.

Introduction to operating systems via an intensive case study of a particular system, namely the UNIX Time-sharing systems which runs on the PDP11 computer. Includes system initialization, memory management, process management, handling of interrupts, basic input/output and file systems. A comparison of UNIX with other operating systems. General principles for operating systems design.

### 6.633 Data Bases and Networks SS L3T2

*Prerequisite:* 6.641. *Excluded:* 6.622, 14.608, 14.607.

*Data base management systems:* data models; relational and network structures; data description languages; data manipulation languages; multi-schema structures. Data distribution integrity and security; recovery; privacy. *Computer networks:* economic and technological considerations; digital data transmission; error detection and recovery; network configurations; cir-

cuit switching, packet switching; communication protocols, current international standards; data compression; encryption and decryption.

#### 6.641 Computing 2C

S1 or S2 L3T2

*Prerequisites:* 6.620 or 6.021D or 6.621.

*Design of data structures:* abstraction, representation, manipulation and axiomatization. Key transformations (hashing), balanced and multiway trees, introduction to graphs. *Files:* sequential access, random access, merging, sorting and updating. File organizations and introduction to data base systems. *Programming in logic:* descriptive programming languages, symbolic manipulation, pattern matching and associative programming. Software engineering: a survey of some current techniques in problem specification and program design.

#### 6.642 Design and Analysis of Algorithms

SS L3T2

*Prerequisite:* 6.641.

Techniques for the design and performance analysis of algorithms for a number of classes of problems. Analysis of algorithms: order notation, recurrence equations, worst case and expected order statistics. Design of efficient algorithms: recursion, divide and conquer, balancing; backtracking algorithms, branch and bound, dynamic programming; set manipulation problems; fast search algorithms, balance optimal and multiway trees; graph representations and algorithms; pattern matching algorithms. NP—complete problems. Design and specification of programs: modularization, interface design, introduction to formal specification techniques.

#### 6.643 Compiling Techniques and Programming Languages

SS L3T2

*Prerequisite:* 6.641. *Excluded:* 6.672.

1. Language description: phrase structure grammars, Chomsky classification, context-free grammars, finite state grammars, Backus Naur Form, syntax graphs LL(k), LR(k), LAL(k). 2. Lexical analysis: translation of an input (source) string into a (machine independent) quasi-terminal symbol string. Finite state recognizers. 3. Syntax analysis: top-down compilation for LL(1) grammars using syntax graph driven analysers or recursive descent. Bottom-up compilation for simple- and weak-precedence and LR(k) grammars. 4. Semantic analysis: program translation and code generation; attributed grammars. 5. Compilers generators: automatic generation of compilers for LALR(1) grammars. 6. Code optimization by systematic program transformation. 7. Run-time organization: activation record stacks, heap management.

#### 6.646 Computer Applications

SS L3T2

*Prerequisites:* 6.620 or 6.021D or 6.621 or both of 10.311A and 10.311B, 10.331, or equivalent. *Excluded:* 6.622.

The use of computers for solving problems with a substantial mathematical and operational research content: includes use of some standard software packages. Topic selected from: discrete event simulation; a simulation language; pseudo random number generation; simple queueing theory, applications of

mathematical programming; dynamic programming; statistical calculations; critical path methods; computer graphics, artificial intelligence.

#### 6.647 Business Information Systems

SS L3T2

*Prerequisites:* 6.641 or 14.501. *Excluded:* 14.605.

Introduction to accounting systems: general ledger, debtors and creditors; models of business information systems; integrated business systems. System specification, system analysis, system design and implementation; testing and debugging. Managing a project team, project control. The COBOL programming language. File organization and design; sequential, indexed sequential, random, inverted, B-tree file organizations; data dictionaries, program generators, automatic system generators. A major project, written in COBOL, is undertaken as a team exercise.

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## Mathematics

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**Note:** When a unit is listed as a prerequisite or co-requisite, the appropriate higher unit may be substituted.

Many units in the School of Mathematics are offered at two levels. The higher level caters for students with superior mathematical ability. Where both levels are offered grades higher than Credit are only awarded in the ordinary level in exceptional circumstances.

Students should note that all of the Mathematics honours programs require them to take most of their Mathematics units at higher level. However, students should not think that the higher level units are intended only for those in honours programs. Any student with the ability to undertake higher units benefits from so doing.

### First Year Mathematics

**10.001 Mathematics 1.** This is the standard subject and is generally selected by the majority of students in the Faculties of Science, Biological Sciences, Engineering and Applied Science who intend to pursue further studies in mathematics, computer science, physics, chemistry or engineering.

**10.011 Higher Mathematics 1 (day course only).** This subject has the same purpose as 10.001, but is aimed at the more mathematically able students, including those who may wish to take an honours degree in mathematics. It covers all the material in 10.001, plus other topics, at greater depth and sophistication. It is intended for students who have obtained high marks in the 3 unit mathematics course of the Higher School Certificate as well as for those who have taken 4 unit course.

### General Mathematics

This is a combination of the single session units 10.021B and 10.021C and provides for students who do not intend studying mathematics beyond first year but whose other studies require

some knowledge of basic mathematical ideas and techniques. It is particularly designed to meet the needs of such students in Biological Sciences, Optometry, Applied Psychology and Wool and Pastoral Sciences. However, students who select this subject should weigh seriously the implications of their choice because *no further mathematical units are normally available*. A student with meritorious performance in 10.021C may be permitted to proceed to a certain limited number of second year subjects intended for biologists and chemical engineers. The single unit 10.021B is also available to students seeking a pre-requisite for 10.001.

### 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 Science and Mathematics Course and 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.

There is also the Level II unit in Statistics, 10.331, which provides an introduction to statistical procedures commonly used in Science, and which also leads to the Level III units 10.3321 Regression Analysis and Experimental Design, 10.3322 Applied Stochastic Processes and, with a Credit Pass, to 10.312B Experimental Design (Applications) and Sampling.

For both the above Level II units the entry qualification is a pass in 10.001 Mathematics 1, but in appropriate cases students who have passed in 10.021C General Mathematics 1C at a satisfactory level may be given permission to enrol.

### 10.001 Mathematics 1

**F L4T2**

*Prerequisite:*

	<i>HSC Exam Score Range Required</i>
2 unit Mathematics* or	67-100
3 unit Mathematics or	1-50
4 unit Mathematics	1-100
or	
10.021B.	

*Excluded:* 10.011, 10.021B, 10.021C.

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

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

### 10.011 Higher Mathematics 1

**F L4T2**

*Prerequisite:*

	<i>HSC Exam Score Range Required</i>
3 unit Mathematics	120-150
or	
4 unit Mathematics	1-100

*Excluded:* 10.001, 10.021B, 10.021C.

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

### 10.021B General Mathematics 1B

**S1 L4T2**

*Prerequisite:*

	<i>HSC Exam Score Range Required</i>
2 unit Mathematics* or	60-100
3 unit Mathematics or	1-50
4 unit Mathematics	1-100
or	
10.021A	

*Excluded:* 10.011, 10.001.

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Functions (and their inverses), limits, asymptotes, continuity; differentiation and applications; integration, the definite integral and applications; inverse trigonometric functions; the logarithmic and exponential functions and applications; sequences and series; mathematical induction; the binomial theorem and applications; introduction to probability theory; introduction to 3-dimensional geometry; introduction to linear algebra.

### 10.021C General Mathematics 1C

**S2 L4T2**

*Prerequisite:* 10.021B. *Excluded:* 10.001, 10.011.

Techniques for integration, improper integrals; Taylor's theorem; first order differential equations and applications; introduction to multivariable calculus; conics; finite sets; probability; vectors, matrices and linear equations.

### 10.031 Mathematics

**F L1T1**

*Prerequisite:* 10.001 or 10.011 or 10.021C (CR).

**Note A:** A unit, together with 10.032, which is available to Faculty of Science students as one of a sequence of two units constituting a terminating service course in mathematics. As such it is mutually exclusive to any other Level II or Level III unit in Pure and/or Applied Mathematics and/or Theoretical Mechanics except that 10.412A may be taken with 10.031 and 10.032.

**Note B:** Mathematics 10.031 is included for students desiring to attempt only one Level II Mathematics unit. If other Level II units in Pure Mathematics or Applied Mathematics are taken, 10.031 Mathematics will not be counted.

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.

### 10.032 Mathematics

**F L1T1**

*Prerequisite:* 10.031.

**Note A:** As for Note A in 10.031 Mathematics.

**Note B:** 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 or Theoretical Mechanics are taken, 10.032 Mathematics will not be counted.

Vector calculus; special functions; convolution theorem and applications; complex variable theory; Fourier integrals; Laplace

transforms with application to ordinary and partial differential equations.

**10.081 Discrete Mathematics S2 L4T2**

*Co-requisites: 10.001 or 10.011.*

Role of proof in mathematics, logical reasoning and implication, different types of proofs. Sets, algebras of sets, operations on sets. Mathematical logic, truth tables, syntax, induction. Graphs and directed graphs, basic graph algorithms. Counting, combinatorial identities, binomial and multinomial theorems. Binary operations and their properties, groups and semigroups, ordered structures. Recursion relations. Application to network theory, assignment problems and population growth.

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**Pure Mathematics**

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**10.111A Pure Mathematics 2 — Linear Algebra F L1½T1**

*Prerequisite: 10.001 or 10.011. Excluded: 10.121A.*

Vector spaces, linear transformations and matrices, change of basis. Eigenvalues and eigenvectors, generalized eigenvectors. Functions of matrices. Linear systems of differential equations including the use of Laplace transform. Inner products, orthogonalization, projections. Unitary and self-adjoint transformations. Quadratic and Hermitian forms.

**10.1113 Pure Mathematics 2 — Multivariable Calculus S1 or S2 L1½T1**

*Prerequisite: 10.001 or 10.011. Excluded: 10.1213.*

Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

**10.1114 Pure Mathematics 2 — Complex Analysis S1 or S2 L1½T1**

*Prerequisite: 10.001 or 10.011. Excluded: 10.121A.*

Analytic functions, Taylor and Laurent series, integrals. Cauchy's theorem, residues, evaluation of certain real integrals.

**10.1115 Pure Mathematics 2 — Finite Mathematics A S1 L1½T½**

*Prerequisite: 10.001.*

Positional number systems, floating-point arithmetic, rational arithmetic, congruences. Euclid's algorithm, continued fractions, Chinese remainder theorem, Fermat's theorem, applications to computer arithmetic. Polynomial arithmetic, division algorithm, factorization, interpolation, finite field. Codes, error-correcting codes, public-key cryptography.

**10.1116 Pure Mathematics 2 — Finite Mathematics B S2 L1½T½**

*Prerequisite: 10.1115 (or any other Year 2 Mathematics half-unit).*

Introduction to combinatorial computing, recurrence relations, examples of divide and conquer strategies, backtrack and branch and bound algorithms. Finite Fourier transforms, roots of unity, convolutions, application to fast multiplication and the analysis of pseudo-random numbers. Boolean algebra, switching circuits.

**10.121A Higher Pure Mathematics 2 — Algebra F L2T½**

*Prerequisite: 10.011 or 10.001 (DN). Excluded: 10.111A, 10.1111.*

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.

**10.1213 Higher Pure Mathematics 2 — Multivariable Calculus S1 L2T½**

*Prerequisite: 10.011 or 10.001 (DN). Excluded: 10.1113.*

As for 10.1113 Pure Mathematics 2 — Multivariable Calculus but in greater depth.

**10.1214 Higher Pure Mathematics 2 — Complex Analysis S2 L2T½**

*Prerequisite: 10.1213. Excluded: 10.1114.*

As for 10.1114 Pure Mathematics 2 — Complex Analysis, but in greater depth.

**10.1111 Pure Mathematics 3 — Group Theory S1 L1½T½**

*Prerequisites: \*\*\* Excluded: 10.121A.*

Mathematical systems, groups, determination of small groups, homomorphisms and normal subgroups.

**10.1112 Pure Mathematics 3 — Geometry S2 L1½T½**

*Prerequisites: \*\*\* Excluded: 10.1424.*

Elementary concepts of Euclidean, affine and projective geometries.

**10.1121 Pure Mathematics 3 — Number Theory SS L1½T½**

*Prerequisites: \*\*\* Excluded: 10.1421.*

Euclidean algorithm, congruences, sums of squares, diophantine equations.

**10.1123 Pure Mathematics 3 — Logic and Computability SS L1½T½**

*Prerequisites: \*\*\**

The propositional calculus — its completeness and consistency; Turing machines; unsolvable problems; computability and Church's thesis; Godel's incompleteness theorems.

**10.1124 Pure Mathematics 3 —  
Combinatorial Topology** **SS L1½T½**

*Prerequisites: \*\*\**

Elementary combinatorial topology of surfaces.

**10.1125 Pure Mathematics 3 —  
Ordinary Differential Equations** **S1 L1½T½**

*Prerequisites: 10.111A. Excluded: 10.1425.*

Systems of ordinary differential equations: variations of constants formula; stability; Poincaré space; Lyapunov's direct method.

**10.1126 Pure Mathematics 3 —  
Partial Differential Equations** **S1 L1½T½**

*Prerequisites: 10.1113, 10.1114. \*\*\* Co-requisite: 10.1125. Excluded: 10.1426.*

System of partial differential equations characteristic surfaces; classifications. Cauchy problem. Dirichlet and Neumann problems; the maximum principle. Poisson's formula: conformal mapping.

**10.1127 Pure Mathematics 3 —  
History of Mathematics** **S2 L1T1**

*Prerequisites: \*\*\*.*

Topics from the history of mathematics, with emphasis on the development of those ideas and techniques used in undergraduate courses. Students are expected to read widely and to present written material based on their readings.

**10.1128 Pure Mathematics 3 —  
Foundations of Calculus** **S1 L1½T½**

*Prerequisites: \*\*\*. Excluded: 10.122B.*

Properties of the real numbers. Convergence of sequences and series. Properties of continuous and differentiable functions of a real variable.

**10.1521 Pure Mathematics 3 —  
Combinatorics  
and its Applications** **SS L1½T½**

*Prerequisites: \*\*\*.*

Generating functions, their properties and applications to partitions and recurrence relations. Branching processes, trees and the analysis of their paths, the analysis of algorithms and the Galton-Watson process. Coding theory and other design problems. Latin squares, block designs and error-correcting codes.

**10.1522 Pure Mathematics 3 —  
Differential Geometry** **SS L1½T½**

*Prerequisites: 10.1113 \*\*\*. Excluded: 10.1325.*

Curves and surfaces in space. Gaussian curvature, Gauss theorem. Gauss-Bonnet theorem.

**10.1523 Pure Mathematics 3 —  
Functional Analysis and  
Applications** **S1 or S2 L1½T½**

*Prerequisites: 10.111A, 10.2112 \*\*\*. Co-requisite: 10.1128 (strongly recommended). Excluded: 10.122B.*

Geometry of Hilbert spaces, approximation problems, linear operators, filters, spectral methods for differential equations.

**10.122B Higher Pure Mathematics 3 —  
Real Analysis and Functional  
Analysis** **F L1½T½**

*Prerequisites: 10.121A or 10.111A (DN), 10.1213 or 10.1113 (DN), Excluded: 10.1128. 10.1523.*

The limit processes of analysis; introduction to Lebesgue integration; introduction to metric spaces. Hilbert spaces; linear operators; Fourier series.

**10.1321 Higher Pure Mathematics 3 —  
Rings and Fields** **S1 L1½T½**

*Prerequisites: 10.121A or 10.111A (DN).*

Rings; integral domains; factorization theory; Fields; algebraic and transcendental extensions. Introduction to algebraic number theory, quadratic reciprocity.

**10.1322 Higher Pure Mathematics 3 —  
Galois Theory** **S2 L1½T½**

*Prerequisites: ††† Co-requisite: 10.1321.*

Galois fields. Galois groups. Solution of equations by radicals. Further algebraic number theory.

**10.1323 Higher Pure Mathematics 3 —  
Complex Analysis** **S1 L1½T½**

*Prerequisites: 10.1214 or 10.1114 (DN), †††. Co-requisites: 10.122B (strongly recommended).*

Topics in advanced complex function theory chosen from the following: Conformal mapping. Analytic continuation. Entire and meromorphic functions. Elliptic functions. Asymptotic methods. Integral formulae. Harmonic functions.

**10.1324 Higher Pure Mathematics 3 —  
Integration and Fourier Analysis** **S2 L1½T½**

*Prerequisites: ††† Co-requisite: 10.122B.*

Lebesgue integration; measure theory. Fourier transforms.

**10.1325 Higher Pure Mathematics 3 —  
Differential Geometry** **S1L1½T½**

*Prerequisites: 10.121A or 10.111A (DN), 10.1213 or 10.1113 (DN), ††† Excluded: 10.1522.*

Curves and surfaces in space; classification of surfaces. Curvature; geodesics.

**10.1326 Higher Pure Mathematics 3 —  
Calculus on Manifolds** **S2 L1½T½**

*Prerequisites: ††† Co-requisites: 10.1325.*

Manifolds; vector fields; flows. Introduction to Morse theory. Differential forms; Stokes' theorem; the Gauss-Bonnet theorem.

**10.1421 Higher Pure Mathematics 3 —  
Number Theory**

**S1 L1½T½**

*Prerequisite:* ††† *Excluded:* 10.1121.

Prime numbers; number theoretic functions; Dirichlet series; partitions. Continued fractions, diophantine approximation; p-adic numbers.

**10.1422 Higher Pure Mathematics 3 —  
Groups and Representations**

**S2 L1½T½**

*Prerequisites:* 10.121A or 10.111A (DN) and 10.111 (DN), †††.

Abelian groups, composition series; nilpotent groups; soluble groups. Representations and characters of finite groups; induced representations.

**10.1423 Higher Pure Mathematics 3 —  
Topology**

**S1 L1½T½**

*Prerequisite:* 10.1213 or 10.1113 (DN), †††.

Naive set theory, the axiom of choice Metric and topological spaces, compactness.

**10.1424 Higher Pure Mathematics 3 —  
Geometry**

**S2 L1½T½**

*Prerequisites:* 10.121A or both 10.111A (DN) and 10.1111 (DN), †††  
*Excluded:* 10.1112.

Axioms for a geometry; affine geometry, Desargues' theorem; projective geometry.

**10.1425 Higher Pure Mathematics 3 —  
Ordinary Differential Equations**

**S1 L1½T½**

*Prerequisite:* 10.121A or 10.111A (DN), 10.1213 or 10.1113 (DN) †††  
*Co-requisites:* 10.122B (strongly recommended). *Excluded:* 10.1125.

Existence and uniqueness theorems. Linearization. Qualitative theory of autonomous systems.

**10.1426 Higher Pure Mathematics 3 —  
Partial Differential Equations**

**S1 L1½T½**

*Prerequisites:* ††† *Co-requisites:* 10.1425. *Excluded:* 10.1126.

Classification, characteristics. Cauchy problem; Dirichlet and Neumann problems. Distributions.

**10.123 Pure Mathematics 4**

An honours program consisting of the preparation of an undergraduate thesis together with advanced lectures on topics chosen from fields of current interest in Pure Mathematics. With the permission of the Head of Department, the subject may also include advanced lecture courses given by other Departments or Schools.

\*\*\*Normal prerequisites for attempting Level III Pure Mathematics units are at least two level II Mathematics units, including any course prerequisites. For any listed prerequisite or co-requisite unit, an appropriate higher unit may be substituted.

†††Students wishing to enrol in Level III Higher Pure Mathematics units should consult with the Department before enrolling. Normal prerequisites for attempting Level III Higher Pure Mathematics units are at least two Level II Mathematics units, including any course prerequisites, at an average of distinction level or their higher equivalents. Subject to the approval of the Head of the Department, these may be relaxed.

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**Applied Mathematics**

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**10.2111 Applied Mathematics 2 —  
Vector Calculus**

**S1 or S2 L1½T½**

*Prerequisite:* 10.001. *Excluded:* 10.2211.

*Properties of vectors and vector fields; divergence, gradient, curl of a vector; line, surface, and volume integrals. Gauss' and Stokes' theorems. Curvilinear co-ordinates.*

**10.2112 Applied Mathematics 2 —  
Mathematical Methods for  
Differential Equations**

**S1 or S2 L1½T½**

*Prerequisite:* 10.001. *Excluded:* 10.2212.

*Mathematical methods for ordinary and partial differential equations. Series solutions, numerical methods, separation of variables. Fourier series. Besser functions.*

**10.2113 Applied Mathematics 2 —  
Linear Programming**

**S1 or S2 L1½T½**

*Prerequisite:* 10.001. *Co-requisite:* 10.111A. *Excluded:* 10.2213.

*Mathematical modelling and solution techniques for linear optimization problems. Feasible regions, graphical methods, the standard problem, basic solutions, fundamental theorem, simplex and revised simplex methods, duality and the dual simplex method, sensitivity analysis, the transportation problem.*

**10.2115 Applied Mathematics 2 —  
Discrete-Time Systems**

**S1 or S2 L1½T½**

*Prerequisite:* 10.001. *Co-requisite:* 10.111A, *Excluded:* 10.2215.

*The study of dynamical systems whose states change at discrete points in time. Difference equations: existence and uniqueness of solutions, general solution of linear equations. Linear systems: dynamics, stability, and oscillations, z-transforms, state-space methods. Nonlinear systems; equilibrium points, limit cycles.*

Applications selected from problems of importance in engineering, biological, social, management, and economic systems.

**10.2116 Applied Mathematics 2 —  
Continuous-Time Systems**

**S2 L1½T½**

*Prerequisite:* 10.001. *Excluded:* 10.2216.

*The study of continuous dynamical systems. One-dimensional systems, kinematic waves, applications to traffic flow and waves in fluids. Momentum equation for one-dimensional fluid flow, sound waves. Dynamics of a system of particles, oscillations. An introduction to the modelling of biological and ecological systems.*

**10.261A Applied Mathematics 2 —  
Mathematical Computing****F L1½T½***Prerequisite:* 10.001.

*The development of efficient and reliable software for mathematical applications using FORTRAN.* Data types, input/output, structured programming, communication between sub-programs, file manipulation, portability, efficiency, accuracy, documentation, de-bugging. Examples will be chosen from the following areas: non-linear equations in one and two variables, extrapolation procedures, numerical quadrature, systems of linear equations, difference equations, ordinary differential equations.

**10.2211 Higher Applied Mathematics 2 —  
Vector Analysis****S1 L2T½***Prerequisite:* 10.011 or 10.001 (CR). *Excluded:* 10.2111.

As for 10.2111 but in greater depth.

**10.2212 Higher Applied Mathematics 2 —  
Mathematical Methods for  
Differential Equations****S2 L2T½***Prerequisite:* 10.011 or 10.001 (CR) *Excluded:* 10.2112.

As for 10.2112 but in greater depth.

**10.2213 Higher Applied Mathematics 2 —  
Linear Programming****S1 or S2 L1½T½***Prerequisite:* 10.011 or 10.001 (CR) *Co-requisite:* 10.111A. *Excluded:* 10.2113.

As for 10.2113 but in greater depth.

**10.2215 Higher Applied Mathematics 2 —  
Discrete-Time Systems****S2 L1½T½***Prerequisite:* 10.011 or 10.001 (DN). *Co-requisite:* 10.111A *Excluded:* 10.2215.

As for 10.2115, but in greater depth.

**10.2216 Higher Applied Mathematics 2 —  
Continuous-Time Systems****S2 L1½T½***Prerequisite:* 10.011 or 10.001 (CR). *Excluded:* 10.2116.

As for 10.2116 but in greater depth.

**10.212A Applied Mathematics 3 —  
Numerical Analysis****S1 L3T1***Prerequisites:* 10.2112, 10.111A. *Excluded:* 10.222A.

*Introduction to the techniques required for the analysis of numerical methods.* Theory of interpolation and approximation, using polynomials, splines, rational functions and Fourier methods. Numerical quadrature including Gaussian and Clenshaw-Curtis rules, adaptive methods and methods for singular and

oscillatory integrands. Sets of linear equations and their numerical solution, matrix eigenvalue problems. Numerical solution of ordinary and partial differential equations, boundary value problems, introduction to finite element methods.

**10.212B Higher Applied Mathematics 3 —  
Fluid Dynamics****S1 L3T1***Prerequisite:* 10.2111, 10.2112. *Excluded:* 10.222B, 10.422A.

*The mathematical modelling and theory of problems arising in the flow of fluids.* Cartesian tensors, kinematics, mass conservation, vorticity, Navier-Stokes equation. Topics from inviscid and viscous fluid flow, gas dynamics, sound waves, water waves.

**10.212D Applied Mathematics 3 —  
Mathematical Methods****S2 L3T1***Prerequisites:* 10.2112, 10.111A, 10.1113, 10.1114. *Excluded:* 10.0331, 10.033, 10.222D, 10.412D, 10.422D, 10.4331, 10.2921.

*Fundamental methods for solution of problems in applied mathematics, physics and engineering.* Functions of a complex variable, contour integration, asymptotic methods. Fourier and Laplace transforms, complex inversion theorems. Orthogonal polynomials and functions, Sturm-Liouville theory, eigenfunction expansions, generalized Fourier series. Applications to the solution of boundary value problems for ordinary and partial differential equations given is for all methods.

**10.212L Applied Mathematics 3 —  
Optimization Methods****S1 L3T1***Prerequisite:* 10.111A, and 10.1113 or 10.2111. *Excluded:* 10.222L.

*Development, analysis and application of methods for optimization problems.* Theory of multivariable optimization; including necessary and sufficient optimality conditions, stationary points, Lagrange multipliers, Kuhn-Tucker conditions, convexity and duality. Numerical methods for one dimensional minimization, unconstrained multivariable minimization (including steepest descent, Newton, quasi-Newton and conjugate gradient methods) and constrained multi-variable minimization (including linear programming and quadratic programming).

**10.212M Applied Mathematics 3 —  
Optimal Control****S1 L3T1***Prerequisites:* 10.1113 and 10.1114, 10.111A. *Excluded:* 10.222M

*Introduction to control of time-varying systems.* Open and closed loop control systems. Mathematical description of dynamical systems. Transform methods for linear systems. Stability, feedback and control. State space, observability and controllability. Optimal control. Dynamic programming and the Bellman equation. The Pontryagin maximum principle. Calculus of variations.

Examples and applications are selected from physical, engineering economics, resource and financial management, social and biological systems.

**10.212N Applied Mathematics 3 —  
Dynamical Systems S2 L3 T1**

*Prerequisites:* 10.111A, 10.2112, 10.1125. *Excluded:* 10.222N

*Nonlinear differential equations and applications to time-dependent systems.* Perturbation methods, averaging and asymptotic techniques, Floquet theory, bifurcation theory. Hamiltonian dynamics, Liouville's theorem, integral invariants, canonical transformations, action-angle variables. Applications to ecological, biological and mechanical systems.

**10.222A Higher Applied Mathematics 3 —  
Numerical Analysis S1 L3T1**

*Prerequisites:* 10.2212 or 10.2112 (CR), 10.121A or 10.111A (CR). *Excluded:* 10.212A.

As for 10.212A but in greater depth.

**10.222B Higher Applied Mathematics 3 —  
Fluid Dynamics S1 L3T1**

*Prerequisites:* 10.2211 or 10.2111 (CR), 10.2212 or 10.2112 (CR) *Excluded:* 10.212B, 10.422A

As for 10.212B but in greater depth.

**10.222C Higher Applied Mathematics 3 —  
Maxwell's Equations and Special Relativity S2 L3T1**

*Prerequisites:* 10.2211 or 10.2111 (CR), 10.2212 or 10.2112 (CR), 10.121A or 10.1114 (CR), 1.001. *Excluded:* 1.033, 1.0333.

*Theory and applications of electromagnetic fields and waves.* Electrostatics; Poisson and Laplace equations, potential theory, boundary value problems, spherical harmonics, Green's functions, dielectrics. Magnetic fields and forces; applications, magnetohydrodynamics. Electromagnetic fields, electromagnetic potentials, waves and radiation, vector and scalar wave equations, spherical waves, applications. Lorentz transformation, relativistic electrodynamics.

**10.222D Higher Applied Mathematics 3 —  
Mathematical Methods S2 L3T1**

*Prerequisites:* 10.2212 or 10.2112 (CR), 10.121A or 10.111A (CR) 10.1213 or 10.1113 (CR), 10.1214 or 10.1114 (CR). *Excluded:* 10.0331, 10.033, 10.212D, 10.412D, 10.422D, 10.4331, 10.2921

As for 10.212D but in greater depth.

**10.222L Higher Applied Mathematics 3 —  
Optimization Methods S2 L3T1**

*Prerequisites:* 10.121A or 10.111A (CR), 10.2211 or 10.2111 (CR) or 10.1213 or 10.1113 (CR). *Excluded:* 10.212L.

As for 10.212L but in greater depth.

**10.222M Higher Applied Mathematics 3 —  
Optimal Control S1 L3T1**

*Prerequisites:* 10.1213 or 10.1113 (CR), 10.1214 or 10.1114 (CR), 10.121A or 10.111A (CR). *Excluded:* 10.212M.

As for 10.212M but in greater depth.

**10.222N Higher Applied Mathematics 3 —  
Dynamical Systems S2 L3T1**

*Prerequisites:* 10.121A or 10.111A (CR), 10.1425 or 10.1125 (CR), 10.2212 or 10.2112 (CR). *Excluded:* 10.212N.

As for 10.212N but in greater depth.

**10.223 Applied Mathematics 4**

An honours program consisting of the preparation of an undergraduate thesis together with advanced lecture courses. Lecture topics include selections from: advanced mathematical methods for applied mathematics, advanced optimization, numerical analysis, theory of linear and non-linear dynamical systems, optimal control, operations research, functional analysis and applications, mathematics of economic models and of economic prediction, fluid mechanics, oceanography, microhydrodynamics, and analytical and numerical solution of partial differential equations. With permission of the Head of Department, the subject may also include advanced lecture courses given by other Departments or Schools.

**10.233 Applied Mathematics 4 (Short Course)**

6 units consisting of the preparation of an undergraduate thesis together with advanced lecture courses. Lecture topics include selections from: topics listed in 10.223. With permission of the Head of Department, the subject may also include advanced lecture courses given by other Departments or Schools.

**10.262A Applied Mathematics 3 —  
Mathematical Software S2 L3T1**

*Prerequisites:* 10.111A, 10.2112, and either 6.621 or 10.211E or 10.261A or equivalent. *Excluded:* 10.612.

*Underlying methods, development, and use of mathematical software packages; primarily of those written in FORTRAN.* Numerically stable methods for matrix factorizations, solution of systems of linear equations and calculation of matrix eigenvalues and eigenvectors. Numerical quadrature, including special methods for singular, oscillatory and infinite integrals and for multiple integrals. Numerical solution of ordinary differential equations, including initial and boundary value problems. Extensive use is made of computers and software packages. A basic knowledge of Fortran is assumed.

**10.292A Applied Mathematics 3 —  
Oceanography S1 L3T1**

*Prerequisite:* 10.2111 or 10.031, 1.001. *Excluded:* 10.412A.

*Review of basic physical features and mathematical description of oceans.* Physical properties of sea water. Elementary hydrodynamics. An elementary discussion of turbulence. Geostrophy,



dynamic heights and the inference of heights from hydrographic measurements. Ekman layers. Wind-driven ocean circulation, western boundary currents. Surface and internal waves, tides. Thermohaline process: mixing, entrainment, double-diffusive phenomena, mixed layers and gravity currents.

**10.2921 Applied Mathematics 3 —  
Transform Methods S1 L1½T½**

*Prerequisites:* 10.1113, 10.1114, 10.2112 or equivalent. *Excluded:* 10.0331, 10.033, 10.212D, 10.222D, 10.412D, 10.422D, 10.4331.

*Theory and use of transform methods in communications, circuit theory and solution of partial differential equations. Fourier and Laplace transforms, generalized functions, solution of partial differential equations.*

**10.2922 Applied Mathematics 3 —  
Applied Time Series Analysis S2 L1½T½**

*Prerequisites:* 10.2112 or 10.031 or 10.022. *Co-requisites:* 10.331 or equivalent, 10.2921 or 10.212D or equivalent. *Excluded:* 10.4129.

*Techniques for analyzing time-varying data. Classification of random processes, sampling for discrete analysis, Fourier analysis, spectra, filtering. Cross-spectra, estimation and hypothesis testing, confidence limits, application to experiment planning. Emphasis on computer analysis of actual data.*

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## Statistics

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**10.311A Theory of Statistics 2 —  
Probability and Random Variables S1 L3T1**

*Prerequisite:* 10.001 or 10.011 or 10.021C(CR). *Excluded:* 10.321A, 10.301, 10.331, 45.101.

Probability, random variables, standard discrete and continuous distributions, multivariate distributions, transformations, random sampling, sampling distributions, limit theorems.

**10.311B Theory of Statistics 2 —  
Basic Inference S2 L3T1**

*Prerequisite:* 10.311A. *Excluded:* 10.321B, 10.301, 10.331, 45.101.

Point estimation: general theory, estimation by moments, maximum likelihood, interval estimation with general theory and application, hypothesis testing using Neyman Pearson theory, linear regression and prediction, analysis of variance.

**10.321A Higher Theory of Statistics 2 —  
Probability and Random Variables S1 L3T1**

*Prerequisite:* 10.001 or 10.011. *Excluded:* 10.311A, 10.301, 10.331, 45.101.

As for 10.311A but in greater depth.

**10.321B Higher Theory of Statistics 2 —  
Basic Inference S2 L3T1**

*Prerequisite:* 10.321A. *Excluded:* 10.311B, 10.301, 10.331, 45.101.

As for 10.311B but in greater depth.

**10.3111 Theory of Statistics 2 —  
Statistical Computing and  
Simulation S1 L1½T½**

*Prerequisite:* 10.001 or 10.011 or 10.021C(CR). *Co-requisite:* 10.311A.

Introduction to APL, random variables, univariate transformation, simulation of random variables, APL programming, integer value random variables, random walks — theory and simulation, introduction to Markov chains.

**10.3211 Higher Theory of Statistics 2 —  
Statistical Computing and  
Simulation S1 L1½T½**

*Prerequisite:* 10.001 or 10.011. *Co-requisite:* 10.321A.

As for 10.3111 but in greater depth.

**10.3112 Theory of Statistics 2 —  
Nonparametric Statistical  
Inference S2 L1½T½**

*Prerequisite:* 10.311A. *Co-requisite:* 10.311B.

Order statistics, exact and approximate distributions, multinomial distributions, goodness of fit, contingency tables, one-sample and two-sample estimation and inference problems.

**10.3212 Higher Theory of Statistics 2 —  
Nonparametric Statistical  
Inference S2 L1½T½**

*Prerequisite:* 10.321A. *Co-requisite:* 10.321B.

As for 10.3112 but in greater depth.

**10.312A Theory of Statistics 3 —  
Stochastic Processes S1 L3T1**

*Prerequisites:* 10.311A, 10.111A, 10.1113. *Excluded:* 10.322A.

Probability spaces, generating functions, convolutions. Poisson process, renewal processes. Branching processes. Recurrent events, Markov chains. Birth-and-death processes, queueing models. Inference for stochastic processes.

**10.312C Theory of Statistics 3 —  
Linear Models S1 L3T1**

*Prerequisites:* 10.311B, 10.111A, 10.1113. *Excluded:* 10.322C.

Matrix theory. Multivariate normal distribution. Quadratic forms (distributions and independence). The general linear hypothesis, Gauss-Markov theorem. Hypothesis testing. Selection of variables. Analysis of residuals. Analysis of variance.

**10.312F Theory of Statistics 3 —  
Statistical Computation S2 L2T2**

*Prerequisites:* 10.311B or 10.321B, 10.3111 or 10.3211.

Array and sequential processing in APL. Standard statistical operations and their efficient coding. Simulation of random vari-

ables and stochastic processes. Efficient coding of survey data. Modular package construction, and the use of packages (eg STATAPL, IDAP, INSTAPAK, SPSS, GLIM, GENSTAT, MINITAB, SAS, BMD). A project, to construct a small package consistent with general specifications and with safeguards against common errors.

**10.3121 Theory of Statistics 3 — Sample Survey Theory S1 L1½T½**

*Prerequisite:* 10.311B. *Excluded:* 10.3221.

Finite population sampling theory illustrated by mean estimation; simple random, stratified, cluster, systematic, multistage and ratio sampling, sampling proportional to size.

**10.3122 Theory of Statistics 3 — Design and Analysis of Experiments S2 L1½T½**

*Prerequisites:* 10.311B, 10.312C. *Excluded:* 10.3222.

Principles of good experimental design. Completely randomized experiment, randomized complete block design. Latin square design. Contrasts and multiple comparisons. Analysis of factorial experiments. Random effects models.

**10.3123 Theory of Statistics 3 — Statistical Inference SS L1½T½**

*Prerequisite:* 10.311B. *Excluded:* 10.3223.

Uniformly minimum variance unbiased estimation. Cramer-Rao inequality, Lehman-Scheffe theorem. Monotone likelihood ratio distributions and uniformly most powerful unbiased tests. Generalized likelihood ratio test, exact test and large samples tests. Bayesian point estimation, interval estimation and hypothesis testing.

**10.3124 Theory of Statistics 3 — Nonparametric Methods SS L1½T½**

*Prerequisite:* 10.311B, 10.3112. *Excluded:* 10.3224.

One sample and two sample problems. Tests for association. Contingency tables. Nonparametric analysis of variance and regression.

**10.3321 Regression Analysis and Experimental Design S1 L1½T½**

*Prerequisite:* 10.331 or 10.311B or approved equivalent. *Excluded:* 10.3122, 10.3222.

A revision of linear regression with extension to multiple and stepwise linear regression. Analysis of block designs, Latin squares, factorial designs, variance component and mixed model analyses. Bioassay, logit models. Contingency tables.

**10.3322 Applied Stochastic Processes S2 L1½T½**

*Prerequisite:* 10.331 or 10.311A or 10.321A, or approved equivalent. *Excluded:* 10.312A, 10.322A.

An introduction to processes in discrete and continuous time Markov chains and Markov processes, branching processes, time series with moving average models.

**10.322A Higher Theory of Statistics 3 — Stochastic Processes S1 L3½T1**

*Prerequisites:* 10.321A, 10.111A, 10.1113. *Excluded:* 10.312A.

As for 10.312A but in greater depth.

**10.322C Higher Theory of Statistics 3 — Linear Models S1 L3½T1**

*Prerequisites:* 10.321B, 10.111A, 10.1113. *Excluded:* 10.312C.

As for 10.312C but in greater depth.

**10.322D Higher Theory of Statistics 3 — Probability Theory S2 L3T1**

*Prerequisites:* 10.321A, 10.111A, 10.1113.

Probability spaces, generating functions. Weak convergence, convergence in probability, weak law of large numbers, central limit theorem. Extreme value distributions. Borel-Cantelli lemma, almost sure convergence, strong law of large numbers. Stable and infinitely divisible distributions.

**10.3221 Higher Theory of Statistics 3 — Sample Survey Theory S1 L1½T½**

*Prerequisite:* 10.321B. *Excluded:* 10.3121.

As for 10.3121 but in greater depth.

**10.3222 Higher Theory of Statistics 3 — Design and Analysis of Experiments S2 L1½T½**

*Prerequisites:* 10.321B, 10.322C. *Excluded:* 10.3122.

As for 10.3122 but in greater depth.

**10.3223 Higher Theory of Statistics 3 — Statistical Inference SS L1½T½**

*Prerequisite:* 10.321B. *Excluded:* 10.3123.

As for 10.3123 but in greater depth.

**10.3224 Higher Theory of Statistics 3 — Nonparametric Methods SS L1½T½**

*Prerequisites:* 10.321B, 10.3212. *Excluded:* 10.3124.

As for 10.3124 but in greater depth.

**10.3225 Higher Theory of Statistics 3 — Statistic Project F**

*Prerequisites:* 10.321A, 10.321B. *Co-requisites:* At least four units from 10.322A, 10.322C, 10.3221, 10.3222, 10.3223, 10.3224, 10.322D, 10.312F.

**10.323 Theory of Statistics 4**

Specialized study, from the topics set out, for students attempting honours in the Science and Mathematics 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.

### 10.301 Statistics SA

**F L1½T½**

*Prerequisite:* 10.001 or 10.021C. *Excluded:* 10.331, 10.311A, 10.311B, 10.321A, 10.321B, 45.101.

Probability, random variables, independence, binomial, Poisson and normal distributions, transformations to normality, estimation of mean and variance, confidence intervals, tests of hypotheses, contingency tables, two sample tests of location, simple and multiple linear regression, analysis of variance for simple models.

### 10.331 Statistics SS

**F L1½T½**

*Prerequisite:* 10.001 or 10.021C (CR). *Excluded:* 10.311A, 10.311B, 10.321A, 10.321B, 10.301, 45.101.

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  $\chi^2$ ,  $t$  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.

## Servicing Subjects

These are subjects taught within courses offered by other faculties.

For Further information regarding the following subjects see the Faculty of Applied Science and Engineering Handbooks.

### 10.022 Engineering Mathematics 2

**F L2T2**

*Prerequisite:* 10.001.

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; introduction to numerical methods; matrices and their application to theory of linear equations, eigenvalues and their numerical evaluation; vector algebra and solid geometry; multiple integrals; introduction to vector field theory.

### 10.0331 Electrical Engineering Mathematics 3 — Transform Methods

**S1 L1½T½**

*Prerequisites:* 10.111A, 10.1113, 10.1114, 10.2122. *Exclusions:* 10.412D, 10.422D and 10.4331.

The mathematics of signals and linear systems. General Fourier series. Fourier, Laplace and related transforms Delta-distributions and others and their transforms. Discrete Fourier and Z-transforms. Applications to spectral analysis, autocorrelation, uncertainty and sampling, linear analog and digital filters, partial differential equations.

### 10.0332 Electrical Engineering Mathematics 3 — Numerical Methods

**S2 L1½T½**

*Prerequisites:* 10.111A, 10.1113, 10.1114, 10.2111, 10.2112. *Exclusions:* 10.212A, 10.222A.

Numerical approximation of solutions to linear and non-linear equations. Interpolation and extrapolation. Approximation of definite integrals. Approximate solution of differential equations. Optimization. Approximate solution of matrix eigenvalue and eigenvector problems.

### 10.341 Statistics SU

**F L1½T½**

*Prerequisite:* 10.001 or 10.011.

For students in the School of Surveying.

Introduction to probability theory, random variables and distribution functions, sampling distributions, including those of  $t$ ,  $\chi^2$  and  $F$ . Estimation procedures, including confidence interval estimation with an emphasis on least squares and surveying problems, and computer based exercises.

### 10.351 Statistics SM

**F L1½T½**

*Prerequisite:* 10.001 or 10.011.

For students in Aeronautical, Industrial and Mechanical Engineering and Naval Architecture.

Introduction to probability theory, with finite, discrete and continuous sample spaces. Random variables: the standard elementary distributions including the binomial, Poisson and normal distributions. Sampling distributions: with emphasis on those derived from the normal distribution:  $t$ ,  $\chi^2$  and  $F$ . Estimation of parameters: the methods of moments and maximum likelihood and confidence interval estimation. The standard test of statistical hypotheses, and, where appropriate, the powers of such tests. An introduction to regression and the bivariate normal distribution.

### 10.361 Statistics SE

**F L1½T½**

*Prerequisite:* 10.001 or 10.011.

For students in the School of Electrical Engineering.

Introduction to probability theory, random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of  $\chi^2$  and  $t$ . Estimation by moments and maximum likelihood; confidence interval estimation. The Standard tests of significance based on the above distribution with a discussion of power where appropriate.

An introduction to linear regression, auto-regression. Probability limit, law of large numbers and central limit theorem. Multivariate normal distribution. Stochastic processes in discrete and continuous time: Poisson and Gaussian processes.

### 10.381 Statistics SC

**S1 or S2 L1½T½**

For students in the School of Civil Engineering.

Introduction to probability. Random variables. Elementary distribution. Statistical inference. Point estimation. Confidence intervals.

## Psychology

### Psychology Level I Unit

#### 12.100 Psychology 1

F L3T2

An introduction to the content and methods of psychology as a basic science, with emphasis on the biological and social bases of behaviour, relationship to the environment, and individual differences. Training in the methods of psychological enquiry, and in the use of elementary statistical procedures.

### Psychology Level II Units

#### 12.200 Research Methods 2

F L2T1

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.)

General introduction to the design and analysis of experiments; hypothesis testing, estimation, power analysis; general treatment of simple univariate procedures; correlation and regression.

#### 12.201 Biological Basis of Psychology 2

S1 L2T2

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.)

Two strands: one emphasises basic biological structures and mechanisms, with particular emphasis on specific sensory systems (eg pain) and behaviour (eg aggression); the other strand emphasises structure and function of sensory systems, evaluates neurological concepts and models, and examines the sensory interaction of people with their environment.

#### 12.202 Social and Cognitive Psychology 2

S2 L2T2

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.)

Two strands; one provides a consideration of the content, methods and models of social psychology and evaluates effects of social factors on behaviour of individuals and groups; the other strand is concerned with cognitive behaviour of humans, particularly in relation to speech, pattern recognition, memory and thinking.

#### 12.203 Psychology 2A

F L2T2

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.) *Co-requisites:* 12.200, 12.201, 12.202. *Excluded:* 12.330.

Available to Course 3431 students only.

Computing, assessment and introduction to clinical practice.

#### 12.204 Human Relations 2

S1 L2T2

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.)

Social and personality development of the individual, human relations in the family group. Interpersonal relationships and, in

particular, the handling of anxiety, aggression and communication.

#### 12.205 Individual Differences 2

S2 L2T2

*Prerequisite:* 12.100. (Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.)

Measurement and significance of individual differences in intellectual, motivational and personality functioning. Statistics, to cover the fundamentals of hypothesis testing.

### Psychology Level III Units: Group A

#### 12.300 Research Methods 3A

S1 L2T2

*Prerequisite:* 12.200.

Analysis of variance for single factor and multifactor designs. Test procedures for planned and post-hoc contrasts defined on parameters of fixed and mixed models. General principles of experimental design.

#### 12.305 Learning and Behaviour 3

S1 or S2 L2T2

*Prerequisites:* 12.200 and 12.201.

The establishment and elimination of extended sequences of behaviour in complex environments. Implications of the theories and research for applied work.

### Psychology Level III Units: Group B

#### 12.301 Research Methods 3B

S2 L2T2

*Prerequisites:* 12.200 and 12.300.

Multivariate statistics and computing. Data analysis using the SPSS and PSY computer programs; their statistical basis.

#### 12.304 Personality and Individual Differences 3

S1 L2T2

*Prerequisites:* 2 Psychology Level II subjects.

Personality dynamics and structure and differences in ability and intelligence.

#### 12.310 Physiological Psychology 3

S2 L2T2

*Prerequisites:* 12.200 and 12.201.

Elementary neuropharmacology and neuroanatomy. Brain control of eating, drinking, aggression, copulation, pain perception, memory, language and functional disorders.

#### 12.311 Perception 3

S2 L2T2

*Prerequisites:* 12.200 and 12.201.

Studies of infant perception, conflict between vision and other senses, certain illusions, and of the perception of size and distance generally.

**12.312 Language and Cognition 3****S1 L2T2***Prerequisite: 12.200 and 12.202.*

Stages involved in reception of stimulus information from environment, its analysis, storage, and transmission into responses. Stress on processing of language.

**12.314 Motivation and Emotion 3****S1 L2T2***Prerequisites: 12.200 and 12.201.*

An examination of contemporary research regarding 'drives', 'incentives' and 'emotions' as determinants of animal and human action. Theoretical perspectives cover biological and social influences.

**12.315 Theories of Associate Learning 3****S2 L2T2***Prerequisite: 12.305.*

Contemporary theoretical approaches to instrumental and classical conditioning. Topics may include: traditional behaviour theories, information processing theory, cybernetic theory, and neurophysiological approaches.

**12.316 Psychophysiology 3****S1 L2T2***Prerequisites: 12.200 and 12.201.*

The major theoretical, methodological, and applied issues in psychophysiology. Topics may include: arousal, attention, habituation, lie detection, clinical assessment, and biofeedback.

**12.320 Social Psychology 3****S1 L2T2***Prerequisites: 12.200 and 12.202.*

Contemporary research areas in social psychology. Topics may include the social basis of human interaction, interpersonal relationships, social perception and cognition, and interpersonal communication.

**12.321 Development Psychology 3****S2 L2T2***Prerequisites: 12.200 and 12.202.*

The development of perception and the development of operational thought, the development of language and its relationship to the development of thought; and the development of reading.

**12.322 Abnormal Psychology 3****S1 L2T2***Prerequisites: 12.200 and 12.201.*

Descriptive psychopathology; symptomatology and diagnostic features of schizophrenia, organic brain syndromes, affective disorders, neurotic disorders, psychopathy, sexual aberrations, and addictions.

**12.324 Experimental Psychopathology 3****S2 L2T2***Prerequisite: 12.322.*

An examination of the aetiology and mechanisms of behavioural disorders in the light of experimental research and theory construction. Major topics include: aetiology and mechanisms of schizophrenia, affective disorders; psychophysiological disorders, anxiety, depression, driven behaviours.

**12.325 Social Behaviour 3****S2 L2T2***Prerequisites: 12.200 and 12.202.*

Research and theory in applied social psychology. Topics may include the relation of the physical setting to behaviour, cross cultural studies, and race relations.

**12.330 Psychological Assessment 3****S1 L2T2***Prerequisites: 12.200, and 1 other Psychology Level II subject. Excluded: 12.203.*

Principles and techniques of psychological assessment. Types of tests and their application in selection and allocation procedures.

**12.331 Counselling Psychology 3****S1 L2T2***Prerequisites: 2 Psychology Level II subjects.*

Principles and techniques of counselling in a variety of contexts. Interviewing, group process and structure, and interpersonal relations.

**12.332 Behavioural Change 3***Prerequisites: 12.200 and 12.201.*

Not offered in 1988.

Use of the methods of behavioural change in individual, group and institutional settings. Non-psychological methods of behavioural influence. A comparison of attitude and behavioural change. Definitions of problem behaviour. Ethical issues.

**12.333 Ergonomics 3****S1 L2T2***Prerequisite: 12.200.*

Aspects of human performance relevant to work design. The principles involved in designing the environment in general, and work in particular, to suit humans' capabilities.

**12.334 Behaviour in Organizations 3** **S1 or S2 L2T2***Prerequisites: 2 Psychology Level II subjects.*

Theories and research methods for understanding behaviour in organizations and in the environment.

**12.335 Behavioural Evaluation and Assessment 3****S2 L2T2***Prerequisite: 12.200.*

Assessment and evaluation of individual behaviour and behavioural change. Problems of measurement and scale construction; objective versus subjective measures; self report, behavioural and psychophysiological measures. Interviewing and behavioural analysis; psychometric testing and case history taking.

**12.340 Special Topic 3****S1 L2T2***Prerequisites: 12.200 and 12.202.*

An occasional elective dealing with a special field of psychology.

## Psychology Level IV Units

### 12.400 Psychology 4 (Thesis — Course 3431)

F

*Prerequisite:* All requirements for Years 1-3 of the course.

Psychology 4 in the BSc(Psychol) degree course. A supervised research thesis and course work to be determined in consultation with the Head of School.

### 12.401 Psychology 4 (Course 3431)

F

*Prerequisite:* All requirements for Years 1-3 of the course.

Psychology 4 in the BSc(Psychol) degree course. Course work and a supervised group research project to be determined in consultation with the Head of School.

### 12.403 Psychology 4 (Thesis)

F

*Prerequisites:* 12.100, 12.200, 12.201, 12.202 and 8 Psychology Level III units, including 12.300 and 12.305 from Group A and 12.301 from Group B, with a weighted average of at least 68% and at the discretion of the Head of School.

Psychology 4 in the Arts, and Science and Mathematics degree courses. A supervised research thesis and course work to be determined in consultation with the Head of School.

### 12.404 Psychology 4

F

*Prerequisites:* 12.100, 12.200, 12.201, 12.202 and 8 Psychology Level III units, including 12.300 and 12.305 from Group A with a weighted average of at least 68% and at the discretion of the Head of School.

Psychology 4 in the Arts, and Science and Mathematics degree courses. Course work and a supervised group research project to be determined in consultation with the Head of School.

## Psychology Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subject see the Faculty of Commerce Handbook.

### 12.651 Psychology (Industrial Relations)

*Prerequisite:* Nil.

Not offered in 1988.

Problems and limitations affecting social research in industry. Critical review of American research from Hawthorne to Herzberg and of British research from Tavistock and Trist to Emery in Australia. Conflict and organic theories of organization and related theories of motivation and morale. The use of library resources. Practice in the skills and discipline required to obtain and evaluate empirical evidence in this field. Recent developments under the headings of 'participation' and democracy in industry.

For further information regarding the following subject see the Faculty of Science section in this Handbook.

### 12.741 Psychology (Optometry)

F L2

*Prerequisite:* 12.100.

*Visual perception:* The nature and characteristics of visual perception. Topics to be discussed include: psychophysics, the organization of visual perception, the influence of context, and the effects of learning and motivation on perception. Throughout the course emphasis will be placed on an examination of relevant experimental data. *Abnormal psychology:* The concepts of normality and abnormality, and an examination of the principal psychodynamic processes. Causes and symptoms of various mental disorders are introduced with some emphasis on the importance of these symptoms in optometrical practice.

## Accountancy

### 14.501 Accounting and Financial Management 1A

S1 or S2 L2T2½

*Prerequisite:* Nil.

The basic concepts of financial model building and information systems, including the double-entry recording system, the accounting cycle, income measurement and financial reporting, and an introduction to basic elements of auditing.

### 14.511 Accounting and Financial Management 1B

S1 or S2 L2T2½

*Prerequisite:* 14.501.

Development of basic concepts introduced in 14.501 Accounting and Financial Management 1A, including corporate reporting, business finance, system design, elementary computer applications.

### 14.522 Accounting and Financial Management 2A

S1 or S2 L2T2½

*Prerequisites:* 14.511 plus

	HSC minimum mark required
2 unit Mathematics or	60
3 unit Mathematics	2 unit 60
	3 unit or 1
	3 unit 1
4 unit Mathematics	4 unit 1

The design, production and use of accounting and other quantitative information in the planning and control of organizations, with particular reference to manufacturing activities.

### 14.542 Accounting and Financial Management 2B

S2 L2T2½

*Prerequisite:* 14.511 plus HSC results as for 14.522.

Critical examination of concepts and problems in income measurement, asset valuation and financial reporting for various forms

of business undertaking with particular reference to corporate organizations, including associated aspects of auditing and taxation and methods of accounting for changing prices.

**14.563 Accounting and Financial Management 3A** **S1 or S2 L2T2½**

*Prerequisite:* 14.542.

Financial Accounting: Advanced aspects of financial accounting and reporting for business enterprises with particular reference to developments in accounting theory and practice and in professional standards, including the financial and accounting aspects of mergers, takeovers and group companies.

**14.573 Accounting and Financial Management 3A (Honours)** **S1 LT6**

*Prerequisite:* 14.542.

Includes 14.563 Accounting and Financial Management 3A as well as additional and more advanced work in both accounting theory and in the financial management and accountability of corporate enterprises.

**14.583 Accounting and Financial Management 3B** **S1 or S2 L2T2½**

*Prerequisite:* 14.522.

Management Accounting: advanced treatment of management accounting theory and applications including statistical cost analysis, budgetary and strategic planning and decision models.

**14.593 Accounting and Financial Management 3B (Honours)** **S2 LT6**

*Prerequisite:* 14.522.

Includes 14.583 Accounting and Financial Management 3B, as well as more advanced work dealing with theoretical and research issues in management accounting.

**14.602 Computer Information Systems 1** **S1 or S2 L2T1**

*Prerequisite:* 15.411 or 15.401 or approved studies in computer science.

Information systems and the organization, architecture of typical commercial application systems, the systems lifecycle, the systems analysis/design task, tools and techniques of the systems analyst, documentation techniques, internal controls and interfacing with the edp auditor, file design concepts, logic and computer hardware, commercial computer programming.

**14.603 Computer Information Systems 2** **S2 L2T1**

*Prerequisite:* 14.602. *Excluded:* 14.606.

Systems design: physical design of business systems, specifications and updating of VSAM files, man-machine dialogue procedures, top-down structured design and evolutionary design methodologies. Introduction to communications networks. Operating systems concepts; processor, storage, device and process management, segmentation and paging systems. COBOL programming.

**14.605 Information Systems Implementation** **S2 L2T1**

*Prerequisite:* 14.603.

Supervised implementation of an information systems project in a commercial programming language. Advanced program design and structured techniques, interface with systems software at application implementation level, comparison of a range of programming languages, test data specification, implementation procedures.

**14.607 Distributed Computer Systems** **S2 L2T1**

*Prerequisite:* 14.603.

Advanced data communication concepts, computer networks, reference to international standards and common industry communications software packages; transaction processing software and interface with data management systems; local networks; interaction between text processing and data processing; a case study based on a microcomputer network.

**14.608 Database Systems** **S1 L2T1**

*Prerequisite:* 14.603 or 14.606.

Advanced data storage concepts, including detailed study of alternative approaches to database management systems. Management information needs and database specification in a commercial environment. Detailed evaluation, with project work, of a microcomputer based database management system. Information retrieval concepts, relational query-systems, security, control and audit considerations.

**14.611 Information Systems Development** **S1 L2T1**

*Prerequisite:* 14.603 and approval by the Head of the Department of Information Systems.

A systems analysis and design case study. Information systems project management, data processing administration, on-line systems, design techniques, internal controls.

**14.613 Business Finance 2A** **S1 or S2 LT3**

*Prerequisite:* 14.511, 15011 and 15.421.

The essential aspects of financial decision-making in business including: factors influencing capital expenditure decisions; alternative approaches to valuation; factors affecting the formulation of the capital structure; influence of the capital market environment.

**14.614 Business Finance 2B** **S1 or S2 LT3**

*Prerequisite:* 14.613.

Financial decision making within the framework of capital market theory. Includes diversification, risk and return, determinants of risk, efficient market hypothesis with emphasis on Australian evidence, capitalization changes and performance measures, takeovers and mergers.

## 14.615 Business Finance 3

S1 L3

*Prerequisite:* 14.614.

Theory and analytical techniques relevant to investment analysis and management. Includes analysis and valuation of securities, properties of accounting numbers, portfolio theory and asset pricing models, capital asset returns and information, bond ratings and yields and financial distress predictions.

## 14.774 Legal Environment of Commerce S1 or S2 L2T1

*Prerequisite:*

*HSC minimum  
mark required*

2 unit English (General) or	60
2 unit English or	53
3 unit English	1

The Australian legal system and areas of substantive law relevant to commerce including contract, business organization, employment, commercial arbitration, advertising, trade regulation, civil compensation, discrimination.

## 14.794 Honours Thesis

## 14.853 Advanced Systems Management

L3

*Prerequisite:* Admission to BCom degree course at Honours level.

As for 14.953G. See Graduate Study: Subject Descriptions.

## 14.857 Operations Research for Management 1

L3

*Entry approval by Head of Department of Information Systems.*

As for 14.957G. See Graduate Study: Subject Descriptions.

## 14.886 Research Topics in Information Systems 1

L3

*Entry approval by Head of Department of Information Systems.*

As for 14.986G. See Graduate Study: Subject Descriptions.

## 14.887 Research Topics in Information Systems 2

L3

*Entry approval by Head of Department of Information Systems.*

As for 14.987G. See Graduate Study: Subject Descriptions.

## 14.891 Decision Support Systems

L3

*Prerequisite:* 14.603

As for 14.991G. See Graduate Study: Subject Descriptions.

# Economics

## 15.001 Microeconomics 1

S1 or S2 L2T1½ or T2

*Commerce/Arts/Applied Science/Sciences prerequisite:*

*HSC minimum  
mark required*

2 unit English (General) or	60
2 unit English or	53
3 unit English	1

Economics as a social science; scarcity, resource allocation and opportunity cost. An introductory analysis of consumer behaviour. The economics of firms and markets: production and costs; the classification and analysis of markets. Efficiency concepts and market failure. The gains from international trade and the impact of trade restrictions. Economic growth and structural change.

## 15.002 Microeconomics 2

S1 L2T2

*Commerce prerequisite:* 15.011.

*Arts/Applied Science/Sciences prerequisites:* 15.011 plus 15.401 or 15.411 or 10.001 or 10.011. *Co-requisite:* 15.412

*Excluded:* 15.012, 15.072.

The theory of consumer behaviour and the theory of the firm. Structure and behaviour: adjustment and stability. General equilibrium analysis in an open economy. Externalities, public goods. Aspects of public sector and international economics.

## 15.003 Macroeconomics 3

S1 L2T2

*Commerce prerequisite:* 15.042 or 15.052.

*Arts/Applied Science/Sciences prerequisite:* 15.042 or 15.052. plus 15.422 or 15.416

*Excluded:* 15.013.

Review and extension of macroeconomic models of open economics. Dynamics, including cyclical. Introduction to the theory of economic policy. Rational expectation and macroeconomic policy. Theory and analysis of Australian fiscal, monetary, exchange rate, public and external debt, and income policy. International policy interdependence. Introduction to macroeconomic models.

## 15.011 Macroeconomics 1

S1 or S2 L2T1½

*Commerce/Arts/Applied Science/Sciences prerequisite:* 15.001.

Introduction to the analysis of aggregate output, employment and economic growth and their relationship to the policy issue of unemployment, inflation and the balance of payments. Social accounting and aggregate income and expenditure analysis. Introduction to macroeconomic models of income determination; consumption and investment functions. The role of money and financial institutions; interactions between goods and money markets in equilibrium and disequilibrium situations. Analysis of recent Australian macroeconomic experience.



**15.042 Macroeconomics 2****S2 L2T2***Commerce prerequisite: 15.011.**Arts/Applied Science/Sciences prerequisites: 15.002 plus 15.412.**Co-requisites: 15.422 or 15.416.**Excluded: 15.052, 15.062.*

Models of aggregate income determination in open economies. Theories of aggregate economic behaviour with respect to consumption and investment expenditures and financial transactions. Balance of payments and exchange rate analysis. Theories of inflation and unemployment. Introduction to dynamic analysis. Theories of growth and cycles.

**15.062 Applied Macroeconomics****S1 or S2 L2T1½***Commerce/Arts/Applied Science/Sciences prerequisite: 15.011.**Excluded: 15.052 and 15.042.*

Economic growth and fluctuations in Australia. Inflation, unemployment and balance of payments issues. Fiscal, monetary, exchange rate and incomes policies. Changes in the structure of the Australian financial system and its links with the international monetary system. Effects of restrictions on capital markets.

**15.072 Applied Microeconomics****S1 or S2 L2T1½***Commerce/Arts/Applied Science/Sciences prerequisite: 15.011.**Excluded: 15.012 and 15.002.*

Structural change in the Australian economy. The effect of different market structures on firms and consumer welfare. The consequences of markets failure and the effects of government regulation. Investment decisions in the public and private sectors, including the estimation of future benefits, revenues and costs, the measurement of consumer and producer surplus. The economics of non-renewable and other resources. Australia's international trade and investment and the effects of restrictions on international trade and investment.

**15.143 Microeconomics 3****S2 L2T2***Commerce prerequisite: 15.002 or 15.012.**Arts/Applied Science/Sciences prerequisite: 15.002 or 15.012 plus 15.422 or 15.416.**Excluded: 15.153.*

General equilibrium and input-output analysis, including the impacts of taxation and other forms of government intervention. Theory of second best. Public enterprise pricing and investment. "Privatisation" and deregulation of markets. Decision-making under uncertainty.

**15.901 Australia in the International Economy in the 20th Century****S1 or S2 L2T1½***Commerce/Applied Science/Arts/Sciences prerequisite:*

	HSC minimum mark required
2 unit English (General) or	60
2 unit English or	53
3 unit English	1

The international economy at the end of the 19th century: trade, factor flows, and payment arrangement. Problems of the international economy between the wars. The impact of World War II and the international economy in the post-war era. Australian economic development and its relationship with the international economy; economic fluctuations; problems of the inter-war period; growth of manufacturing; government policy and action; the importance of the mining industry; economic development and the distribution of income and wealth.

**15.902 Management Strategy and Business Development****S2 L2T1½***Commerce prerequisite: 15.901.**Applied Science/Arts/Sciences prerequisite:*

	HSC minimum mark required
2 unit English (General) or	60
2 unit English or	53
3 unit English	1

The strategy and structure of large scale business enterprise over the past century. An analysis of the process of growth from small family firms and partnerships to corporate enterprises and multi-national corporations. The external business environment. Case studies of managerial hierarchies, investment strategy and diversification of firms in transport, mass retailing and mass production.

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**Biological Sciences**

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**17.031 Biology A****S1 L2T4***Prerequisite:*

	HSC Exam Mark Range Required
2 unit Science (Physics) or	53-100
2 unit Science (Chemistry) or	53-100
2 unit Science (Geology) or	53-100
2 unit Science (Biology) or	53-100
3 unit Science or	90-150
4 unit Science	1-50

Basic cell structure; membranes, organelles, prokaryotic and eukaryotic cells; cellular locomotion; basic biological molecules; enzymes; structure and metabolic roles, cellular compartmentalization and enzyme function; diffusion, osmosis and active transport; theory of inheritance, linkage, mutation, information transfer and protein synthesis.

*Requirements for Practical Work*

Equipment required for practical work is set out in the *Course Guide*, available during enrolment time at the First Year Registration Centre (Physics Building). Students must purchase this *prior* to the first week of session.

## 17.041 Biology B

S2 L2T4

*Prerequisite:* 17.031. *Excluded:* 17.021.

The evolution, diversity and behaviour of living things and the ways in which they have adapted to varying environments. Emphasis on the structure and function of flowering plants and vertebrate animals, and their roles in Australian ecosystems. The theory covered in lectures and tutorials is illustrated by observation and experiment in laboratory classes.

## 17.012 General Ecology

S2 L2T4

*Prerequisites:* 17.031 and 17.041.

Evolution and environmental selection in the Australian continent; geological, palaeoclimatological, biogeographical and historical background. Functional organization of ecosystems; energy budgets, hydrological and biogeochemical cycles. Integrated structure and function of ecosystems, including cropping and management of natural resources. Aspects of microbial ecology. Students are required to attend a field camp as an integral part of the course.

# Applied Geology

## 25.110 Earth Materials and Processes

S1 L2T4

*Constitution of the Earth.* The Earth and the Solar System. The interior of the Earth: the crust and its chemical composition, gravity and isostasy. Minerals and rocks, economic mineral deposits. *Earth Processes.* The origin of igneous rocks; plutonism and volcanism. The geological cycle. Weathering processes, soil formation and landforms. The origin of sedimentary rocks; transportation, deposition, lithification. Arid, glacial and periglacial processes. Geological time. Metamorphism and metamorphic rocks. Structural geology, classification and origin of faults and folds. Quaternary stratigraphic sequences, neotectonics. *Field work* of up to two days is a compulsory part of the subject.

## 25.120 Earth Environments and Dynamics

S2 L2T4

*Prerequisites:*

2 unit Mathematics\* or  
3 unit Mathematics or  
4 unit Mathematics  
and  
2 unit Science (Physics) or  
2 unit Science (Chemistry) or  
4 unit Science (multistrand)  
and  
25.110

\*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

*Earth Environments:* Introductory palaeontology, including the evolution of life, invertebrates and vertebrates. Principles of stratigraphy. The stratigraphy of New South Wales: Broken Hill, Lachlan Orogen, New England Fold Belt and Sydney Basin. Introductory stratigraphy of Australia from the Precambrian to the Recent. The mineralogical study of rocks; techniques and significance of mineralogy. Structural geology; stereographic and statistical treatment of structural data. *Earth Dynamics:* The evolution of ocean basins; sea-floor spreading and sea-level changes. Climates of the past. Geophysical methods of exploration; seismology and earthquake prediction. Plate tectonics and continental drift. *Field work* of up to four days is a compulsory part of the subject.

## 25.211 Earth Materials 1

S1 L2T4

*Prerequisite:* 25.120.

*Mineralogy:* Principles of optical crystallography and the use of the polarizing microscope. Chemical and physical properties of rock forming minerals. Mineral identification. *Igneous Petrology:* Occurrence, classification and origin of igneous rocks. Fractional crystallization and differentiation. Partial melting. Simple binary melting diagrams. Igneous petrology relating to plate tectonics. *Practical:* Macroscopic and microscopic examination of rock forming and ore minerals and igneous rocks in the field and the laboratory. *Field work* of five days is a compulsory part of the subject.

## 25.212 Earth Environments 1

S1 L3T3

*Prerequisite:* 25.120.

*Sedimentology:* Flow regimes and bedding forms, sedimentary structures. Modern and ancient sedimentary environments of deposition: alluvial, nearshore, shelf and deep sea, in both terrigenous clastic and carbonate/evaporite domains. The facies concept: lateral and vertical relationships between depositional environments and associated lithofacies within developing sediment wedges. *Palaeontology:* Morphology and stratigraphic distribution of invertebrates, including Foraminifera, Brachiopoda, Mollusca, Arthropoda, Protochordata and Echinodermata. Introductory palaeobotany. Palaeoecology. Biogeography. Trace fossils. Reef building organisms and the evolution of reefs. *Field work* of up to five days is a compulsory part of the subject.

## 25.221 Earth Materials 2

S2 L3T3

*Prerequisite:* 25.211.

*Sedimentary Petrology:* The influence of transportation, deposition and diagenesis on the composition, texture and structure of detrital sedimentary rocks. The non-clastic sedimentary rocks including phosphates, evaporites, ferruginous and siliceous deposits. *Metamorphic Petrology:* Origin and classification of metamorphic rocks as an aid in understanding common mineral assemblages. Petrographic studies of common metamorphic rocks. Field studies. *Structural Geology:* Origin, classification and description of structures in rocks. Techniques of stereographic projection of structural elements and analysis of simple fracture systems. Tectonics and tectonic analysis. *Field work* of up to four days is a compulsory part of the subject.

**25.223 Earth Physics****S2 L2T4***Prerequisite:* 25.110.

*Global Geophysics:* Principles of gravity, geomagnetism, palaeomagnetism, geothermy and seismology and their relation to shape, internal constitution, dynamic processes and major tectonic features of the earth. *Photogeology:* The use of air photos for geological mapping and geomorphological evaluation of land. Techniques and principles of photo-interpretation and multi-band photography. Photo-interpretation of folds, faults, joints, bedding, limestone, intrusive igneous volcanic rocks, alluvial fans, terraces, slopes, landslides, coastal and tropical landforms. Relationships between geology, drainage, soil and vegetation, orebody expression gossans, colouration halos. An introduction to remote sensing. *Geological Surveying:* Levels, tachometers and theodolites. Field techniques. Precision of angular measurements. Stadia surveying. Levelling. Field computations. Closed and open traverses. Coordinates and their computation. *Field work* of two days is a compulsory part of the subject.

**25.2261 Mathematical Geology 1****S2 L2T1***Prerequisite:* 25.120.

*Geological Statistics:* Measurement scales in geology. Probability distributions and their properties; sampling and test of significance. Application of these techniques using geological data. *Geological Computing:* FORTRAN programming; text editing; control language for VAX and CYBER.

**25.311 Earth Materials 3****S1 L2T4***Prerequisite:* 25.221.

*Mineralogy:* Principles of X-ray powder diffractometry and the use of X-ray powder cameras and diffractometers. Elementary stereo-logy. Laboratory methods of mineral separation. Mineral characterization. *Geochemistry:* Accuracy, precision and quality of geochemical data. Graphical display of analyses. Norms. The distribution of elements in terrestrial rocks. Nature and origin of meteorites and tektites. *Aqueous Geochemistry:* Redox potentials in nature. Oxidation/reduction and sediment formation. Solubilities, metal transport and ore deposition. The growth of minerals from solution and the development of mineral textures. Particular aqueous geochemical systems.

**25.321 Earth Materials 4****S2 L3T3***Prerequisite:* 25.221.

*Clay Mineralogy:* The structure and properties of the clay mineral groups including the kaolinites, illites, smectites, chlorites, mixed layered and fibrous clay minerals. Techniques for the identification of the clay minerals. Clay-water systems and ion exchange. Chemical weathering and the origin of the clay minerals. Industrial uses of clays and bauxite. *Advanced Igneous Petrology:* Origin of silicate liquids. High pressure and low pressure fractionation. Liquids and fluids. Nature of the Upper Mantle. The use of trace elements and isotopes as petrogenetic indicators. Practical petrography and literature studies of igneous suites. Field study. *Advanced Metamorphic Petrology:* Facies series. Metamorphic reactions. Isograds. Mineral assemblages

as geobarometers and geothermometers. Fluids in metamorphism. Fabric. Relationships of deformations and recrystallization.

**25.312 Earth Environments 2****S1 L3T3***Prerequisite:* 25.212 (note: it is desirable that students taking this unit have also taken 25.223).

*Stratigraphy:* Stratigraphic classification. Biological and physical methods of correlation. Introduction to radiogenic methods of age determination:  $^{14}\text{C}$ , K/Ar, Rb/Sr, Nd/Sm, U/Th/Pb and fission track methods. Definition of international stratigraphic boundaries, stratotypes and reference points. Types of sedimentary basins and continental margins. The development of the Precambrian craton of Australia. The geological evolution of eastern Australia, particularly the late Palaeozoic and Mesozoic history of the Tasman Mobile Belt. Intracratonic basins of western and southern Australia and the effects of the dispersal of Gondwanaland. Geological evolution of the northern margin of the Australian plate, particularly the Mesozoic to Recent of Papua-New Guinea. *Palaeontology:* Theories of biological classification. Processes and theories of evolution. The origin and early history of life. Functional morphology. Practical application of palaeontology. *Field Mapping:* Geological mapping in a complicated geological terrain. Geological report writing and cartography. *Field work* of up to seven days is a compulsory part of the subject.

**25.314 Mineral and Energy Resources 1****S1 L3T3***Co-requisite:* 25.221 or 25.311.

*Metallic Resources:* Classification and origin of the ore deposits, geochemical processes, research methods. Orthomagmatic, hydrothermal, porphyry, volcanic-sedimentary, Mississippi Valley type, chromium, iron, manganese ores, residual and mechanical ores. Introduction to mineral exploration. Laboratory study of hand specimens, thin sections and polished sections of various ore types; study of selected mining areas representing various genetic types of ore. *Economic Mineralogy:* Nature of reflected light. Ore textures and their interpretation. Phase relations and paragenesis of ore minerals. Practical work in optical properties of ore minerals, hardness and reflectivity measurements: study of selected ores and ore minerals under the microscope including textural studies. *Field work* of up to three days is a compulsory part of the subject.

**25.3162 Mathematical Geology 2****S1 L2T1***Prerequisite:* 25.2261.

Application of the mathematical techniques listed below to geological data processing and analysis. Analysis of variance. Introduction to matrix algebra. Regression analysis; trend surface analysis; time series analysis; Markov chain analysis. Introduction to nonparametric statistics. Introduction to multivariate statistics. *Practical work* based on the use of SPSS, BMDP and other library programs.

Metamorphic petrology of Australia. Practical macroscopic and microscopic study of metamorphic rocks. *Field work* of up to six days is a compulsory part of the subject.

**25.324 Mineral and Energy Resources 2**

**S2 L3T3**

*Prerequisite:* 25.212 or 25.5212.

*Coal Geology:* Nature and properties of coal. Methods of testing and analysis. Introduction to coal petrology. Origin of coal seams and coal-bearing sequences. Coalfield exploration and coal mining geology. Geological factors in coal preparation and use. Geology of oil shale. *Petroleum Geology:* Geological factors critical to the occurrence of oil and natural gas. Geochemistry of hydrocarbons and formation fluids; techniques of petroleum exploration. Assessment and development of reserves. Typical petroleum occurrences in Australia and overseas. *Non-metallic Minerals:* Occurrence and economic use of non-metallic and industrial minerals including limestone, silica, asbestos and construction materials. *Sedimentary Basin Analysis:* Techniques of analysis and data presentation using information from outcrops, boreholes (including geophysical logs) and seismic sections. Construction and interpretation of structural, isopachous and lithofacies maps. Seismic stratigraphy. Styles of sedimentation within and structural development of basins in different tectonic regimes. Evolution of sedimentary basins. *Field work* of four days is a compulsory part of the subject.

**25.325 Engineering and Environmental Geology**

**S2 L4T2**

*Environmental Geology:* Hydrodynamics of pollutants and water quality principles. Domestic, industrial and radioactive waste disposal, deep well injections. Geological hazards and urban planning. Environmental impacts of dams, mineral exploration, mining and impact statement techniques. Water resources law and pollution. Land use conflicts. *Hydrogeology:* The hydrological cycle; confined and unconfined groundwater. Hydrological characteristics of rocks and their measurement. Pump tests. Aquifer boundaries. Exploration for groundwater development and monitoring of groundwater resources. Groundwater flow tests. Case studies from the Great Artesian Basin and the Murrumbidgee area. *Geomechanics:* Rock and soil masses and their engineering behaviour influence of composition and fabric. Discontinuities in rocks and soils and their analysis for engineering purposes. Mechanical properties and their measurement. Stress-strain theory. *Coastal Geology:* Properties of sedimentary populations. Sampling practices. Measurements of grain size, grain shape and packing; analyses of measured data. Geological significance of sediment parameters. The shoreline processes Littoral and longshore drifts and net sand movement. Coastal engineering works. The estuarine environment. *Field work* of up to three days is a compulsory part of the subject.

**25.3261 Geochemical Analytical Techniques**

**S2 L1T1**

*Prerequisite:* 25.311.

Sampling and sample preparation. Modern destructive methods of rock and mineral analysis. Non-destructive methods; X-ray fluorescence spectroscopy and electron probe microanalysers.

**25.3271 Structural Geology**

**S2 L1T1**

*Prerequisite:* 25.221.

*Advanced Structural Geology:* Analysis of structural elements at the microscopic, mesoscopic and macroscopic scales. Detailed studies of the analysis of metamorphic terrains, eg Cooma Complex, Broken Hill. *Field work* of up to four days is a compulsory part of the subject.

**25.333 Exploration Geophysics**

**S1 L3 and S2 L1T1**

*Prerequisite:* 25.120.

Physical properties of rocks and soils. Introduction to seismic, gravity, magnetic, electrical, electromagnetic and radiometric methods of geophysical exploration. Application of these methods in the search for mineral deposits, petroleum, coal and groundwater and in civil and mining engineering projects. Interpretation of geophysical data. *Field work* of up to three days is a compulsory part of the subject.

**25.410 Resource Geology**

**S1 L3T6**

*Exploration Geochemistry:* Principles and techniques of soil, drainage and rock geochemistry as applied to mineral exploration. *Mathematical Geology:* Application of probability graphs to exploration data. Processing and interpretation of geological data using selected univariate and multivariate statistics; typical case studies in mathematical geology exemplifying these techniques.

*Remote Sensing:* Principles of various remote sensing techniques including landsat and side-looking airborne radar. The techniques of image enhancement and digital processing. Applications of remote sensing in lithological mapping and tectonic analysis. Integration of remotely sensed data with conventional data sources. Practical work with the interactive computer on image analysis with particular reference to student field study areas. *Precambrian Geology:* Distribution, terminology, concepts, general features of the Archaean and Proterozoic. Archaean of Australia: Pilbara, Yilgarn. Proterozoic of Australia: Kimberleys, Broken Hill. Precambrian syntheses: tectonic, plate tectonics. Aspects of Precambrian mineralization. *Resource Economics:* Introduction to the role of earth resources in industrial society; availability of resources and consideration of grade, price, economic, technical and political factors. Distribution, production, consumption and trade in minerals. Supply adequacy and resource assessment. Review of Australian and New South Wales mineral industry. Economics of engineering geological works. *Report Writing:* Techniques of scientific report writing, especially preparation of theses and research articles. Methods of illustrating verbal and written presentations. Guidelines to verbal presentations. *Field work* of up to seven days is a compulsory part of the subject.

**25.412**

**25.414**

**25.415**

**25.420 Field Project****S2**

A major field-laboratory project, which generally includes geological mapping, on some aspect of mineral or sedimentary basin resources, engineering or environmental geology or resource geophysics.

**25.4101 Topics in Advanced Geology****S1 L3**

Topics in geology selected from a list of subjects available from the Head of Department.

**25.434****25.5212 Sedimentology****S1 L1T1**

*Prerequisite:* 25.120. *Excluded:* 25.212.

As for *Sedimentology* in 25.212 Earth Environments 1. Available only to Course 3145.

**25.5313 Stratigraphy****S1 L2**

*Prerequisite:* 25.5212. *Excluded:* 25.312.

As for *Stratigraphy*, in 25.312 Earth Environments 2.

**25.621 Marine Geology 1****F L1T2**

*Prerequisites:* 25.601 or both 25.110 and 25.120.

*Sedimentology:* Flow regimes and bedding forms, sedimentary structures. Modern and ancient sedimentary environments of deposition: alluvial, nearshore, shelf and deep sea, in both terrigenous clastic and carbonate/evaporite domains. The facies concept: lateral and vertical relationships between depositional environments and associated lithofacies within developing sediment wedges. *Global Geophysics:* Principles of gravity, geomagnetism, palaeomagnetism, geothermy and seismology and their relation to shape, internal constitution, dynamic processes and major tectonic features of the earth. *Mineralogy and Petrology:* Igneous and sedimentary rock types of the ocean floor and their significance.

*Field work* of five days is a compulsory part of the subject.

**25.622 Hydrological and Coastal Surveying****F L1T2**

*Prerequisites:* Nil.

General principles of surveying, with particular reference to coastlines and off-shore techniques. Optical and electronic methods of distance measuring and position fixing. Methodology for short-term and long-term measurement of tides and flow currents. Bathymetric surveys in shallow and deep water conditions. Coastline morphologies and their relationship to the behaviour of water masses. Analysis of sedimentary systems in deltaic, estuarine and near-shore environments. Data collecting, processing and storage. Shallow-water investigations for bed-rock morphologies. *Field work* of five days is a compulsory part of the subject.

**25.631 Marine Geology 2****F L1T2**

*Prerequisite:* 25.621.

*Clay Mineralogy:* Structure and properties of the clay mineral groups including the kaolinites, illites, smectites, chlorites, mixed layered and fibrous clay minerals. Techniques for identification of the clay minerals. Clay-water systems and ion exchange. Chemical weathering and the origin of the clay minerals. *Sedimentary Basin Analysis:* Technique of analysis and data presentation using information from outcrops, boreholes (including wireline logs) and seismic sections. Construction and interpretation of structural, isopachous and lithofacies maps. Seismic stratigraphy. Styles of sedimentation within and structuring of basins in tensional, compressive and strike-slip tectonic regimes. Basin evolution. *Stratigraphy:* Ocean basin stratigraphy and the environmental and chronological utility of the principal groups of index fossils. Stratigraphical history and correlation of sedimentary rocks in the deep ocean basins and on continental shelves. Changes of sea level. The Quaternary history of the oceans. Reefs and carbonate sedimentation. Deep sea consolidated sediments. *Field work* not exceeding two days is a compulsory part of the subject.

**25.632 Estuarine Geology****F L1T2**

*Prerequisite:* Nil.

The physical nature of the estuarine environment: its characteristic topography, chemistry and layering of water masses; tidal behaviour. Characteristic sediments, stratigraphy of sediment bodies and distribution patterns of sediments and microfossils in estuaries. Inorganic and microbial diagenesis of estuarine sediments. Procedures for mapping, sampling and sample analysis. Mineral morphology. Statistical treatment of results. *Field work* of four days is a compulsory part of the subject.

**25.6341 Marine Mineral Deposits and Oceanic Minerals****S1 L1T1**

Oceanic minerals and mineral deposits: detrital, authigenic and epigenetic. Methods of exploration, assessment and exploitation, international law relating to the sea floor. Resources important to human civilization of a biological, fluid and mineral nature. Mining of ocean resources. Geological aspects of waste disposal and engineering works in the ocean. Tidal energy.

**25.6342 Exploration and Seismic Methods****S2 L2T1**

Geophysics of ocean basins and off-shore areas and the techniques of their study. Seismic refraction, reflection and computational methods, instrumentation of seismic and acoustic sources, recording systems and signal processing. Geological and physical interpretation of results. Practical work on instrumentation, recording and interpretation of field data.

**25.931**

## 25.9311 Gravity and Magnetic Methods S1 L2T1

*Prerequisites:* 1.001 and 10.001. It is desirable that students taking this unit have a background in geology.

Fundamental principles. Field procedures and instruments. Reduction of field data. Regionals and residuals. Effects of sources of simple geometrical shapes and generalized two and three-dimensional distributions. Applications. *Field work* of one day is a compulsory part of the subject.

## 25.9312 Seismic Methods S1 L2T1

*Prerequisites:* 1.001 and 10.001. It is desirable that students taking this unit have a background in geology.

Seismic waves. Physical/engineering properties of geological materials. Ray theory in seismic refraction and reflection methods. Instrumentation. Data acquisition and processing. Depth and velocity analysis. Geophysical and geological interpretation. Case history studies. *Field work* of one day is a compulsory part of the subject.

## 25.9313 Electrical Methods S1 L2T1

*Prerequisites:* 1.001 and 10.001. It is desirable that students taking this unit have a background in geology.

Introductory theory and field practice of resistivity, self-potential, induced polarization and airborne and ground electromagnetic methods. Geological interpretation of field data. Geophysical logging. *Field work* of one day is a compulsory part of the subject.

## 25.9314 Geological Applications S1 L1T1

*Prerequisite:* 25.120.

A subject of ten weeks' duration. *Structural Geology:* Elements of structural geology, stereographic projection and fracture analysis. *Geology of Fuels:* Origin of coal, oil and natural gas; stratigraphic and structural consideration of oil and coalfields. *Hydrogeology:* Principles of hydrogeology; transmission of groundwater in rocks and soils. *Field work* of one day is a compulsory part of the subject.

## 25.9321 Geophysical and Geological Applications S2 L1T2

*Prerequisite:* 25.120. *Excluded:* 25.6342.

*Geological Interpretation of Geophysical data:* Seismic stratigraphy. Coal-seam geometry from high resolution seismic and in-seam data. *Geology of Ore Deposits:* Mineralogy of industrially important metallic and non-metallic minerals. Theories of ore formation including secondary enrichment processes. Available only in program 2503.

# Geography

## 27.010 Land Studies S1 L2T2

Concepts, significance and problems of land. Land as territory and land as resource in Australia. Constraints imposed by the

physical environment on human occupancy and settlement patterns, the variety of conflicts that result and management strategies. Practical work involves study of the ways in which the attributes and characteristics of land are displayed on maps, air photos and satellite imagery, and introduces these as basic information sources and research tools in applied geography.

## 27.030 Environmental Processes S2 L2T2

Essential and continuing links between components of the physical environment. Movement of energy and matter in the physical environment, including consideration of Earth's energy balance, the hydrological cycle, nutrient cycles in vegetation and soil, imbalances leading to land degradation and instability, alternatives to and movement of materials.

## 27.050 Geographical Data Analysis F L2T2

*Prerequisites:* 27.111 or 27.010 and 27.030. *Excluded:* 27.162, 27.632, 27.813, 27.884.

Inferential statistics and hypothesis testing in the analysis of spatial data. Methods of analysing categorical data, identifying spatial correlation and associations, and multivariate methods applicable to topics in physical and economic geography.

## 27.133 Pedology S2 L2T3

*Prerequisites:* 27.010 and 27.030 or 27.111 or any two units from 2.111, 2.121, 2.131, 2.141, and 27.811, 27.828 or 27.311 or 25.012 or 25.022.

Methodology of pedogenic studies and the application of these studies to the understanding of soil-landform relationships. Soil physical and chemical properties and their interrelationships, emphasizing clay-mineral structure and behaviour, soil solution chemistry, soil water movement and the application of these properties to elements of soil mechanics. Soil properties in natural, rural and urban landscapes, including assessment of soil fertility, swelling characteristics, dispersibility, erodibility and aggregate stability. Laboratory analysis of soil physical and chemical characteristics with emphasis on properties associated with land capability assessment. Statistical analysis of soil data and its application to mapping. The use of soil micromorphological and mineralogical studies in pedology.

## 27.143 Biogeography S1 L2T3

*Prerequisites:* 27.010 and 27.030 or 27.811 or 27.828 or 17.031 and 17.041 or 27.111 or 27.172.

Distribution of taxa. Floras of the Southern Hemisphere with particular reference to Australia. Endemic, discontinuous and relict taxa. Dispersal and migration of species. Origin, evolution and geological history of Angiosperms. The development of the Australian biogeographic element. Study of the recent past to understand present distributions of taxa. The role of man and climatic change on Australian vegetation. Detection of pattern and association and their causes. Classification, ordination and mapping of vegetation. Ecology of selected Australian vegetation types. Composition, structure, productivity and environmental control of heathland, woodland, grassland and rainforest communities. Management of vegetation in different climate regimes. *Field work* of up to five days is a compulsory part of the subject.

**27.153 Climatology****S1 L2T3**

*Prerequisites:* 1.001 or 27.811 or 27.828 or 25.110 and 25.120 or 17.031 and 17.041 or 27.111.

Physical bases for understanding microclimate. Processes of energy exchange at the earth's surface, and the atmospheric and terrestrial surface controls of the heat and mass budgets. Atmospheric diffusion. Wind profiles and atmospheric turbulence as affected by stability and surface properties. Determinants of the local and site-specific climatic environment, particularly topographic, surface cover and substrate conditions. Urban climate and climate in relation to human comfort and health. Building constructional design aspects of climate and applications of climatology in urban and regional planning. Climatic aspects of the development and regional planning. Climatic aspects of the development and utilization of solar and wind energy sources.

**27.172****27.175 Introduction to Remote Sensing****S1 L2T2**

*Prerequisite:* Successful completion of a Year 1 program in Applied Science, Science or Arts (or equivalent) as approved by the Head of School.

Principles and technical aspects of remote sensing. Forms of available imagery, their utility and facilities for interpretation. Basic airphoto interpretation techniques relevant to environmental assessment. Introduction to principles of the electromagnetic spectrum, photometry and radiometry. Sensor types, image formation and end products associated with selected satellite programs, including Landsat. Land-cover and land-use interpretation procedures in visual image analysis. Basic procedures in machine-assisted image enhancement.

**27.176 Remote Sensing Applications****S2 L2T2**

*Prerequisite:* 27.175 or 27.1711, 29.514 or 29.511 and 29.631. *Excluded:* 27.1712

Spectral characteristics of natural phenomena and image formation. Ground truthing, collection and calibration. Introduction to computer classification procedures. Multitemporal sampling procedures, image to image registration and map to image registration. Major applications of remote sensing in the investigation of renewable and non-renewable resources to include: soils, geology, hydrology, vegetation, agriculture, rangelands, urban analysis, regional planning, transportation and route location and hazard monitoring.

**27.183 Geomorphology****S2 L2T3**

*Prerequisites:* 25.110 and 25.120 or 27.010 and 27.030 or 27.811 or 27.828 or 27.111 or 27.172. *Excluded:* 27.860.

Beaches and their response to waves, currents and sediment movement. Barrier systems, lagoons and estuaries. Rock platforms. Quaternary sea level changes. Hydraulic geometry of stream channels, including effects of sediment transport and human activities. Hillslope form, process and associated slope materials. Methods of slope measurement, analysis and survey. Hillslope models. Systems approach, equilibrium concepts and modelling in landform studies. Field projects in coastal and fluvial geomorphology, and laboratory time is devoted to statistical exercises using data collected from maps, airphotographs and in the field.

**27.193 Environment Impact Assessment****S1 L2T2**

Rationale and basic objectives; standardized types of environmental impact assessment (EIA), including matrix approach, adopted methods of EIA in Australia. Frequently used assessment and predictive techniques for meteorological, hydrological, biological, socio-economic impacts. Techniques of impact evaluation in terms of socio-economic criteria. Environmental decision making and planning under conditions of uncertainty. Case studies exemplifying procedures, techniques and issues. Trends, changes and possible future developments in EIA. Practical exercises representing components of typical EIAs.

**27.432 Computer Mapping and Data Display****S1 L1T3**

*Prerequisites:* Successful completion of a Year 1 program in Applied Science, Science or Arts (or equivalent) as approved by Head of School.

Introduction to theoretical and practical problems in displaying data graphically and constructing thematic maps by computer using the GIMMS mapping package. The emphasis is on developing skills in automated cartography through hands-on experience culminating in the preparation of a folio of maps of selected census data. No previous computing expertise is required.

**27.652 Geographic Information Systems****S2 L2T2**

*Prerequisites:* 10.021B and 10.021C, or 10.001 or 10.011 or 27.432.

An introduction to information systems of particular relevance for geographers with special reference to computer-based systems for resource evaluation. Problems of data structures, geocoding, and spatial identifiers. Model-based information systems. Project work: case study evaluation and the development of information systems for monitoring spatial change.

**27.753 Social Welfare and Urban Development****S1 L2T3**

*Prerequisite:* 27.829 or 27.812. *Note:* This prerequisite does not necessarily apply to students enrolled in the Faculty of Applied Science.

Offered subject to availability of staff.

A consideration of welfare aspects of urban development, including social policies and urban structure; social costs and benefits of urban renewal especially in the inner city; growth centres and new towns; distributional aspects of social services; and spatial disparities in social well-being.

**27.813 Geographic Methods****S2 L2T2**

*Prerequisites:* 27.010 and 27.030, or 27.111 or 27.801 and 27.802, or 27.818 and 27.819. *Excluded:* 27.050, 27.813.

Statistical procedures and field methods used in both human and physical geography. Includes: measures of dispersion; measures of spatial distribution; samples and estimates; correlation and regression; tests for distribution in space; data collection and analysis; field observations.

**27.818 Australian Environment and Human Response****S1 L2T2***Prerequisite:* Nil. *Excluded:* 27.010, 27.030, 27.801, 27.295, 27.111.

Themes selected from the mechanisms of the physical environment with particular reference to Australia and the Sydney region. *Landscape as an expression of dynamic response:* land capability and land use problems, humans as agents of landscape change. *Energy and Atmospheric Circulation over Australia:* local weather patterns and weather extremes, human responses to fire, flood, and drought hazards. *Development and Stability of Hillslopes:* soil, vegetation and drainage relationships, problems of soil erosion. *Coastal Ecosystems:* problems of demand, risk and management in the coastal zone. Lectures are supplemented with tutorials, workshops, and field tutorials. Students are required to provide some materials for workshop exercises and to contribute to the cost of field tutorials.

**27.819 Technology and Regional Change****S2 L2T2***Prerequisite:* Nil. *Excluded:* 27.802.

The impact of technological change on the spatial organization of human activities and regional development and disparities. The implications of technological change on population distribution, resource utilization, and settlement patterns are examined at different scales emphasizing the social consequences at the community and regional level. Examples are taken from Third World and modernized countries, with particular reference to Australian case studies.

**27.824 Spatial Population Analysis****S2 L2T2***Prerequisite:* 27.812, or 27.829. *Excluded:* 27.834.

Population growth and structure in an urban and regional context. The components and processes of population change; fertility, mortality and migration set within the framework of demographic transition theory. Theories of migration and mobility and of optimal populations. Demographic and social indicators for urban and regional analysis and their implications for disparities in living conditions, residential differentiation and regional growth. The adjustment of immigrant and migrant populations to the urban environment.

**27.825 Urban Activity Systems****S1 L2T2***Prerequisite:* 27.812, 27.829. *Excluded:* 27.835.

Focus is on trip making, movement, and activity patterns in urban areas. Topics include: the activity concept, travel behaviour and urban spatial structure; constraints to individual travel behaviour and activity pattern linkages; the urban transport disadvantaged; public transport problems and issues in Australian capital cities; travel and activity consequences of transport infrastructure developments.

**27.826 Urban and Regional Development****S2 L2T2***Prerequisite:* 27.812, or 27.829. *Excluded:* 27.836.

Theories of urban and regional change leading to assessment of the role of planning. Emphasis on resource allocation, conflict

resolution and evaluation techniques including cost-benefit analysis and environmental impact assessment. Lectures accompanied by seminars and workshop sessions which concentrate on methodology.

**27.828 Australian Natural Environments****S2 L2T2***Prerequisite:* 27.801 or 27.818. *Excluded:* 27.010, 27.030, 27.111, 27.811.

Emphasizing interdependencies of climate, hydrology, landforms, soils and vegetation. Consideration of the development of landform, soil and vegetation patterns. Classification of climates. Case studies of selected zones in Australia and comparison with neighbouring areas. Climatic analysis and mapping, and analysis of natural landscapes.

**27.829 Australian Social Environments****S1 L2T2***Prerequisite:* 27.802 or 27.819. *Excluded:* 27.010, 27.030, 27.812.

Focus is on the interaction between human communities and the built environment in Australia: the effects of the natural environment on the evolution of settlement patterns; detailed analysis of rural and metropolitan social environments. Emphasis on inner city, suburbia, behavioural and social area approaches, and to managerialist and structural theories of social change on areas and their communities.

**27.844 Honours Geography****F**

*Prerequisites:* Arts students must satisfy Faculty requirements for entry to the Honours Level program and must have obtained at least 54 credit points in Geography subjects, including 12 Level 1 credit points. A minimum cumulative average at Credit level is required for all Upper Level subjects taken which must include 27.884.

Details of Honours Geography for science students are available from the School of Geography office.

Students are required: **1.** To undertake an original piece of work extending throughout the year and to submit a thesis based upon it. **2.** To participate in seminars and fieldwork as notified by the School of Geography.

**27.862 Australian Environment and Natural Resources****S1 L2T2***Prerequisite:* 27.010 and 27.030 or 27.811 or 27.812 or 27.828 or 27.829. *Excluded:* 27.872.

Continental and regional patterns of land, water and energy resources in Australia and its territorial waters, and natural factors affecting their development, including climate, soils and terrain; problems of limited surface and underground water resources and of conflicting demands, exemplified through particular basin studies; comparable reviews of energy, minerals and forest resources, human resources and development.

**27.863 Ecosystems and Man****S2 L2T2***Prerequisite:* 27.010 and 27.030, or 27.111 or 27.311/811 or 27.312/812 or 27.828 or 27.829. *Excluded:* 27.873, 27.363.

The structure and functioning of ecosystems, human interaction with ecosystems; Australian case studies of ecosystem



management, including pastoral, cropping, forestry, coastal and urban ecosystems.

### 27.883 Special Topic

**S1 or S2 L4**

*Prerequisite:* Nil.

Admission by permission to suitable students with good Passes in at least four subjects at Upper Level. A course of individually supervised reading and assignments as an approved topic in Geography not otherwise offered.

### 27.884 Advanced Geographic Methods

**S1 L2T2**

*Prerequisites:* 27.813 or both 27.2813 and 27.2814. *Excluded:* 27.050, 27.880.

Additional quantitative research techniques normally taken by Honours students in their third year. Research organization; computer analysis; collection and organization of data; statistical description; hypothesis testing and sampling; simple and multiple association analysis; nonparametric methods.

## Surveying

### 29.1010 Surveying 1

**S1 L2½T2½**

Introduction to surveying. Co-ordinate systems. Minor instruments. Introduction to distance measurement. Band measurement. Detail surveys with minor instruments. Construction, testing and adjustment of levels. Principles of levelling: methods and recording. Contouring.

### 29.2010 Surveying 2

**S2 L1½T2½**

Theodolites; principles and construction. Horizontal and vertical angle measurement. Areas of regular and irregular figures. Traversing and traverse computations.

### 29.441 Surveying for Engineers

**S1 or S2 L2T4**

Co-ordinate systems. Levelling. Theodolite and angular measurements. Distance measurements: steel band, electronic. Traversing. Tacheometry. Contour and detail surveys. Horizontal and vertical curves. Area and volume computations. Control, engineering and underground surveys. Outline of photogrammetry.

### 29.491 Survey Camp

A one-week field camp for students studying 29.441 Surveying for Engineers.

## Optometry

### 31.821 Anatomy and Physiology of Eye and Visual System

**S1 L4T2 S2 L5T2**

*Prerequisites:* 17.031, 17.041. *Co-requisite:* 73.011A.

*Histology, anatomy and embryology of the eye and associated structures:* Fibrous, vascular and neural tunics of the eye. The eyelids and lacrimal apparatus. Blood supply and innervation of these tissues. Visual pathways and gross anatomy of the brain. Functional architecture of the visual pathways. Pathways involved in ocular motility. Elementary embryology of the eye and associated structures. Developmental abnormalities of the eye. Internal and external examination of the eye using clinical techniques. *Vegetative physiology of the eye:* Corneal function: Transparency and thickness related to hydration. Ionic bases of corneal hydration; corneal metabolism and biochemistry. Epithelial electrophysiology. Control of intraocular pressure. Mechanisms of production and drainage of aqueous humour. Physiology of the crystalline lens. Electropotentials. Lens biochemistry and the basis of cataract formation. Autonomic reflexes: Pupil size and retinal illumination. Accommodation and the synkinetic near response. Blinking. Physiology of the lacrimal apparatus. Introduction to clinical techniques for evaluation of ocular function *Physiology of vision:* Photochemistry, Pigment bleaching and regeneration in rods and cones. Psychophysics and physiology of adaptation. Physiology, psychophysics and perception of colour. Visual electrophysiology. Theories of parallel and hierarchical processing of visual information. Perception of spatial and temporal modulation of retinal illuminance. Ocular motility. Binocular vision, fusion and stereopsis. Introduction of issues of interest in current visual science. *Visual perception:* Perception of form. Space perception. Visual illusions.

### 31.851 Optics

**S1 L4T4 S2 L1T3**

*Prerequisites:* 1.001 or 1.021, 10.001 or 10.021B and 10.021C or 10.011.

*Physical optics:* extension of Physics I content on the nature of light, interference, diffraction, polarisation. *Geometrical optics:* reflection, refraction, thin lenses, lens systems, thick lenses, optical instruments. *Mechanical optics and optical dispensing:* manufacture and properties of spectacle lens materials. Optical properties of spherical, cylindrical, spherocylindrical, 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.

### 31.852 Visual Optics

**S1 L1T1 S2 L2T1**

*Prerequisites:* 1.001 or 1.021, 10.001 or 10.021B and 10.021C or 10.011.

*Optical systems of the eye:* schematic eye, reduced eye, emmetropia, spherical ametropia, astigmatic ametropia, correction of ametropia, elementary magnification effects, aphakia. Accommodation, presbyopia, correction of presbyopia. Accommodation and convergence. Aberrations of the eye Phorias, measurement of phorias. Modulation transfer function Gradient index optics.

### 31.853 Measurement of Light and Colour S2 L1T1

*Prerequisite:* Nil.

Sources of radiant energy, detection and measurement of radiant energy. Distribution temperature. Colour temperature. The eye as a photoreceptor. Luminous energy. Relative luminous efficacy. Photometric measures and units. Reflection and transmission of light. Spectrophotometry. Colour mixture. Colorimetric equations. Grassman's Laws. Geometrical representation of colour. Transformation of primaries. CIE System. CIE Standard Observers. Uniform colour space. Colour differences. Colour rendering. Correlated colour temperature. Colour order systems.

### 31.841 Clinical Optometry F L1T15½

*Prerequisites:* 31.861, 31.862, 31.863, 31.864.

Students are required to examine patients in the Optometry Clinic, to diagnose their problems and to prescribe optical aids, orthoptic treatment or other management or referral as required. They also work in special clinics, including orthoptics, colour vision, low vision, children's vision and contact lenses, and participate in patient review clinics.

### 31.861 Optometry A F L5½T½

*Prerequisites:* 31.821, 31.851, 31.852, 31.853.

*Refraction:* theory and practice of keratometry, measurement of vision and visual acuity, aetiology and treatment of ametropia, objective and subjective refraction, prescribing special visual aids. *Orthoptics and binocular vision:* convergence/accommodation anomalies, strabismus, amblyopia. *Contact lenses:* corneal anatomy and physiology, contact lens design and manufacture, fitting techniques. *Low vision:* examination of the low vision patient, selection of aids.

### 31.862 Diagnosis and Management of Ocular Disease F L5T½

*Prerequisites:* 31.821.

*Microbiology:* cell structure, genetics, metabolism and classification of microbes. Special environments. Host-parasite relations. Introductory chemotherapy and immunology. Pathogenic micro-organisms and parasites. Viruses. *Pathology:* acute inflammation, chronic inflammation, repair, regeneration, haemorrhage, thrombosis, embolism, ischaemia, infraction, hyperplasia, hypertrophy, atrophy, metaplasia, neoplasia, carcinogenesis. *Diseases of the eye:* aetiology, pathology, diagnosis, prognosis and management of diseases of the eyelids, cornea, conjunctiva, iris, ciliary body, choroid, retina, optic nerve, lacrimal apparatus, sclera, orbit, lens and vitreous. Glaucoma. Lesions of the visual pathways. Ocular manifestations of systemic disease. *Diagnostic examination:* history taking and symptomatology, internal and external examination, ophthalmoscopy, slit-lamp biomicroscopy, tonometry, gonioscopy, visual field examination, colour vision tests.

### 31.863 Theory of Spectacle Lenses and Optical Instruments F L1½

*Prerequisite:* 31.851, 31.852.

Advanced geometrical optics and spectacle lens design. Aberrations and their control. The elements of microscopic and macroscopic systems.

### 31.864 Clinical Methods F T5

*Prerequisites:* 31.821, 31.851, 31.852, 31.853. *Co-requisites:* 31.861, 31.862.

Practical assignments in ophthalmoscopy, biomicroscopy, tonometry, gonioscopy, visual fields, colour vision tests, refraction, assessment of binocular vision, strabismus.

### 31.871 Optometry B F L6

*Prerequisites:* 31.861, 31.862, 31.863, 31.864.

*Public health optometry:* visual task analysis, visual standards vision screening. Industrial hazards; identification assessment and prescription of protective measures. Ergonomics and visual ergonomics. Illuminating engineering. Fatigue and visual fatigue. Epidemiology. *Contact lenses:* materials. Fitting. Residual astigmatism. Care, maintenance and solutions. Continuing patient care. Extended wear and special applications. *Pharmacology and drugs used in refraction:* classification. Pharmaceutical aspects: administration, absorption, elimination, accumulation, sterilisation. Preservatives. Chemotherapy. Toxicity. Ocular drugs and complications. Mydriatics, Miotics, Cycloplegics, Anaesthetics. Staining agents and contact lens solutions. *Paediatric optometry:* visual and perceptual maturation. Juvenile ocular pathology. Clinical procedures. Vision screening. *Colour vision:* normal and abnormal. Features and mechanisms. Genetics. *Advanced Physiological optics and optometry:* current issues and research. *History of optometry:* development of optics, optometry and ophthalmology. *Legal aspects of optometry.* Projects.

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## Biochemistry

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### 41.101 Biochemistry F L2½T3½

*Prerequisites:* 17.041, 2.121 and 2.131, or 2.141. *Excluded:* 2.003J.

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. The intermediary metabolism of carbohydrates, lipids and nitrogenous compounds. The relationship between structure and function of enzymes, other proteins, hormones and biological membranes, metabolic networks and control mechanisms. The molecular mechanism of gene expression and protein synthesis. Photosynthesis. Practical work to amplify the lectures.

### 41.102 Biochemistry of Macromolecules S1 L3T9

*Prerequisites:* 41.101, and 2.102B or 2.102D. *Excluded:* 41.102A

Complex carbohydrates. 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. Enzyme kinetics and enzyme mechanisms. Spectroscopy of biopolymers. Practical work to illustrate the lectures and to provide experience in modern biochemical techniques.

#### 41.112 Human Biochemistry

**S2 L2T4**

*Prerequisite:* 41.101.

Aspects of metabolism that are of particular relevance to the human: nutrition, exercise, neurochemistry, xenobiotics and genetic diseases.

The role of triglyceride, cholesterol and lipoprotein metabolism in human health, and other selected areas of human nutrition. Exercise, the metabolic fuels utilized and the use of *in vivo* NMR to monitor changes in energy metabolism. Specialized aspects of endocrinology and neurochemistry including prostaglandins, leukotrienes, enkephalins and endorphins. The interrelation of purines, pyrimidines, folate and cobalamin metabolism in humans. Xenobiotics: the metabolism of foreign compounds by humans. Biochemical aspects of genetic disease including the use of recombinant DNA techniques for prenatal diagnosis and carrier detection. Practical work to amplify the lectures.

#### 41.122 Cellular Biochemistry and Control

**S2 L2T4**

*Prerequisite:* 41.101. *Excluded:* 41.102B

Cell biology from a molecular physicochemical viewpoint. Biochemical aspects of cellular organization and how they are integrated and controlled. The arrangement of the component molecules of organelles, their function in integrated cellular metabolism to molecular interactions between the cells of multicellular organisms. The biochemistry of the cytoskeleton, carriers and intracellular transport systems. The regulation of cellular processes at the molecular endocrine level. Growth and differentiation. Aspects of cancer metabolism, the biochemistry of cell to cell communication and the structure and function of the extracellular matrix. This subject is complementary to 43.192 Ultrastructure, and students with a special interest in cell biology are encouraged to take both subjects. Practical work to amplify the lectures.

#### 41.132 Molecular Biology of Higher Organisms

**S2 L2T4**

*Prerequisite:* 41.102. *Excluded:* 41.102E

The organization of the genomes of higher organisms derived mainly from the application of recombinant DNA technology and related techniques. Methods used for the isolation, identification and characterization of eukaryotic genomes in terms of the organization of single-copy and repeated sequences and of coding and non-coding sequences and of several gene clusters, eg the alpha and beta globin gene cluster. Mechanisms known to operate in the control of eukaryotic gene expression, both at the DNA level and at the level of RNA processing. Review of several specialized genetic systems in plants and animals such as mitochondria, chloroplasts and RNA and DNA tumour viruses. Practical work provides training in the use of sterile techniques and in working with polynucleotides under nuclease-free conditions, using basic techniques such as hybridization and DNA sequencing.

#### 41.142 Biochemistry and Genetic Engineering of Plants

**S2 L2T4**

*Prerequisite:* 41.101.

The techniques of recombinant DNA technology and plant tissue culture with their application to the modification and improvement of plant productivity.

Plant organ, tissue and cell culture, organogenesis, embryogenesis and clonal plant propagation. The long term preservation of germplasm and plant genetic resources. Products from cultured plant cells and the technology of plant cell culture. Structure and expression of plant genes. Plant molecular biology including cloning plant genes and vectors for gene cloning. Genetic manipulation of plants to improve their natural resistance to pests, disease and environmental stress. Practical work provides training in the basic techniques of plant tissue culture with application of selected techniques to plant genetic engineering.

#### 41.103 Biochemistry Honours

Advanced training in selected areas of biochemistry including a supervised research program that places emphasis on the use of specialized techniques relevant to the research area. A written thesis on the research is required.

### Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subjects see the Faculty of Medicine Handbook.

#### 41.001 Biochemistry for Medical Students

#### 41.002 Medical Biochemistry and Genetics

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## Biotechnology

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#### 42.101 Introduction to Biotechnology

**S2 L2T4**

*Prerequisites:* 2.121 and 2.131, or 2.141; 17.041; 10.011 or 10.001 or 10.021B and 10.021C.

An introduction to biotechnology as a multidisciplinary subject, dealing with the application of biochemical systems or their products in industry. Industrial uses include: production of single products (such as amino acids, vitamins, antibiotics etc), single cell protein, alternate fuels from renewable resources and fermented foods and beverages; biological waste treatment; aspects of pollution control, biodeterioration and biodegradation; and principles of enzyme technology. Concepts relevant to productivity in these systems, including: thermodynamic feasibility, techniques of environmental and genetic manipulation, choice of the appropriate biological catalyst(s) for a particular

process, regulation of gene activity. The laboratory component emphasizes the manipulation of different classes of microorganisms and the use of biochemical products involved in a variety of biotechnological areas.

#### 42.102A Biotechnology A

S1 L2T4

*Prerequisites: 41.101 and 42.101 or 44.101 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable).*

The basic principles involved in the operation of microbial processes on an industrial scale. Includes: the selection, maintenance and improvement of microorganisms; the influence of physical and chemical factors on the microbial environment; the control of environmental factors; the effects of operational patterns on batch and continuous flow cultivation; aeration and agitation; scale-up of microbial processes; air and media sterilization; the harvesting, purification and standardization of products; the principles involved in microbial processes for chemical, pharmaceutical and food production, microbial waste treatment and environmental control. The laboratory component includes manipulation of micro-organisms, laboratory-scale fermenter operation, microbial enzyme isolation, visits to industrial fermentation plants and industrial seminars.

#### 42.102B Biotechnology B

S2 L2T4

*Prerequisite: 42.102A (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable).*

Application of principles of biotechnology to the analysis and design of microbial processes of industrial relevance (antibiotics, microbial enzymes, single cell protein from carbohydrates and hydrocarbons, fermented foods and beverages, amino acids and vitamins, microbial polysaccharides, activated sludge and photosynthetic processes for waste treatment, microbial teaching of low-grade minerals). Emphasis on quantitative approach; mass and heat balance calculations, kinetic and thermodynamic analysis, detailed equipment design and specification, process design and layout, process simulation, plant location, application of optimization techniques. The economics of microbial processes are considered and comparison made with alternative modes of production or treatment. The economics of agro-industry in Australia using microbial processes. Marketing of fermentation products, clinical trials required, legal constraints, patent rights. Technical and economic feasibility studies, and a design project.

#### 4.102C Microbial Genetics

S1 L2T4

*Prerequisites: 41.101 or 44.101. Excluded: 43.102.*

A detailed study of the mutational basis of microbial variation. Mutagens: mechanisms of mutagenesis; induction, enrichment, isolation and characterization of mutants; mechanisms of repair of mutational damage. Systems of gene transfer and recombination in fungi, bacteria and bacterial viruses; the use of these systems in constructing genetic maps, and as tools for probing aspects of microbial physiology and biochemistry. Genetic control of gene expression; the operon concept and its application to specific regulatory systems. Genetic code, collinearity between a gene and its product, genes within genes, suppression of mutations. Restriction and modification of DNA; genetic engineering — its implications and prospects. Genetics of nitrogen fixation.

#### 42.103 Biotechnology (Honours)

Advanced formal training in selected areas of biotechnology and participation in one of the school's research projects.

#### 42.114 Fermentation Processes

Factors governing the use of micro-organisms in industrial processes, including the selection, maintenance and improvement of micro-organisms, the control of environmental factors, batch and continuous flow operational patterns, product recovery, process optimization and waste disposal. Demonstrations of the operation and control of fermenter systems and of microbial process simulation.

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## Botany

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#### 43.111 Flowering Plants

S1 L2T4

*Prerequisites: 17.031 and 17.041.*

Plant cell structure, structure and functions of the major organs in angiosperms (flowers, roots, stems and leaves), secondary thickening and arborescence, transport systems in plants, seeds and germination. Variation in structure and function in relation to environment. Introduction to taxonomy and identification of major Australian plant families. A short field excursion is part of the subject.

#### 43.131 Fungi and Man

S1 L2T4

*Prerequisites: 17.031 and 17.041.*

An introduction to the biology and taxonomy of fungi followed by a study of their economic importance to man. Includes: fungi as pathogens of plants and animals; use of fungi as food and in the production of useful chemical products; medical uses of fungi, including drugs and hallucinogens; degradation of organic matter, particularly in soils and of timber; interaction of fungi with other organisms; chemical control of fungi.

#### 43.112 Taxonomy and Systematics

S1 L2T4

*Prerequisite: 43.111.*

The assessment, analysis and presentation of data for classifying organisms both at the specific and supra-specific level.

#### 43.121 Environmental Physiology

S2 L2T4

*Prerequisites: 17.031, 17.041, 2.121 and 2.131, or 2.141.*

How plants function in relation to the constraints imposed on them by soil and atmospheric environments. Includes: germination, growth and development, particularly photosynthesis, respiration, inorganic nutrition, water relations, transport processes and reproductive physiology. Important practical applications of various physiological mechanisms.

**43.132 Mycology and Plant Pathology S2 L2T4**

*Prerequisite:* 43.131.

A detailed study of the fungi, including both saprophytic and plant pathogenic species. Includes: hyphal structure and ultrastructure; morphology and taxonomy of members of major taxonomic groups; spore liberation, dispersal, deposition, germination, infection and the establishment of a host-pathogen relationship; morphogenesis of vegetative and fruiting structures; cytology, genetics; ecological considerations of fungi in specialized habitats, survival mechanisms and methods of control of plant pathogens.

**43.142 Environmental Botany S1 L2T4**

*Prerequisites:* 17.031 and 17.041.

The soil and atmospheric environments in which plants live and a study of the interaction of plants with their environment. Energy and mass transfer. Emphasis is placed on the role of environmental science in food production.

**43.152 Plant Community Ecology S2 L2T4**

*Prerequisites:* 43.111 and 17.012 or 27.111.

Recognition and delimitation of plant communities. Ecology of selected Australian vegetation types. Use of numerical methods and application of community concepts to palaeoecology. Field work is an integral part of this course.

**43.172 Phycology and Marine Botany S2 L2T4**

*Prerequisite:* 43.111.

The biology of freshwater, marine and soil algae with particular emphasis on the marine flora of SE Australia. Field work is part of the subject.

**43.192 Ultrastructure S2 L2T4**

*Prerequisite:* 43.111 or 43.121 or 41.101 or 44.101 or 45.201 or 45.301.  
*Excluded:* 43.182.

The impact of the study of ultrastructure in biological research. Techniques currently used in ultrastructural research. The basic ultrastructure of prokaryotes and of eukaryote cells and organelles, emphasis also on areas where ultrastructural research is at present making an important contribution to understanding how cells work; for example, motility, secretion, control of cell wall deposition transport and cell communication. *Practical work:* students use transmission and scanning electron microscopes to investigate material they themselves prepare, using negative staining, ultra-microtomy and freeze-fracture also includes optical systems in light microscopy, principles and practice of fixation and embedding tissues for light and electron microscopy; histochemistry and techniques of enzyme localization.

**Servicing Subjects**

These are subjects taught within courses offered by other faculties.

**43.202 Botany for Landscape Architects S1 L2T3**

*Prerequisite:* Nil.

How green plants function. What is known about how plants grow. Specific topics include: what happens in a plant meris-

tem, hormone interactions and growth, transport systems in plants, water uptake and use, mineral nutrition, the role of light and leaves in photosynthesis, control of flowering process, germination and senescence. Emphasis is on the interaction between plant structure and function.

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**Microbiology**

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**Level II Units****44.101 Introductory Microbiology S1 L2T4**

*Prerequisites:* 17.031 and 17.041.

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. The relationship between microorganisms and their environment, ecological considerations. Interactions between microorganisms and higher organisms.

**44.121 Microbiology 1 S2 L2T4**

*Prerequisites:* 44.101 and 41.101 or 2.003J.

The balanced structure of this unit makes it suitable for students majoring in microbiology and also for students who wish to enlarge their knowledge and skills in microbiology beyond those obtained in 44.101 Introductory Microbiology or equivalent units at other institutions.

The classification and function of bacteria. Differentiation of major families and genera of bacteria. Measurement models and theory of microbial growth. Comparative aspects of microbial growth. Bacterial nutrition and biosynthetic pathways. Microbial survival. Theory and practice of sterilization. Introduction to applied aspects of microbiology especially medical microbiology and the role of bacteria in ecosystems.

**Level III Units****44.102 General Microbiology S1 L4T8**

*Prerequisites:* 44.101, 44.121 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable), 41.101.

Systems for the isolation, identification and taxonomic description of microorganisms; fine structure, cyto-chemistry, genetics of bacteria and viruses; metabolic requirements of microorganisms; microorganisms and their environment, growth, inhibition and death; energy-yielding and biosynthesizing systems; geotypic and phenotypic control systems.

#### 44.112 Applied Microbiology

S2 L4T8

*Prerequisite:* 44.102.

Endeavours to relate the basic facts about microorganisms to a variety of practical conditions. The occurrence, importance, activity and control of microorganisms in soil, air, water and in their relationship with higher organisms (other than humans), their industrial applications including manufacture, preservation and spoilage of food and dairy products. The nature of bacterial and fungal diseases of humans, their cultural and serological diagnosis, epidemiology, treatment and prevention will be discussed in some detail.

#### 44.122 Immunology

S2 L2T4

*Prerequisites:* 17.031 and 17.041, 41.101.

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; transplantation.

#### 44.132 Virology

S2 L2T4

*Prerequisite:* 44.102.

The structure, replication and behaviour of animal, plant and bacterial viruses; applications of virological techniques; virus diseases of animals and plants, their epidemiology and control.

### Level IV Units

#### 44.103 Microbiology Honours

F

Advanced training in selected areas of microbiology, **1.** a formal component consisting of seminars, tutorials, introductory electron microscopy and written assignments, **2.** a supervised research program in a specific area of microbiology or immunology.

### Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subject see the Faculty of Medicine Handbook.

#### 80.311 Paraclinical Science

In conjunction with School of Pathology and School of Physiology and Pharmacology.

## Zoology

Students are not admitted to Level III Zoology units, without special permission of the Head of School, unless Chemistry 2.121 and 2.131, or 2.141, has been completed.

#### 45.101 Biometry

S2 L2T4

*Prerequisites:* 17.031, 17.041. *Excluded:* 10.311A, 10.321A, 10.331.

Statistical methods and their application to biological data, including introduction to probability; the binomial, Poisson, normal distributions; student's  $t$ ,  $f^2$  and variance ratio tests of significance based on the above distributions, the analysis of variance of orthogonal and some non-orthogonal designs; linear regression and correlation. Non-linear and multiple regression. Introductory factorial analysis. Introduction to experimental design. Non-parametric statistics, including tests based on  $f^2$ , the Kruskal-Wallis test, Fisher's exact probability test and rank correlation methods. Introduction to programming in BASIC.

#### 45.112 Marine Ecology

S1 L2T4

*Prerequisite:* 17.031, 17.041, 45.201 or 25.022 or 2.002D.

A study of the ecology 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.

Students intending to enrol in this unit should register with the School of Zoology by 13 January for the February field trip.

#### 45.121 Evolutionary Theory

S1 L3T3

*Prerequisites:* 17.031, 17.041.

Current evolutionary theory, emphasizing the population level. Ecological genetics, evolutionary aspects of ecological niche theory, speciation, evolution of social behaviour, molecular evolution and general evolutionary genetics. Some background in genetics is desirable.

#### 45.122 Animal Behaviour

S2 L2T4

*Prerequisites:* 45.101, and 45.201 or 45.301.

An introduction to Ethology, the biological study of behaviour. Physiological, ecological, developmental and evolutionary aspects of behaviour are examined as important elements in the analysis of behaviour, particularly social behaviour. Both field and laboratory work are included.

#### 45.132 Ecological Physiology

S2 L2T4

*Prerequisites:* 45.201 or 45.301.

A study of physiological adaptation to habitat in animals. The problems imposed by the basic physiological characteristics of major animal groups under different environmental conditions are

examined, especially osmotic and ionic regulation, oxygen availability, metabolism and temperature regulation/acclimation. Particular attention is given to Australian fauna and conditions.

#### **45.142 Comparative Physiology** **S1 L2T4**

*Prerequisite:* 45.201 or 45.301.

Basic physiology of nerves, muscles, sensory perception, blood circulation, respiration, gastrointestinal tract, kidneys and hormones. Physiology of reproduction. The control of organ systems and body functions.

#### **45.152 Population and Community Ecology** **S1 L2T4**

*Prerequisites:* 17.041 and 10.001 or 10.011 or both 10.021B and 10.021C.

Examination of the dynamics of one, two or more interacting populations. Systems analysis and simulation in ecology. Theoretical and mathematical analysis of the dynamics and stability of ecosystems. Topics in the optimal management of renewable resources. Unifying concepts in ecology.

#### **45.201 Invertebrate Zoology** **S2 L2T4**

*Prerequisites:* 17.031, 17.041.

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.

#### **45.301 Vertebrate Zoology** **S1 L3T3**

*Prerequisites:* 17.031, 17.041.

A comparative study of the Chordata, with particular reference to the vertebrates, including morphology, systematics, evolution and natural history, with reference to selected aspects of physiology and reproduction. Practical work to supplement the lecture course. Field excursions as arranged.

#### **45.302 Vertebrate Zoogeography and Evolution** **S2 L2T4**

*Prerequisite:* 45.301.

A geographic approach to the current distribution, abundance and types of vertebrate species in the Australian region. Particular emphasis is placed on the basic principles of speciation, the history of the Australian continent, vertebrate adaptations and changes in the distribution and abundance of the Australian vertebrate fauna under the influence of humans. Field excursions as arranged.

#### **45.402 Entomology** **S1 L2T4**

*Prerequisites:* 17.031, 17.041, 45.201.

Classification, external morphology and internal anatomy of insects, studies on environmental sensory physiology and behaviour—especially reproductive behaviour, social organization, pheromones and rhythms. Practical work to illustrate the lectures.

#### **45.422 Economic Zoology** **S2 L2T4**

*Prerequisite:* 45.201 or 45.402.

A study of the biology, ecology and control of vertebrate and invertebrate animals which harm humans and their possessions. Human and domestic animal parasitology, pests on plants, diseases caused or spread by animals, chemicals, biological and physical control, and side effects.

#### **45.601 Introductory Genetics** **S2 L2T4**

*Prerequisites:* 2.131 or 2.141, 17.031, 17.041. *Excluded:* 9.801.

Structure, function and organization of DNA in prokaryotes and eukaryotes. Genetic bases of life cycles in prokaryotes and eukaryotes. Recombination in prokaryotes and eukaryotes. Genetic aspects of development. Gene control. Genetic engineering. Mutation, gene interaction and linkage analysis in prokaryotes and eukaryotes. Binomial Square Law and extensions. Effects of population size on levels of genetic variation. Selection in natural populations. Molecular evolution and levels of selection. Cytogenetics, gene mapping, levels of variation and selection in human populations.

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## **Chemical Engineering and Industrial Chemistry**

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#### **48.023**

#### **48.024**

#### **48.037**

#### **48.038 Chemical Engineering Principles 2**

**S1 L3T1 S2 L1T1**

*Prerequisite:* 48.024.

The following topics, from 48.037; Mass Transfer (Theory), Heat Transfer 2 (Theory), Fluid-particle Systems, Surface Separation Processes.

#### **48.403 Polymer Science**

**F L2T1**

*Prerequisites:* 2.102A, 2.102B, 10.031, 10.301. *Co- or prerequisites:* 48.001, 48.113.

Polymerization processes; step growth and chain growth (free radical and ionic), stereospecific catalysts. Methods of polymer-

ization: bulk suspension, emulsion, solution, high pressure. Industrial examples. Principles of analysis of polymers using chemical and instrumental methods. Molecular weight applied to macromolecules: number-, weight-, viscosity- and z-average weights. Molecular weight distribution. Thermodynamics of polymer solutions, theta solvent. Measurement of molecular weight. Fractionation methods. Conformation of a polymer chain. The crystalline state. The amorphous state. Stress/strain behaviour. Creep. Impact. Rubber elasticity. Dynamic mechanical properties. Principles of operation of polymer processing equipment; safety procedures. Polymer compound design.

## Philosophy

Philosophy is a wide-ranging discipline, catering for a great diversity of interests, for instance, in science, reasoning, persons, and social issues, and encouraging critical and imaginative thought about the foundations of other subjects. Apart from providing considerable choices for students majoring in Philosophy, the diversity of Upper Level subjects makes it possible for students majoring in other disciplines to select subjects complementing their main interest.

### First Enrolment in Philosophy

There are two Level I subjects:

52.103 Introductory Philosophy A (Session 1)

52.104 introductory Philosophy B (Session 2)

Each of these has 1-unit value they can be taken separately, and a student can gain Upper Level status in Philosophy (quality to enrol in Upper Level subjects) by passing in only one. However, students enrolling in one will normally enrol in both, and students wishing to major in Philosophy must do so.

### Value of Upper Level Subjects in Philosophy

With the exception of two which count as *full units*, all upper level subjects in Philosophy are *part units*, of which three together have the value of two full units; otherwise, each one counts as a half-unit.

### Major in Philosophy

Students majoring in Philosophy must take the equivalent of two full Upper Level (II/III) units in Year 2, and the equivalent of 4 full Upper Level (II/III) units in Year 3.

### Level II/III

Some Upper Level subjects deal with particular philosophical topics; others can be taken in sequence to give more sustained treatments of larger areas. Students may select freely among these, subject to stipulations regarding prerequisites. They are welcome to seek advice and further information from the School.

In certain circumstances the prerequisites specified for units or half-units may be waived; for example, in the case of students

who have already studied similar material, or who wish to take isolated units or half-units relevant to another discipline. Students who feel they have a case for a concession of this kind should consult the School.

### 52.103 Introductory Philosophy A

S1 L3T1 C6

*Prerequisites:* Nil.

Consult School for details.

### 52.104 Introductory Philosophy B

S2 L3T1 C6

*Prerequisites:* Nil.

Consult School for details.

### 52.219 Philosophical Foundations of Marx's Thought

S2 L3 C6

Neil Harpley, Barbara Roxon

*Prerequisite:* Upper Level status in Philosophy. Excluded 52.373.

Not offered in 1988.

### 52.2001 The Nature of Mind

S1 L2 C4

Philip Cam

*Prerequisite:* Upper Level status in Philosophy.

Not offered in 1988.

### 52.2002 Contemporary Philosophy of Mind

S1 L2 C4

Philip Cam

*Prerequisite:* Upper Level status in Philosophy.

General introduction to current issues in the Philosophy of Mind: intentionally and intentional systems; computational models and their physical basis; the nature of mental representation; theories of consciousness; philosophy and artificial intelligence; the concept of a person; mechanism, freedom and responsibility.

### 52.2003 Issues in the Philosophy of Psychology

S2 L2 C4

Philip Cam

*Prerequisite:* Either 52.2001 or 52.2002.

A philosophical investigation of some theoretical issues in psychology and related sciences: folk psychology and psychological science; behaviourism and its critics; some limits of cognitive psychology; relations between psychological and physiological explanation; the computer as a model of the mind; perceptions as hypotheses; the character and status of mental images.

### 52.2010 Reasoning Skills

S1 L2 C4

*Prerequisite:* Any Level I subject. Excluded: 52.233.

Reasoning skills in which practical arguments are examined in classroom exercises; lectures on practical argument in politics



and everyday life as compared with arguments in mathematics and theoretical science.

*Assessment:* Exercises, essay and class examination.

**52.2020**

**52.2021**

**52.2030**

**52.2031**

**52.2040 Greek Philosophy: Thales to Plato S2 L2 C4**

Ray Walters

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.183.

The leading ideas of the Greek philosophers from Thales to Plato with special reference to the Pre-Socratics.

*Assessment:* To be decided in consultation with students.

**52.2050 Classical Political Philosophy S1 L2 C4**

Stephen Cohen

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.203.

The basis of political society, its various functions and its relation to the individuals in it, investigated primarily through the works of Hobbes, Locke, Rousseau and Mill. Topics include the theory of a social contract, the establishment of political rights and obligations, and the relation of moral and political concerns within a political society.

*Assessment:* Two short essays and an examination.

**52.2060 Sartre S1 L2 C4**

Barbara Roxon

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.213.

An examination of Sartre's account of emotion; freedom and contingency; and action.

*Assessment:* Essays.

**52.2130 British Empiricism S2 L2 C4**

Neil Harpley

*Prerequisite:* Upper Level status in Philosophy. Excluded 52.173.

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

*Assessment:* Exercises and essays or examination.

**52.2140 Scientific Method S1 L2 C4**

Ray Walters

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.193.

The nature of empirical knowledge as exemplified in the physical and social sciences, with emphasis on the concept of expla-

nation, the nature of induction and scientific laws, and controversies over the nature of scientific knowledge.

*Assessment:* Exercises or essay and examination.

**52.2150 Philosophy of Law**

**S2 L2 C4**

Stephen Cohen

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.105.

Selected conceptual and normative issues in the philosophy of law, centring around the broad areas of law (eg, its nature, validity, bindingness, and relation to morality), liberty, justice, responsibility (including strict and vicarious liability), and punishment.

*Assessment:* Essays, possibly an examination.

**52.2170 Hume**

**S1 L2 C4**

Neil Harpley

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.152, 52.563.

A study of Hume's epistemology, his discussion of arguments for the existence of God and free will.

*Assessment:* Essay and exercises or examination.

**52.2220 The Ethics of Plato and Aristotle S1 L2 C4**

Stephen Cohen

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.523, 52.5231.

A systematic investigation of the moral theories of Plato and Aristotle. Beginning with the immoral and subsequent amoral position of Thrasymachus and his question in Book 1 of *The Republic*, "Why should I be just?", the subject investigates the ways in which Plato and Aristotle each set out the problems of the nature of morality and why a person should be moral, their approaches to the solutions of these problems, and their positive moral theories.

*Assessment:* Two short essays and an examination.

**52.2230 Theories in Moral Philosophy S2 L2 C4**

Stephen Cohen

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.523, 52.5232.

Three moral theories central in the history and development of moral philosophy. Hume, Kant, and Mill offer differing kinds of moral theories, differing approaches to arriving at a moral theory, and specific theories which are markedly different from each other. Each moral theory in itself and in comparison with the other two theories examined.

*Assessment:* Two short essays and an examination.

**52.2240 Philosophical Study of Woman S1 L2 C4**

*Prerequisite:* Upper Level status in Philosophy. Excluded: 52.283.

Not offered in 1988.

**52.2250 Plato's Theory of Forms S2 L2 C4**

*Prerequisite:* Upper Level status in Philosophy. *Excluded:* 52.483.

Not offered in 1988.

**52.2260 Aesthetics S2 L2 C4**

Ray Walters

*Prerequisite:* Upper Level status in Philosophy. *Excluded:* 52.273.

An examination of the central concepts, types of judgement and theories occurring in the field of aesthetics or theory of art.

*Assessment:* Exercises or essay and examination.

**52.2270 Social and Political Philosophy L2 C4**

Stephen Cohen

*Prerequisite:* Upper Level status in Philosophy. *Excluded:* 52.513.

Not offered in 1988.

**52.2330 Psychoanalysis — Freud and Lacan S2 L2 C4**

Barbara Roxon

*Prerequisite:* Upper Level status in Philosophy. *Excluded:* 52.573.

A discussion of psychoanalytic theory, particularly for what it shows about the relation between the individual and the social.

*Assessment:* Essays.

**52.2360 Theories, Values and Education S2 L2 C4**

Martin Bibby

*Prerequisite:* Upper Level status in Philosophy. *Excluded:* 52.583.

The nature of theories of education, and the contributions to them of philosophy, psychology and sociology; values in education and the social sciences; the justification of an ordering of educational goals.

*Assessment:* Essay.

**52.2371 Plato's Later Dialogues S2 L2 C4**

*Prerequisite:* 52.483 or 52.2250 (or, by permission, a course covering similar material). *Excluded:* 52.293.

Not offered in 1988.

**52.2980 Seminar A S2 T2 C4**

*Excluded:* 52.423.

Admission by permission, based on a student's performance in Upper Level subjects. Topics vary and are influenced by student requests.

*Assessment:* Essay.

**52.2990 Reading Option A S1 or S2 C4**

*Excluded:* 52.413.

Admission by permission, to suitable students with good Passes in at least two subjects at Upper Level. A course of individually supervised reading and assignments on an approved topic not otherwise offered.

*Assessment:* Essay.

**52.3010 Seminar B S1 T2 C4**

*Excluded:* 52.433.

As for 52.2980 Seminar A.

**52.3020 Seminar C S2 T2 C4**

*Excluded:* 52.443.

As for 52.2980 Seminar A.

**52.3030 Reading Option B S1 or S2 C4**

*Excluded:* 52.453.

As for 52.2990 Reading Option A.

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## Sociology

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**53.001 Introduction to Sociology F 3CCH C12**

An introduction to a critical and reflexive sociology by examination of contemporary Australian society. *Major topics include:* Thinking about Australian society; political economy of Australian society; social movements, social philosophies and State responses; and culture and resistance. *Specific topics:* the analysis of every day life; social class; gender; political party formation; popular culture; media moral panics. Provides a sound basis for further studies in the social sciences.

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## Education

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**58.704 Theory of Education 3 F L3**

*Prerequisite:* 58.703.

*Sociology of Education:* Includes sociology of the school and classroom, deviance, knowledge and the curriculum, sexism, in schools, social trends and problems and their implications for education, technology work and lifelong learning. *Selected Studies in Education:* two education theory options to be selected from among a number available; some deal with the

separate disciplines of philosophy, psychology, sociology, others may draw from more than one. In any given year the options offered depend on the staff available and on student demand. *Topics may include the following:* Computer assisted instruction, the talented child, learning disabilities, social trends and problems, sociology of the school and classroom, methodology for criticism, ethical theory and moral education, science and religion in education.

### **58.714 Teaching Practice 3** **F 15 days**

*Prerequisites:* 58.713, 58.723 or 58.733 or 58.743 or 58.753.  
*Co-requisites:* 58.724 or 58.734 or 58.744 or 58.754 or 58.764.

Provision for further opportunities for students to develop teaching competence; each student is placed in a high school for 15 days and works in close association with a teacher.

### **58.734 Science Curriculum and Instruction 3** **S1 L1T4 S2 T3**

*Prerequisites:* 58.703, 58.713, 58.733.

Examination of NSW secondary school science syllabuses, investigation of curriculum material suitable for use in teaching secondary school science, development of teaching resources, the professional development of the science teacher, the teaching of biology, chemistry, geology and physics. *Classroom Issues and Strategies:* aspects relating to assessment and measurement including test planning, standardized tests, marking and reporting, essay-type tests, scaling of test scores, uses and effects of assessment.

### **58.744 Mathematics Curriculum and Instruction 3** **S1 L3 S2 L2**

*Prerequisites:* 58.703, 58.713, 58.743.

The teaching of senior secondary school mathematics syllabuses, curriculum development projects in mathematics and their application in NSW, critical analysis of learning problems of school students, investigation of practical remedies for such problems. The subject is designed to complement 58.714 Teaching Practice 3, taken together these subjects provide a wide set of experiences which equip potential teachers to fit successfully into the NSW teaching environment. *Classroom Issues and Strategies:* aspects relating to assessment and measurement including test planning, standardized tests, marking and reporting, essay-type tests, scaling of test scores, uses and effects of assessment.

### **58.793 Advanced Education 1** **F 1CCH**

Students study *one* of the following segments: *Philosophy of Education segment:* some connected issues in social and political philosophy, and their implications for educational theory and practice. Includes: freedom, compulsion and the aims of education; neutrality of education systems, schools, teachers and courses; and justice and equality. *Educational Psychology segment:* introduction to selected aspects of on-going research activities in educational psychology. The area is selected following discussions with staff members. *Sociology of Education segment:* more detailed and extensive examination of central topics studied in the pass strand. Consideration of selected issues to do with social theory, the nature of the sociological enterprise and sociological methods.

### **58.794 Advanced Education 2** **F 1CCH**

Each student engages in twenty-eight hours of supervised study appropriate to his or her proposed research, as approved by the Head of School.

### **58.795 Advanced Education 3** **F 4CCH**

Enrolment is subject to approval by the Head of School.

In their full-time Honours year, all students enrol in four twenty-eight-hour units of study appropriate to their research, as approved by the Head of School.

### **58.799 Thesis**

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## **Science and Technology Studies**

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Students undertaking subjects in Science and Technology Studies are required to supplement the class contact hours by study in the Library.

### **Level I**

#### **62.101I Science, Technology and Social Change** **S1 L2T1 C6**

*Prerequisite:* Nil. *Excluded:* 62.110.

Relations between science, technology and society which have evolved in the 20th century. **1.** Topics which illustrate the effects of scientific and technological development on society — especially those, such as pollution and unemployment, which are apparently unintended; and **2.** Selected theories which have been proposed to explain and evaluate the nature of technological change. Topics include: the use of pesticides; the implications of microprocessor technology; the development of nuclear energy and the debate about recombinant DNA research. Theories of Galbraith, Commoner, Dickson and others — particularly in relation to the question as to whether unintended consequences of scientific and technological development can be eliminated by 'technological fixes' or whether they are inevitable in modern industrial society.

*Assessment:* Essay (40 percent); tutorials (30 percent); class tests (30 percent).

#### **62.102I Man, Megalith and Cosmos** **S1 L2T1 C6**

*Prerequisite:* Nil. *Excluded:* 62.111, 62.219U.

The roots of scientific thinking in antiquity, and the development of the central traditions which were to form the foundations of modern science, stressing origins of geometry, astronomy, astrology and cosmology. Emphasis on the interpretation of evidence from archaeology, particularly that relating to the megalithic cultures, and on the assessment of the rele-

vance of anthropological studies, particularly of Australasia and the Pacific region. Topics include: evidence for archaeoastronomical interpretations of prehistoric sites; theories of the origins of geometry; inter-relationships of science and religion; traditional Pacific navigation; patterns of reasoning in early times, and in primitive cultures today; the evolution of mythology; cosmology and astronomy in mythology; the scientific and philosophical legacy of Greek science, particularly of Aristotle, Euclid and Ptolemy; a comparative study of the astronomy and cosmology of Mesopotamia, Egypt, Greece, America, etc; the background to the Copernican Revolution; the Von Daniken phenomenon; the mystery of the Dogons; an appraisal of astrology.

**Assessment:** 2 short essays (33⅓ percent); 2 tests (33⅓ percent); tutorials (33⅓ percent).

#### 62.104I The Seventeenth Century Intellectual Revolution

**S2 L2T1 C6**

**Prerequisite:** Nil. **Excluded:** 62.211, 62.219U.

The intellectual revolution, centred upon science of the 17th and early 18th centuries, which led on to the Enlightenment. The Mediaeval and Renaissance background. Bacon and Baconianism; empiricism; experimentation and the virtuosi; the idea of progress. The mechanization of the world picture; Descartes and Cartesianism; rationalism; the revival of atomism, materialism. The Copernican Revolution. Locke. Hobbes.

**Assessment:** Essay (40 percent), tutorials (30 percent); examination (30 percent).

### Level II/III

#### 62.201U Materials, Machines and Men

**S2 L2T1 C6**

**Prerequisite:** Completion of Arts subjects carrying at least 24 credit points, or a Pass in four Level I Science units. **Excluded:** 26.564, 26.251, 62.022, 62.253.

The rise of technology in its social and cultural context before, during and since the Industrial Revolution. This Revolution, which has been described as the most significant event in human history since the Agricultural Revolution of the New Stone Age, is examined in some detail, and concentrates on technology and its effects on human beings. Considers the professionalization of engineering, the spread of industrialization in Britain, in Europe and the USA, and examines the Second Industrial Revolution. Emphasis on the social and economic effects of the interactions of technology and society.

**Assessment:** Tutorial paper (30 percent); performance in class (40 percent); class test (10 percent); examination (20 percent).

#### 62.202U The Scientific Theory

**S2 L2T1 C6**

**Prerequisite:** As for 62.201U. **Excluded:** 62.032, 62.505, 62.232, 62.219U.

A critical examination of the scientific theory — its origins, nature and nurture. With particular reference to selected historical examples chosen from both the physical and biological sciences, a number of philosophically interesting problems relating to scientific theories are subjected to analysis. Topics include: the principles of theory construction; perception and observation; the structure of scientific revolutions; scientific explanation;

the status of laws and theoretical terms; the 'existence' of theoretical entities; relationships between theory and observation; the structure of scientific revolutions; scientific explanation; the status of laws and theoretical terms; the 'existence' of theoretical entities; relationships between theory and observation; the functions of models; the principles of theory establishment and rejection.

**Assessment:** One essay (33⅓ percent); tests (33⅓ percent); tutorials (33⅓ percent).

#### 62.203U Scientific Knowledge and Political Power

**S1 L2T1 C6**

**Prerequisite:** As for 62.201U. **Excluded:** 62.052, 62.252.

An introduction to the political dimensions of 20th century science. Topics include: growth of expenditure on science in the 20th century; attempts to define the social function of science in the inter-war years; the radical scientists' movement of the 1930s — the freedom *versus* planning debate; science and politics in the Second World War; government patronage and political expectations in the post-war period; science and economic growth; the science-technology relationship; the rejection of *laissez-faire* in the 1960s; approaches to science policy; critiques of the role of science in contemporary society; scientists as experts; the question of social responsibility in science.

**Assessment:** Essays (50 percent) tutorials (50 percent).

#### 62.204U The Social System of Science

**S2 L2T1 C6**

**Prerequisite:** As for 62.201U. **Excluded:** 62.062, 62.262.

An introduction to the social dimension of the practice of science. The production and application of scientific knowledge as an activity in constant interaction with its socio-economic, political and cultural environments. The principal features of this interaction in relation to each of the following aspects of scientific activity: the processes of research and discovery; the dissemination of research findings and their acceptance or rejection; the development or abandonment of accepted theories; and the technological applications of scientific knowledge.

**Assessment:** Essays and tutorial work.

#### 62.205U Historical Origins of the American Scientific Estate

**S1 L2T1 C6**

**Prerequisite:** As for 62.201U. **Excluded:** 62.072, 62.272.

The development of American scientific institutions and research from the early years of the Republic, when that country was a scientific backwater, to its present position of global dominance in terms of research resources. Questions about the historical roots of organized research in universities, industrial corporations and government organizations. The American case illustrates well the processes whereby the rapidly emerging scientific profession and its varied specialisms forged links between these sectors of society. Topics: the place of science in a young resource-rich democracy, the uses of science in Progressive ideology, and the war-born relationship of science, government and the military.

**Assessment:** 2 essays (60 percent); tutorial assessment (40 percent).

**62.206U Science, Technology and Developing Countries****S1 L2T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.082, 62.282.

The disparities between the scientific and technical capabilities of industrialized and developing societies. The reasons for these disparities and their economic and social consequences. Aspects include: the problems of dependency; the product cycle and its impact on location of production; concepts of the 'learning curve', aspects of technology choice; bargaining processes; transnational corporations and the 'truncation' of the industrial sector; efforts to define 'appropriate' technologies; modes of technology transfer; alternate models and policies for scientific and technological development; the role of traditional technology; the impact of modern technology on international relations. Issues: the consequences of modern science and technology for the role of the military in developing countries; food and population problems; energy use; environmental impacts; class structure, etc. The social role and function of scientific communities in less developed countries and the process of diffusion of science from the centre to the periphery and the evolution of national scientific communities and institutions are addressed through the use of case studies.

*Assessment:* Essay (50 percent); tutorials (50 percent).**62.207U The Discovery of Time****S1 L2T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.103, 62.223.

The history of time, from the Ancient World through the Twentieth Century. The principal strands studied are: clocks and other instruments for the measurement of time, civil and religious calendars, concepts of time, philosophy and theology of time, conceptions of history and of progress, the cognition of time, the age of the Earth and the antiquity of humanity, time and the development of modern science. Throughout, attention will be paid to the historical context within which specific episodes and developments occurred and to cultural consequences of changes in the cognition of time.

*Assessment:* Essay (33⅓ percent); tutorials (33⅓ percent); 2 class tests (33⅓ percent).**62.208U The Darwinian Revolution****S1 L1T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.104, 62.243.

Scientific, philosophical, and social antecedents and consequences of Darwin's theory of evolution. The prevailing ideas in biology before Darwin in the context of the general climate of ideas in the 18th and early 19th centuries. Darwin's life and work in some detail, followed by a consideration of the work of Mendel and the establishment of the 'synthetic' theory of evolution. The impact of evolutionary ideas in such diverse fields of thought as religion, literature, music, political theory, epistemology, ethics, and the social and behavioural sciences.

*Assessment:* Examination (30 percent); tutorial exercises (40 percent); essay (30 percent).**62.209U Mind, Mechanism and Life****S1 L2T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.106, 62.273, 62.302.

The development of scientific ideas concerning the nature of life, mind and behaviour. While the subject includes both a brief

treatment of early ideas and reference to issues in contemporary biological and behavioural sciences, the main focus is on the period from the Proto-Scientific Revolution of the 16th century to the advent of the general purpose computer. Topics include: Vesalius and the School of Padua; the biological thought of William Harvey; machines and the mechanical philosophy; Cartesianism and the mechanization of biology; classical theories of the relationship between mind and body; neurophysiology from the 18th to the early 20th century; the mechanist-vitalist disputes; Wundt, Fechner and the rise of experimental psychology; the Freudian revolution; Pavlov and the conditioned reflex; behaviorism and its critics; mind, brain, life and the computer.

*Assessment:* Essay (33⅓ percent); tutorial assessment (33⅓ percent); tests (33⅓ percent).**62.210U History of Medicine****S L2T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.109, 62.273, 62.309, 26.568, 26.506.

Not offered in 1988.

**62.211U Relations Between Science and the Arts****S1 L2T1 C6***Prerequisite:* As for 62.201U. *Excluded:* 62.241.

The relationships between science, literature, painting and music in the history of Western culture. 'Art' and 'Science' in the ancient world. Pythagoreanism and its cultural influences. Science, painting and architecture in the Renaissance. The Scientific Revolution and its influences on English literature. Optical theories of Newton and Goethe and their effect on literature and painting. Science, philosophy, technology and their influence on painting, literature and music in the 19th and 20th centuries. Creativity in science and the arts. Scientific and humanistic cultures in the modern world. The 'two-cultures' debate.

*Assessment:* Tutorial exercises (40 percent); essay (30 percent); examination (30 percent).**62.212U The New Biotechnologies and Their Social Context****S2 L2T1 C6***Prerequisite:* 62.1011 or by permission of the Head of School for Biological Science students in Years 3 and 4. *Excluded:* 62.245.

The social implications of the new biotechnologies, including recombinant DNA techniques, genetic manipulation of animals and test tube babies. The present achievements and likely future developments of the new genetic and reproductive technologies, together with detailed discussions of the social, ethical and political implications of these developments. *Topics include:* the debate on the safety of genetic engineering; *in vitro* fertilization and related reproductive technologies; the ethics of human genetic engineering; university-industry interactions in biotechnology; the release into the environment of engineered organisms; mechanisms for public participation in the control of biotechnology.

**62.213U Technological Development in 20th Century Australia****S2 L2T1 C6***Prerequisite:* 62.101U. *Excluded:* 62.246.

The historical development of technology in Australia during the 20th century, with an analytic focus on three key dimensions:

linkages between scientific research, industrial development and economic growth, technological change and its impact on Australian society: the distinctive features of Australia's geopolitical situation. *Topics include:* The origin, expansion and transformation of the CSIRO, the maturation and professionalization of the Australian research community; the politicization of science and the post-war legacy; the failure of Australian research to serve an industrialized economy; science policy and technological change in the 1970s and 1980s; comparison with the Canadian situation and the experience of newly industrializing countries.

### 62.214U Man, Woman and Deity

S2 L2T1 C6

*Prerequisite:* As for 62.201U. *Excluded:* 62.285.

Conceptions of deity, from earliest times to the present, in relation to changing notions of sexuality and generation; the place of human beings in relation to their environment and the cosmos; the roles of the sexes within different cultures. *Topics:* Archaeological evidence for early ideas concerning generation and for the relations of man to the cosmos; the Earth Mother Goddess; biology, religion and mythology; feng-shui and geomancy; the symbolism of city, temple and dwelling; religion, sexuality and generation in ancient civilizations and primitive societies, with special reference to the Australian Aborigines; the Medieval and Renaissance world views; the tyranny of the machine; conservation and stewardship in the Middle Ages; the cultus of the Virgin Mary in relation to scientific and social change; theories of biological generation; concepts of Deity and Nature in relation to science and the environmentalist movement; the Gaia hypothesis.

*Assessment:* 1 essay (33⅓ percent); 2 tests (33⅓ percent); tutorials (33⅓ percent).

### 62.215U The Arch of Knowledge: Philosophy and Methodology of Science to 1800

S1 L2T1 C6

*Prerequisite:* As for 62.201U. *Excluded:* 62.543, 62.551, 62.561.

The development of ideas concerning the nature and methods of the sciences from antiquity to 1800: Platonism and Aristotelianism; scholastic philosophy; the realist/nominalist debate; the Paduan school; Galileo and the mathematization of nature; Bacon and Baconianism; Descartes and Cartesianism; Newton and Newtonianism; Locke as an under-labourer in the Newtonian garden; criticisms of Newtonian science and Lockean empiricist epistemology; Leibniz, Berkeley and Hume; French empiricism and philosophy of language: Condillac; Kant's Copernican Revolution and principles of Kantian philosophy.

*Assessment:* 2 essays (50 percent); 2 seminar presentations (50 percent).

### 62.216U Philosophy and Methodology of Science: 1800 to the Present

S2 L2T1 C6

*Prerequisite:* 62.215U or by permission of the Head of School. *Excluded:* 62.552, 62.543, 62.562.

The development of ideas concerning the nature and methods of the sciences from 1800 to the present: Herschel, Mill and Whewell (British empiricism in conflict with Kantian transcen-

dental philosophy); Comte, Mach and 19th century positivism; Peirce, James and pragmatism; Poincare and conventionalism; Duhem and instrumentalism; Meyerson and realism; Frege, Russell and logicism; Wittgenstein and Hanson; Einstein and the new science; Bridgman and operationism; Eddington and selective subjectivism; the Vienna Circle and logical positivism; Carnap and positivist reductionism; Hesse and modellism; Popper and falsificationism; Lakatos and 'research programs'; Feyerabend and methodological anarchism; sociologists of knowledge.

*Assessment:* 2 essays (50 percent); 2 seminar presentations (50 percent).

### 62.217U Computers, Brains and Minds: Foundations of the Cognitive Sciences

S2 L2T1 C6

*Prerequisite:* As for 62.201U. *Excluded:* 62.554, 52.564.

Introduction to contemporary discussions of the mind, thought, intelligence and consciousness. Focus on the issues which arise in connection with the so-called 'cognitive sciences' — the disciplines which include such fields as computer science, the various neuro-sciences, cognitive psychology, linguistics and the philosophy of mind. Stress on the recent revolutionary developments in the computer simulation of thought or 'artificial intelligence' and linguistics, since both these areas shed new light on traditional questions concerning the mind. Questions are: Can computers think? and Is the brain a machine? Exploration of the theories, methods and philosophical issues which arise from the 'computational' or 'information processing approach' to the mind.

*Assessment:* Essay (40 percent); tests (30 percent); tutorials (30 percent).

### 62.218U Language and Mind: The Impact of Chomsky's Revolution

S1 L2T1 C6

*Prerequisites:* As for 62.201U. *Excluded:* 62.570.

Chomsky's theories of language and mind which have revolutionised linguistics, psychology and philosophy. History of linguistics and psychology, especially the Behaviourist approach of Skinner. Chomsky's impact on traditional philosophical debate between Rationalists and Empiricists concerning innate ideas.

## Level III

### 62.300U Research Methods in Science and Technology Studies

S1 T2 C6

*Arts prerequisite:* Completion of Arts or other approved subjects, carrying at least 72 credit points; including at least 12 credit points gained in Science and Technology Studies subjects completed with an average grade of Credit or better. *Excluded:* 62.105, 62.520.

*Sciences prerequisite:* 4 S & T subjects with an average of Credit or better or by permission of the Head of School. *Excluded:* 62.105, 62.520.

A weekly seminar designed to prepare students to carry out Honours level research. The historiography of science, and its relations to philosophical and social studies of science, are analysed through discussion of texts representing predominant approaches to Science and Technology Studies. In addition, bibliographical, editorial, and other research exercises are carried out.

*Assessment:* Essay, seminars and written exercises.

### **62.3001 Philosophical Problems in Evolutionary Biology** **S2 L2 C4**

*Arts prerequisite:* Completion of Arts or other approved subjects, carrying at least 72 credit points. *Co-requisite:* 62.202U or 62.208U. *Sciences prerequisites:* Third year standing. *Co-requisite:* 62.202U or 62.208U.

Current controversies in evolutionary theory, with consideration of topics such as essentialism and population thinking, falsifiability of the principle of natural selection, the group selection controversy, sociobiology, problems in classification and cladism, the neutral theory of evolution and the role of chance, punctuated equilibrium theory, the origin of life, neo-Lamarckism, and creationism.

### **62.3005 Issues in the Philosophy of Science** **S2 L2 C4**

*Prerequisite:* As for 62.300U.

Selected topics in contemporary philosophy of science chosen from among the following: Scientific Laws, Theories and Explanations, Observation, Evidence, Confirmation, Induction, Models and Metaphors, Realism and Instrumentalism, Verification and Falsification, Scientific Discovery and Scientific Revolutions, Theoretical Reduction, Methodological Problems of Social Sciences, Teleological and Purposive Explanation, Rationality and Scientific Method, Science and Pseudo-Science Demarcation.

## **Level IV Honours Programs**

### **62.400H Science and Technology Studies Honours.**

*Prerequisite:* Completion of years 1-3 of program 6200, with marks that result in an average of Credit or better in the eight S & T units included in that program.

In the Honours program, candidates are required to present a thesis and to complete course work as approved by the Head of School. In certain circumstances, generally relating to the proposed Honours thesis topic, the Head of School may also require a student to complete one or more specified units offered by other Schools in the University.

## **Board of Studies in Science and Mathematics**

### **68.302 Introductory Marine Science** **S1 L3T1**

*Excluded:* 25.601.

Ocean basins, sediments, properties of seawater, ocean circulation, coasts and coastal processes. Marine biology and ecology, primary and secondary productivity.

Field work in mid-year recess.

### **68.313 Physical Oceanography** **S2 L2T2**

*Prerequisites:* 10.001 or 10.011, 1.001.

The physical properties and motions of the oceans, and their measurement. Oceanographic instrumentation. The design of small and large scale ocean experiments. Laboratory and field work.

### **68.451 Biological Laboratory Computing** **S2 L2T4**

*Prerequisites:* As for 10.021B. *Excluded:* 1.041. *Programs* 0600, 6806.

Concepts and problems in biology and biology-related areas amenable to the application of computers; experience in elementary BASIC programming and data analysis using large mainframes and laboratory microcomputers: use of microcomputers for collecting data from laboratory instruments, and for controlling instruments in experiments. Includes a segment taught in common with 1.041 Laboratory Computers in Physical Sciences.

### **68.430 Geology and Physics Honours**

An honours program combining Geology and Physics in Program 0100, made by arrangement with the Heads of the two Schools.

### **68.601 Genetics of Behaviour 1** **S1 L2T3**

*Prerequisite:* 17.031. *Excluded:* 79.402.

Introductory behaviour genetics with most examples coming from human genetics. Single gene, polygene and chromosomal genetics which illuminate normal and abnormal behaviour; mathematical treatment of data, non-human mammalian behaviour. Practical classes and limited clinical contact.

### **68.602 Genetics of Behaviour 2** **S2 L2T3**

*Prerequisite:* 68.601 or 79.402. *Excluded:* 79.403.

The topics of 68.601 at a more advanced level. Continued emphasis on human behaviour with essential consideration of microbial and invertebrate studies. Extended mathematical treatment of data. Projects involving community contact replace some of the practical sessions.

## **Anatomy**

### **70.011A Histology 1** **F L1T2**

*Prerequisites:* 17.031, 17.041. *Co-requisite:* 70.011C

Elementary theory of light and electron microscopy. Cell morphology and cell ultrastructure. Introduction to simple histological techniques. Basic histology, including the morphological and functional properties of epithelial, connective, muscle and nerv-

ous tissues. Systematic histology, including a histological examination of the major systems of the body; cardiovascular, respiratory, lymphatic, integumentary, digestive, endocrine, urinary, reproductive and nervous (including eye and ear). Emphasis on the ability to interpret histological sections and selected electron micrographs of mammalian tissues and organs and to relate morphology to tissue and organ function. One lecture per week followed by a 2-hour practical-tutorial class.

### 70.011B Mammalian Embryology F L1T2

*Co-requisites:* 70.011A, 70.011C

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

### 70.011C Introductory Anatomy S1 L2T4

*Prerequisites:* 17.031, 17.041.

Introduction to gross anatomy, based on a study of prosected specimens. Musculoskeletal, cardiovascular, respiratory, gastrointestinal, genitourinary and nervous systems. General topographical and surface anatomy.

### 70.012B Visceral Anatomy S2 L2T4

*Prerequisite:* 70.011C.

A detailed study of the visceral system, including autonomic nervous system, head and neck regions and the cardiovascular, respiratory, gastrointestinal and genitourinary systems. In addition, tutorials include clinical cases and surface and radiological anatomy.

### 70.012C Neuroanatomy 1 S1 L2T4

*Prerequisites:* 70.011A, 70.011C.

Nerve cells and neuronal satellite cells, cytoarchitecture of brain and spinal cord, comparison of peripheral and central nervous systems. Functional anatomy of sensory and motor processing, and higher cerebral functions such as language and emotions. Blood supply of the central nervous system, cerebrospinal fluid and membranous coverings. Comparative anatomy of the brain.

### 70.013 Anatomy 4 F

*Prerequisite:* Completion of the first three years of any Science program with a major in Anatomy (see Table 3 of Combined Sciences Handbook).

An honours program consisting of the preparation of an undergraduate thesis and participation in School seminars.

### 70.304 Histology 2 S2 L2T4

*Prerequisite:* 70.011A. *Excluded:* 70.3041. (If 70.304 is taken after 70.3041, total counts only 1 unit.)

May not be offered in 1988.

Mammalian histology, with particular reference to the human. Practical histological procedures: fixation, section preparation,

staining. Microscopy. Theoretical, practical and applied histochemistry.

### 70.3041 Histological and Histochemical Techniques S2 L1T2

*Prerequisites:* 17.031, 17.041 and either 41.101 or 45.301 or 70.011A. *Excluded:* 70.304.

Practical histological procedures: fixation, section preparation, staining. Microscopy. Theoretical, practical and applied histochemistry.

### 70.305 Neuroanatomy 2 S2 L1T2

*Prerequisite:* 70.021C.

In seminar format, topics in contemporary neuroanatomy, working from original papers. Includes: sensory and motor areas of the neocortex, hippocampus, cerebellum, and sense organs. Recent work on the development of the central nervous system. Recent advances in neurohistochemistry and neuroendocrinology. Students are required to undertake a substantial amount of private study.

### 70.306 Functional Anatomy 1 S1 L2T4

*Prerequisite:* 70.011C.

Introduction to fundamental issues in the morphology and dynamics of human movement systems. Includes: physical properties of bone, muscle and connective tissue; biomechanics, movement analysis and neuromuscular control. These basic principles are applied to a study of musculoskeletal components of head and neck and upper limb. Emphasis on modern analytical techniques and findings. Tutorials include limb and joint dissections plus study of surface and radiological anatomy.

### 70.307 Functional Anatomy 2 S2 L2T4

*Prerequisite:* 70.306.

A continuation of 70.306. Includes: a detailed study of the musculoskeletal components of trunk and lower limb, functional morphology of muscle, biomechanics and energetics of walking and running.

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## Pathology

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### 72.301 Basic and Applied Pathology F L2T1

*Prerequisites:* 70.011A, 70.011C, 73.111 or equivalent.

Lectures and practical class demonstrations. Includes exposition of the basic classification of pathological processes, study of the processes of cell and tissue degeneration, acute and chronic inflammation, vascular disease, including thrombosis, embolism, ischaemia and infarction. Coverage of the processes



of healing and regeneration with specific reference to healing of skin wounds and the healing of fractures. Aberrations of cell growth used to introduce the subject of neoplasia and carcinogenesis. Exposure to examples of specific disease entities of general practical importance exemplifying the basic or fundamental processes such as appendicitis, pneumonia, arthritis, pulmonary and myocardial infarction as well as lung, alimentary and cerebral tumours. Correlation of pathological processes with development of specific clinical syndromes.

**72.304**

## Physiology and Pharmacology

### 73.111 Physiology 1

**F L2T4**

*Prerequisites:* 17.031 & 17.041; 2.121 & 2.131, or 2.141; 10.001 or 10.011 or 10.021 B & C. *Excluded:* 73.121, 73.011. *Co-requisite:* 41.101.

Introduction to fundamental physiological principles, dealing first with basic cellular function in terms of chemical and physical principles, and, second, with the operation of the various specialized systems in the body, for example, the cardiovascular system, whose function it is to transport materials to and from the tissues of the body; the respiratory system which must maintain the exchange of oxygen and carbon dioxide between the atmosphere and the blood; the gastrointestinal system which enables food materials to be modified by digestion and absorbed into the circulation; the kidney which is involved in the regulation of body fluid and electrolyte balance and with the excretion of the waste products of metabolism; the endocrine system which releases chemical messengers, called hormones, that are carried in the blood stream to regulate a great variety of body functions, eg metabolism and reproductive activity; the nervous system which by means of very rapidly propagated electrical impulses is responsible for all our movements, sensations, memories, emotions and consciousness itself. A substantial series of practical class experiments on these different areas of physiology is included in the course. This subject is taken by students enrolled in any of the Physiology program.

**73.011A**

### 73.012 Physiology 2

**F L4T8**

*Prerequisites:* 73.111, 41.101, 41.111.

A major subject offered in third year, providing a more advanced course of study in Physiology. Students spend considerable time performing laboratory experiments which illustrate various physiological principles and introduce them to the techniques used in physiological investigation. The course is orientated towards the areas of physiology constituting the major research interests of the School. It is divided into several sections which may be available in special circumstances as separate 1 and 2 unit

Level III courses, including Membrane Biology, Neurophysiology and Organ Physiology, details of which are given below.

### 73.012A Membrane Biology

**S1 L2T4**

*For entry consult Head of School of Physiology and Pharmacology.*

The properties of cell membranes including permeation of ions, solutes and water across membranes, generation of electrical signals in nerve and muscle cells produced by ion movements, and transmission of information between cells. Stress on modern research techniques and on a critical examination of appropriate classical papers.

### 73.012B Neurophysiology

**S1 L2T4**

*For entry consult Head of School of Physiology and Pharmacology.*

A detailed study in two broad areas, neural mechanisms in sensation and the control of posture and movement. Includes the regulation of visceral and other autonomic effector structures and the neural substrates and correlates of certain higher functions such as speech, memory and consciousness. Directed towards the experimental analysis of nervous system function, to introduce the techniques and approaches used in neurophysiological research. Sensation: an integrated lecture and experimental course is given on somatic, visual and auditory sensory mechanisms. Laboratory work: students conduct psychophysical experiments to evaluate subjective sensory capabilities. The neural mechanisms underlying these subjective abilities are examined in animals in electrophysiological experiments which involve recording the impulse patterns from individual neurones within the sensory systems. Students are required to analyze the mechanisms employed by the nervous system to code information about specific parameters of sensory stimuli.

Lectures and experiments on motor function are directed towards an understanding of the various reflex and voluntary mechanisms controlling posture and movement. The section dealing with nervous control of visceral function is concerned mainly with regulation of cardiorespiratory activity.

### 73.012C Organ Physiology

**S2 L4T8**

*Prerequisites:* for 73.012A, B, C: normally as for 73.012. *For entry consult Head of School of Physiology and Pharmacology.*

An advanced study dealing with major physiological systems of the body and usually includes detailed segments from: the cardiovascular and respiratory systems; endocrines, kidney, fetal physiology, gastrointestinal physiology and exercise physiology. Emphasis on the functions of individual organs as well as the overall operations of particular body systems including their neural control mechanisms. Emphasis on the approaches and techniques involved in physiological research. Students are therefore required to carry out an extensive series of experiments which usually employ mammalian (including human) preparations.

### 73.012F Clinical Physiology

**F T3**

*Excluded:* 73.012 *Prerequisites:* 73.111; 41.101; 41.111 or 2.002B; 70.011A; 70.011C; 80.014.

This Level III subject is only available in course 3820, and only to those students not undertaking Physiology 2. The subject is

intended to supplement the Level II, Physiology 1A course in order to provide an adequate grounding for double degree students in applied or clinical aspects of physiology before they enter Year 3 of the Medical Course.

Covers aspects of normal and disordered physiology in the following areas: cardiovascular and cardiorespiratory mechanisms; body fluid balance and kidney function; the endocrine system; central nervous system; gastrointestinal physiology.

### 73.022 Pharmacology F L2T4

*Prerequisite:* 73.111 or 73.121. *Co-requisites:* 73.012 or 41.102A & 41.102B or two Level III Chemistry units.

Includes a study of the absorption, distribution and metabolism of drugs, as well as a study of the pharmacology of the autonomic nervous system, the cardiovascular system, the central nervous system, the kidney, the endocrine system and also a study of pharmacokinetics. A practical class program complements the lecture program by demonstrating a variety of basic pharmacological techniques.

### 73.111 Physiology 1 F L2T4

*Prerequisites:* 17.031 & 17.041; 2.121 & 2.131, or 2.141; 10.001 or 10.011 or 10.021 B & C. *Excluded:* 73.121, 73.011. *Co-requisite:* 41.101.

Introduction to fundamental physiological principles, dealing first with basic cellular function in terms of chemical and physical principles, and, second, with the operation of the various specialized systems in the body, for example, the cardiovascular system, whose function it is to transport materials to and from the tissues of the body; the respiratory system which must maintain the exchange of oxygen and carbon dioxide between the atmosphere and the blood; the gastrointestinal system which enables food materials to be modified by digestion and absorbed into the circulation; the kidney which is involved in the regulation of body fluid and electrolyte balance and with the excretion of the waste products of metabolism; the endocrine system which releases chemical messengers, called hormones, that are carried in the blood stream to regulate a great variety of body functions, eg metabolism and reproductive activity; the nervous system which by means of very rapidly propagated electrical impulses is responsible for all our movements, sensations, memories, emotions and consciousness itself. A substantial series of practical class experiments on these different areas of physiology is included in the course. This subject is taken by students enrolled in any of the Physiology program.

mating, inbreeding, sexual selection), finite populations, systematic forces (selection, mutation, migration), genetic distance between populations, genetic load, stable populations, molecular population genetics, evolutionary trees; observed human population structures; computer methods.

### 79.202 Human Genetic Analysis S2 L2T3

*Prerequisites:* one unit of genetics and one unit of statistical methods, or theory, as approved by the Head of School.

Principles and methods of human genetics: design of surveys, including twin and family studies; estimation and applications of genic and genotypic frequencies, selective values, mutation and migration rates, coefficients of kinship, inbreeding and assortative mating, effective population sizes, recombination fractions and heritabilities; segregation analysis; risks of recurrence of disease; genetical consequences of human intervention; computer methods.

### 79.302 Biochemical Genetics of Man S1 L2T4

*Prerequisites:* 41.101, 43.101.

Inherited variation of blood group antigens, serum proteins and red-cell enzymes, their possible selective roles, and their application to the study of differences between and within populations. Application of statistical techniques to analyzing population data.

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## Faculty of Medicine

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### 80.014 Human Behaviour F L3

*Prerequisites:* No formal prerequisites. Students may take the subject in Year 2 or Year 3 of Course 3820.

As for 80.012. See **Undergraduate Study: 3800 Medicine Course**, earlier in this handbook.

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## Community Medicine

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### 79.201 Population Genetics S1 L2T3

*Prerequisite:* one unit of statistical methods, or theory, as approved by the Head of School.

The genetic structure of populations: demographic structure, genetic relationships, mating systems (random and assortative

**Graduate Study:**  
**Faculty of Biological Sciences**  
**Faculty of Science**





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## Faculty of Biological Sciences and Faculty of Science Enrolment Procedures

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All students re-enrolling in 1988 or enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures 1988* available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

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## Faculty of Biological Sciences

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Facilities are available in each of the Schools for research leading to the degrees of Master of Science and Doctor of Philosophy. The School of Biotechnology offers a graduate diploma course in Biochemical Engineering, a graduate diploma in Biotechnology and a Master's course in Biotechnology by formal study, and the School of Psychology offers Master of Psychology and Master of Science (Psychology) degree courses.

### Higher Degree Qualifying Program

Students without a BSc Honours degree wishing to register as higher degree candidates must usually complete a qualifying program, admission to which is subject to the approval of the Faculty Higher Degree Committee.

Applicants must normally have a degree or diploma in an appropriate field of study from an approved university or institution, and in the case of a diploma, appropriate professional experience.

Undergraduate of this University may be admitted to the full-time or part-time Honours undergraduate course. Other applicants may be admitted to a full-time, part-time or external qualifying program. The duration of the qualifying program is a minimum of one year for full-time and two years for part-time or external students.

### *Content of Qualifying Program*

The qualifying program consists of the whole of the usual program for the final Honours year of the undergraduate course, the following being the prescribed Level IV subjects:

- 41.103 Biochemistry Honours
- 42.103 Biotechnology Honours
- 43.103 Botany Honours
- 44.103 Microbiology Honours
- 12.403 Psychology 4 (Thesis)
- 45.103 Zoology Honours

The qualifying program is graded in the usual way, and in appropriate cases the results are expressed as a grading equivalent to Honours.

### *Alternative Qualifying Program*

Applicants who cannot attend the University regularly for the above programs may be admitted as external qualifying students to a program similar to a standard Honours year. The following are the alternative qualifying subjects:

- 41.999G Biochemistry
- 42.999G Biotechnology
- 43.999G Botany
- 44.999G Microbiology
- 12.999G Psychology
- 45.999G Zoology

The results in alternative qualifying subjects are graded Pass or Fail only.

#### Fees

Candidates enrolled in the Alternative Qualifying Program are exempt from student service fees.

## Biotechnology

### 5014 Biochemical Engineering Graduate Diploma Course

#### Graduate Diploma GradDip

The Department of Biotechnology, conjointly with the School of Chemical Engineering and Chemical Technology, offers a course in biochemical engineering which leads to the award of a graduate diploma (GradDip). The course is open to graduates in the biological sciences, chemistry, chemical engineering or agriculture, and can be completed in one year of full-time or over a longer period by part-time study. It contains a component of graduate level 'bridging' subjects, designed to facilitate the introduction of graduates with a variety of backgrounds to the current practice of biochemical engineering.

The normal entrance requirement is an appropriate degree or equivalent qualification in biological sciences, chemistry, chemical engineering or agriculture. Intending students are referred to the conditions for the award of Graduate Diplomas set out later in this handbook.

	Hours per week	
	S1	S2
<i>Session 1</i>		
41.211G Principles of Biology	3	0
42.212G Principles of Biochemistry	3	0
44.101 Introductory Microbiology	6	0
48.282G Thermodynamics	4	0
48.284G Mass Heat and Momentum Transfer	4	0
<i>Session 2</i>		
42.213G Biochemical Methods	0	3
42.214G Biotechnology	0	3
48.283G Process Dynamics and Biochemical Engineering Design	0	8

### 5015 Biotechnology Graduate Diploma Course

#### Graduate Diploma GradDip

The graduate diploma course provides the opportunity for graduates with no previous tuition in biotechnology to undertake training in this discipline.

A degree in a science-based course is required for admission. If the degree course has not included a biology component, the candidate is required to undertake some basic biology training as a prerequisite or co-requisite.

Under normal circumstances, students whose previous training has included a substantial component of biotechnology will not be admitted to the course.

The course comprises study of undergraduate and graduate formal subjects, plus extensive laboratory training in biotechnology.

The diploma is awarded after one year's full-time study, consisting of an average of 19 hours per week, or two years part-time study, consisting of an average of 9½ hours per week. The program includes the listed obligatory subjects plus sufficient of the listed elective subjects to meet the hours of study required. The electives include subjects necessary for students without previous tuition in biochemistry and/or microbiology, as well as alternatives for those with previous tuition in these disciplines. The choice of electives in each individual case is subject to approval by the Head of School.

		Hours per week	
		S1	S2
<b>Obligatory Subjects</b>			
<i>Full Year</i>			
42.215G	Practical Biotechnology	7	7
<i>Session 1</i>			
42.102A	Biotechnology A	6	
<b>Elective Subjects</b>			
<i>Full Year</i>			
42.104G	Graduate Seminars	2	2
42.111G	Reading List in Biotechnology (Microbiology)	3	3
42.112G	Reading List in Biotechnology (Biochemistry)	3	3
42.305G	Case Studies	0	2
<i>Session 1</i>			
44.101	Introductory Microbiology	6	
42.212G	Principles of Biochemistry	3	
<i>Session 2</i>			
42.101	Introduction to Biotechnology		6
42.102B	Biotechnology B		6
44.121	Microbiology 1		6

### Master of Science (Biotechnology)

The Department also offers a formal graduate course at the master's level (Master of Science (Biotechnology)). The course includes advanced treatments of all areas of biotechnology. It is open to graduates with a four-year degree in biotechnology or a related discipline, or who have, in the opinion of the Higher Degree Committee, acquired equivalent qualifications or experience. Intending students are referred to **Conditions for the Award of Graduate Degrees** set out later in this handbook.

The course consists of lectures, tutorials, practical sessions, case history studies and a supervised project. The minimum period of registration before the award of the degree is two sessions for full-time students and four sessions for part-time students.

To qualify for the degree students must satisfy the examiners in the prescribed examinations, which include the submission and assessment of a report on the specified project.

## 8041 Master of Science (Biotechnology) Graduate Course

### Master of Science (Biotechnology) MSc(Biotech)

	Hours per week	
	S1	S2
<i>Full Year</i>		
42.306G Project	7	7
<i>Session 1</i>		
42.303G Biochemical Process Control	5	0
42.304G Biodeterioration and Biodegradation	5	0
<i>Session 2</i>		
42.301G Microorganism Productivity	0	5
42.302G Enzyme Technology	0	5
42.305G Case Studies	0	2
	17	19

## Psychology

Head of School  
Professor B.J. Gillam  
Administrative Officer  
Mr. T.J. Clulow

The School offers courses leading to the award of the degrees of Master of Psychology and Master of Science (Psychology).

### Master of Psychology

This course is designed to provide professional training at an advanced level for honours graduates in psychology.

The normal entrance requirements are:

1. a degree of Bachelor, with Honours Class I or Class II in Psychology;
  2. completion of a research thesis or research project in the Honours fourth year;
- and

3. completion of approved courses in learning, perception and cognition, physiological psychology, psychological statistics, psychometrics and abnormal psychology, or in such other fields as may be prescribed by the Head of the School.

A student who does not satisfy the above requirements may be permitted to undertake a qualifying course prescribed by the Head of School, satisfactory completion of which will be accepted as meeting entrance requirements.

Selection of students is based on academic qualifications and suitability for the course. It may be necessary to limit the number of new enrolments in any year. An application to register for the degree of Master of Psychology must be made on the prescribed form which shall be lodged with the Registrar at least two months before the commencement of the academic year.

The minimum period of registration before the award of the degree is four sessions for full-time students and six sessions for part-time students.

To qualify for the degree, students must satisfy the examiners in respect of their academic attainments, and their skill and competence in relevant aspects of practical professional work.

The course consists of lectures, seminars, demonstrations and practical work, supervised clinical and community work, and a research thesis.

The major aims of the course are: **1.** to acquaint students with the issues, findings and problems of contemporary clinical and community psychology; and **2.** to equip them with basic clinical skills and techniques. A total of 250 hours of supervised clinical practice must be completed in the first year, and a further 430 hours in the second year.

Assessment of student performance is by sessional examinations, class tests, seminar papers and a research thesis.

It should be noted that the course extends over two calendar years and not just four academic sessions with vacation breaks.

## 8250 Master of Psychology Graduate Course — Full-time

### Master of Psychology MPsychol

<i>Year 1</i>	Hours per week	
	S1	S2
<i>Full Year</i>		
12.230G Developmental Disabilities and Disorders		3
12.231G Professional Practice: 250 hours		
12.237G Biological and Environmental Bases of Behavioural Disturbance	2	2
12.239G Research and Evaluation Methods	2	

*Year 1 subjects continued overleaf*

		Hpw	
		S1	S2
12.241G	Graduate Colloquium	1	1
12.242G	Research Thesis*		
12.243G	Experimental Clinical Psychology	4	4
12.244G	Psychological Assessment 2		2
12.245G	Behavioural Health Management	2	2
12.249G	Child Clinical Psychology	2	
12.250G	Psychological Assessment 1	3	
12.251G	Human Neuropsychology		3

## Year 2

### Full year

12.231G	Professional Practice:		
	180 hours in Session 1		
	250 hours in Session 2		
12.235G	Community Psychology	3	
12.240G	Graduate and Clinical Seminars	2	2
12.241G	Graduate Colloquium	1	1
12.242G	Research Thesis*		
12.243G	Experimental Clinical Psychology	2	

\*Contributes approximately 40 per cent to the overall grading for the degree.

Note: Part-time students normally are expected to take half the full-time program in any one session.

## Master of Science (Psychology)

The degree is available only to students who hold the degree of Doctor of Philosophy in an approved area of psychology. In combination with the PhD, the degree is designed to train candidates for academic positions in clinical psychology and to provide the background necessary for advancement to senior posts in applied fields.

The minimum period of full-time registration for the degree is three sessions, and the minimum period of part-time registration is six sessions. Students with advanced standing may have the minimum period reduced by up to one-third of the program.

Assessment of student performance is by sessional examinations, class tests and seminar papers.

## 8255

## Master of Science (Psychology) Graduate

### Course —

### Full-time

## Master of Science (Psychology)

### MSc(Psychol)

		Hours per week	
		S1	S2
12.230G	Development Disabilities and Disorders		3
12.231G	Professional Practice: 250 hours		
12.237G	Biological and Environmental Bases of Behavioural Disturbance	2	2
12.239G	Research and Evaluation Methods	2	
12.240G	Graduate and Clinical Seminars	2	2
12.241G	Graduate Colloquium	1	1
12.243G	Experimental Clinical Psychology	4	4
12.244G	Psychological Assessment 2		2

		Hpw	
		S1	S2
12.245G	Behavioural Health Management	2	2
12.249G	Child Clinical Psychology	2	
12.250G	Psychological Assessment 1	3	
12.251G	Human Neuropsychology		3

## Year 2

12.231G	Professional Practice: 430 hours		
12.235G	Community Psychology	3	
12.241G	Graduate Colloquium	1	
12.243G	Experimental Clinical Psychology	2	

Note: Part-time students take half the full-time program in any one session.

## Faculty of Science

Facilities are available in each of the schools for research leading to the award of the higher degrees of Master of Science and Doctor of Philosophy.

The following formal courses leading to graduate awards are also offered:

Faculty of Science	Graduate Diploma in Physical Oceanography
School of History and Philosophy of Science	Master of Science and Society
School of Optometry	Master of Optometry
School of Chemistry	Master of Chemistry
	Graduate Diploma in Food and Drug Analysis
School of Mathematics	Master of Mathematics
	Master of Statistics
School of Physics	Master of Physics

For admission to registration for all degrees of Master (except Master of Statistics), candidates must have completed one of the following:

1. An approved degree of Bachelor with Honours.
2. An approved three year course leading to the degree of Bachelor plus an approved qualifying program. Suitable professional and/or research experience may be accepted in lieu of the qualifying program.
3. An approved four year course leading to the degree of Bachelor.

Applicants for registration for the degree of Master of Statistics shall have been admitted to the degree of Bachelor with major studies in the field of statistics in the University of New South Wales or other approved university.

The manner of presentation and examination of reports of projects undertaken as part of formal courses shall be determined by the Head of the School.

The conditions governing these awards are set out later in this handbook.



## 5530 Physical Oceanography Graduate Diploma Course

### Graduate Diploma in Physical Oceanography GradDip

This graduate diploma is intended to train graduates in the physical sciences or engineering in the basic techniques of physical oceanography.

It is intended to develop student skills in planning and execution of oceanographic experiments, in the theory of oceanographic fluid mechanics, the applications and limitations of oceanographic equipment and of commonly used data analysis techniques.

Recent rapid developments in marine science coupled with the relative scarcity of persons able to take up support positions demonstrate the need for skilled persons who will be able to assist oceanographic research with minimum training. This program is aimed at providing such skilled graduates.

Intending students are referred to the conditions for the award of graduate diplomas set out elsewhere in this handbook. Basic entry qualifications for this program are a degree in Engineering or in Science with major studies in mathematics or physics.

The program, requiring 28 credits for completion, consists of a major project (67.001G) worth 50% of the total accreditation for the program, the remaining 50% being comprised as indicated below.

#### 1. Compulsory Subjects

67.001G	Experimental Project	14 credits
67.002G	Geophysical Fluid Dynamics	4 credits
67.003G	Instrumentation	1 credit
67.004G	Applied Data Analysis	2 credits

#### 2. Elective Subjects

6.580G	Image Analysis in Remote Sensing	3 credits
6.581G	Microwave Remote Sensing	3 credits
8.863G	Estuarine Hydraulics	3 credits
27.043G	Remote Sensing Applications	3 credits
67.005G	Theoretical Project	7 credits

Appropriate existing subjects within mathematics, physics or engineering chosen on the basis of individual background

Here 1 credit is defined as being 1 hour per week for one session. The course may be taken over one year (full-time) or two years (part-time).

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## Chemistry

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### Head of School

Professor P.J. Derrick

### Executive Assistant to Head of School

Dr. D.S. Alderdice

## 8770 Master of Chemistry Graduate Course

### Master of Chemistry MChem

Three programs are available, emphasizing different areas of chemistry. Each program consists of a number of lecture courses (each separately examinable), laboratory instruction and visits to laboratories. In addition each student undertakes a short research project, with a research report assessed by two examiners. The student may also be required to undergo an oral examination.

Program 2.581G Advanced Analytical Chemistry and 2.583G Analytical Science (Chemistry) are available only on a full-time basis; however, the qualifying program may be taken part-time.

Program 2.582G Food and Drug Chemistry may be taken either full-time or part-time.

Details of the programs are:

#### 2.581G Advanced Analytical Chemistry

This program should be of interest to chemistry graduates who are involved in the practice or teaching of analytical chemistry.

##### 1. 2.581G Advanced Analytical Chemistry Lecture Courses

Students are required to take *all* of the following nine core courses of lectures:

- (1) Analytical flame spectroscopy;
- (2) Advanced electrochemical analysis;
- (3) Chromatography;
- (4) Analytical chemistry of pollutants;
- (5) Emission, IR, Mass and XRF spectroscopy;
- (6) Calculations and statistics in analytical chemistry;
- (7) Chemical analysis of organic and biological materials;
- (8) Operations and applications of minicomputers in chemistry;
- (9) Chemical microscopy.

The lecture time for the whole course is a minimum of 140 hours.

##### 2. Laboratory Instruction and Visits to Laboratories

An additional minimum of 150 hours is spent by students in selected areas of laboratory practice, instruction and visits to laboratories.

##### 3. Research Project

A short research project (with report) of approximately 4 months' duration full-time (400 hours laboratory work) is selected in relation to the combined interests of the student and the supervisor.

#### 2.582G Food and Drug Chemistry

This program involves an advanced study of the chemistry, stability, mode of action (where applicable) and analysis of food constituents, food additives and selected drugs. Entry to this program is excluded in the case of applicants who have completed the Graduate Diploma in Food and Drug Analysis (course 5510).

### 1. Food and Drug Chemistry Lecture/Laboratory Courses

- (1) Food and Drugs 1
- (2) Treatment of Analytical Data
- (3) Instrumental Techniques in Food and Drug Analysis
- (4) Food and Drugs 2
- (5) Toxicology, Occupational and Public Health
- (6) Introductory Microbiology

The lecture time for the whole course is 160 hours. An additional 392 hours is spent by students in formal laboratory work. Students who have not previously taken an approved course in microbiology are required to complete unit 44.101 Introductory Microbiology (84 hours) in addition to the above program.

### 2. Research project

A short research project (with report) of approximately 4 months' duration full-time (400 hours laboratory work) is selected in relation to the combined interests of the student and the supervisor.

### 2.583G Analytical Science (Chemistry)

This program provides a more broadly based training in methods of chemical analysis than 2.581G.

#### 1. Formal course work

Students are required to complete all of the following courses of lectures and associated laboratory work.

- (1) Classical methods of chemical analysis
- (2) Instrumental analysis
- (3) Toxicology, occupational and public health
- (4) Special instrumental analysis methods

The lecture time for the whole course is 98 hours. An additional 196 hours is spent in formal laboratory sessions.

#### 2. Project

A short project (with report) requiring 400 hours of laboratory work, which may be either original research work or development work. The field of work will be selected considering the combined interests of the student and supervisor.

**5510**

## Food and Drug Analysis Graduate Diploma Course

### Diploma in Food and Drug Analysis DipFDA

According to demand the course may be available on a full-time basis over one year or on a part-time basis over two years.

The course in food and drug analysis is designed to provide systematic training at an advanced level for chemists who wish to extend their acquaintance with analytical techniques, and thus is suitable for those who may wish to practice as public analysts. It is also suitable for those who wish to work in the food or pharmaceutical industry. The prime aim is to present discussions of the principles and design of analytical methods which are therefore presented on a comparative basis.

It is considered that the techniques involved in the handling of foods and drugs together with those discussed in the ancillary subjects of the course provide a firm basis of approach to many other fields.

Intending students are referred to the conditions for the award of graduate diplomas set out later in this handbook.

### Year 1

#### Part-time\*\*

		Hours per week
2.231G	Food and Drugs 1	4
2.371G	Treatment of Analytical Data	1
2.281G	Instrumental Techniques in Food and Drug Analysis	4
		<hr/> 9

### Year 2

2.242G	Food and Drugs 2	4
2.251G	Toxicology, Occupational and Public Health	4
44.101	Introductory Microbiology	3†
		<hr/> 11

†Offered in Session 1 only, at 6 hpw.

\*\*Full-time students take Years 1 and 2 in the one year.

## Science and Technology Studies

### Head of School

Professor W.R. Albury

The School offers a graduate program of coursework and research leading to the award of the degree of Master of Science and Society. The course is designed for graduates in the natural sciences, the applied sciences, technology and the social sciences or other relevant disciplines, who have a special interest in contemporary relationships between science and society, government and politics. The conditions for the award of the degree are set out later in this handbook.

**8780**

## Master of Science and Society Graduate Course

### Master of Science and Society MScSoc

The MScSoc pass program comprises 8 units of the course, which should normally be completed over 4 sessions of part-time (evening) study. A unit of the course requires 28 hours of seminar classwork and additional private study.

The following core units are common to the programs of all candidates:

- 62.716G Science and Society in the Twentieth Century\*
- 62.713G Project\*

Candidates may select 4 further units from the following list:

- 62.709G The Scientific Community  
 62.710G Science, Philosophy and Social Values  
 62.714G Knowledge, Power and Public Policy  
 62.718G Science in National Cultures;  
 Comparative Historical Perspectives  
 62.719G Science Policy: The International Dimension  
 62.720G Philosophy of Science and the Sociology of  
 Knowledge  
 62.721G Science, Politics and the Media  
 62.730G The Economics of Australian Innovation  
 15.716G Science, Technology and Economic Development  
 30.960G Technological Change and Organisational  
 Participation  
 53.576G Social and Technological Forecasting  
 53.571G Technology and Working Life

\*2 units.

Selected candidates may undertake a third-year MScSoc honours degree program of advanced study which includes a dissertation based on supervised research into particular aspects of the relationships between science, technology and social institutions.

## Mathematics

**Head of School**  
 Professor I.H. Sloan

The School offers graduate courses leading to the award of the degrees of Master of Mathematics (MMath) and Master of Statistics (MStats). (The School also offers the pass degree of MA. For further details see the Faculty of Arts Handbook.)

## 8740 Master of Mathematics Graduate Course

### Master of Mathematics MMath

The Master of Mathematics Course is intended for honours graduates in pure or applied mathematics, but others may be admitted after completing a qualifying course. The course may be completed in one year of full-time or two years of part-time study. The course may be taken as a preliminary step towards the award of a PhD in mathematics. It also provides advanced training for persons specializing in the teaching of mathematics in tertiary institutions. In addition an appropriate program may provide training for those employed or seeking employment in the area of industrial mathematics.

The program consists of seven lecture courses from 10.194G, the duration of each being two hours per week for one session. With the approval of the Head of the School of Mathematics a student may substitute for one or more of these lecture courses a reading course supervised by a member of staff. Again with this approval a student may substitute for at most two of these courses graduate courses offered either within or outside the School of Mathematics. Students are also required to participate in relevant departmental seminars. In addition, students are required to undertake a project supervised by a staff member,

consisting of either a critical review of the literature in a specific field of mathematics, or a short research project. It is anticipated that students will spend three hours per week for two sessions on their project. Each candidate's proposed program of study requires the approval of the Head of the School of Mathematics.

The conditions for the award of the degree are set out later in this handbook.

## 8750 Master of Statistics Graduate Course

### Master of Statistics MStats

The Master of Statistics Course covers a wide range of statistical theory and practice and provides advanced training for practising statisticians. The course may be completed in two years of full-time or four years of part-time study, and it 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 conditions for the award of the degree are set out later in this handbook.

The academic requirement for the degree is 24 credits.

Each candidate's program of study must be approved by the Head of the School.

<b>Compulsory Subjects</b>	<b>Credits</b>
10.381G Experimental Design 1	2
10.383G Stochastic Processes	2
10.385G Multivariate Analysis 1	2
10.390G Statistical Inference	2
10.392G Project	2

<b>Elective Subjects</b>	
10.382G Experimental Design 2	2
10.384G Time Series	2
10.386G Multivariate Analysis 2	2
10.387G Sample Survey Design	2
10.388G Sequential Analysis	2
10.389G Non-Parametric Methods	2
10.391G Special Topic* A	2
10.393G Special Topic* B	2
10.394G Discrete Distributions	2
10.212M Optimal Control Theory or	
10.222M Higher Optimal Control Theory	3

Up to 6 credits may be taken in graduate subjects offered by other Departments or Schools within the University, subject to the approval of the Head of School. Such subjects include:

8.403G Theory of Land Use/Transport Interaction	2
8.405G Urban Transport Planning Practice	2
8.417G Transport and Traffic Flow Theory	4
10.212L Optimization Methods or	
10.222L Higher Optimization Methods	3
15.423 Econometrics B	2
18.711G Simulation in Operations Research	2

\*To be arranged: eg biological statistics, further work on order statistics, population statistics, non-linear programming.

## Optometry

### Head of School

Professor H. B. Collin

The School offers a formal graduate course leading to the award of the degree of Master of Optometry (MOptom). This course comprises the study of three elective graduate subjects and of 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 (to meet the needs of practising optometrists) in two or three years of part-time study. The course provides advanced training in clinical and theoretical aspects of Optometry, with opportunities for specialization in fields such as contact lenses, occupational optometry, and orthoptics.

Conditions for admission and for the award of the degree of Master of Optometry are set out later in this handbook.

### 8760

## Master of Optometry Graduate Course

### Master of Optometry MOptom

	Hours per week
31.701G Advanced Clinical Optometry	4
Three elective graduate subjects chosen from the list below (each 4 hours)	12
31.799G Project	8
	<u>24</u>

### Elective Graduate Subjects

31.702G Advanced Physiological Optics	4
31.703G Pleorhoptics and Binocular Vision	4
31.704G Advanced Contact Lens Studies	4
31.705G Advanced Contact Lens Practice	4
31.706G Occupational Optometry	4
31.707G Clinical Photography	4

The six elective graduate subjects offered are quite independent, and any three of them are suitable for a student seeking advanced professional training of a general nature. If clinical specialization is aimed at, the student would be advised to elect the graduate subjects shown below:

Specialization	Graduate Subjects
Contact Lenses	1. Advanced Contact Lens Studies 2. Advanced Contact Lens Practice 3. Clinical Photography
Occupational Optometry	1. Occupational Optometry 2. Pleorhoptics and Binocular Vision 3. Advanced Physiological Optics
Orthoptics	1. Pleorhoptics and Binocular Vision 2. Clinical Photography
ALD36160	

## Physics

### Head of School

Associate Professor J. C. Kelly

### Executive Assistant to Head of School

Dr J. R. Hanscomb

### Administrative Officer

Mrs P. Shaw

### 8730

## Master of Physics Graduate Course

### Master of Physics MPhysics

The School offers a graduate course leading to the award of the Master of Physics degree (MPhysics).

The Master of Physics degree course is intended for honours graduates in physics. Others may be admitted if they have submitted evidence of such academic and professional attainments as may be approved by the Faculty of Science on the recommendation of its Higher Degree Committee. Applicants with other qualifications may be admitted after completing a qualifying examination approved by the Faculty of Science.

The subject matter of the course provides an advanced training in a branch of physics, the topic of which is determined during the year preceding that in which it is offered.

Students undertaking the masters course by formal study must enrol in *one* of the following subjects:

1.801G	Energy Alternatives
1.802G	Astrophysics
1.803G	Acoustics
1.804G	Biophysics
1.805G	Applied Physics

Enrolment in any one of the above subjects normally involves at least five units of lecture material, a literature survey, and small research project.

## Graduate Study

# Subject Descriptions

## Identification of Subjects by Number

A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.
2. Each subject number is unique and is not used for more than one subject title.
3. Subject numbers which have not been used for some time are not used for new subject titles.
4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The identifying numerical prefixes for each subject authority are set out on the following page.

**Servicing Subjects** are those taught by a school or department outside its own faculty. Their subject descriptions are published in the handbook of the faculty which originates the subject and are also published in the handbook of the Faculty in which the subject is taught.

### HSC Exam Prerequisites

Subjects which require prerequisites for enrolment in terms of the HSC Examination percentile range, refer to the **1978 and subsequent Examinations**.

Candidates for enrolment who obtained the HSC in previous years or hold other high school matriculation should check with the appropriate school on what matriculation status is required for admission to a subject.

### Information Key

The following is the key to the information which may be supplied about each subject:

**S1** Session 1, **S2** Session 2

**F** Session 1 *plus* Session 2, ie full year

**S1** or **S2** Session 1 *or* Session 2, ie choice of either session

**SS** single session, but which session taught is not known at time of publication

**CCH** class contact hours

**L** Lecture, followed by hours per week

**T** Laboratory/Tutorial, followed by hours per week

**hpw** hours per week

**C** Credit point value

**CR** Credit

**DN** Distinction

**HD** High Distinction

School, Department etc	Faculty	Page	School, Department etc	Faculty	Page
*Subjects also offered for courses in this handbook			*Subject also offered for courses in this handbook		
<b>1 School of Physics</b>	<b>Science</b>		42 School of Biological Technologies (Biotechnology)*	Applied Sciences	
<b>2 School of Chemistry</b>	<b>Science</b>		<b>44 School of Microbiology</b>	<b>Biological and Behavioural Sciences</b>	
3 School of Chemical and Industrial Engineering (New Course)	Applied Science		<b>45 School of Biological Science</b>	<b>Biological and Behavioural Sciences</b>	
4 School of Materials Science and Engineering	Applied Science		46 Faculty of Applied Science	Applied Science	
5 School of Mechanical and Industrial Engineering	Engineering		47 Centre for Safety Science	Engineering	
6 School of Electrical Engineering and Computer Science	Engineering		48 School of Chemical Engineering and Industrial Chemistry* (Old course)	Applied Science	
7 School of Mines (Mineral Processing and Extractive Metallurgy and Mining Engineering)	Applied Science		49 School of Biological Technologies	Applied Science	
8 School of Civil Engineering	Engineering		50 School of English	Arts	
9 School of Fibre Science and Technology (Wool Science)	Applied Science		51 School of History	Arts	
<b>10 School of Mathematics</b>	<b>Science</b>		52 School of Philosophy	Arts	
11 School of Architecture	Architecture		53 School of Sociology*	Arts	
<b>12 School of Psychology</b>	<b>Biological Sciences</b>		54 School of Political Science	Arts	
13 School of Fibre Science and Technology (Textile Technology)	Applied Science		55 School of Librarianship	Professional Studies	
14 School of Accountancy	Commerce		56 School of French	Arts	
15 School of Economics*	Commerce		57 School of Theatre Studies	Arts	
16 School of Health Administration	Professional Studies		58 School of Education	Professional Studies	
<b>17 Faculty of Biological and Behavioural Sciences</b>	<b>Biological Sciences</b>		59 Department of Russian Studies	Arts	
18 School of Mechanical and Industrial Engineering (Industrial Engineering)	Engineering		60 Faculty of Arts	Arts	
21 Department of Industrial Arts	Architecture		61 Department of Music	Arts	
25 School of Mines (Applied Geology)	Applied Science		62 School of History and Philosophy of Science*	Arts	
26 Department of General Studies	Board of Studies in General Education		63 School of Social Work	Professional Studies	
27 School Geography	Applied Science		64 School of German Studies	Arts	
28 School of Marketing	Commerce		65 School of Spanish and Latin American Studies	Arts	
29 School of Surveying	Engineering		66 Subjects Available from Other Universities		
30 Organizational Behaviour Unit*	Commerce		<b>67 Faculty of Science</b>	<b>Science</b>	
<b>31 School of Optometry</b>	<b>Science</b>		<b>68 Board of Studies in Science and Mathematics</b>	<b>Board of Studies in Science and Mathematics</b>	
32 Centre for Biomedical Engineering	Engineering		70 School of Anatomy	Medicine	
Faculty of Arts	Arts		71 School of Medicine	Medicine	
35 School of Building	Architecture		72 School of Pathology	Medicine	
36 School of Town Planning	Architecture		73 School of Physiology and Pharmacology*	Medicine	
37 School of Landscape Architecture	Architecture		74 School of Surgery	Medicine	
38 School of Biological Technologies (Food Science)	Applied Science		75 School of Obstetrics and Gynaecology	Medicine	
39 Graduate School of the Built Environment	Architecture		76 School of Paediatrics	Medicine	
40 Professorial Board			77 School of Psychiatry	Medicine	
<b>41 School of Biochemistry</b>	<b>Biological and Behavioural Sciences</b>		78 School of Medical Education	Medicine	
			79 School of Community Medicine	Medicine	
			80 Faculty of Medicine	Medicine	
			81 Medicine/Science/Biological Sciences	Medicine	
			85 Australian Graduate School of Management	AGSM	
			90 Faculty of Law	Law	
			97 Faculty of Engineering	Engineering	

## Physics

Not all graduate subjects are necessarily offered in any one year.

### 1.118G Methods of Theoretical Physics

For PhD degree, MSc and MPhysics degree course students.

Response functions and Green's functions. Symmetry and group theory. Many particle systems. Tensor calculus and variational techniques.

### 1.128G Methods of Experimental Physics

For PhD degree, MSc and MPhysics degree course students.

Signal processing and retrieval. Resonance spectroscopy techniques. Diffraction and scattering techniques. Electron microscopy.

### 1.801G Energy Alternatives

For MPhysics degree course students.

A study of energy alternatives: solar thermal and solar electric energy; energy from fossil fuels; conversions, hydrogen, nuclear fusion and fission, wind, ocean and geothermal sources of energy; political and sociological aspects of energy alternatives.

### 1.805G Applied Physics

For MPhysics degree course students.

A study of advanced physical instruments, data handling and control, measurement technology and materials science with special reference to physics in industry.

## Servicing Subjects

These are subjects taught within courses offered by other faculties.

For further information regarding the following subject see the Faculty of Architecture handbook.

### 1.927G Acoustic Theory

S2 L1½T½

2 credit points.

Sources of acoustic radiation; simple, dipole, quadrupole, plane, impulsive source, random source, aerodynamic sources. Free field propagation in fluids, interference and diffraction, absorption, shock waves. Boundary effects: reflection and transmission at fluid/fluid and fluid/solid interfaces, fluid waveguides, solid waveguides. Reception and analysis; transducers. Fourier analysis, statistical methods, impulse measurement.

## Chemistry

### 2.231G Food and Drugs 1 and

F L1T3

### 2.242G Food and Drugs 2

F L1T3

These two units contain common subject material but are subdivided to enable them to be taken over one or two years.

Treatment of the food section develops from considerations of proximate analysis — gross determination of classes of food components — to detailed examinations within the groups for more important compounds. Conversely the course in drug work progresses from the examination of simple materials, including identification of unknowns by macro and micro procedures to the examination of compounded materials. A background section on food handling is included, while some attention is given to chemotherapy etc in the drug course.

Subject-matter covers treatment of the main classes of food-stuffs, such as: *Foods*: Origin, general introduction to analytical methods, relation to likely adulterations and impurities, groups of constituents; carbohydrates, sugars, by physical and chemical methods, jams and preserves, pectin, agar, alginates, oils and fats; protein foods, meat, gelatin, fish products; dairy products, milk, cream, cheese, etc; fermented liquids, beer, wine, spirits, minor constituents. Principles of food processing, dehydration, quick freezing, canning; cereal products; beverages and flavouring essences; nutritional aspects, vitamins in detail; preservatives and food additives; radiation chemistry of food products. *Drugs*: Elements of pharmacology chemotherapy and modes of action, galenicals, identification tests for alkaloids, etc. Analytical chemistry of analgesics, sedatives, hypnotics, steroid hormones, antihistamines, etc. Antibiotics, penicillin, streptomycin, aureomycin, sulphonamides. Activity of enzyme preparations; antiseptics and disinfectants; soaps and detergents.

### 2.251G Toxicology, Occupational and Public Health

F L1T3

Important classes of toxic materials found in the environment; treatment of pesticide residues, industrial chemicals of various types, toxic gases, mould metabolites and bacterial toxins occurring in food, carcinogenic substances, toxic metals, etc. Effects of these substances on living organisms, particularly man. Practical work: pesticide residue analysis, blood and urine analysis, gas sampling and analysis, trace metal determination and experiments on the animal metabolism of toxic substances.

### 2.271G Chemistry and Analysis of Foods

F L1T3

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. 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

F L1T3

Principles involved in modern instrumental techniques; detailed application and interpretation of results. UV, IR, NMR, and ESR, emission and atomic adsorption spectroscopy, polarography, X-ray methods, fluorescence spectroscopy and gas chromatography. Services 2.231G, 2.242G and 2.251G but is also suitable as a single subject for those wishing to familiarize themselves with modern techniques.

## 2.371G Treatment of Analytical Data

F L1

Errors of measurement, the treatment, interpretation and comparison of sets of measurements, associated data and problems involving analysis of variance. Topics: Description 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:* 1. Analytical flame spectroscopy. 2. Advanced electrochemical analysis. 3. Chromatography. 4. Analytical chemistry of pollutants. 5. Emission, IR, mass and XRF spectroscopy. 6. Calculations and statistics in analytical chemistry. 7. Chemical analysis of organic and biological materials. 8. Operations and applications of minicomputers in chemistry. 9. Chemical microscopy. *Laboratory:* Practice, instruction and visits. *Research Project.*

# Mathematics

## 10.194G Advanced Mathematics Lecture Courses

Each year a selection of courses is offered in the following areas:

Algebraic geometry; algebraic topology; categorical and homological algebra; commutative algebra; group theory; Lie groups and algebras; representation theory; group theory and its physical applications; advanced quantum mechanics; differential geometry; differential equations; optimal control theory; functional analysis; applied functional analysis; operator theory; harmonic analysis; advances numerical analysis; theory of functions; finite mathematics: number theory; logic; theoretical astrophysics; history of mathematics; recent advances in mathematics; mathematical economics; optimization and control.

## 10.302G Regression Analysis and Experimental Design

S1 L1½T½

*Prerequisite:* First course in Statistics.

A revision of linear regression with extension to multiple and stepwise linear regression. Analysis of block designs, Latin squares, factorial designs, variance component and mixed model analyses. Bioassay, logic models. Contingency tables.

## 10.303G Applied Stochastic Processes

S2 L1½T½

*Prerequisite:* First course in Statistics.

An introduction to processes in discrete and continuous time. Markov chains and Markov processes, branching processes, time series with moving average models.

## 10.372G Statistical and Experimental Design

The concepts of random variables, means, variances, the common tests and confidence intervals based on the normal distribution, some simple analyses of variance.

Comparative experiments: requirements of a good experiment, assumptions underlying the conventional models of standard designs and their analyses, purpose of randomization; how the physical circumstances of an experiment are related to its formal model on which its analysis is based; the internal estimate of error obtained from the variation left after accounting for all sources of systematic variation, these points illustrated by considering in some detail the fully randomized design, the randomized block design, the 2<sup>2</sup> factorial fully randomized design, and the fully randomized design with one concomitant variable.

Survey sampling: the distinction between a survey sample and an experiment planned to compare a set of treatments, and how it affects the inferences that may be made; simple random sampling, stratified random sampling.

## 10.381G Experimental Design 1

Modified designs for fixed effects models. Incomplete and balanced incomplete block designs. Confounding and fractional replication. Randomization theory. Multiple comparisons.

## 10.382G Experimental Design 2

Extensive treatment of random and mixed models. Combinatorial structure of designs, cross-over and lattice designs, response surfaces.

## 10.383G Stochastic Processes

Discrete parameter, continuous time Markov processes. Brief survey of birth-and-death, immigration, epidemic and predator-prey processes. Introduction to dam and storage problems. Queueing processes. Diffusion approximations.

## 10.384G Time Series

Spectral estimates, discrete and continuous spectra. Periodogram analysis. Probability theory, special processes. Ergodicity, harmonic analysis and linear filters. Estimation and hypothesis testing.

## 10.385G Multivariate Analysis 1

Likelihood ratio tests for means, variances and structure. Discriminant, principal component, canonical and factor analysis.



**10.386G Multivariate Analysis 2**

The general linear hypothesis and analysis of dispersion. Tests based on roots, distribution theory.

**10.387G Sample Survey Design**

Simple, stratified and systematic random sampling. Estimation of proportions, ratios, and sample sizes. Multi-stage sampling.

**10.388G Sequential Analysis**

The sequential probability ratio test — OC and ASN functions. General theory of sequential tests. Sequential estimation.

**10.389G Non-Parametric Methods**

Sign test, run tests, goodness-of-fit tests. Order statistics and range. Rank-order statistics. Wilcoxon and signed-rank tests, one- and two-way rank analyses of variance. Rank correlation. Randomization theory and permutation tests. Paired comparisons. Censoring and truncation.

**10.390G Statistical Inference**

Decision theory. General theory of estimation and hypothesis testing.

**10.391G Special Topic A**

To be arranged, eg biological statistics, further work on order statistics, population statistics, non-linear programming, discrete distribution theory.

**10.392G Project****10.393G Special Topic B**

To be arranged, eg biological statistics, further work on order statistics, population statistics, non-linear programming, and other topics.

**10.394D Discrete Distributions**

Discrete and lattice distributions — their general properties mostly via generating functions. The structures of contagious (clustered) distributions, with a study of specific examples such as the negative binomial. Neyman and Poisson-Pascal families, together with estimation and fitting procedures.

**10.401G Seiches and Tides**

The equations of motion of a shallow liquid. Shallow water waves, oscillations of rectangular and circular lakes. The tides, their observation and measurement. Newton's equilibrium theory. Harmonic analysis and prediction. Local tides. Oscillations and resonance of harbours and bays.

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## Servicing Subjects

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These are subjects taught within courses offered by other faculties.

For further information regarding the following subject see the Faculty of Arts Handbook.

**10.062G Advanced Mathematics General**

For research workers throughout the University requiring employment of advanced mathematics. Topics vary from year to year according to demand and interest.

For further information regarding the following subjects see the Faculty of Engineering Handbook.

**10.061G Advanced Mathematics for Electrical Engineers****C3**

Boundary value problems in partial differential equations. Selected topics from complex variable analysis, integral transforms, and orthogonal functions and polynomials.

**10.361G Statistics****C3**

Probability theory, a survey of random processes with engineering applications — processes in discrete and continuous time. Markov processes, ergodicity, stationarity, auto-correlation, power spectra, estimation of auto-correlation and power spectra.

**10.371G Statistics****C3**

Revision of probability and distribution theory, including estimation of hypothesis testing. Extension of this to include topics such as more complex probabilistic modelling, analyses of modified data (censored, truncated and missing observations), general statistical inference (decision theory), acceptance testing, and reliability analysis (hazard functions).

**32.012G Biomedical Statistics****SS L2½T1½ C4**

Statistical assessment of normal and diseased states. Statistical relationships between multiple variables used to assess disease; analysis of variance, regression, factor analysis, discriminant analysis. Progression of diseases over time. Diagnosis and assessment of treatments. Experimental design and sampling. Computation methods.

**32.101G Mathematical Modelling for Biomedical Engineers****S1 L3T1 C4**

Model formulation and validation of ordinary and partial differential equations by analytical and numerical techniques.

**12.710G Experimental Psychology in Cognitive Science**

Theory of experimental psychology pertinent to cognitive science. Learning, memory, decision making, problem solving, perception, and language comprehension.

**12.711G Behavioural Neuroscience**

The neurophysiological substrates of learning, memory, perception and cognition. Introduction to the basic structure and physiology of the nervous system.

**12.712G Human Information Processing**

Human information processing: advanced topics in cognitive psychology with particular reference to temporal dynamics of attention, organisation, integration and retrieval processes for sensory and linguistic information.

**12.713G Neuroscience: Human Neuropsychology**

Advanced topics in the neurophysiology of human cognitive functioning, including consideration of the influence of brain disease and brain damage.

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**Psychology**


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**12.230G Developmental Disabilities and Disorders**

An essentially practical course focusing on childhood disorders, such as mental retardation, infantile autism, physical and sensory handicaps, specific learning difficulties, and hyperactivity. Methods of assessment to be studied include standardized tests of child development, behavioural check lists and interviews, and observation of present behaviour. Behavioural change procedures that may be effective in the treatment and management of the behavioural problems in question.

**12.231G Professional Practice**

Supervised work with clients in the School's clinic, and in approved institutions.

**12.235G Community Psychology**

A range of basic theoretical issues, community problems and intervention strategies using recent concepts in behavioural community psychology as a framework. Development of community psychology and relationships with other areas of psychology and other disciplines, theoretical systems and models, factors related to community problems, values and intervention, intervention strategies at different systems levels, prevention, health promotion, institutional change, service delivery systems, needs assessment, planning and evaluation of programs, and psychologists' current and likely future roles in the community.

**12.237G Biological and Environmental Bases of Behavioural Disturbance**

A series of lectures and seminars on biological aspects of the aetiology and treatment of behavioural disturbance. Includes: behavioural genetics; organic brain syndromes; schizophrenia; depression; psychophysiology of stress; metabolic and endocrinological aspects of behavioural disturbance; nutrition and behavioural disturbance; psychopharmacology and pharmacotherapy; somatic treatments.

**12.239G Research and Evaluation Methods**

Problems of experimental design in the clinical field; measurement and scaling; analysis of change, including sequential analysis, and the application of the experimental methods to the individual cases. Design and evaluation of community programs.

**12.240G Graduate and Clinical Seminars**

A series of seminars on topics of particular relevance to the practice of clinical psychology, eg the organization and regulation of psychology as a profession; ethical standards in relation to clients, members of other professions, and the public; legal aspects of psychological practice. Additional topics dealing with contemporary issues in clinical psychology are chosen in consultation with students undertaking the seminars.

**12.241G Graduate Colloquium**

Participation in the staff-graduate student colloquium.

**12.242G Research Thesis**

A research thesis involving an investigation into some aspect of clinical or community psychology.

**12.243G Experimental Clinical Psychology**

The theoretical basis of clinical practice in individual, group, institutional, and community settings. The application of the principles of experimental psychology to the analysis of both adaptive and maladaptive patterns of behaviour. The study of a wide range of techniques of behavioural intervention.

**12.244G Psychological Assessment 2**

*Prerequisite:* 12.250G.

The application of the principles of experimental psychology to problems of behavioural assessment in a wide variety of situations, eg lifestyle change; the management of behavioural disorders; institutional behavioural programs. Assessment procedures studied include: psychological tests, behavioural analysis and case history taking, psychophysiological and other objective measures.

**12.245G Behavioural Health Management**

Lectures, practical classes and supervised clinical experience concerned with the theoretical and practical issues associated with the design, implementation and evaluation of behavioural programs for the promotion of positive mental and physical health.

**12.249G Child Clinical Psychology**

Description, assessment and treatment of child psychopathol-

ogy. Role of environmental factors in maintenance of maladaptive behaviour, practical implications for assessment and treatment. Theoretical bases of behavioural, cognitive, medical and family treatment approaches.

### 12.250G Psychological Assessment

A theoretical basis, background information and practical skills in methods of assessment typically used in clinical psychology. Theory and research on interviewing, introduction to DSM III, clinical assessment interviewing, assessment of intellectual functioning (including in children), test access and use and computerised testing, neuropsychological and organicity assessment, personality assessment and its clinical use, assessment and goal attainment scaling, and ethical, legal and professional issues.

### 12.251G Human Neuropsychology

Neural bases of human behaviour, with particular emphasis on clinical applications. Issues in assessment and rehabilitation, functional analysis of each cerebral lobe, and particular disorders such as the dementias and aphasias.

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## Organizational Behaviour

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### 30.960G Technological Change and Organizational Participation S1 and S2 L3

*Prerequisite:* 30.942G or 14.956G.

The complex relationships between technological change and organizational participation in societies using advanced technology, with particular reference to Australia, California, Japan, Germany and the Nordic nations. Key issues include: the relationship between technological change and sociotechnical systems, skill formation, organizational learning, industrial relations, humanization of work, organizational equity, participation, and power.

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## Optometry

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### 31.701G Advanced Clinical Optometry F T4

Clinical work on selected patients, with special emphasis on advanced techniques and new developments. All areas of optometric examination procedures are covered, including: external and internal examination of the eyes; visual functions; tonometry; objective optometry; evaluation of binocular functions; ani-

seikonia; sub-normal vision; geriatric and pediatric optometry; the clinical application of electrophysiological techniques. The assessment of new instruments, methods and treatment.

### 31.702G Advanced Physiological Optics F L2T2

Advanced studies in a number of areas of physiological optics. *Refractive state of the eye:* physiological basis of ocular refraction, advanced study of the schematic eye, modern concepts of ocular image formation, resolution of the ocular image. Scatter, absorption and reflection of light within the eye, illumination of the retina, receptor density and the retina image, image-forming properties of the rods and cones. Ultrasonic, X-ray and optical techniques for defining the parameters of the refractive state. Aetiology of the refractive state. *Perceptual organization of the retinal image:* neural networks in the retina and their mathematical analogs, visual transfer functions. Mach bands, retinal inhibition, spatial and temporal resolution of the retina, static and dynamic visual acuity. Stabilization of the retinal image. Periodic stimulation processes. *Electrophysiology of vision:* electrical fields of the eye, monitoring the ocular potential. Electro-oculography, electro-retinogram, electro-myogram, electro-encephalogram. Electro-pathology of vision. *Autonomic servo-mechanisms of the eyes:* pupillometry. Accommodation. *Colour vision:* basic mechanics of colour vision; visual pigments, fundus reflectometry, Stiles' increment threshold technique. Derivation of fundamental response curves. Differential and incremental colour thresholds. Temporal and spatial effects. Defective colour vision. Parafoveal colorimetry. Colour scales and colour spaces.

### 31.703G Pleorhoptics and Binocular Vision F L2T2

An integrated subject, in which binocular vision and pleorhoptics are studied from theoretical and clinical viewpoints. Clinical experience is provided by selected patients. Includes: The nature and control of eye movements and their role in maintaining the perception of a stable visual world. Binocular and monocular subjective visual directions. The neurophysiological substrate of binocular vision and its phenomena. Stereopsis and its measurement. Accommodation, convergence, and oculo-motor imbalance. Laboratory and clinical methods of measuring eye position and visual directions. The aetiologies, measurement, and treatment of strabismus, anomalous correspondence, eccentric fixation and amblyopia.

### 31.704G Advanced Contact Lens Studies F L1T3

*Contact lens materials:* polymer chemistry, physical and chemical properties of soft and hard lens materials. *Contact lens design:* the relationship of theoretical contact lens design and corneal topography. Clinical evaluation of current and new soft and hard lens designs. *Contact lens care and maintenance:* theory and performance of various soft and hard lens care and maintenance systems. Soft and hard lens parametric variations. *Contact lens patient:* systems and techniques for evaluating contact lens patients; new techniques for patient instruction and management. Evaluation of patient responses to lenses.

### 31.705G Advanced Contact Lens Practice F L1T3

The examination, evaluation and aftercare of contact lens patients.

### 31.706G Occupational Optometry

F L2T2

Visual job analysis, human aspects of people-machine systems. Information theory, channel capacity. Visual aspects of people-machine relationships. Visual presentation of information, visual detection, identification and estimations, visual coding. Layout of workplaces, illumination, effects of environment on human performance. Relevant aspects of anthropometry. Visual screening techniques. Industrial eye protection and elements of Safety Engineering. Research techniques in Human Engineering. Visual factors in driving and road safety. Visual factors in aviation.

### 31.707G Clinical Photography

F L2T2

Introduction to clinical photography, cameras and lens systems, colour films, black-and-white films and filters, apparatus and accessories. Patient preparation and positioning, backgrounds and foregrounds, lighting, the 'safe-set' method. Copying, slide making, macrophotography, microphotography. 'Invisible light' photography (ultra-violet and infra-red), photofluorography, speedlight techniques, fundus photography. Dark-room techniques, portable dark-rooms. Quantitative photographic data analysis.

### 31.799G Project

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## Biotechnology

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### 42.104G Graduate Seminars

### 42.111G Reading List in Biotechnology (Microbiology)

### 42.112G Reading List in Biotechnology (Biochemistry)

### 42.211G Principles of Biology

SS L3

A study of the characteristics of living systems, including a functional treatment of cytology, metabolism, bioenergetics; structure, function and characteristics of single and multicellular systems; growth; cell division; reproduction; heredity and evolution.

### 42.212G Principles of Biochemistry

SS L3

A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaplerotic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose. O-oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation; metabolic regulation and integration.

### 42.213G Biochemical Methods

SS T3

A laboratory program in practical biochemistry. The basic instrumentation and methodology of the biochemist will be introduced by practical exercises and demonstrations. A comprehensive treatment of the relevance and applicability of biochemical techniques is covered in tutorials.

### 42.214G Biotechnology

SS L2T1

The selection, maintenance and genetics of industrial organisms; metabolic control of microbial synthesis; fermentation kinetics and models of growth; batch and continuous culture; problems of scale-up and fermenter design; control of the microbial environment; computer/fermentor interactions. Industrial examples will be selected from: antibiotic and enzyme production, alcoholic beverages, single cell protein (SCP), microbial waste disposal and bacterial leaching. *Tutorial/practical sessions* include: problem solving, instrumentation, continuous culture techniques, and mathematical modelling and simulation of industrial processes.

### 42.215G Practical Biotechnology

F T7

Illustration, demonstration and operation of laboratory-scale and pilot-scale equipment. Visits to appropriate industries. Experimental project or critical review.

### 42.301G Micro-organism Productivity

SS L2T3

Mechanisms of metabolic control: induction, repression and forms of activation and inhibition; microbial genetics; mutation, selection, genetic transfer and manipulation; environmental parameters; oxygen tension, pH, temperature, energy source etc. as are relevant to productivity in industrially important microorganisms.

Detailed studies: choice of substrate, screening and isolation of microorganisms, systematic application of techniques of genetic and physiological manipulation required to optimize product formation (products include amino acids, nucleotides, enzymes and other macromolecules, antibiotics and other physiologically active compounds), potential strain improvement of micro-organisms involved in other industrial processes (for example, mineral leaching, single cell protein production, detoxification and waste disposal).

Laboratory component includes current techniques of micro-organism isolation and maintenance, genetic manipulation and physiological manipulation.

**42.302G Enzyme Technology****SS L2T3**

Enzymes in vivo; properties; roles; sources; optimization of enzyme concentration, for example by nutritional control, environmental control and by genetic manipulation. Isolation of enzymes: methods of extraction and purification; stabilizing safeguards; assay procedures; kinetics of isolated enzymes. Immobilization of enzymes: entrapment in insoluble matrices; adsorption on high molecular weight inert carriers; ionic binding to ion-exchange materials; covalent enzyme-enzyme linkage via a low molecular weight bifunctional reagent; covalent linkage to a high molecular weight support; changes in kinetic parameters and stability after immobilization; advantages and disadvantages of immobilization. Enzyme Reactor Engineering: design of batch and continuous systems, including open and closed plug flow and stirred reactors; comparison of kinetics in various designs; scale-up. Enzyme application: analysis; fabric, food and biochemical industries; medical treatment; medical diagnosis. Occupational hazards: allergic responses to enzymes; infection from pathological samples.

Methods of isolation, immobilization and application of enzymes for analytical, industrial and medical purposes will be illustrated by laboratory exercises and short projects. Practical comparison of various reactor designs will also be made.

**42.303G Biochemical Process Control****SS L2T3**

Biochemical reactors; range of basic designs; range of biocatalysts, from microbial conglomerates to free enzymes; heat and mass transfer; design; scale-up; sterility; kinetics; economic considerations. Techniques for efficient operation and control of batch, single-stage continuous and multi-stage continuous processes.

Use of computers: aids to understanding the effects of operating variables for process optimization and control. Detailed examples: microbial processes such as production of antibiotics, organic acids, amino acids and enzymes; enzymic processes.

Practical illustration of: sample processes such as yeast and antibiotic production; mathematical simulation by analog computation; computer control of biochemical processes.

**42.304G Biodeterioration and Biodegradation****SS L2T3**

Basic mechanisms of biodeterioration and biodegradation; direct and indirect attack mechanisms; co-metabolism and mixed population phenomena; factors controlling rates of degradation and recalcitrance of materials to biological attack; biological accelerators.

Detailed treatment of: biological corrosion of metals and alloys; biodeterioration of fuels, petrochemical products, synthetic materials, timber and cellulosic products, building materials etc.; degradation of rocks and minerals; biological leaching of ores and mineral processing residues.

The laboratory component includes assessment of biodegradability of common industrial materials (detergents, surface coatings, fuels, biocides etc); evaluation of protective methods; determination of biological leachability of minerals and mineral processing residues.

**42.305G Case Studies****SS T2**

Critical evaluation of industrial processes and research and development procedures. Includes: study of isolated and selected areas of biotechnology, detailed study and evaluation of all aspects of an industrial process from the isolation of the appropriate organism or other biological starting material to the production and use of the final products, critical evaluation of techniques arising from current research and development programs.

**42.306G Project****F T7**

An experimental or technical investigation or design project in the general field of biotechnology.

**42.407G Biological Principles****S1 L3**

Characteristics of living systems. Biological molecules: carbohydrates, lipids, proteins and nucleic acids. Cell structure and function: prokaryotic and eukaryotic cells. Basic biochemistry: thermodynamics and catalysis of metabolism; catabolic and anabolic processes; properties of enzymes; DNA replication; protein synthesis. Comparative metabolism of viruses, bacteria, fungi, plants and animals. Metabolic regulation. Modes of nutrition and nutrient cycles. Reproduction and genetics: eukaryotic and prokaryotic systems; sexual and asexual reproduction; bacterial genetics; recombinant DNA technology. Micro-organisms of commercial significance. Biodeterioration and biodegradation. Pathogenic micro-organisms; aetiology and epidemiology of infection; host defence mechanisms; chemotherapy; mechanisms of drug action; drug resistance.

**42.408G Bioengineering Principles****S1 L3**

Steady state and differential balances as a basis for quantification of complex real systems. Concepts in rate processes and kinetic analysis with application to biological systems. Experimental determination of rate data. Correlation of simple lumped rate processes and simultaneous distributed processes and the concepts involved in dimensionless numbers.

Lamina and turbulent flow. The structure of homogeneous and boundary layer turbulence flow in pipes and channels. Mixing theory. Process vessel (reactor) models.

Fluid viscosity, Newtonian and non-Newtonian fluids, convective and molecular transport processes. Heat and mass transport, film coefficients. Film, boundary layer, penetration and surface renewal theories (descriptive only).

Quantification of complex systems. Empirical and mechanistic models in biological systems.

**42.999G Alternative Higher Degree Qualifying Program**

Training similar in content and standard to 42.103 Biotechnology (Honours), but designed specifically for students who cannot regularly attend the University.

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## Microbiology

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### 44.999G Alternative Higher Degree Qualifying Program

Similar in standard to 44.103 Microbiology Honours, but designed for students who cannot regularly attend the University.

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## Zoology

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### 45.900G Ecological Studies in Arid Lands Management

**S2 L2T4**

*Prerequisite: Degree with background in bioscience or equivalent.*

Techniques in ecological studies of animal communities. Adaptations to an arid environment — environmental and social determinants. Behaviour, diet and condition of native and feral animals. Competition between native and introduced herbivores. Strategies in the management of arid zone wildlife. Concurrent studies in relevant units in the School of Botany are prescribed to cover aspects of vegetation description and plant/environment interactions.

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## Economics

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### 15.114G Economics A

**S1 L2T1**

*Prerequisite: Nil.*

Microeconomic theory and applications including consumer behaviour and the theory of demand; costs, production and the theory of the firm price determination under competition, monopolistic and oligopolistic markets; investment and technology; wages, and the distribution of income; welfare, economic efficiency and public policy.

### 15.125G Economics B

**S2 L2T1**

*Prerequisite: 15.114G.*

Overview of the macroeconomy; determination of aggregate income, interest rate and employment in closed and open economies; theories of inflation; inflation and unemployment policy; monetarist and Keynesian controversies.

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## Organizational Behaviour

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### 30.960G Technological Change and Organizational Participation

**S1 L3**

*Prerequisite: 30.942G or 14.956G.*

The complex relationships between technological transfers change and organizational participation in societies using advanced technology, with particular reference to Australia, California, Japan, Germany and the Nordic nations. Key issues include: the relationship between technological change and sociotechnical systems, skill formation, organizational learning, industrial relations, humanization of work, organizational equity, participation, and power.

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## Chemical Engineering and Industrial Chemistry

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### 48.283G

### 48.284G

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## Sociology

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### 53.309G Social and Technological Forecasting

**F L2**

**Sol Encl**

The interaction between science, technology and society, and the role of science and technology in social change and their potential contribution to the future shape of social existence; the potential contribution of science and technology to the solution of social problems and the relationship of forecasting to fundamental views about history and society; the nature of various contemporary approaches to social and technological forecasting; and the uses to which forecasting has been put by industry and government.

### 53.571G Technology and Working Life

Technology as a social and political phenomenon. Responses to technology both in the present (eg the microprocessor, nuclear

energy debates) and in the past (eg Luddism). The way particular schools of social theory have conceived of technology: Marx, Weber, Frankfurt school and other relevant theoretical perspectives. Other topics include: micro-electronic technology and the labour process; nuclear energy; technology and sexism; weapon technology; and alternative technology.

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## Science and Technology Studies

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### 62.709G The Scientific Community

A sociological analysis of the pure science community, which establishes the characteristics of this subgroup of society by examining its internal and external social relations. The internal relations refer to cognitive and behavioural factors within the community itself that promote (or retard) the advancement of science. The external relations refer to the political, ideological, economic and bureaucratic forces in society that shape and control the scientific community and the knowledge it produces.

### 62.710G Science, Philosophy and Social Values

Exposition and appraisal of some of the classical ethical theories. Examination of the claims of science to be able to provide a basis for moral judgements. Attempted establishment of an ethical framework which may serve as a basis for decision-making when problems of an ethical nature arise in science. Selected case studies, in which decisions as to the most appropriate form of action are evaluated in the light of the ethical framework previously established. The social responsibility in science movement and its problems.

### 62.713G

### 62.714G Knowledge, Power and Public-Policy

An introduction to the relationship between science and politics in the 20th century; the nature and consequences of government support for research and development; the freedom vs planning debate in science policy, decision-making frameworks and the attempts to establish criteria of choice in a no-growth situation; science and technology policy — international perspectives.

### 62.716G

### 62.718G Science in National Cultures: Comparative Historical Perspectives

Historical and contemporary aspects of the comparative development of scientific institutions and research styles in different national contexts. Other themes: the modes of interaction and mutual perceptions of scientific communities in Western industrializing nations from the 19th century, the question of convergence in systems of scientific organization in East and West.

### 62.719G Science Policy: The International Dimension

A detailed consideration of the justification for, and the arguments against government intervention in systems of research and development. Theoretical discussions of this problem are given concrete focus by appraisals of the policy machinery evolved in various developed countries, including the United States, Great Britain, Australia, Canada, France, West Germany, Holland and Israel.

### 62.720G Philosophy of Science and the Sociology of Knowledge

Recent philosophical and sociological theories concerning the nature of scientific knowledge and the role which social conditions play in its production and acceptance. Topics include: post-Kuhnian philosophies of science; neo-Marxist theories of science and ideology; the 'strong program' for the sociology of knowledge; 'field' theories and the analysis of power relations in science; and epistemological problems raised by commercial and governmental direction of scientific research.

Graduate Study

# Conditions for the Award of Higher Degrees

## First Degrees

Rules regulations and conditions for the award of first degrees are set out in the appropriate **Faculty Handbooks**.

For the list of undergraduate courses and degrees offered see **Disciplines of the University: Faculty (Undergraduate Study)** in the Calendar.

## Higher Degrees

The following is the list of higher degrees and graduate diplomas of the University, together with the publication in which the conditions for the award appear.

For the list of graduate degrees by research and course work, arranged in faculty order, see **Disciplines of the University: Table of Courses (by faculty): Graduate Study** in the Calendar.

For the statements **Preparation and Submission of Project Reports and Theses for Higher Degrees** and **Policy with respect to the Use of Higher Degree Theses** see the Calendar.

## Higher Degrees

Title	Abbreviation	Calendar/Handbook
Doctor of Science	DSc	Calendar
Doctor of Letters	DLitt	Calendar
Doctor of Laws	LLD	Calendar
Doctor of Medicine	MD	Calendar Medicine
Doctor of Philosophy	PhD	Calendar and all handbooks
Master of Applied Science	MAppSc	Applied Science
Master of Architectural Design	MArchDes	Architecture
Master of Architecture	MArch	Architecture
Master of Archives Administration	MArchAdmin	Professional Studies



Title	Abbreviation	Calendar/Handbook
Master of Arts	MA	Arts University College
Master of Biomedical Engineering	MBiomedE	Engineering
Master of Building	MBuild	Architecture
Master of of Building Management	MBM	Architecture
Master of the Built Environment	MBEnv	Architecture
Master of the Built Environment (Building Conservation)		
Master of Business Administration	MBA	AGSM
<b>Master of Chemistry</b>	<b>MChem</b>	<b>Sciences*</b>
Master of Cognitive Science	MCogSc	Arts
Master of Commerce (Honours)	MCom(Hons)	Commerce
Master of Commerce	MCom	Commerce
Master of Community Health	MCH	Medicine
Master of Education	MEd	Professional Studies
Master of Educational Administration	MEdAdmin	Professional Studies
<b>Master of Engineering</b>	<b>ME</b>	<b>Applied Science</b>
<b>Master of Engineering without supervision</b>		Engineering University College
Master of Engineering Science	MEngSc	Engineering University College
<b>Master of Environmental Studies</b>	<b>MEnvStudies</b>	<b>Applied Science</b>
Master of General Studies	MGenStud	General Studies
Master of Health Administration	MHA	Professional Studies
Master of Health Personnel Education	MHPed	Medicine
Master of Health Planning	MHP	Professional Studies
Master of Industrial Design	MD	Architecture
Master of Landscape Architecture	MLArch	Architecture
Master of Laws	LLM	Law
Master of Librarianship	MLib	Professional Studies
<b>Master of Mathematics</b>	<b>MMath</b>	<b>Sciences*</b>
Master of Music	MMus	Arts
Master of Nursing Administration	MNA	Professional Studies
<b>Master of Optometry</b>	<b>MOptom</b>	<b>Sciences*</b>
Master of Paediatrics	MPaed	Medicine
<b>Master of Physics</b>	<b>MPhysics</b>	<b>Sciences*</b>
<b>Master of Psychology</b>	<b>MPsychol</b>	<b>Sciences§</b>
Master of Safety Science	MSafetySc	Engineering
<b>Master of Science</b>	<b>MSc</b>	<b>Applied Science</b>
<b>Master of Science without supervision</b>		Architecture Engineering Medicine Military Studies Sciences*§
Master of Science (Acoustics)	MSc(Acoustics)	Architecture

**Higher Degrees  
(continued)**

**Higher Degrees  
(continued)**

Title	Abbreviation	Calendar/Handbook
<b>Master of Science and Society</b>	<b>MScSoc</b>	<b>Sciences*</b>
Master of Science (Biotechnology)	MSc(Biotech)	Sciences§
Master of Science (Building)	MSc(Building)	Architecture
Master of Science (Industrial Design)	MS(IndDes)	Architecture
Master of Science (Psychology)	MSc(Psychol)	Sciences§
Master of Science and Society	MScSoc	Sciences*
Master of Social Work	MSW	Professional Studies
Master of Statistics	MStats	Sciences*
Master of Surgery	MS	Medicine
Master of Surveying	MSurv	Engineering
Master of Surveying <i>without supervision</i>		
Master of Surveying Science	MSurvSc	Engineering
Master of Town Planning	MTP	Architecture
Master of Welfare Policy	MWP	Professional Studies

**Graduate Diplomas**

Graduate Diploma	GradDip	<b>Applied Science</b> Architecture Engineering Sciences*§
	DipPaed	Medicine
	DipEd	Professional Studies
	DiplM-ArchivAdmin	
	DiplM-Lib	
	DipFDA	<b>Sciences*</b>

\*Faculty of Science

\*Faculty of Biological Sciences

**Higher Degrees**

**Doctor of Philosophy  
(PhD)**

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty or board (hereinafter referred to as the Committee) to a candidate who has made an original and significant contribution to knowledge.

**Qualification**

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment as a candidate for the degree.

**Enrolment and  
Progression**

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Register at least one calendar month before the commencement of the session in which enrolment is to begin.

- (2) In every case, before permitting a candidate to enrol, the head of the school\* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.
- (3) An approved candidate shall be enrolled in one of the following categories:
  - (a) full-time attendance at the University;
  - (b) part-time attendance at the University.
- (4) A full-time candidate shall be fully engaged in advanced study and research except that the candidate may undertake not more than five hours per week or a total of 240 hours per year on work which is not related to the advanced study and research.
- (5) Before permitting a part-time candidate to enrol, the Committee shall be satisfied that the candidate can devote at least 20 hours each week to advanced study and research for the degree which (subject to (8)) shall include regular attendance at the school\* on an average of at least one day per week for 48 weeks each year.
- (6) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such assessment and perform such other work as may be prescribed by the Committee.
- (7) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.
- (8) The work, other than field work, shall be carried out in a school\* of the University except that the Committee:
  - (a) may permit a candidate to spend not more than one calendar year of the program in advanced study and research at another institution provided the work can be supervised in a manner satisfactory to the Committee;
  - (b) may permit a candidate to conduct the work at other places where special facilities not possessed by the University may be available provided the direction of the work remains wholly under the control of the supervisor;
  - (c) may permit a full-time candidate, who has been enrolled as a full-time candidate for at least six academic sessions, who has completed the research work and who is writing the thesis, to transfer to part-time candidature provided the candidate devotes at least 20 hours each week to work for the degree and maintains adequate contact with the supervisor.
- (9) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school\* in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.
- (10) No candidate shall be awarded the degree until the lapse of six academic sessions from the date of enrolment in the case of a full-time candidate or eight academic sessions in the case of a part-time candidate. In the case of a candidate who has had previous research experience the committee may approve remission of up to two sessions for a full-time candidate and four sessions for a part-time candidate.
- (11) A full-time candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. A part-time candidate for the degree shall present for examination not later than twelve academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the investigation.

Thesis

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall comply with the following requirements:

- (a) it must be an original and significant contribution to knowledge of the subject;
- (b) the greater proportion of the work described must have been completed subsequent to enrolment for the degree;
- (c) it must be written in English except that a candidate in the Faculty of Arts may be required by the Committee to write a thesis in an appropriate foreign language;
- (d) it must reach a satisfactory standard of expression and presentation;

\*Or department where a department is not within a school.

(e) it must consist of an account of the candidate's own research but in special cases work done conjointly with other persons may be accepted provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may not submit as the main content of the thesis any work or material which has previously been submitted for a university degree or other similar award but may submit any work previously published whether or not such work is related to the thesis.

(5) Four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.

(6) It shall be understood that the University retains the four copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

## Examination

**5. (1)** There shall be not fewer than three examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least two of whom shall be external to the University.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that:

- (a) the candidate be awarded the degree without further examination; or
- (b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school\*, or
- (c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or
- (d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
- (e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners' reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate be permitted to resubmit the thesis after a further period of study and/or research.

## Fees

**6.** A candidate shall pay such fees as may be determined from time to time by the Council.

## Master of Chemistry (MChem), Master of Mathematics (MMath), Master of Optometry (MOptom) and Master of Physics (MPhysics) Qualifications

**1.** The degree of Master of Chemistry or Master of Mathematics or Master of Optometry or Master of Physics by formal course work may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

**2. (1)** A candidate for the degree shall have been awarded an appropriate four-year degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Science (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may prescribe, before permitting enrolment.

## Enrolment and Progression

**3. (1)** An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which enrolment is to begin.

\*Or department where a department is not within a school.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of a candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these time may be granted by the Committee.

4. A candidate shall pay such fees as may be determined from time to time by the Council.

Fees

1. The degree of Master of Engineering or Master of Science by research may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

**Master of Engineering (ME) and Master of Science (MSc)**

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

Qualifications

(2) An applicant who submits evidence of such other academic or professional attainments as may be approved by the Committee may be permitted to enrol for the degree.

(3) When the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant, before being permitted to enrol, to undergo such examination or carry out such work as the Committee may prescribe.

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

**Enrolment and Progression**

(2) In every case, before permitting a candidate to enrol, the head of the school\* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;

(b) part-time attendance at the University;

(c) external — not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school\* in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who has had previous research experience the Committee may approve remission of up to one session for a full-time candidate and two sessions for a part-time or external candidate.

(8) A full-time candidate for the degree shall present for examination not later than six academic sessions from the date of enrolment. A part-time or external candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

\*Or department where a department is not within a school.

- Thesis**
4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the original investigation.
  - (2) The candidate shall give in writing two months notice of intention to submit the thesis.
  - (3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.
  - (4) The candidate may also submit any work previously published whether or not such work is related to the thesis.
  - (5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.
  - (6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.
- Examination**
5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.
  - (2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the merits of the thesis and shall recommend to the Committee that:
    - (a) the candidate be awarded the degree without further examination; or
    - (b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school\*; or
    - (c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or
    - (d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
    - (e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.
  - (3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.
  - (4) The Committee shall, after consideration of the examiners' reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.
- Fees**
6. A candidate shall pay such fees as may be determined from time to time by the Council.

**Master of Engineering (ME), Master of Science (MSc) and Master of Surveying (MSurv) without supervision**

1. The degree of Master of Engineering or Master of Science or Master of Surveying without supervision may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.
2. A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales with at least three years relevant standing in the case of Honours graduates and four years relevant standing in the case of Pass graduates, and at a level acceptable to the Committee.

\*Or department where a department is not within a school.

3. An application to enrol as a candidate for the degree without supervision shall be made on the prescribed form which shall be lodged with the Registrar not less than six months before the intended date of submission of the thesis. A graduate who intends to apply in this way should, in his or her own interest, seek at an early stage the advice of the appropriate head of school\* with regard to the adequacy of the subject matter and its presentation for the degree. A synopsis of the work should be available.

Enrolment

4. (1) A candidate shall submit a thesis embodying the results of the investigation.

Thesis

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall present an account on the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.

(6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

Examination

(2) Before the thesis is submitted to the examiners the head of the school\* in which the candidate is enrolled shall certify that it is *prima facie* worthy of examination.

(3) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that:

(a) the candidate be awarded the degree without further examination; or

(b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school\*; or

(c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or

(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or

(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(4) If the performance at the further examination recommended under (3)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(5) The Committee shall, after consideration of the examiners' reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

6. A candidate shall pay such fees as may be determined from time to time by the Council.

Fees

See Master of Chemistry above.

**Master of Mathematics  
(MMath)**

\*Or department where a department is not within a school.

**Master of Optometry  
(MOptom)**

See Master of Chemistry above.

**Master of Physics  
(MPhysics)**

See Master of Chemistry above.

**Master of Psychology  
(MPsychol)**

1. The degree of Master of Psychology by formal course work may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study. The degree shall be awarded at the Pass level or with the grade of Honours Class 1 or with the grade of Honours Class 2.

**Qualifications**

2. (1) A candidate for the degree shall have been awarded a degree of Bachelor with Honours in psychology from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution, at a level acceptable to the Higher Degree Committee of the Faculty of Biological Sciences (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

**Enrolment and  
Progression**

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the academic year.

(2) A candidate for the degree shall be required to undertake such formal subjects and, except in exceptional circumstances, pass at the first attempt such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of four academic sessions from the date of enrolment in the case of a full-time candidate or six sessions in the case of a part-time candidate. The maximum period of candidature shall be six academic sessions from the date of enrolment for a full-time candidate and ten sessions for a part-time candidate. In special cases an extensions of these times may be granted by the Committee.

**Fees**

4. A candidate shall pay such fees as may be determined from time to time by the Council.

**Master of Science (MSc)**

See Master of Engineering above.

**Master of Science (MSc)  
without supervision**

See Master of Engineering above.



1. The degree of Master of Science (Biotechnology) by formal course work may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

**Master of Science  
(Biotechnology)  
(MSc(Biotech))**

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution, at a level acceptable to the Higher Degree Committee of the Faculty of Biological Science (hereinafter referred to as the Committee).

**Qualifications**

(2) In exceptional cases an applicant who submits evidence of such other academic and/or professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

**Enrolment and  
Progression**

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extensions of these times may be granted by the Committee.

4. A candidate shall pay such fees as may be determined from time to time by the Council.

**Fees**

1. The degree of Master of Science (Psychology) by formal course work may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

**Master of Science  
(Psychology)  
(MSc(Psychol))**

2. (1) A candidate for the degree shall have been awarded the degree of Doctor of Philosophy from the University of South Wales or a qualification considered equivalent from another university or tertiary institution, in an area of psychology acceptable to the Higher Degree Committee of the Faculty of Biological Sciences (hereinafter referred to as the Committee).

**Qualifications**

(2) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodge with the Registrar at least two calendar months before the commencement of the academic year.

**Enrolment and  
Progression**

(2) A candidate for the degree shall be required to undertake such formal subjects and, except in exceptional circumstances, pass at the first attempt such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of three academic sessions from the date of enrolment in the case of a full-time candidate or six sessions in the case of a part-time candidate. A candidate who has been granted exemptions may have the minimum period reduced by up to one third. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. A candidate shall pay such fees as may be determined from time to time by the Council.

**Fees**

**Master of Science and  
Society (MScSoc) at  
Honours Level**

**Qualifications**

1. The degree of Master of Science and Society at Honours level may be awarded by the Council on the recommendation of the Higher Degree Committee of the Faculty of Science (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submissions of a thesis embodying the results of an original investigation. The degree shall be awarded with the grade of Honours Class 1 or with grade of Honours Class 2.

2. (1) A candidate for the degree shall

(a) have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee, and

(b) have completed the requirements for the award of the degree at Pass level.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

**Enrolment and  
Progression**

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the Head of the School of History and Philosophy of Science (hereinafter referred to as the head of the school) shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;

(b) part-time attendance at the University;

(c) external — not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such assessment and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who has had previous research experience the Committee may approve remission of up to one sessions for a full-time candidate and two sessions for a part-time or external candidate.

(8) A full time candidate for the degree shall present for examination not later than four academic sessions from the date of enrolment. A part-time or external candidate for the degree shall present for examination not later than eight academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

**Thesis**

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the investigation.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.

(6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

**5.** (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that:

(a) the candidate be awarded the degree either with Honours Class 1 or with Honours Class 2 without further examination; or

(b) the candidate be awarded the degree either with Honours Class 1 or with Honours Class 2 without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school; or

(c) the candidate be awarded the degree either with Honour Class 1 or with Honours Class 2 subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or

(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or

(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at a further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners' reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

**6.** A candidate shall pay such fees as may be determined from time to time by the Council.

## Examination

## Fees

**1.** The degree of Master of Science and Society at Pass level may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

## Master of Science and Society (MScSoc) at Pass Level

**2.** (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Science (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

## Qualifications

**3.** (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of four academic sessions from the date of enrolment. The maximum period of candidature shall be eight academic sessions from the date of enrolment. In special cases an extension of time may be granted by the Committee.

## Enrolment and Progression

**4.** A candidate shall pay such fees as may be determined from time to time by the Council.

## Fees

**Master of Statistics  
(MStats)**

**Qualifications**

1. The degree of Master of Statistics by formal course work may be awarded by the Council to a candidate who has satisfactorily completed a program of advance study.

2. (1) A candidate for the degree shall have been awarded a degree of Bachelor with major studies in statistics from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Science (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

**Enrolment and  
Progression**

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of four academic sessions from the date of enrolment in the case of a full-time candidate or eight sessions in the case of a part-time candidate. In the case of a candidate who has been awarded a degree of Bachelor with Honours in statistics the Committee may approve remissions of up to two sessions for a full-time candidate and four sessions for a part-time candidate. The maximum period of candidature shall be six academic sessions from the date of enrolment for a full-time candidate and ten sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

**Fees**

4. A candidate shall pay such fees as may be determined from time to time by the Council.

**Graduate Diploma**

**Graduate Diploma  
(GradDip  
or DipFDA)**

**Qualification**

1. A Graduate Diploma may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

2. (1) A candidate for the diploma shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualifications considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee).

(2) An applicant who submits evidence of such other academic or professional attainments as may be approved by the Committee may be permitted to enrol for the diploma.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

**Enrolment and  
Progression**

3. (1) An application to enrol as a candidate for diploma shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the diploma shall be required to undertake such formal subjects and pass such assessment as prescribed.

(3) The progress of a candidate shall be reviewed at least once annually the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the diploma until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and six sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. A candidate shall pay such fees as may be determined from time to time by the Council.

Fees

## Scholarships and Prizes

The scholarships and prizes listed below are available to students whose courses are listed in this handbook. Each faculty handbook contains in its **Scholarships and Prizes** section the scholarships and prizes available with that faculty. The **General Information** section of the Calendar contains a comprehensive list of scholarships and prizes offered throughout the University.

### Scholarships

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#### Undergraduate Scholarships

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Listed below is an outline only of a number of scholarships available to students. Full information may be obtained from Room G20, located on the Ground Floor of the Chancellery.

Unless otherwise indicated in footnotes, applications for the following scholarships should be made to the Registrar by 14 January each year. Please note that not all of these awards are available every year.

Donor	Value	Year/s of Tenure	Conditions
<b>General</b>			
Bursary Endowment Board*	\$200 pa	Minimum period of approved degree/combined degree course	Merit in HSC and total family income not exceeding \$6000
Sam Cracknell Memorial	Up to \$3000 pa payable in fortnightly instalments	1 year	Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need

\*Apply to The Secretary, Bursary Endowment Board, PO Box 460, North Sydney 2060, immediately after sitting for HSC.

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**Undergraduate Scholarships (continued)**


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Donor	Value	Year/s of Tenure	Conditions
<b>General (continued)</b>			
Girls Realm Guild	Up to \$1500 pa	1 year renewable for the duration of the course subject to satisfactory progress and continued demonstration of need	Available only to female students under 35 years of age who are permanent residents of Australia enrolling in any year of a full-time undergraduate course on the basis of academic merit and financial need.
W.S. and L.B. Robinson**	Up to \$4200 pa	1 year renewable for the duration of the course subject to satisfactory progress	Available only to students who have completed their schooling in Broken Hill or whose parents reside in Broken Hill; for a course related to the mining industry. Includes courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering and science.
Universities Credit Union	\$500 pa	1 year with the possibility of renewal	Prior completion of at least 1 year of any undergraduate degree course. Eligibility limited to members of the Universities Credit Union Ltd of more than one year's standing of members of the family of such members.

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**Science  
Chemistry**

John Ragnar Anderson Memorial Bequest	Up to \$1500 pa	1 year renewable for the duration of the course subject to satisfactory progress	Permanent residence in Australia and eligibility for admission to a full-time degree course in Chemistry
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**Mathematics**

George Szekeres Award	\$200 pa	1 year	Open to students entering the final year of the honours degree course in Pure Mathematics
Olivetti Australia Pty Ltd	Up to \$600 pa	2 years subject to satisfactory progress	Eligibility for admission to the third year of an honours program in the School of Mathematics in Pure/Applied Mathematics, Theoretical Mechanics or Statistics and leading to the award of the degree of Bachelor of Arts, Bachelor of Science, or Bachelor of Science Diploma in Education

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**Optometry**

Gibb and Beeman	Up to \$750 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Available to students under 21 years of age who are permanent residents of Australia enrolling in Year 1 of the full-time degree course in Optometry
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\*\*Applications close 30 September each year.

## Graduate Scholarships

Application forms and further information are available from the Student Enquiry Counter, located on the Ground Floor of the Chancellery unless an alternative contact address is provided. Information is also available on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

The following publications may also be of assistance: 1. *Awards for Postgraduate Study in Australia and Awards for Postgraduate Study Overseas*, published by the Graduate Careers Council of Australia. PO Box 28, Parkville, Victoria 3052;\* 2. *Study Abroad*, published by UNESCO;\* 3. *Scholarships Guide for Commonwealth Postgraduate Students*, published by the Association of Commonwealth Universities.\*

Details of overseas awards and exchanges administered by the Department of Employment Education and Training can be obtained from: Awards and Exchanges Section, Department of Employment Education and Training, PO Box 826, Woden, ACT 2606.

Where possible, the scholarships are listed in order of faculty.

Donor	Value	Year/s of Tenure	Conditions
<b>General</b>			
University of New South Wales Postgraduate Scholarships	Living allowance of \$7000 pa. Other allowances may also be paid.	1-2 years for a Masters and 3-4 years for a PhD degree	Applicants must be honours graduates (or equivalent). Applications to Dean of relevant Faculty.
Commonwealth Postgraduate Research Awards			Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia. Applications to Registrar by 31 October.
Commonwealth Postgraduate Course Awards	Living allowance of \$8882 pa. Other allowances may also be paid.	1-2 years; minimum duration of course	Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Post-graduate Award. Applicants must be domiciled in Australia. Preference is given to applicants with employment experience. Applications to Registrar by 30 September.
Australian American Educational Foundation Travel Grant (Fulbright)*			Applicants must be graduates, senior scholars or post-doctoral Fellows. Applications close 30 September.
Australian Federation of University Women	Amount varies, depending on award	Up to 1 year	Applicants must be female graduates who are members of the Australian Federation of University Women
Commonwealth Scholarship and Fellowship Plan	Varies for each country. Generally covers travel, living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.	Usually 2 years, sometimes 3	Applicants must be graduates who are Australian citizens and who are not older than 35 years of age. Applications close with Registrar in September or October each year.

\*Available for reference in the University Library.

\*Application forms are available from The Secretary, Department of Employment Education and Training, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.



## Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
<b>General (continued)</b>			
The English-Speaking Union (NSW Branch)	\$5000	1 year	Applicants must be residents of NSW or ACT. Awarded to young graduates to further their studies outside Australia. Applications close mid-April.
Frank Knox Memorial Fellowships tenable at Harvard University	Stipend of US\$7000 pa plus tuition fees	1, sometimes 2 years	Applicants must be British subjects and Australian citizens, who are graduates or near graduates of an Australian university. Applications close with the Registrar mid-October.
Robert Gordon Menzies Scholarship* to Harvard	Up to \$US 15,000	1 year	Tenable at Harvard University. Applicants must be Australian citizens and graduates of an Australian tertiary institution. Applications close 31 December.
Gowrie Scholarship Trust Fund	\$4000 pa. Under special circumstances this may be increased.	2 years	Applicants must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War. Applications close with Registrar by 31 October.
Harkness Fellowships of the Commonwealth Fund of New York**	Living and travel allowances, tuition and research expenses, health insurance, book and equipment and other allowances for travel and study in the USA	12 to 21 months	Candidates must be Australian citizens and <b>1.</b> Either members of the Commonwealth or a State Public Service or semi-government Authority. <b>2.</b> Either staff or graduate students at an Australian university. <b>3.</b> Individuals recommended for nomination by the Local Correspondents. The candidate will usually have an honours degree or equivalent, or an outstanding record of achievement, and be not more than 36 years of age. Applications close 29 August.
The Packer, Shell and Barclays Scholarships to Cambridge***	Living and travel allowances, tuition expenses.	1-3 years	Applicants must be Australian citizens who are honours graduates or equivalent, and under 26 years of age. Applications close 15 October.
The Rhodes Scholarship§	Approximately L3600 stg pa	2 years, may be extended for a third year	Unmarried male and female Australian citizens aged between 19 and 25 who have been domiciled in Australia at least 5 years and have completed at least 2 years of an approved university course. Applications close in mid-September each year.
Rothmans Fellowships Award††	\$25000 pa plus up to \$3500 for equipment and fees	1 year, renewable up to 3 years	Tenable at any Australian university. Applicants must have at least 3 years graduate experience in research and be under 28 years of age. Applications close in July.

\* Application forms are available from The Registrar, A.N.U. GPO Box 4 Canberra.

\*\* Application forms must be obtained from the Australian representative of the Fund, Mr J. T. Larkin, Department of Trade, Edmund Barton Building, Kings Avenue, Barton, ACT 2600. These must be submitted to the Registrar by 15 August.

\*\*\* Application forms are available from The Secretary, Cambridge Commonwealth Trust, PO Box 252, Cambridge CB2 1TZ U.K.

§ Applications to The Honorary Secretary of the NSW Committee, University of Sydney, NSW 2006.

†† Applications to the Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.

## Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
<b>Biological Sciences</b>			
John Clark Memorial Award in Psychology	\$1000	1 year	Applicants must be enrolled in a graduate course in psychology undertaking research in an area concerned with the ongoing problems of the community, particularly the behaviour of the 'whole person' in a social milieu
Science Research Scholarship of the Royal Commission of the Exhibition of 1851	See under <b>Science</b>		
National Heart Foundation The National Health and Medical Research Council	See under <b>Medicine</b>		
<b>Science</b>			
Australian Telecommunications and Electronics Research Board	\$11,500 pa if only scholarship held or \$5000 if additional to another scholarship	1 year for a Masters and up to 3 years for a PhD degree	Applicants must be first class honours graduates (or equivalent) or scholars who will graduate with honours in the current academic year, who are Australian citizens or permanent residents and who are aged under 25 years at 1 January. Applications close late September.
Australian Institute of Nuclear Science and Engineering Studentships	See under <b>Engineering.</b>		
Contact Lens Society of Australia	\$2000 pa		To enable a graduate in optometry, medicine, or other appropriate discipline to undertake the degree of Master of Science or PhD in the School of Optometry. Enquiries to Associate Professor B. Holden, School of Optometry.
Gordon Godfrey Scholarship in Theoretical Physics	\$1500 pa	1-3 years	To enable a suitable graduate to undertake a research degree in Theoretical Physics. May be held concurrently with another award.
The Rutherford Scholarship	Travel, fees, etc. A stipend which, if held in the UK, is approx. £4610 stg pa.	3 years	To enable graduates under 26 years of age to undertake experimental research in a branch of natural science. It is tenable at a British Commonwealth University other than the country in which the applicant graduated. Applications close mid-February with the Registrar.
Science Research Scholarship of the Royal Commission for the Exhibition of 1851	£4560 stg pa	Normally tenable 3 years	To enable graduates under 26 years of age to undertake research in some branch of pure or applied science, or engineering, at an overseas university. Applicants must be British Commonwealth citizens or citizens of the Republics of Ireland, Pakistan or South Africa. Applications close mid-February with the Registrar.

\*Tenure may be varied in exceptional circumstances.

## Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
<b>Science (continued)</b>			
**Shell Scholarship in Science or Engineering	Adequate funds for living allowance tuition and travel expenses	2 years, sometimes 3	Applicants must be Australian citizens, under 25 years of age, with at least 5 years' domicile in Australia and who are completing the requirements for an honours degree in Science or Engineering. The successful candidate will attend a British university to pursue a higher degree. Applications close 30 September.

\*\*Applications to the Personnel Manager, Shell Australia, 140 Phillip Street, Sydney 2000.

## Prizes

### Undergraduate University Prizes

The following table summarizes the undergraduate prizes awarded by the University. Prizes which are not specific to any School are listed under General. All other prizes are listed under the Faculty or Schools in which they are awarded.

Information regarding the establishment of new prizes may be obtained from the Examinations Section located on the Ground Floor of the Chancellery.

Donor/Name of Prize	Value\$	Awarded for
<b>General</b>		
Sydney Technical College Union Award	300.00 and medal	Leadership in the development of student affairs, and academic proficiency throughout the course
University of New South Wales Alumni Association	Statuette	Achievement for community benefit — students in their final or graduating year

### Faculties of Applied Science and Engineering

Institution of Engineers, Australia	Medal and 200.00	The most proficient final year (or last 2 years part-time) student in the Bachelor of Engineering (or Bachelor of Science (Engineering)) degree courses offered by the following Schools: Civil Engineering Electrical Engineering and Computer Science Mechanical and Industrial Engineering Chemical Engineering and Industrial Chemistry Mining Engineering Textile Technology (Engineering option only)
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### Board of Studies in Science and Mathematics

Logica Pty Limited	1000.00	Best performance by a graduand in the Computer Science Honours degree course
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## Undergraduate University Prizes (continued)

Donor/Name of Prize	Value \$	Awarded for
<b>School of Biological Technologies</b>		
<b>Department of Biotechnology</b>		
Mauri Foods	175.00	Best result in 42.101 Introduction to Biotechnology
	175.00	Best result in one of the Level 3 Biotechnology subjects
	175.00	Best result in the Biotechnology honours degree program
<b>Department of Food Science and Technology</b>		
Cottees General Foods	120.00	38.141 Food Regulation and Control
Nestle Australia Pty Ltd	200.00	Best performance in 38.140 Food Technology project in the Bachelor of Science degree course in Food Technology
Wilfred B.S. Bishop	75.00	General proficiency throughout Bachelor of Science degree course in Food Technology by a student who has made a significant contribution to staff and student activities
<b>School of Chemical Engineering and Industrial Chemistry</b>		
Abbott Laboratories Pty Ltd	150.00	Bachelor of Engineering degree course in Chemical Engineering — Year 4
Australasian Corrosion Association (NSW Branch)	150.00 and one year's membership of the Association	Best performance in 48.121 Corrosion in the Chemical Industry
AGL Sydney Limited — in Chemical Engineering	200.00	Subject selected by Head of School
Australian Paper Manufacturers Ltd	100.00	48.163 Instrumentation and Process Control in Industrial Chemistry
	100.00	48.163 Instrumentation and Process Control in Chemical Engineering
Chemical Technology Society	25.00	Best graduate in Bachelor of Science degree in Industrial Chemistry
	25.00	Best graduate in Bachelor of Science degree course in Industrial Chemistry, Years 1 and 2 or Stages 1 to 4
CSR Limited	50.00	Subject within the discipline of Industrial Chemistry, selected by Head of School
Esso Australia Ltd	200.00	Best performance in Year 2 Chemical Engineering
Institution of Chemical Engineers	100.00 and medal	Best result for the thesis in the final year, or equivalent part time stage, of the Bachelor of Engineering degree course

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**Undergraduate University Prizes (continued)**


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Donor/Name of Prize	Value \$	Awarded for
<b>School of Chemical Engineering and Industrial Chemistry (continued)</b>		
Shell	100.00	General proficiency in Year 2 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course
	100.00	General proficiency in Year 3 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course
	100.00	General proficiency in Year 4 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course
	100.00	For a student who, in the opinion of the Head of School, has performed some meritorious activity of note either inside or outside the University
Simon-Carves Australia	21.00	48.135 Thermodynamics
Stauffer Australia Limited	100.00	Subject selected by Head of School
Western Mining Corporation Ltd	150.00	48.036 Chemical Engineering Laboratory 1
	150.00	48.044 Chemical Engineering Laboratory 2

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**Department of Fuel Technology**

Australian Institute of Energy	50.00	For a fuel subject or allied subject project
Fuel Technology Staff	200.00	Best performance in Year 3 or 4 Fuel Technology subject in the Bachelor of Engineering degree course in Chemical Engineering
Shell	200.00	Subject selected by Head of School

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**School of Chemistry**

ACI Australia Limited	60.00	Subject selected by Head of School
Inglis Hudson Bequest	15.00	2.002B Organic Chemistry I
Jeffery Bequest	100.00	2.043L Chemistry and Enzymology of Foods
Merck Sharp & Dohme (Aust) Pty Ltd	52.50	Chemistry — Level II subjects in the Science and Mathematics Course
	52.50	Chemistry — Level III subjects in the Science and Mathematics Course
RACI Analytical Chemistry Group	150.00	2.013D Advanced Analytical Chemistry

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**Undergraduate University Prizes (continued)**


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Donor/Name of Prize	Value \$	Awarded for
<b>School of Chemistry (continued)</b>		
UNSW Chemical Society Parke-Pope	100.00	Subject selected by Head of School
UNSW Chemical Society George Wright	100.00	
June Griffith Memorial	60.00	Best performance in 2.121 and 2.131 Year 1 Chemistry

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**School of Electrical Engineering and  
Computer Science**

Austral Crane	37.50	Bachelor of Engineering degree course in Electrical Engineering, Year 3
	37.50	Power or Control elective
Electricity Supply Engineers Association of New South Wales	100.00	Overall performance including proficiency in Electric Power Distribution in Year 3 full-time or equivalent part-time degree course
IBM	150.00	Best performance in 6.611 Computing 1
Institution of Electrical Engineers	100.00	Best performance in Year 3 Electrical Engineering
J. Douglas MacLurcan	60.00 Book order	Outstanding performance in the field of control systems
Lionel Singer Corporation — in Computer Science	1500.00	Best performance in core subjects in Year 3 leading to Honours degree

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**School of Fibre Science and Technology**
**Department of Textile Technology**

J. B. Speakman	50.00	Undergraduate thesis
Textile Institute	Two years' membership of the Institute	Best performance in 13.113 Textile Technology 3 in the Bachelor of Science in Textile Technology degree course
R. J. Webster	250.00	General proficiency throughout the Bachelor of Science degree course in Textile Technology

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**Undergraduate University Prizes (continued)**


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Donor/Name of Prize	Value \$	Awarded for
<b>School of Geography</b>		
Jack Mabbutt Medal	Medal	Best performance in Fourth Year Project in Applied Geography by a student proceeding to Bachelor of Science
Jack Mabbutt Prize	150.00	Best performance by a third year student proceeding to Honours in Geography

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**School of Mathematics**

Amatil Limited	200.00	Best performance in Theory of Statistics 3 or Higher Theory of Statistics 3
Applied Mathematics	50.00	Excellence in Level III Applied Mathematics subjects
C. H. Peck	50.00	Best performance in Year 2 Mathematics proceeding to Year 3 in the School of Mathematics
Head of School's	50.00	Excellence in 4 or more Mathematics units in Year 2
IBM	200.00	Final year of an honours degree course
ICI Theory of Statistics IV	100.00	Best performance in 10.323 Theory of Statistics 4
I. P. Sharp Associates	75.00	Excellence in Higher Theory of Statistics 2
J. R. Holmes	75.00	Excellent performance in at least 4 pass-level (up to 1 pass-level unit may be replaced by a higher-level unit) Pure Mathematics Level III units taken over no more than two consecutive years
Michael Mihailavitch Erihman	750.00	Best performance by a student enrolled in a Mathematics Program, in examinations conducted by the School of Mathematics in any one year
Pure Mathematics	50.00	Best performance in Level III Pure Mathematics subjects
School of Mathematics	50.00	Best performance in 10.011 Higher Mathematics 1
	50.00	Best performance in basic Year 2 Higher Mathematics units
	50.00	Excellence in 4 or more Mathematics units in Year 2
Statistical Society of Australia (New South Wales (Branch)	100.00	General proficiency — Theory of Statistics subjects

## Undergraduate University Prizes (continued)

Donor/Name of Prize	Value \$	Awarded for
<b>School of Optometry</b>		
Australian Optometrical Association	200.00	Best performance in Year 3 of the Optometry degree course
Bausch & Lomb Soflens	Diagnostic set of contact lenses valued at 700.00	31.841 Clinical Optometry
Contavue	Trial fitting set of contact lenses	Best essay or project on contact lenses
G. Nissel & Co Aust Pty Ltd	Trial fitting set of contact lenses	31.871 Optometry B and 31.841 Clinical Optometry — Contact Lenses sections
Hoya Lens Australia Pty Ltd	250.00	Highest academic record in the Optometry degree course
Hydron (Australia) Pty Ltd	100.00	31.871 Optometry B
	100.00	Optometry Year 4
The Keith Woodland Memorial	100.00	Binocular vision component of 31.871 Optometry B and 31.841 Clinical Optometry
Martin Wells Pty Ltd	200.00	31.821 Anatomy and Physiology of the Eye and Visual System
	200.00	31.862 Diagnosis and Management of Ocular Disease
	200.00	Final Year Essay
Optical Products Pty Ltd	100.00	Subject selected by Head of School
Optometric Vision Research Foundation	100.00	Research project in the final year
Optometrists' Association of NSW	50.00	Subject selected by Head of School
Optyl (Australia) Pty Ltd	100.00	31.864 Clinical Methods practical work
Safilo Australia	100.00	Subject selected by Head of School
Theo Kannis	250.00	31.841 Clinical Optometry

## School of Physics

Australian Institute of Physics	100.00 and one years' membership of the Institute	Highest aggregate in any 3 units chosen from 1.0133 Quantum Mechanics, 1.0143 Nuclear Physics, 1.023 Statistical Mechanics and Solid State Physics, 1.0333 Electromagnetism, 1.0343 Advanced Optics, and 1.043 Experimental Physics A in the Bachelor of Science
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**Undergraduate University Prizes (continued)**


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Donor/Name of Prize	Value \$	Awarded for
<b>School of Physics (continued)</b>		
ETP-Oxford	200.00	Most meritorious design study of an optical system in the subject 1.713 Advanced Laser and Optical Applications
Gordon and Mabel Godfrey in Theoretical Physics 3	100.00	Best performance in selection of Year 3 Theoretical Physics subjects chosen from 1.5133, 1.5233, 1.5333, 1.5433 and 1.5533
Gordon and Mabel Godfrey in Theoretical Physics 4	100.00	Excellence in the subject 1.504 Theoretical Physics 4 in the Bachelor of Science degree course with Honours in Physics
Gordon and Mabel Godfrey	300.00	Best performance by a student who has completed third year and is entering the final year of the Honours Degree course in Theoretical Physics
Head of School's in Physics	50.00	Best Year 4 Honours Thesis in Physics in the Bachelor of Science degree course
Laser Electronics	200.00	Excellence in the laboratory work of 1.763 Laser and Optical Technology Laboratory 1
Physics Staff for Physics 1	100.00	Best performance in 1.001 Physics 1
Physics Staff for Physics 2	100.00	Highest aggregate in 1.002 Mechanics, Waves and Optics, 1.012 Electromagnetism and Thermal Physics, 1.022 Physics and 1.032 Modern Laboratory in the Bachelor of Science degree course
Physics Staff for Physics Honours	100.00	Best performance in the Physics Honours Year of the Bachelor of Science degree course
The Bodal	100.00	Best performance in a competition based on the use of microcomputers in 1.061 Computer Applications in Experimental Science 1
The Laser Dynamics	200.00	Excellence in the subject 1.713 Advanced Laser and Optical Applications
The Parameters	200.00	Excellence in 1.133 Electronics, or, if no student of sufficient merit 1.043 Experimental Physics A and 1.763 Laser and Optical Technology Laboratory 1

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**School of Psychology**

Australian Psychological Society	100.00	A Year 4 Psychology subject selected by Head of School
Milon Buneta	50.00	Best Psychology Year 2 performance by a student in the Bachelor of Science degree course in Psychology
Psychology Staff	80.00	Psychology Year 2

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## Graduate University Prizes

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The following table summarizes the graduate prizes awarded by the University.

Donor/Name of Prize	Value \$	Awarded
<b>School of Biological Technologies</b>		
Mauri Foods	175.00	Best overall performance in the Master of Science (Biotechnology) degree course

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## School of Chemistry

Smith Kline and French	175.00	Best performance in the Food and Drug Analysis graduate diploma course
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## School of Mathematics

J. R. Holmes	50.00	Master of Arts pass degree course in Mathematics
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## School of Optometry

Hydron Contact Lens	A trial fitting set of contact lens	31.705G Advanced Contact Lens Theory and Practice
Theo Kannis	250.00	31.701G Advanced Clinical Optometry

# The University of New South Wales Kensington Campus

## Theatres

Biomedical Theatres E27  
 Central Lecture Block E19  
 Classroom Block (Western Grounds) H3  
 Rex Vowels Theatre F17  
 Keith Burrows Theatre J14  
 Main Building Theatre K14  
 Mathews Theatres D23  
 Parade Theatre E3  
 Science Theatre F13  
 Sir John Clancy Auditorium C24

## Buildings

Affiliated Residential Colleges  
*New (Anglican)* L6  
*Shalom (Jewish)* N9  
*Warrane* M7  
 Applied Science F10  
 Architecture H14  
 Arts (Morven Brown) C20  
 Banks F22  
 Barker Street Gatehouse N11  
 Basser College C18  
 Biological Sciences D26  
 Central Store B13  
 Chancellery C22  
 Chemistry  
*Dalton* F12  
*Robert Heffron* E12  
 Civil Engineering H20  
 Commerce (John Goodsell) F20  
 Dalton (Chemistry) F12  
 Electrical Engineering G17  
 Geography and Surveying K17  
 Goldstein College D16  
 Golf House A27  
 Gymnasium B5  
 House at Pooh Corner N8  
 International House C6  
 Io Myers Studio D9  
 John Goodsell (Commerce) F20  
 Kanga's House O14  
 Kensington Colleges C17 (Office)  
*Basser* C18  
*Goldstein* D16  
*Philip Baxter* D14  
 Main Building K15  
 Maintenance Workshop B13  
 Mathews F23

Mechanical and  
 Industrial Engineering J17  
 Medicine (Administration) B27  
 Menzies Library E21  
 Metallurgy E8  
 Morven Brown (Arts) C20  
 New College (Anglican) L6  
 Newton J12  
 NIDA D2  
 Parking Station H25  
 Philip Baxter College D14  
 Robert Heffron (Chemistry) E12  
 Sam Cracknell Pavilion H8  
 Shalom College (Jewish) N9  
 Sir Robert Webster  
 (Textile Technology) G14  
 Squash Courts B7  
 Swimming Pool B4  
 Unisearch House L5  
 University Regiment J2  
 University Union  
 (Roundhouse) – Stage I E6  
 University Union  
 (Blockhouse) – Stage II G6  
 University Union  
 (Squarehouse) – Stage III E4  
 Wallace Wurth School of Medicine C27  
 Warrane College M7  
 Wool Science B8

## General

Academic Staff Office C22  
 Accountancy F20  
 Admissions C22  
 Adviser for Prospective Students F15  
 Graduate and Alumni E4  
 Anatomy C27  
 Applied Geology F10  
 Applied Science (Faculty Office) F10  
 Architecture  
 (including Faculty Office) H14  
 Arts (Faculty Office) C20  
 Audio Visual Unit F20  
 Australian Graduate  
 School of Management G27  
 Biochemistry D26  
 Biological Sciences (Faculty Office) D26  
 Biomedical Library F23  
 Biotechnology D26  
 Bookshop G17

Botany D26  
 Building H14  
 Careers and Employment F15  
 Cashier's Office C22  
 Centre for Biomedical Engineering A28  
 Centre for Medical Education  
 Research and Development C27  
 Centre for Remote Sensing K17  
 Chaplains E15a  
 Chemical Engineering and  
 Industrial Chemistry F10  
 Chemistry E12  
 Child Care Centres N8, O14  
 Civil Engineering H20  
 Commerce (Faculty Office) F20  
 Committee in Postgraduate Medical  
 Education B27  
 Community Medicine D26  
 Computing Services Department F21, D26  
 Continuing Education Support Unit F23  
 Economics F20  
 Education G2  
 Education Testing Centre E15d  
 Electrical Engineering and  
 Computer Science G17  
 Energy Research, Development and  
 Information Centre F10  
 Engineering (Faculty Office) K17  
 English C20  
 Examinations C22  
 Fees Office C22  
 Food Science and Technology F10  
 French C20  
 General Staff Office C22  
 General Studies C20  
 Geography K17  
 German Studies C20  
 Graduate School of the Built  
 Environment H14  
 Health Administration C22  
 History C20  
 History and Philosophy of Science C20  
 Industrial Arts H14  
 Industrial Engineering J17  
 Institute of Rural Technology B8b  
 Japanese Economic Management  
 Studies Centre G14  
 Kanga's House O14  
 Kindergarten (House at Pooh Corner) N8  
 Landscape Architecture K15  
 Law (Faculty Office) F21

Law Library F21  
 Librarianship F23  
 Library E21  
 Lost Property C22  
 Marketing F20  
 Mathematics F23  
 Mechanical Engineering J17  
 Medicine (Faculty Office) B27  
 Metallurgy E8  
 Microbiology D26  
 Mining Engineering K15  
 Music B11b  
 National Institute of Dramatic Art D2  
 Off-campus Housing C22  
 Optometry J12  
 Organizational Behaviour F20  
 Pathology C27  
 Patrol and Cleaning Services C22  
 Petroleum Engineering D11  
 Philosophy C20  
 Physics K15  
 Physiology and Pharmacology C27  
 Political Science C20  
 Printing Unit B22  
 Psychology F23  
 Public Affairs Unit C22  
 Publications Section B22  
 Regional Teacher Training Centre C27  
 Russian C20  
 Science and Mathematics Course  
 Office F23  
 Social Work G2  
 Sociology C20  
 Spanish and Latin American Studies C20  
 Sport and Recreation Centre B6  
 Student Counselling and Research F15  
 Student Health E15b  
 Student Records C22  
 Students' Union E4 and C21  
 Surveying K17  
 Tertiary Education Research Centre E15d  
 Textile Technology G14  
 Theatre Studies B10  
 Town Planning K15  
 Union Shop (Upper Campus) D19  
 University Archives E21  
 University Press A28  
 University Union (Blockhouse) G6  
 Wool Science B8a  
 Zoology D26

