Course
Handbook

Schools of
Agriculture,
Behavioural Sciences,
Biological Sciences,
Physical Sciences

La Trobe University
Calendar 1977
Volume 2

Course Handbook

Schools of
Agriculture
Behavioural Sciences
Biological Sciences
Physical Sciences

La Trobe University
Calendar 1977

There are six volumes of the 1977 Calendar beginning with the Course Handbooks. Each volume is distributed on publication.

La Trobe University Calendar 1977 Volume 1,
Course Handbook, Schools of Behavioural Sciences, Economics, Education, Humanities, Social Sciences.
Publication date — November 1976.

La Trobe University Calendar 1977 Volume 2,
Course Handbook, Schools of Agriculture, Behavioural Sciences, Biological Sciences, Physical Sciences.
Publication date — November 1976.

La Trobe University Calendar 1977 Volume 3,
Information for Students
Publication date — December 1976.

La Trobe University Calendar 1977 Volume 4,
Statutes and Regulations
Publication date — March 1977.

La Trobe University Calendar 1977 Volume 5,
Tenth Annual Report of Council 1976
Publication date — April 1977.

La Trobe University Calendar 1977 Volume 6,
Research Report 1976
Publication date — September 1977.

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Official Details

Enquiries
All enquiries should be directed to
The Registrar
La Trobe University
Bundoora
Victoria 3083
Australia
Telephone enquiries
(03) 478 3122

Term Dates 1977

First term: 14 March to 14 May
Second term: 6 June to 13 August
Third term: 5 September to 22 October

Examinations begin on 7 November
and conclude on 20 November 1977.

The one-year Diploma in Education course
commences on 7 March.

Note

Some departments may require students to take part in excursions or other out-of-term activities as part of courses offered.

Volume 3 of the Calendar, *Information for Students,* contains full details of all important dates, administrative requirements and general information of assistance to students.

Contents

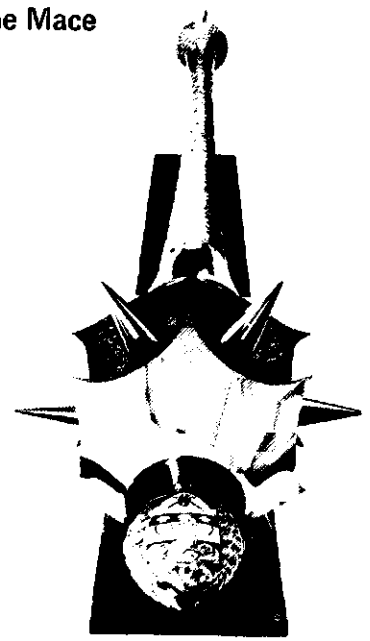
Armorial Bearings

The official description of the University's armorial bearings is 'For the Arms, Argent, a chaplet of common heath proper tied azure and circling in chief a Book expanded also proper leathered Gules, over all on a fesse of the last three Escallops Silver, and for the Crest on a Wreath Argent and Gules a Parchment Scroll perched thereon an Australian Wedgetailed Eagle, wings addorsed and inverted proper, the dexter claw supporting an Escallop of the Arms. The Mantling is Gules doubled Argent and the Motto – 'Qui cherche trouve'.

Australia is represented by the wedge-tailed eagle and Victoria by the sprigs of heath, the State's floral emblem. The open book symbolises learning and the scallop shells, which symbolise pilgrimages, are a reference to the armorial bearings of the La Trobe family.

The French motto 'Qui cherche trouve' (He who seeks will find) is a modern version of the La Trobe family motto.

The Mace



The Mace is a metal club traditionally carried to protect the Chancellor from his adversaries. Through the generosity of the late Lt. Col. A.G. Oldham, CBE, ED, La Trobe University was presented with its mace prior to the first graduation ceremony in December 1969. It was designed and created in London by Australian silversmith Stuart Devlin, designer of Australia's decimal currency.

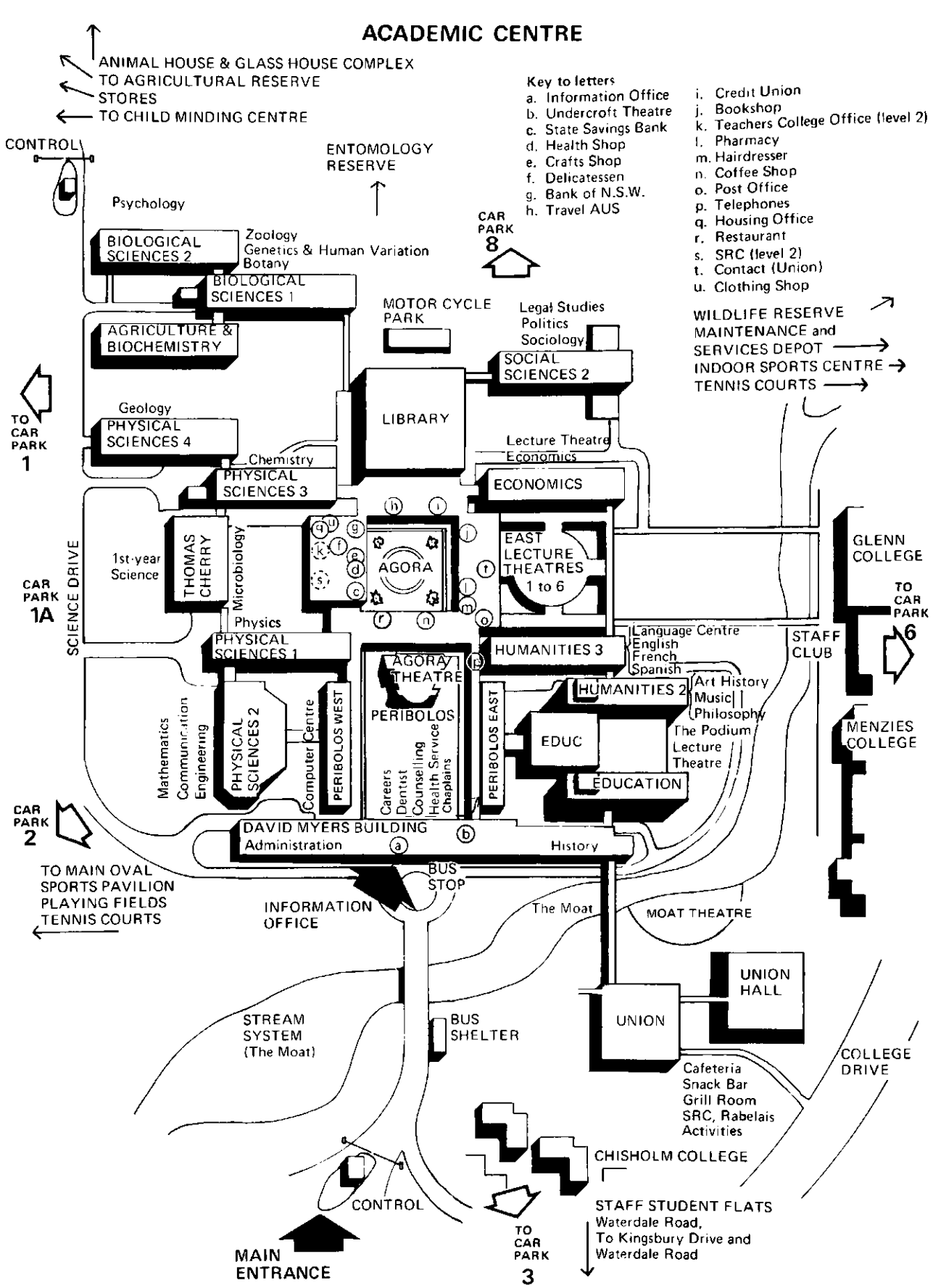
D.M. Myers University Medal

The D.M. Myers University Medal is awarded annually to the outstanding honours graduate in each School, if of sufficient merit.

Cast in bronze from a design by the late Andor Mezaros, the medallion's theme is the origin of communication. A primaeval hero is shown clubbing a lion and in the background there is pictorial representation – the first hieroglyph – suggesting the beginning of writing.

Letters of different alphabets, hieroglyphs, cryptograms and signs form the rest of the background and illustrate the development of written communication. Myths and legends evolve – depicted in the two seated figures recalling the hero's deed.

Andor Mezaros came to Australia from Hungary in 1939. A medallionist and sculptor of international repute, his major works include the King George V Memorial Statue (Sydney, King George V Hospital) in marble, an altar piece in the Canterbury Cathedral, and the 1956 Olympic Medallion.


ACADEMIC CENTRE
ANIMAL HOUSE & GLASS HOUSE COMPLEX
TO AGRICULTURAL RESERVE
STORES
TO CHILD MINDING CENTRE
CONTROL
ENTOMOLOGY RESERVE
Psychology
CAR PARK 8
Key to letters
a. Information Office
b. Undercroft Theatre
c. State Savings Bank
d. Health Shop
e. Crafts Shop
f. Delicatessen
g. Bank of N.S.W.
h. Travel AUS
i. Credit Union
j. Bookshop
k. Teachers College Office (level 2)
l. Pharmacy
m. Hairdresser
n. Coffee Shop
o. Post Office
p. Telephones
q. Housing Office
r. Restaurant
s. SRC (level 2)
t. Contact (Union)
u. Clothing Shop
BIOLOGICAL SCIENCES 2
Zoology
Genetics & Human Variation
Botany
BIOLOGICAL SCIENCES 1
MOTOR CYCLE PARK
Legal Studies
Politics
Sociology
WILDLIFE RESERVE
MAINTENANCE and SERVICES DEPOT
INDOOR SPORTS CENTRE
TENNIS COURTS
AGRICULTURE & BIOCHEMISTRY
SOCIAL SCIENCES 2
TO CAR PARK 1
Geology
PHYSICAL SCIENCES 4
LIBRARY
Lecture Theatre
Economics
Chemistry
PHYSICAL SCIENCES 3
ECONOMICS
SCIENCE DRIVE
1st-year Science
THOMAS CHERRY
Microbiology
AGORA
EAST LECTURE THEATRES 1 to 6
GLENN COLLEGE
TO CAR PARK 6
CAR PARK 1A
Physics
PHYSICAL SCIENCES 1
HUMANITIES 3
Language Centre
English
French
Spanish
STAFF CLUB
AGORA THEATRE
HUMANITIES 2
Art History
Music
Philosophy
PERIBOLOS
The Podium Lecture Theatre
EDUC
MENZIES COLLEGE
Mathematics
Communication
Engineering
PHYSICAL SCIENCES 2
Computer Centre
PERIBOLOS WEST
Careers
Dentist
Counselling
Health Service
Chaplains
PERIBOLOS EAST
EDUCATION
CAR PARK 2
DAVID MYERS BUILDING
Administration
History
TO MAIN OVAL
SPORTS PAVILION
PLAYING FIELDS
TENNIS COURTS
BUS STOP
INFORMATION OFFICE
The Moat
MOAT THEATRE
UNION HALL
UNION
STREAM SYSTEM (The Moat)
BUS SHELTER
COLLEGE DRIVE
Cafeteria
Snack Bar
Grill Room
SRC, Rabelais
Activities
CHISHOLM COLLEGE
CONTROL
STAFF STUDENT FLATS
Waterdale Road,
To Kingsbury Drive and
Waterdale Road
TO CAR PARK 3
MAIN ENTRANCE

La Trobe University 1976, looking north.

Principal Officers of the University 1977

The Visitor, His Excellency, the Hon. Sir Henry Winneke, KCMG, OBE, K St J, QC.
Governor of Victoria.

The Chancellor
The Hon. Mr Justice Smithers

The Deputy Chancellor
Mr A.J. Gorman.

The Vice-Chancellor
Professor J.F. Scott.

The Acting Vice-Chancellor
Professor E.K. Braybrooke (January to July 1977).

The Vice-Chancellor
Professor J.F. Scott (from July 1977).

The Registrar
Mr D.D. Neilson.

The Business Manager
Mr R.C. Chrstie.

Members of Council as at 31 August 1976

	Term Expires
The Hon. Mr Justice Smithers *Chancellor*, elected by members of Council	31 December 1976
Mr A.J. Gorman *Deputy Chancellor*, appointed by the Governor in Council	18 December 1978
Dr D.M. Myers CMG *Vice-Chancellor, ex-officio*	
Mr P.R. Bain *President SRC, ex-officio*	
Mr J.J. Bayly, appointed by the Governor in Council	18 December 1978
Professor E.K. Braybrooke *Deputy Chairman of the Academic Board, ex-officio*	
Dr R.W. Cattrall, elected by the Academic Board	February 1977
Mr T.W. Cherrey, elected by students other than postgraduate students	18 June 1977
Professor B.S. Crittenden, elected by the Academic Board	5 August 1979
Dr J.M. Fitzgerald, elected by members of staff	5 October 1978
The Hon. J.W. Galbally, QC, MP, appointed by the Governor in Council	18 December 1978
Mr J. McK. Hilliard, appointed by the Governor in Council	18 December 1978
Mr G.W. Hutton, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Miss P. Kennedy, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Dr C.A. Lamp, elected by members of staff	5 October 1976
Mrs J.I. Marsh, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Mr D.S. McCloskey, elected by students other than postgraduate students	5 July 1978
Mr J.D. Norgard, appointed by Governor in Council	18 December 1978
Dr G.C. O'Brien, elected by members of staff	5 October 1976
Mr W.G. Philip, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1976
Dr L.W. Shears *Director General of Education, ex-officio*	
Professor G. Singer, elected by the Academic Board	5 August 1978

Mrs C. Storey, appointed by the Governor in Council	18 December 1978
Mr D.J.G. Strang, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Professor J.S. Turner, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Mr R.M. Vale, MP, appointed by the Governor in Council	18 December 1978
Mr J.R. Whitecross, elected by members of staff	5 October 1978
Mr M.S. Whiting, MP, appointed by the Governor in Council	18 December 1978
Mr H.C. Williams, appointed by co-option under para 7(d) of the La Trobe University Act of 1964	18 December 1978
Mr K.G. Wilson, elected by postgraduate students	5 July 1978
Mr M.H. Winneke, appointed by the Governor in Council	18 December 1978

Academic Staff and Schools

as at 31 August 1976

School of Agriculture

Dean	Professor R.F.M. Van Steveninck
Professors	Reid, R.L. B Sc Agr (Syd), Ph D Camb., FRSE Van Steveninck, R.F.M. Candidaats, IR (Wageningen), Ph D (Lond)
Visiting Professor	Leggett, J.E. AB (Glenville State), MS, Ph D (Maryland)
Reader	Connor, D.J. B Agr Sc, Ph D (Melb)
Senior Lecturers	Cranwell, P.D. B Agr Sc (NZ), M Agr Sc (Massey) Foster, W.N.M. MA, D Phil (Oxf), BVM & S (Edin), MRCVS *Lamp, C.A. M Agr Sc (Melb), Ph D (Tas) Leaver, D.D. B V Sc (Syd), M Sc, Ph D (Melb) *Quilkey, J.J. B Ec (Syd), Ph D (NE) Willatt, S.T. B Sc (W Aust), M Sc (NSW)
Lecturers	Boston, R.C. M Sc, Ph D (Melb), MACS, AIEE Dumsday, R.G. B Agr Sc (Melb), Ph D (NE) Luke, R.J.K. B Agr Sc (Melb), Ph D (ANU) Uren, N.C. B Agr Sc, Ph D (Melb), Dip Ed (Monash)
Principal Tutor	Towns, Kristin M. B Agr Sc (Melb), M Agr Sc
Research Assistant	Maughan, Jackie P. B Agr Sc

School of Behavioural Sciences

Dean	Professor G. Singer
Psychology	
Professors	Over, R.F. BA Ph D (Syd), FASSA Singer, G. MA, Ph D (Syd), FAPsS
Visiting Fellow	Gordon, I.E. B Sc, Ph D (Exe)
Senior Lecturers	*Montgomery, R.B. BA (Syd), Ph D (Macq), MAPsS Ng, K.T. BA, Ph D (Syd), *Chairman*

Lecturers	Coleman, G.J. BA, Ph D (Syd) Cumming, G.D. B Sc (Monash), D Phil (Oxf), MAPsS Gibbs, Marie E. B Sc (Melb), Ph D (Monash) McKenzie, Beryl E. BA (Melb), Ph D (Monash) Oei, T.P.S. BA (Qu), M Psychol (NSW), MAPsS Prior, Mrs Margot R. B Mus, BA (Melb), M Sc, Ph D (Monash) Wallace, Meredith BA (Syd), Ph D (Macq)
Research Fellow	Coyle, I.R. BA (Syd), Ph D, MAPsS
Social Work	
Professor	Bisno, H. BA (Wis), MSW (Calif), ACSW, *Chairman*
Visiting Fellows	Plotnick, H.L. BSS (CCNY), MS, DSW (Col) Thompson, Faith BA (W Aust), Ph D (Monash), Dip SS (Melb)
Senior Lecturer	Pilcher, D.M. BS (Kansas State), MSW (Kansas), Ph D (Calif)
Lecturers	Frederico, Margarita M. DipSS BA (Melb), MSW (Smith Coll) Leckie, Lorna M. Dip SS, BA (Melb), Mental Health Cert. (LSE) Pilcher, Ann J. MA (Wis), MSW (Mass)

School of Biological Sciences

Dean	Professor B.A. Stone
Biochemistry	
Professor	Stone, B.A. B Sc (Melb), Ph D (Lond), *Chairman*
Senior Lecturers	Hoogenraad, N.J. B Agr Sc, Ph D (Melb) Polya, G.M. B Sc (Tas), Ph D (Flin) Scopes, R.K. BA, Ph D (Camb)
Lecturers	Fincher, G.B. B Agr Sc, Ph D (Melb) *Phillips, D.R. B Sc, Ph D (Adel), Dip T (ATC) Wettenhall, R.E.H. B Sc (Melb), Ph D (Monash)
Research Fellow	Howlett, G.J. B Sc, Ph D (Melb)
Botany	
Professor	Wardrop, A.B. M Sc (Tas), Ph D (Leeds), D Sc (Melb), FAA, *Chairman*
Senior Lecturers	Anderson, J.W. B Agr Sc, Ph D (Melb) Pallaghy, C.K. B Sc (Melb), Ph D (Tas) Parsons, R.F. B Sc (Adel), Ph D (Melb) Staff, I.A. M Sc, Dip Ed (Syd), Ph D (S Ill)
Lecturers	Keane, P.J. B Agr Sc (Adel), Ph D (PNG) Whiffin, T.P. MA (Camb), Ph D (Texas) Williamson, R.E. MA, Ph D (Camb) Woelkerling, W.J. M Sc (Wis), Ph D (Adel)
Genetics and Human Variation	
Professor	Parsons, P.A. B Agr Sc (Adel), M Sc (Melb), Ph D, Sc D (Camb), *Chairman*
Senior Lecturers	Hynes, M.J. B Agr Sc (Adel), Ph D (Flin) MacPhee, D.G. B Sc, Ph D (Edin) Westerman, M. B Sc, Ph D (Birm)

Lecturers	Bock, I.R. B Sc, Ph D (Qld) Fripp, Yvonne J. B Sc Agr (Syd), Ph D (Birm) Graves, Jennifer M. M Sc (Adel), Ph D (Calif) Hay, D.A. MA (Aberd), Ph D (Birm) McKenzie, J.A. B Sc, Ph D Mitchell, R.J. BA, Dip Anthrop, Ph D (Durh), MI Biol Murray, N.D. B Sc, Ph D (Syd)
Principal Tutor	†Rose, Astrid B Sc, Dip Ed (Melb), M Sc
Senior Demonstrator	McDonald, Janice B Sc (Monash)
Microbiology	
Professor	Waid, J.S. B Sc (Lond), B Sc, D Phil (Oxf), M I Biol, *Chairman*
Senior Lecturer	Roxon, J.J. M Sc, Ph D (Syd)
Lecturers	Macaulay, B.J. M Sc (Melb), Ph D (Syd) May, J.T. B Sc, Ph D (Adel) Stanisich, Vilma A. M Sc (Melb), Ph D (Monash)
Zoology	
Professor	Thornton, I.W.B. B Sc, Ph D (Leeds), *Chairman*
Readers	Marshall, A.T. B Sc (Leeds), Ph D (HK), DIC Wright, A. B Sc, Ph D (Liv)
Senior Lecturers	Danthanarayana, W. B Sc (Ceyl), Ph D (Lond), DIC New, T.R. B Sc, Ph D (Lond), ARCS, DIC Rawlinson, P.A. B Sc (Melb) Woolley, Patricia A. B Sc (W Aust), Ph D (ANU)
Lecturers	Moisescu, D.G. B Sc (Bucharest), Ph D (Brist) Zann, R.A. B Sc, Dip Ed (NE), Ph D (Q'ld)
Research Fellow	Barnett, J.L. B Sc (Sheff), Ph D (Monash)
Senior Demonstrator	Chung, K.B. Ph D (HK)

School of Economics

Dean	Professor F.G. Davidson
Professors	Burley, S.P. B Sc (Adel), MA (Prin), Ph D (Adel & Prin) Davidson, F.G. MA (Camb) Jones, E.L. BA (Nott), MA, D Phil (Oxf) Pattanaik, P.K. BA (Utkal) MA, Ph D (Delhi) Whitehead, D.H. MA (Oxf)
Reader	Csapo, L. MA, Ph D (Bud)
Visiting Fellow	Falkus, M.E. B Sc (Lond)
Senior Lecturers	Anderson, J.L. BA (NE) Burley, H.T. B Ec (Adel), MA, Ph D (Camb) *Hazari, B.R. MA (Delhi), AM, Ph D (Harv) Horrigan, W. MA (Wales) O'Brien, G.C. B Sc (Qld), M Sc (NE), Ph D (ANU) Schneider, M.P. BA (Adel), M Sc (Camb) Scorgie, M.E. B Com (Melb) Stent, W.R. B Agr Sc (Melb), DTA (ICTA), Dip Agric Econ (Oxf.) Thomas, K.D. BA (Adel), M Ec (Calif) Weston, Caryl R. B Com (Melb), B Juris, LLB, Ph D (Monash)

Lecturers	Huynh, F.C.H. B Com (WA), M Ec (Monash), Ph D (Mich State) Kiefer, D.M. BS (Carnegie Tech), MA, Ph D (Mich) Kennedy, J.O.S. B Sc (Brist), Ph D (Lond) Langley, P.C. B Sc (Econ) (Hull), MA (Car) Marriott, J.F. M Ec (Monash) Sgro, P. B Ec Vishwakarma, K.P. B Eng (I I Sc), M Tech (I I T Kanpur), D Econ Sc (N E H Rotterdam)
Principal Tutor	Wiltshire, Mrs Zaiga M Ec (Syd)

School of Education

Dean	Professor B.S. Crittenden
Sub-Dean	Mr S. Oates

Centre for Comparative and International Studies in Education

Professor	Fraser, S.E. B Com, B Ed (Melb), MA (Ed) (Stan), MA (Oxf), Ed D (Colorado), Ph D (Lond)
Reader	Lovegrove, M.N. BA (NZ), MA, Ph D (Auck), Dip T (ATC), ABPsS, MIAAP
Senior Lecturers	Bessant, B. BA, M Ed (Melb), Ph D (Monash) *Price, R.F. B Sc, Ph D (Lond), M I Biol *Chairman* Sheehan, B.A. B Com, B Ed (Melb), MA (Lond)
Lecturers	Burns, Robin J. BA (Syd), M Sc (Monash), Dip Ed Collins, K.A. B Ed (W. Aust.), MA (Alta), Ph D (Mich. State) Kelabora, L. BA, Dip Ed (Adel), M Ed (Monash) Newman, R.S. BA, M Sc, Ph D (Corn) Simkin, K.A. BA, B Ed (Melb), MA (Tor)

Centre for the Study of Educational Commonication and Media

Senior Lecturers	Edgar, Mrs Patricia M. BA, B Ed (Melb), MA (Stan), Ph D Newton, R.A.C. B Com (Melb), MA (Stan)
Lecturers	Bertrand, Mrs Ina W. BA, Dip Ed (Melb), Ph D Drummond, P.A. BA (Monash), ATTI (Dip-Mercer House) Mills, R.I. BA (Syd), MA (Adel), Ph D (Wis), *Chairman* Peck, J.W. BA (Kalamazoo), MA, Ph D (Wis) Routt, W.D. AB, MA (Chic) Stern, Lesley F. BA (Lond) White, P.B. BA (Melb), MS, Ph D (Syr)

Centre for the Study of Innovation in Education

Reader	Turner, M.L. B Sc, B Ed (Melb), MA, Ed D (Calif)
Senior Lecturer	White, D.C. B Sc, M Ed (Melb), TPTC, *Chairman*
Lecturers	††Szorenyi-Reischl, N.A. BA (Adel), MA (Melb) Wesson, Mrs Gwenneth L. BA, B Ed (Melb)

Centre for the Study of Teaching and Human Interaction

Reader	*Lett, W.R. BA, B Ed (Melb), Ph D (Calif), *Chairman*
Senior Lecturers	Duckers, A. B Sc (Lond) Rado, Marta J. Ph D (Bud), Dip Ed (Melb)

††Joint appointment with the department of philosophy.

Lecturers	Brown, A.J. BA, B Ed (Monash), TPTC
	Neville, B.W. MA (Adel), Ph D
	Williams, A.J. BA, B Ed (Melb), M Ed
	Wills, G. MA, Dip Psych (Melb), TSTC

Centre for the Study of Urban Education

Professor	Goldman, R.J. BA (Manc), MA (Chic & Birm), Ph D (Birm), NFF DIP, FBPsS, *Chairman*
Senior Lecturers	Claydon, L.F. Dip Ed (Brist), MA (Brist & Lond)
	Toomey, D.M. BA(Manc), Dip Ed (Leeds), MA (Kent)
Lecturers	Danna, Jo J. BA (Hunter Coll), MA, Ph D (Col)
	Knight, A.T. B Sc, M Sc Ed, MA, Ph D (Oregon)
	Langford, P. B Sc (Lond), Ph D (Liv)
	Lewin-Poole, Mrs Sonia M. B Sc (Manc), M Sc (Lond)
	Moore, Helen M. BA (ANU), Dip Ed (Syd), MA (Lanc)

Centre for the Study of Curriculum and Teacher Education

Professor	Crittenden, B.S. MA (Syd), Ph D (Ill), *Chairman*
Senior Lecturer	Oates, S. BA, B Ed (Melb), TPTC
Lecturers	Currin, C.B. BA (Calif), Ph D (Syr)
	Foster, Lois E. BA, M Ed (Syd), Litt B (NE), Ph D (Alta)
	Hodgson, C.P. B Sc, Dip Ed (Durh), M Sc (E. Anglia)
	Murison, Mrs D. Molly BA (Melb), Dip Ed (Oxf), M Ed (Monash)
	Stockley, D.M. BA, Dip T (Adel), Ph D (NSW)

School

Lecturer	Rowley, G.L. B Sc, B Ed (Melb), MA, Ph D (Tor)
Principal Tutor	Marsh, Barbara B Sc (Melb)

School of Humanities

Dean	Professor R.W. Thompson

Art History

Professor	Tomory, P.A. MA (Edin), FAHA, *Chairman*
Senior Lecturer	Gaston, R.W. MA (Melb), Ph D (Lond)
Lecturers	Ellem, Mrs Lucy M. BA (Melb), MA M Phil (Yale)
	Haese, R.P.P. BA (Adel), Dip Art T (SA School of Art)
	Heckes, F.I. AB (Calif), MA (Indiana), MA (Mich)
	McPhee, I.D. BA (Syd), Ph D (Cinc)

English

Professor	de Chickera, E.B. BA (Lond), B Litt (Oxf), *Chairman*
Readers	Barnes, R.J. MA (Melb), MA (Camb)
	French, A.L. MA, M Litt (Camb)
Senior Lecturers	Burns, G.J. MA (Melb)
	*Frost, Lucile BA (Wilson Coll Penn,) MA, Ph D (Roch)
	Rawlinson, D.H. MA (Camb), AM (Stan)
	Wiltshire, J.A. BA (Camb)

Lecturers	Blake, Mrs Ann MA, B Litt (Oxf) Clancy, L.J. BA (Melb), MA Dove, Mrs Mary MA, Ph D (Camb) Gardiner, N.B. BA (Hamilton Coll), MA (Ariz), Ph D (Lond) Hancock, Mrs Susan M. MA (NZ & Oxf) Henry, G.B.M. BA (Melb), MA (Syd) Johnstone, R.A. BA (N'cle) Jones, D.G.H. MA (Camb) Richards, M.E.A. MA (Auck) Rodriguez, Mrs Judith C. BA (Q'ld, MA (Camb) Stanyon, C. BA (Keele) Topliss, I.E. BA (Monash), BA (Camb) Underhill, H.A. BA (Nott), Ph D (Kent) Watson, C.J. BA (Melb), Ph D (Br Col) Wightman, Mrs Jennifer A. MA (Adel) Williams, B.J. BA (W Aust), MA (Camb)
Principal Tutor	Merli, Mrs Carol A. BA (Melb)
French	
Professor	*Forsyth, E.C. BA, Dip Ed (Adel), DU (Paris), FAHA, Officier des Palmes Academiques, *Chairman*
Senior Lecturer	Paradissis, A.G. BA (Lond), MA, Ph D (Melb), L en D (L'aurore, Shanghai)
Lecturers	Bessiere, L. L es L, DES (Paris) Masterman, Lindis E. BA (Melb), DES (Paris) Pagliaro, A.D. MA (Melb) Schutte, Mrs Marie-France M es L (Paris)
History	
Professors	Gregory, J.S. MA (Melb), Ph D (Lond) Joyce, R.B. BA, LL B (Syd), M Litt (Camb), *Chairman* Salmond, J.A. MA (Otago), Ph D (Duke)
Readers	Mulligan, Lotte MA (Melb), Ph D (Adel) Phillipp, June M. MA, Ph D (Melb) Ward, A.D. MA (NZ), Ph D (ANU)
Senior Lecturers	Ahmad, Z. BA (Calc), BA (Lond), B Litt (Oxf) Barrett, J. BA (Adel), Ph D (ANU) Breen, W.J. BA (Melb), MA, Ph D (Duke) Disney, A.R. MA (Oxf), Dip Ed (Melb), MA, Ph D (Harv) Frost, A.J. MA (Q'ld), Ph D (Roch) Hirst, J.B. BA, Ph D (Adel) Isaac, R.L. BA (Cape T), MA (Oxf) Johanson, D.F.C. BA (Melb), MA (Oxf) Kent, Dale V. BA, Dip Ed (Melb), Ph D (Lond) Oram, N,D. MA (Oxf) Painter, J. L Th (Aust Coll), Dip RE (Melb Coll of Div), BD (Lond), Ph D (Durh) Phillips, W.W. BA (Adel), Ph D (ANU) Schultz, R.J. BA (Iowa), MA (Omaha), Ph D (ANU) Stremski, R. BS (Loyola), MS, Ph D (Wis) Tyrrell, A. MA (Edin & McM)

Lecturers

Barta, A.A. MA (Otago)
Bull, P.J. BA (Adel), Ph D (Camb)
Carr, B. MA, D Phil (Oxf)
Cashmere, J.J. BA (NSW), Dip Ed (Syd), MA (Tas)
Clendinnen, Inga V. MA (Melb)
Cook, P.S. B Ec, BA (Adel), Ph D (ANU)
Douglas, Bronwen P. BA (Adel), Ph D (ANU), Dip T (ATC)
Dunning, T.P. MA, Ph D (Calif)
Ellem, W. BA (NE), MA, M Phil (Yale)
Ferrell, D. BA (Duke), MA (N Carolina), Ph D (ANU)
Graham, J.K. BA, Dip Ed (Monash), MA (Wash)
Hammerton, A.J. BA (Sir G Wms), Ph D (Br Col)
Huish, D.J. BA (Camb), Ph D (ANU)
Martell, W.H.T. MA (Adel), Dip Ed (Melb)
Murray, W.J. BA (Adel), Ph D (ANU), Dip T (ATC)
Niblo, S.R. BA (Colorado), MA, Ph D (N Ill)
Potts, D.J.E. MA (Melb), B Ed, TPTC
Richards, Mrs Judith MA (Auck)
Rule, P.A. BA (Melb), Ph D (ANU)
Siegelbaum, L.H. BA (Col), D Phil (Oxf)
Spear, T.T. BA (Williams, Mass), MA, Ph D (Wis)

Music

Professor

Humble, L.K. Dip Mus (Melb), *Chairman*

Lecturers

Hair, G. M Mus (Melb), Ph D (Sheff)
Pressing, J.L. BS (Cal. Tech), Ph D (Calif)

Principal Tutor

Sosnin, J.V. B App Sc (Electronics) (Melb)

Senior Tutors

Burt, W.A. BA (SUNY, Albany), MA (Calif)
Whiffin, L. Perf Dip (Melb), 5^{me} degre libre Piano (Paris, Ecole de Musique)

Philosophy

Professors

Ellis, B.D. B Sc, BA (Adel), B Phil (Oxf), FAHA
McCloskey, H.J. MA, Ph D (Melb), FAHA

Visiting Professors

Gasking, D.A.T. BA (Liv), MA (Camb. & Melb)
Munro, D.H. MA (NZ)

Senior Lecturers

Hyslop, A. MA (Adel)
Jackson, F.C. B Sc, BA (Melb), Ph D
McCullagh, C.B. BA (Syd), MA, Ph D (Camb)
*Mackie, Alwynne MA, Ph D (Melb), TSTC
*Mitchell, Mrs Dorothy J. MA (Melb), B Phil (Oxf)
Oakley, I.T. BA (Melb), B Phil (Oxf)
Pargetter, R.J. B Sc, MA (Melb), Dip Ed (Monash)
Pinkerton, R.J. BA (Syd), B Phil (Oxf) *Chairman*
Richards, T.J. MA (Well), D Phil (Oxf), FRAS
Singer, P.A.D. MA (Melb), B Phil (Oxf)
Young, R.B. B Ec, BA (Syd), Ph D (Flin)

Lecturers	Brady, R.T. B Sc (Syd), MA (NE), Ph D (St And) Brumerhurst, Mrs Maya MA (Tel Aviv) Cann, M.R. AUA, BA, B Mus (Adel) Farrell, R.J. B Sc (NSW), MA (Harv) Fox, J.F. BA (Melb) Giles-Peters, A.R. BA (Melb), MA Kesarcodi-Watson, I. BA (Melb), MA (McM) Kroy, M. MA (Hebrew), Ph D (Tel Aviv) Murphy, C.P. BA (Syd) Phillips, R.G. BA (Qld) ††Szorenyi-Reischl, N.A. BA (Adel), MA (Melb) Thompson, Janna L. BA (Minn), B Phil (Oxf), Dip Ed (Monash) *Von Thun, M. BA, Ph D (Syd)
Principal Tutor	Fox, R.A. LLB, MA (Melb)
Spanish	
Professor	Thompson, R.W. MA (Dub), *Chairman*
Lecturers	Rodriguez, F. L en L (Caldas), Dip en Lit Hispano-Americano (Caro Y Cuervo) Scarfe, F.H.B. MA (Oxf.), Dip Estud Hisp (Salamanca))
Principal Tutor	Sangiau, J.M. BU (Valladolid)

School of Physical Sciences

Dean	Professor B.A. Mond
Communication Engineering	
Professor	Hooper, D.E. BEE, ME (Melb), *Chairman*
Senior Lecturers	Badcock, J. McR. BE, M Eng Sc (Melb), Ph D, Dip Ed (Monash) Murphy, J.V. BE, BA (Melb)
Inorganic and Analytical Chemistry	
Professor	Magee, R.J. M Sc (Belf), Ph D, D Sc (Edin), C Chem, FICI, FRIC, FRSH, FRACI, *Chairman*
Senior Lecturers	Cardwell, T.J. B Sc, Ph D (Belf), C Chem, ARACI, MRIC Cattrall, R.W. B Sc, Ph D (Adel), FRACI O'Connor, M.J. B Sc (Adel), Ph D (Monash), FRACI
Lecturers	Grant, M.W. MA, Ph D (Camb), ARACI *Hill, J.O. B Sc, Ph D (Lond), C Chem, ARACI, MRIC Wedd, A.G. B Sc, Ph D (Tas), ARACI
Research Fellow	James, B.D. B Sc, Ph D (Sheff), C Chem, MRIC, ARACI
Principal Demonstrator	Tariq, S.A. M Sc (Panjab I), Ph D (S'Ton), ARACI
Organic Chemistry	
Professor	Topsom, R.D. M Sc (NZ), Ph D (Lond), FRIC, FRACI, FNZIC, *Chairman*
Reader	Deady, L.W. M Sc, Ph D (Cant), MNZIC
Senior Lecturers	Davis, M. BA, Ph D (Camb), FRACI Ternai, B. B Sc, DCE (Bud), M Sc (Melb), Ph D (E. Anglia), ARACI
Lecturers	Brownlee, R.T.C. BA (Camb), M Sc, Ph D (E. Anglia), ARACI *Broxton, T.J. B Sc, Ph D (W Aust) Reiss, J.A. B Sc, Ph D (Adel), ARACI

†† Joint appointment with the School of Education.

Senior Demonstrator	Rowe, J.E. B Sc (Adel), Ph D (Alta), ARACI
Senior Research Asst	Pirzada, N.H. M Sc (Punj), Ph D
Physical Chemistry	
Professor	Morrison, J.D. Ph D, D Sc (Glas), FAA, FRACI, *Chairman*
Senior Lecturers	Arthur, N.L. B Sc, Ph D (Adel), ARACI
	Mackay, Maureen F. B Sc (Syd), Ph D (Melb), ARACI
	Peel, J.B. B Sc, B Ed (Melb), Ph D (Monash), ARACI
Senior Research Fellow	Smith, J.F. M Sc, ARMIT
Lecturers	Christie, J.R. B Sc, Ph D (ANU)
	Derrick, P.J. B Sc, Ph D (Lond), C Chem, MRIC, ARACI
	Nyberg, G.L. B Sc (W Aust), Ph D (Camb)
Research Fellow	Traeger, J.C. B Sc (Melb), Ph D
Research Assistant	Stepan, S. B Sc, B Ec
Geology	
Professor	White, A.J.R. B Sc (Adel), Ph D (Lond), *Chairman*
Lecturers	Gray, C.M. B Sc (Adel), Ph D (ANU)
	Kwak, T.A.P. M Sc (Br Col), Ph D (McM)
	Nesbitt, H.W. B Sc (Car), Ph D (Johns H)
Applied Mathematics	
Professor	Eliezer, C.J. MA, Ph D (Camb), M Sc, D Sc (Lond), Bar-at-Law (Middle Temple), FIMA
Senior Lecturers	Andrew, A.L. M Sc (NZ), M Sc (ANU), Ph D
	Cohen, H.A. B Sc (Syd), Ph D (ANU)
	Johnston, R. B Sc (Glas)
	Ross, D.K. MA (Melb), Ph D (Manc), FIMA
	Roy, S.K. M Sc, Ph D (Patna), FIMA, FIP
	††Woodhouse, D. MA, D Phil (Oxf), M Sc (E Af), Dip Ed, MLMS, MACS
Lecturer	Robinson, I.G.A. B Sc, Ph D (Melb)
Mathematical Statistics	
Professor	Brockwell, P.J. BEE, MA (Melb), Ph D (ANU), *Chairman*
Senior Lecturers	Basawa, I.V. MA (Karn), Ph D (Sheff)
	Becker, N.G. M Sc (Melb), Ph D (Sheff)
	Brown, B.M. M Sc (Melb), Ph D (Purdue)
	*Staudte, R.G. BA, B Sc (Brown), M Sc, Ph D (Ill)
Lecturer	Scott, D.J. BA, Ph D (ANU)
Pure Mathematics	
Professor	Mond, B.A. BA (Yeshiva), MA (Bucknell), Ph D (Cinc), *Chairman*
Reader	Morris, S.A. B Sc (Qld), Ph D (Flin)
Senior Lecturers	Elton, G.C. M Sc (Well), Ph D (ANU)
	Jones, A.R. MA, Ph D (Melb)
	Pearson, K.R. BA, Ph D (Melb)
	††Woodhouse, D. MA, D Phil (Oxf), M Sc (E Af), Dip Ed, MLMS, MACS

††Joint appointments with the Departments of Pure Mathematics and Applied Mathematics respectively.

Lecturers Davey, B.A. M Sc (Monash), Ph D (Manit)
Davis, G.E. B Sc, Ph D (Monash)

Lecturers Gray, A.R. BA (Monash), Ph D
Stacey, P.J. MA (Camb), M Sc, D Phil (Oxf)
Strantzen, J.B. B Sc (Melb)

Division of Theoretical and Space Physics

Professor Cole, K.D. Dip Ed, M Sc, D Sc (Qld), FAIP, FIP, *Chairman*

Senior Lecturers Butcher, E.C. B Sc, Ph D (Exe)
Dyson, P.L. B Sc, Ph D (Melb)
Essex, Elizabeth A. B Sc, Ph D (NE), MAIP, MIP
Kalotas, T.M. M Sc (NSW), D Phil (Sus)
McLaughlin, I.L. B Sc, Ph D (Adel), Dip Ed (Monash)

Division of Electron Physics

Professor Davies, D.E. B Sc, Ph D (Wales), FIP, FAIP, *Chairman*

Readers Jenkin, J.G. B Sc (Adel), Ph D (ANU), MAIP
Leckey, R.C.G. B Sc, Ph D (Belf), FIP
Liesegang, J. B Sc (Qld), D Phil (Oxf), FAIP

Senior Lecturers Lee, A.R. B Sc (HK), Ph D (Lond)
Riley, J.D. B Sc, B Eng (Syd), D Phil (Oxf)

Lecturer Miller, R.B. B Sc, Ph D (NE)

School of Social Sciences

Dean Professor E.K. Braybrooke

Legal Studies

Professor Braybrooke, E.K. LLM (NZ & Col), Barrister and Solicitor of the Supreme Courts of NZ and WA.

Senior Lecturers Bayne, P.J. LLB (Melb), JD (Chic), *Chairman*, Barrister and Solicitor of the Supreme Courts of Papua New Guinea and Victoria and of the High Court of Australia.
Bentil, J.K. LLB LLM B Sc Econ, M Phil (Lond), Barrister at Law of the Lincoln's Inn, Advocate and Solicitor of the Supreme Court of Ghana.
††*Fitzgerald, J.M. LLB (Melb), LLM, MA, Ph D (Northwestern)

Lecturers Douglas, R.N. BA, LLB (Melb), M Phil (Yale)
Hart, G.E. BA, LLB (Qld), LLM (Lond), Barrister of the Supreme Court of Queensland
Petersen, Kerry, A. LLB (Melb), Barrister and Solicitor of the Supreme Court of Victoria,
Sallmann, P.A. LLB (Melb), MSAJ (American), Barrister and Solicitor of the Supreme Court of Victoria.
Willis, J.E. BA, LLB, Dip Ed (Melb), Barrister and Solicitor of the Supreme Court of Victoria.

Senior Tutor Hardie, Mrs Sybil B. LLB, Dip Criminol (Melb), Barrister and Solicitor of the Supreme Court of Victoria.

††Joint appointment with the Department of Sociology.

Politics

Professors	Martin, R.M. MA (NZ), Ph D (ANU) Rydon, C. Joan BA, Dip Ed (Syd), Ph D (Melb) Wolfsohn, H.A. BA (Melb)
Senior Lecturers	Glezer, L. BA (Melb) Miller, J. MA (Camb) Plehwe, R. BA, LLB (Tas), MA, Ph D (Duke), *Chairman*
Lecturers	Camilleri, J. BA (Melb), MA (Monash), Ph D (Lond) *Chiddick, J.P. MA, B Phil (Oxf), M Sc (Lond) Jacobs, J.B. AB, MA, Ph D (Col) James, M.H. BA, Ph D (Durh) McIntyre, A.P. BA,(Syd), MA (Yale) Manne, R. BA (Melb), B Phil (Oxf) Polis, T. BA (Melb) Schehtman, J. BA (Jerusalem)

Sociology

Professors	Clark, A.W. MA (Melb), Ph D (NSW), *Chairman* Veliz, C. B Sc (Flor), Ph D (Lond)
Reader	Edgar, D.E. BA, M Ed (Melb), Ph D (Stan)
Senior Lecturers	Arnason, J.P. D Phil (Prague), D Phil (Frankfurt/Main), D Habil (Bielefeld) Balmer, C.J. BA (Tas), Ed D (Flor) Carroll, J.B. BA (Melb), MA, Ph D (Camb) *Cubbon, H.A. MA (Camb), Ph D (Melb) Dempsey, K.C. BA (Syd), Dip Ed, Ph D (NE) ††*Fitzgerald, J.M. LLB (Melb), LLM, MA, Ph D (Northwestern) Hickman, D.C. BA, B Ed (Melb), Ph D (ANU) Ireland, R.H. BA (Melb), PhD (Harv) Mulligan, D.C. MA (NZ), Ph D (Lond) Pelz, W. BA (Lond), Ph D (Brist) Rose, G. MA (Oxf), MA (Camb) Scutte, H. Dip I Handelslehrer (Cologne), Dr Sc Pol (Kiel) Sugimoto, Y. BA (Kyoto), Ph D (Pitt) Trahair, R.C.S. BA, Ph D (Melb)
Lecturers	Bailey, J.P. B Sc (Lond), M Sc (Bath), Ph D (Sur) Donaldson, Beryl A. BA, B Ed (Melb), MA (Tor) Goldlust, J. MA (Melb) Harvey, Mrs Susan D. BA (W Aust), Dip Soc Stud (Syd), MA (ANU) Kitaoji, H. BA (Internat. Christian, Tokyo), MA (Texas), Ph D (ANU) Otto, Mrs Rosemarie BA, Dip SS (Melb) Richards, Mrs Marilyn G. BA (Adel), MA Richmond, Mrs Katy BA (Melb), MA (ANU) *Ternowetsky, G.W. BA (Winn), MA (Calg) Wearing, Rosemary J. BA (Adel), MA, Ph D (Ill) White, Mrs Naomi Rosh BA (Melb), MA, Ph D (Syr)

††Joint appointment with the department of legal studies.

*On leave for part of 1977, please contact the department for details.

Resident Fellow

Professor Trendall, A.D. AC, CMG, MA, Litt D (Camb & NZ), Hon Litt D (Melb & ANU), Hon D Litt (Adel & Syd), FSA, FBA, FAHA

Senior Library Staff

Chief Librarian Borchardt, D.H. MA (NZ), Dip NZ Lib Sch, ALA (UK), FLAA

Readers Services

Associate Librarian McKinlay, J.W. BA (Tas), ALAA

Senior Reference Librarian Choate, C.R. BA (Wyoming), MS (Col), ALAA

Reference Librarian Hyslop, Margot J. BA (Melb), ALAA

Lending Librarian Quinn, E.G. BA, Dip Lib (Belf), ALAA

Reader Education Librarian Dash, Mrs Ursula M. BA (Melb), Dip Lib (NSW), ALAA

Selection

Senior Librarian Horacek, J.I. BA (University Coll, Lond), ALAA

Serials

Librarian-in-charge Longley, Pamela R. BA (Tas), ALAA

Documents Librarian Miller, Ann E. BA (Melb), Dip Lib (NSW)

Systems

Librarian

Technical Services

Associate Librarian Stecher, G. BA (Melb), BLS (McG), ALAA

Senior Librarian

Librarians Hoffmann, Mrs Helen K. BA (Melb), ALAA
Trier, Pamela R. BA (Melb), ALAA

Senior Administrative and College Staff

Vice-Chancellor Myers, D.M. CMG, B Sc, BE, D Sc Eng (Syd), FIEE, FIE (Aust), F Inst P (to 31 December 1976)

Acting Vice-Chancellor Braybrooke, E.K. LLM (NZ & Col), Barrister and Solicitor of the Supreme Courts of NZ and WA. (January to July 1977)

Registrar Neilson, D.D. B Ec (Syd)

Head, Division of Academic Services Griffith, D.A.C. TD, B Sc (Eng) (Lond), AFAIM

Head, Division of Staff and Information Services Tolhurst, N.M. BA

Head, Division of Student Affairs Kellock, M.D. M Surv (Qld)

Business Manager	Christie, R.C. BE (Civil), B Com (Melb)
Deputy Business Manager	Smith, J.M. B Com (Melb), AASA, ACIS
Deputy Business Manager (Physical Planning)	Russell, T.C.C. ARIBA, FRAIA
Chisholm College	
Head	Morrison, Professor J.D. Ph D, D Sc (Glas), FRACI, FAA
Bursar	McVeity, M.C. AMIREE, AFAIM
Glenn College	
President	Oates, S. BA, B Ed (Melb), TPTC
Secretary	Bodey, N.H.
Menzies College	
Chairman	Collins, K.G. B Ed (W Aust), MA (Alta), Ph D (Mich State)
Manager	Gibbs, C.M.
Computer Centre	
Director	Edwards, J.A. BA (Keele)
Language Centre	
Director	Hooke, R.L.G. BA (Melb), MA (Essex)

University Advisory Services

Health Service	
Physician-in-charge	Semmens, K. MB, BS (Melb), DTM & H (Lond)
Couselling Service	
Director	Bailey, C.F. B Ec (Syd), Dip Psych (Melb)
Careers Advisory Service	
Advisor	Waterhouse, J.L. B Com (Melb)

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Part II School of Agriculture

Details of Courses

The course in agricultural science is designed to encourage in the student a basic understanding of the relations between the soil, the plant, the animal and the environment. It should be emphasized that the degree is in agricultural science, not in agriculture. Agriculture is not only an important component of our environment, it reacts with and affects the non-agricultural components. The emphasis in the course is therefore on the sciences relevant to an understanding of the rural environment. Substantial emphasis is also given to the study of economic and social aspects of agriculture and farm management.

The biology part of the course concentrates on the sciences which are concerned with soil productivity and plant and animal production. They include soil chemistry and physics, plant and animal nutrition, physiology and biochemistry, and plant and animal health. For these, the basic science courses (first and part of second year) are chemistry, mathematics, physics and biology. Production economics, farm-management economics, rural sociology and agricultural extension constitute one third (or more, depending on the student's interest) of the third and fourth years of the course following an introduction to the subject in the second year.

The course leads to a B Agr Sc (pass or honours degree) at the end of four years. Graduates may then do postgraduate course work or research in a specific area of agricultural biology or in agricultural economics, leading to a M Agr Sc or Ph D degree. A one-year program of postgraduate study for the Graduate Diploma in Agriculture is also available.

Some six hectares of the University campus are presently used by the School of Agriculture for field work involving crops, pastures and livestock. This gives students day-to-day contact with agricultural experimentation as well as with the more applied aspects of crop and animal husbandry.

Agricultural science graduates find employment in a wide variety of positions in State and Commonwealth government departments, as research workers or extension officers, in advisory and teaching services or in special areas such as conservation, agricultural economics and trade. Many have joined private firms which service the agricultural industries or process agricultural products, for example, chemical and food processing companies and agricultural consultant and management groups.

It can be expected that, as the Australian economy develops and agriculture adapts to the rapid changes now occurring, the opportunities open to graduates may also change. For example, there will be increasing emphasis on environment protection, conservation and land use in the coming years and agricultural scientists are well suited to undertake many tasks in these areas. Indeed many agricultural scientists have been engaged in this kind of activity for a long time. Also private organizations such as large-scale primary producers, commodity boards and other marketing groups and farmer organizations may become larger employers of agricultural science graduates; there are already at least 130 non-government employers of such graduates in Australia.

Prerequisite for Admission

Students seeking admission should hold a Higher School Certificate including passes in chemistry and in either physics or a branch of mathematics. This is the minimum requirement; most students are expected to have done physics and at least one branch of mathematics. However, prerequisites have been waived in the past for particular students with an appropriate background and interest in the subject. Prospective students who might fall into this category should not hesitate to contact the Dean of the School of Agriculture in the first instance. It is usually a simple matter to arrange an interview, either by letter or by telephone, particularly if this is done before mid-December. Diplomas from approved agricultural colleges are accepted as satisfying the prerequisites, providing a pass in higher school certificate English has been obtained, but possession of a Diploma does not give automatic entry to the School.

Quota and Selection

Unless the number of students seeking entry into the School of Agriculture is far greater in 1977 than it was in 1976 no quota will be imposed in 1977. However, should this number be greater than expected, selection will, in the first instance, be on academic merit judged by reference to examination results. Prospective students, other than those seeking entry direct from higher school certificate examination, may be required to attend for interview by the selection committee between 24 January and 18 February. Interviews outside this period can, however, be arranged by writing direct to the School of Agriculture, preferably as early as possible.

Academic Progress

Passes in each subject will normally be graded in four categories: A, B, C and D. A: 80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.

The academic progress committee of the School maintains a continuing review of students' academic progress and students may at any time of the year be asked to meet this committee to discuss their performance. A student whose progress has been considered unsatisfactory may be informed that, should he again seek enrolment, he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from the course. In any event a student will not be allowed to retain his place in the School if his progress continues to be unsatisfactory, and enrolment may be terminated at any time.

A student will normally be required to pass all subjects of one year before proceeding to the next year or to achieve such a standard as to be awarded a pass in the year as a whole, under conditions laid down from time to time by the board of studies.

First Year Courses

Agriculture I

Dr C.A. Lamp, Dr W.N.M. Foster, Professor R.L. Reid

Description of Course

Agricultural botany; the classification and identification of plants (weeds, grasses and legumes) important to agriculture. Introductory animal science, with particular reference to animal diversity, the microstructure (histology) of animal tissues and the anatomical systems of the domestic animals. Principles of climatology, with particular reference to physical aspects; climate and vegetation, climate and pasture; chemical composition of pastures and seasonal changes; introductory animal nutrition.

Class Requirement

70 lectures and 20 practical classes throughout the year.

Assessment

Written and practical tests during and at the completion of the course.

Prescribed Reading

†*Hubbard, C.E. *Grasses,* Penguin 1954.
†Lamp, C.A. and Collet, F. *A Field Guide to Weeds in Australia,* Inkata 1976.

Recommended Reading

*Black, J.M. *Flora of South Australia,* Parts I, II, III and IV, Government Printer South Australia 1948, 1948, 1964, 1965.
*Hanson, E.D. *Animal Diversity,* Foundation of Modern Biology Series, Prentice-Hall 1961.
Ham, A.W. *Histology,* J.P. Lippincott Co. 1965.

Biology IA

See entry under Biology, in Part VI Disciplines.

Chemistry I

See entry under Chemistry, in Part VI Disciplines.

Physical Sciences IT

See entry under Physical Sciences, in Part VI Disciplines.

Second Year Courses

The second year includes Agriculture IIA (animal physiology), Agriculture IIB (soil science), Biology II (plant anatomy and physiology, agricultural genetics), Chemistry IIB and Agriculture IIC (economics). These subjects do not carry equal weightings. Their respective weights are 0.2, 0.2, 0.2, 0.3 and 0.1.

Agriculture IIA

Dr D.D. Leaver, Mr P.D. Cranwell, Mrs K.M. Towns

Description of Course
This course provides an understanding of the principles of animal physiology. Basic cell functions are dealt with initially and the course then progresses to analyse the concept of the body's internal environment, the nature of biological control systems and the properties of the major specialised cell types – nerve, muscle and gland. Finally, coordination of body functions such as circulation, respiration, reproduction, regulation of water and electrolyte balance and digestion and absorption of food, is discussed in terms of the principles outlined in the first two sections.

Class Requirements
50 lectures and 20 3-hour practical classes.

Assessment
Examination at the end of the course and performance in practical work.

Prescribed Reading
†Vander, A.J., Sherman, J.H. and Luciano, Dorothy S. *Human Physiology: The Mechanisms of Body Function,* 2nd edn, McGraw-Hill 1975.

Agriculture IIB

Dr N.C. Uren

Description of Course
The course deals with the soil as *an environment* from which plants derive nutrients. It includes a description of the solid phases of soils and their formation; soil erosion; soil microbiology; and the chemistry of essential plant nutrients in relation to their availability to plants.

Class Requirements
50 lectures and fifteen 3-hour practical classes, including field excursions.

Assessment
Class tests, assignment and an end-of-year examination.

Prescribed Reading
†Leeper, G.W. *An Introduction to Soil Science,* 4th edn, Melbourne University Press 1964.

Preliminary Reading
Leeper, G.W. *Storehouse for Plants: The Chemistry of the Soil,* Nelson 1972.

Recommended Reading
Cooke, G.W. *Control of Soil Fertility,* Crosby Lockwood 1970.
Leeper, G.W. *Six Trace Elements in Soils,* Melbourne University Press 1970.
Russell, E.W. *Soil Conditions and Plant Growth,* 10th edn, Longman 1973.

Agriculture IIC
Dr R.G. Dumsday

Description of Course
The course introduces the basic concepts and principles of economics and the relevance of these principles to decision-making in agriculture for the individual farm, for particular agricultural industries, and at the national and international levels.

Class Requirements
20 lectures and up to 10 tutorials.

Assessment
End-of-year examination.

Prescribed Reading
Hardaker, J.B., Lewis, J.N. and McFarlane, G.C. *Farm Management and Agricultural Economics,* Angus and Robertson 1970.

Preliminary Reading
Williams, B.D. (ed) *Agriculture in the Australian Economy,* Sydney University Press 1970.

Recommended Reading
Boulding, K. *Economic Analysis* vol. I, *Microeconomics,* Harper and Row, New York 1966.
Boulding, K. *Economic Analysis* vol. II, *Microeconomics,* Harper and Row, New York 1966.

Biology II
See entry under Biology, in Part VI Disciplines.

Chemistry IIB
See entry under Chemistry, in Part VI Disciplines.

Third-Year Courses
Agriculture IIIA (animal sciences),
Agriculture IIIB (plant-soil sciences) and
Agriculture IIIC (economics, agricultural economics, computing and statistical methods) each account for one-third of the third year of the course.

Agriculture IIIA
Dr R.K.J. Luke, Mr P.D. Cranwell, and Professor R.L. Reid.

Description of Course
This subject includes nutritional biochemistry and physiology, and agricultural microbiology, together with some applied aspects of nutrition. Topics covered include chemistry of foodstuffs; food intake; physiological, microbiological and biochemical aspects of digestion, absorption and metabolism in ruminants and non-ruminants, metabolism of carbohydrates, fats and proteins and its control; special

aspects of metabolism and requirements for energy and protein associated with growth, fattening, pregnancy and lactation; metabolic changes during undernourishment; minerals and vitamins in metabolism and nutrition.

Assessment
(a) Performance in practical work, tests and assignments throughout the year.
(b) Written examinations.

Class Requirements
Four lectures and 3-6 hours practical work per week throughout the year.

Prescribed Reading
†Lehninger, A.L. *Biochemistry,* 2nd edn, Worth 1975.
†*Stanier, R.Y., Dondoroff, M. and Adelberg, E.A. *The Microbial World,* Prentice-Hall 1970; also known as *General Microbiology,* Macmillan 1971.

Preliminary Reading
*Postgate, J. *Microbes and Man,* Pelican 1975.
*Rose, S. *The Chemistry of Life,* Pelican 1970.

Recommended Reading
Bartley, W., Birt, L.M. and Banks, P. *The Biochemistry of Tissues,* Wiley 1968.
Church, D.C. *Digestive Physiology and Nutrition of Ruminants, Vols I and II,* D.C. Church 1969, 1971.
Davis, B.D., Culbeco, R., Eisen, H.N., Ginsberg, H.S. and Wood, W.B. *Microbiology,* Harper International 1967.
McDonald, P., Edwards, R.A. and Greenhalgh, J.F.D. *Animal Nutrition,* Oliver and Boyd 1973.
McGilvery, R.W. *Biochemistry – A Functional Approach,* Saunders 1970.
Underwood, E.J. *The Mineral Nutrition of Livestock,* Commonwealth Agricultural Bureau 1966.

Agriculture IIIB

Mr S.T. Willatt, Dr D.J. Connor, Dr C.A. Lamp, Professor R.F.M. van Steveninck

Description of Course
This course deals with plants and their chemical, nutritional and physical environments. It is currently presented in three segments.
Soil physics:
Physical methods and techniques for the description and measurement of the soil physical environment; the relation between the physical environment and plant growth.
Plant and crop physiology:
Photosynthesis and transpiration of leaves, plants and crops as related to environmental factors; physiological basis of yield; optimum productivity; growth analysis; competition; structure, light relationships and photosynthesis of plant canopies.
Plant nutrition:
Crop germination and establishment; root development; structural, physical and metabolic aspects of mineral nutrient uptake; pathways and regulation of nutrient transport; nutrient functions, deficiencies and toxicities; fertilizer use in relation to plant growth, animal health and pollution.

Class Requirements
Four lectures and one three-hour practical class weekly throughout the year.

Assessment
Tests, essays and by examination at the end of each section.

Prescribed Reading
†*Milthorpe, F.L. and Moorby, J. *An Introduction to Crop Physiology,* Cambridge University Press 1974.
†Clarkson, D.T. *Ion Transport and Cell Structure in Plants,* McGraw-Hill 1974.

Preliminary Reading
*Sutcliffe, J.F. and Baker, D.A. *Plants and Mineral Salts,* Edward Arnold 1974.

Recommended Reading
Kohnke, H. *Soil Physics,* McGraw-Hill 1968.
Kramer, P. *Plant and Soil Water Relationships,* McGraw-Hill 1969.
Hillel, D. *Soil and Water,* Academic Press 1971.
Taylor, S.A. and Ashcroft, G.L. *Physical Edaphology,* Freeman & Co. 1972.
Marshall, T.J. *Relations Between Water and Soil,* C.A.B. Technical Communication No. 5, Commonwealth Bureau of Soils.
Eastin, J.D. *et al. Physiological Aspects of Crop Yield,* Am. Soc. Agron. 1969.
Zelitch, A. *Photosynthesis, Photorespiration and Plant Productivity,* Academic Press 1971.
Gauch, H.G. *Inorganic Plant Nutrition,* Dowden, Hutchinson and Ross 1972.
Peel, A.J. *Transport of Nutrients in Plants,* Butterworth 1974.
Russell, E.W. *Soil Conditions and Plant Growth,* 10th edn, Longman 1973.
Black, C.A. *Soil-Plant Relationships,* 2nd edn, Wiley 1968.
Fried, M. and Broechart, H. *The Soil-Plant System in Relation to Inorganic Nutrition,* Academic Press 1967.

Agriculture IIIC

Dr J.J. Quilkey, Mr I. Tuck, Dr R.C. Boston

Description of Course
Microeconomics:
Topics include the price mechanism; opportunity cost, demand and supply; the concept of elasticity; profit maximization and marginal concepts; pure competition; imperfect competition, monopoly and oligopoly; countervailing power; pricing behaviour; microeconomic policy.
Production economics:
Planning under perfect knowledge; concept of production functions; law of diminishing returns; marginality, marginal, average and total product, elasticity of production; factor-product relationships; factor-factor relationships; resource substitution; price ratios; resource combination; cost minimization; iso-cost curves; iso-product curves; resource allocation; joint products; by-products; competitive products. Planning under imperfect knowledge; concept of risk and uncertainty; basic probability theory; discounting; time and risk; planning under risk situations; planning under uncertain situations; minimizing income variations; resource allocation at the national policy level.

Computer Programming:
An introduction to computing; the basis of FORTRAN programming; the notion of algorithms and iterative programming; input and output procedures; advanced debugging techniques.
Statistics:
The application of statistics to agricultural problems. The work includes an introduction to data summarising; elementary probability theory; discrete probability distributions; continuous probability distributions; hypothesis testing; sampling distributions; experimental design, and applied regression analysis.

Class Requirements
Microeconomics:
30 lectures and 10 tutorials
Production economics:
30 lectures and 10 tutorials
Computer Programming:
10 lectures and 8 tutorials
Statistics:
20 lectures and 40 tutorials

Assessment
Tests, assignments and examination.

Prescribed Reading
†Heady, E.O. *Economics of Agricultural Production and Resource Use,* Prentice-Hall 1952.
†Mansfield, E. *Micro-economics, Theory and Applications,* Norton 1970.

Recommended Reading
Lipsey, R.G. *An Introduction to Positive Economics,* Weidenfeld and Nicolson 1966.
Stilwell, J.A. and Lipsey, R.G. *Workbook to Accompany an Introduction to Positive Economics,* Weidenfeld and Nicolson 1967.
Bishop, C.E. and Toussaint, W.D. *Agricultural Economic Analysis,* Wiley 1958.
Chisholm, A.H. and Dillon, J.L. *Discounting and Other Interest Rate Procedures in Farm Management,* University of New England Professional Farm Management Guidebook No. 2, 1966.
Hardaker, J.B., Lewis, J.N. and MacFarlane, G.C. *Farm Management and Agricultural Economics, An Introduction,* Angus and Robertson 1970.
*Moroney, M.J. *Facts from Figures,* Pelican 1973.
Cochran, W.G. and Cox, G.M. *Experimental Designs,* Wiley 1957.
*Galbraith, J.K. *American Capitalism,* Penguin 1963.

Fourth Year Courses

As in third year, there are three subjects: Agriculture IVA (animal sciences), Agriculture IVB (plant-soil sciences) and Agriculture IVC (agricultural economics, farm management, rural sociology and agricultural extension). All academic staff and most visiting lecturers are involved in fourth-year teaching.

Formal contact hours — lectures or practical classes — are kept to the minimum necessary to complete the basic requirements of the course and comprise only

about 30 per cent of the work load. Students must satisfy the requirements of the basic minimum courses but, by the choice of a number of advanced topics and written assignments and a 12-week research project to be carried out and written up in thesis form in third term, they are able to develop their own particular interests to a considerable extent.

Special courses in radio-active isotope usage, basic electronics in plant and animal environment measurement, computer simulation of physical and biological processes, applied marketing in agriculture, and agricultural extension have been offered as options. Applications to take units of subjects offered in other Schools will also be considered. Students in fourth year are also required to participate in a comprehensive seminar program arranged by the School by giving at least one seminar themselves and attending others given by postgraduate students, by members of staff or by distinguished visiting lecturers.

The basic courses are as follows:

Agriculture IVA

Description of Course
Parasitology — life histories of parasitic anthropods and helminths; epidemiology and current methods of parasitic disease control; *infectious diseases* — the nature of and the factors which determine the onset of infectious disease; mode of transmission with examples of endemic and exotic diseases; quarantine; *immunology* — natural resistance and acquired immunity; antigenic determinants and antibodies, vaccination and hyper-sensitivity, serology. The rest of the course consists of lectures and selected topics of special importance in animal production, given partly by the staff of the School and partly by visiting lecturers who are recognized authorities in their fields. Such special courses have covered human and animal nutrition, animal reproduction, growth and development, animal breeding, antibiotics, plants poisonous to animals etc.

Class Requirements
Three lectures and one 3-hour practical class per week over the first and second terms.

Assessment
Examination at end of course.

Recommended Reading
Gray, D.F. *Immunology,* Cheshire 1970.
Seddon, H.E. *Diseases of Domestic Animals in Australia,* No. 5-10, Canberra Department of Health Service Publications 1966.
Blood, D.C. and Henderson, J.A. *Veterinary Parasitology,* Oliver and Boyd 1968.
Soulsby, E. *Helminths, Arthropods and Protozoa of Domesticated Animals,* Bailliere, Tindall and Cassell 1968.

Agriculture IVB

Description of Course
Entomology — a brief synopsis of insect classification; feeding habits and types of damage; insect and mite pests of agricultural importance with special reference to Australia; chemical, biological, cultural and other control methods; integrated

control and pest management; *plant pathology* – an introductory course in applied mycology, virology and nematology. The rest of the course consists of lectures on selected topics of special importance in the plant-soil sciences, given partly by the staff of the School and partly by visiting lecturers who are recognized authorities in their fields. Such special courses have covered soil pollution, fertilizer use, drainage and salinity, soil conservation and land use, stress physiology, crop physiology, pastures etc.

Class Requirements
Three lectures and one 3-hour practical class per week over first and second terms.

Assessment
Examination at end of course.

Recommended Reading
Moore, R.M. (ed) *Australian Grasslands,* ANU Press 1970.
Barnard, C.E. (ed) *Grasses and Grassland,* Macmillan 1964.
James, B.J.F. (ed) *Intensive Utilization of Pastures,* Angus and Robertson 1969.
Commonwealth Agricultural Bureau *Research Techniques in Use at the Grassland Research Institute, Hurley,* Bulletin No. 45, 1961.
Lazenby, A. and Swain, F.G. (ed) *Intensive Pasture Production,* Angus and Robertson 1972.
Levitt, J. *Responses of Plants to Environmental Stresses,* Academic Press 1972.
Evans, L.T. (ed) *Crop Physiology,* Cambridge University Press 1975.
Kozlowski, T.T. *Water Deficits and Plant Growth* Vol. III, Academic Press 1972.

Agriculture IVC

Description of Course
The course has two components. *Sociology and extension:* Communication, perception, empathy, meaning; organizations; filtration and overload; spreading new ideas in rural areas; the importance of opinion leaders; motivation; getting ideas into practice; a theory of social action. *Agricultural economics and business management:* The estimation of response surfaces; functional forms for production functions; the role and functions of management; farm business analysis; budgets, gross margins and programming methods for farm planning; farm planning under risk; long-run farm planning; systems analysis in agriculture; government intervention and agricultural policy; farm finance; evaluation of public investment in agriculture; technical change; marketing of agricultural products.

Class Requirements
Sociology and Extension:
12 lectures
Agricultural economics and business management:
Three lectures per week in first and second terms.

Assessment
Assignments and examination.

Prescribed Reading
†*The Principles of Rural Policy in Australia (Report to the Prime Minister by a Working Group),* Australian Government Publishing Service 1974.
†*Campbell, K.O. *Agricultural Marketing and Prices,* Cheshire 1973.

†Dillon, J.L. *The Analysis of Response in Crop and Livestock Production,* Pergamon Press 1968.
†Tisdell, C.A. *Economics of Markets; An Introduction to Economic Analysis,* Wiley 1974.

Preliminary Reading

Hardaker, J.B., Lewis, J.N. and McFarlane, G.C. *Farm Management and Agricultural Economics, An Introduction,* Angus and Robertson 1970.
Kohls, R.L. *Marketing of Agricultural Products,* Macmillan 1961.
Shepherd, G.S. *Agricultural Price Analysis,* Iowa State University Press 1963.
Williams, D.B. (ed) *Agriculture in the Australian Economy,* Sydney University Press 1967.

Recommended Reading

Dent, J.B. and Anderson, J.R. *Systems Analysis in Agricultural Management,* Wiley and Son 1971.
Heady, E.O. *Economics of Agricultural Production and Resource Use,* Prentice-Hall 1952.
*Throsby, C.D. (ed) *Agricultural Policy,* Penguin 1972.
**Farm Management Report Series and Professional Farm Management Guidebook Series,* Faculty of Economic Studies, University of New England, Armidale.
Heady, E.O. and Dillon, J.L. *Agricultural Production Functions,* Iowa State University Press 1961.
Heady, E.O. *Agricultural Problems and Policies of Developed Countries,* Johansen and Neilsen 1966.
*James, P.G. *Agricultural Policy in Wealthy Countries,* Angus and Robertson 1970.

Other Requirements of the Undergraduate Course

Plant Collection

Students are required to make a plant collection as part of the plant science area of study and progress is assessed each year. The first section of the collection, consisting of 50 species, must be handed in at the the beginning of the second year. The final assessment will be made on a collection of at least 150 correctly identified specimens which must be submitted by the end of the first week of first term in the fourth year of the course.

Farm Practical Work Requirements

All students are required to obtain at least 12 weeks' practical farm experience. Usually a maximum of four weeks' credit is given for a work period on a single farm. Credit up to four weeks may also be given for practical work in other approved (off-farm) agricultural activities, for example government departments, secondary industry associated with agriculture etc.
Students with a farming background and those with a diploma from a recognized agricultural college may be granted exemption from part or all of this requirement.

A written report of acceptable standard must be submitted within the academic term following each vacation exercise. Late reports may result in credit not being granted for the work involved; poor reports may be rejected and returned for re-writing.

Students seeking exemption are also expected to submit a report of acceptable standard stating their reasons and describing their background and the experience already gained.

Students are responsible for arranging their own vacation work but overseas students may be given some assistance.

Excursions

Some excursions are an essential part of certain subjects, and are therefore compulsory; others are optional. Transport costs of compulsory excursions are normally paid by the School; the costs of optional excursions must be met by the student.

A major excursion of five days' duration is held after the end of second term in fourth year.

Postgraduate Studies

The School of Agriculture offers programs leading to a Graduate Diploma in Agriculture (Grad Dip Agr) and to the higher degrees, Master of Agricultural Science (M Agr Sc) and Doctor of Philosophy (Ph D). The Graduate Diploma is a one-year program of mostly formal courses selected to meet the students' interest. The Masters degree program has a minimum duration of two years and may involve both coursework and research. The Ph D is a research degree awarded by examination of a thesis reporting original research work carried out under supervision over a minimum candidacy of three years. The Ph D committee may approve that specified coursework be undertaken during candidature where it aids the candidate's research progress.

University regulations require an appropriate degree for admission to the Graduate Diploma or Masters program and at least a 2A honours degree or a Masters degree for admission to Ph D candidature.

Postgraduate Courses

A flexible structure of postgraduate courses has been designed to meet a variety of interests and to allow for continued development. Individual subjects, of which some 40 are offered, comprise about 10 lectures plus associated activities and are grouped into the following four broad subject areas:

(1) numerical studies (core area);
(2) plant-soil sciences (theme: crop and pasture development);
(3) animal sciences (theme: intensive animal production);
(4) agricultural economics.

In any year individual courses will be offered when warranted by enrolment.

Graduate Diploma

A candidate for the Graduate Diploma is required to complete at least 12 units. Of these three to six units must be selected from numerical studies (core area) with the remainder selected from the elective areas. In addition candidates will work individually for about one term (one third of the year) on a short project or case study. This work will be assessed by written thesis.

Further details on postgraduate studies are available from the office of the Dean, School of Agriculture.

Part III School of Behavioural Sciences

The School of Behavioural Sciences was founded in 1973 and consists of the departments of genetics, psychology, sociology and zoology. In addition the School includes the department of social work which accepts graduates for training for the degree of Bachelor of Social Work. Plans are under consideration for the establishment of further departments at the senior undergraduate and postgraduate level.

A clinic has been established in the psychology department to provide teaching and research facilities in clinical psychology; these are normally available for honours and graduate students in the School of Behavioural Sciences. A course in clinical psychology is available to graduates of this and other universities to enable them to obtain registration as professional psychologists.

Degree Structures Including Psychology

Students enrolled in the School of Behavioural Sciences
The School of Behavioural Sciences offers a course leading to a Bachelor of Behavioural Science (B B Sc) with a major in psychology. There are no prerequisites for entry to the School, but students intending to enrol in subjects provided by the Schools of Biological Sciences and Physical Sciences are required to meet the prerequisites for these subjects as laid down by those Schools.

The pass course requires three years of full-time study. An extra year of study is required for the honours degree, and may lead to registration as a professional psychologist after further postgraduate training or supervised experience.

The pass degree comprises nine units and is subject to the following requirements:

(1) students must take a sequence of three psychology units, at least one biology unit and at least one unit of sociology or an approved alternative;

(2) not more than four units may be taken at first year level and at least two units are required at third year level;

(3) a student is not normally allowed to take more than three units outside the disciplines of genetics, psychology, sociology and zoology, but other units may be permitted in special cases with the approval of the Board of Studies. In 1977, approved alternatives to Sociology I will be politics and legal studies.

Second year level students may enrol in the unit of Physiology and Nutrition II which provides a general introduction to the principles of mammalian physiology and nutrition. The course includes consideration of biological control systems, co-ordinated body functions and important aspects of human nutrition.

Students wishing to continue their studies at later year levels in aspects of Biology relevant to the study of behaviour may enrol in the half-unit of Sociobiology II/III or the full unit of Man and Environment II.

The following subjects are available within the School of Behavioural Sciences:

First year:
Psychology I, Man and Environment I, Biology IB, Sociology I (or approved alternatives).
Second year:
Psychology II, Genetics II, Man and Environment II, Physiology and Nutrition II, Sociology II, Sociobiology II, Sociology II/III, Zoology II
Third year:
Psychology III, Genetics III, Sociology III, Sociobiology II/III, Zoology III

Students enrolled in other Schools
Students enrolled in Schools other than Behavioural Sciences should comply with the degree structure of their respective Schools. Such students should, however, note the next paragraph.

Concurrent Study of Biology
We feel that the fullest understanding of behaviour and of psychology requires some background in biology; therefore students enrolled for the B B Sc degree are required to pass in a biology unit. However, students enrolled in other Schools and who are taking Psychology I are strongly advised to include a biology unit in their first-year studies also. Those students who wish to go on to higher-year studies in biology (and who have the necessary prerequisites) should take Biology IB, but those students who are seeking a grounding in biology as background to studies in psychology should take Man and Environment I, which is a first year course especially designed to give the appropriate background for students in behavioural sciences. Some B B Sc students may choose to do both courses.

Neither biology unit is a prerequisite for entry to Psychology II, and students in Schools other than Behavioural Sciences may go on to higher studies in psychology without them; however it is our advice that an introduction to modern biology will complement and assist study in psychology. Further it will be assumed that students who elect to take Psychology II have completed a biology unit. Thus, taking this biology subject as part of the first-year course complements the studies in psychology.

Pattern of courses possible with B B Sc

Year	Major Subject	Minor Subject	Third Subject
1	Psychology I	Sociology I	Man and Environment I
2	Psychology II	Sociology II	Man and Environment II
3	Psychology III	Sociology III (1½ units)	Sociobiology III (½ unit)

Year	Major Subject	Minor Subject	Third Subject	Fourth Subject
1	Psychology I	Biology IB	Sociology I	Maths I
2	Psychology II	Zoology II	Physiology and Nutrition II	–
3	Psychology III	Zoology III	–	–

While both a 3-3-3 and a 4-3-2 pattern are acceptable, students enrolled for a B B Sc degree are strongly advised to take a 4-3-2 pattern for the best distribution of workload.

Bachelor of Social Work (BSW)

The department of social work offers a professional course of study in social work leading to the degree of Bachelor of Social Work. The course will prepare students to practise in a wide range of social work roles including direct service, administration and social policy and planning. Study areas will include the social welfare institution, social-personal systems, the development of the profession, social policies and programs, social work practice methodologies, research-statistics, laboratory work and field instruction. At present it is necessary for entrants to possess a degree requiring at least three years of full time study at a university, or other tertiary qualifications deemed to be the equivalent, and which desirably contains, as a minimum, four units of Psychology and Sociology; at least two of which should be in Psychology. It is important that the study in Psychology should include segments in developmental, abnormal, social psychology and research methodology. Studies in economics, legal studies or politics are also very useful and will be recognised as an alternative to a second unit of sociology. Applicants will also be interviewed.

In view of the possibility of the introduction of certain changes in the social work program, consideration may be given to admitting applicants whose qualifications do not meet these prerequisites. Enquiries relating to special admission should be referred to the chairman of the department of social work.

B B Sc (Honours) and Higher Degrees

Students wishing to obtain the degree of B B Sc (honours), M B Sc or Ph D may be accepted by the department of psychology provided their previous academic record is of high standard. Prospective candidates should contact the chairman of the department for further information.

Details of the psychology courses offered in 1977 are shown in the disciplines section of this handbook.

Professional Training in Clinical Psychology

The department of psychology offers a course of specifically professional training in clinical psychology which will lead to a postgraduate diploma in clincial psychology. The aim of the course is to prepare students to practise in a range of professional fields as a therapist, consultant and community psychologist. Entrants to the course must possess a degree in psychology which must be considered the equivalent of the B B Sc course currently offered by the School of Behavioural Sciences. Applicants will also be assessed for clinical aptitude. The course includes training and seminars in behavioural psychotherapy with adults and children, organizational and community psychology, supervised casework and field placements. The minimum full-time candidature will normally be six terms, and the maximum twelve terms. As only a small number of places will be available in 1977, all enquiries should be directed to the department of psychology, telephone 479 2150.

Part IV Schools of Biological and Physical Sciences

Degree of Bachelor of Science in the Schools of Biological and Physical Sciences

A person may undertake the B Sc degree course in either the School of Biological Sciences or the School of Physical Sciences. In making application for entry into the B Sc degree students should give some consideration to the subjects proposed for study in later years of the course. Students contemplating physical sciences subjects as major studies should apply for entry into the School of Physical Sciences; students contemplating biological sciences subjects should apply for entry into the School of Biological Sciences. In the event of a student's interests changing during the first year the student may change Schools subject to the approval of the appropriate board of studies.

The pass degree will consist of subjects which have a total work value of nine units, including one each year from the main discipline, and should be taken over a period of not less than three years as shown in Table I below.

Table I

School	Degree	Years of study for pass degree	Total units to qualify	Units at each year level			
				1st	2nd	3rd	4th
Biological Sciences	B Sc	3	9	4	3	2	–
Physical Sciences	B Sc	3	9	4	3	2	–

An honours degree will be awarded on the basis of a fourth year of study upon completion of the pass degree course. A pass in a science language may be a requirement for an honours degree, but not for the pass degree.

Completion of a subject includes attendance at such lectures and tutorial classes as are prescribed, as well as completion of such exercises and laboratory work as shall satisfy the discipline concerned. If a student has not complied with the prescribed requirements, he may be refused admission to the annual examination in that subject. Reasonable notice of the prescribed requirements will be given.

At the beginning of each year, a student shall obtain the approval of an adviser of studies of the School for his proposed selection of subjects to be completed in that year.

No student may: (a) take subjects which have a total work value of more than four units in the first year; (b) take a second-year level subject until he has completed first-year subjects with a total work value of three units, except with the permission of the School.

Except with the approval of the School, a candidate shall complete all subjects within a period of six years from the beginning of the academic year in which he completes the first of such subjects.

Course Structures for the B Sc Degree

A summary of these structures is set out in Table II.

Table II:

Course structures for the B Sc degree in the Schools of Biological and Physical Sciences

Note:
This table is a summary only. Certain restrictions apply in the choice of subjects, especially in the choice of mathematics subjects. These restrictions are set out under choice of subjects.

Year	School of Biological Sciences	School of Physical Sciences
1st	Four subjects*, two of which must be Biology IA and Biology IB. Chemistry I is highly recommended as a third subject.	Four subjects*, at least two of which must be selected from Chemistry I, Geology I, Mathematics IA, Mathematics IB and Physics I.
2nd	Three subjects*, at least two of which must be selected from Biochemistry II, Botany II, Genetics II, Microbiology II and Zoology II.	Three subjects*, at least two of which must be selected from Chemistry II, Geology II, Physics II and various Mathematics II subjects.
3rd	Two subjects*, at least one of which must be selected from Biochemistry III, Botany III, Genetics III, Microbiology III and Zoology III.	Two subjects*, at least one of which must be selected from Chemistry III, Geology III and Physics III, and various Mathematics III subjects.

*See subject listings in disciplines section of this Handbook.

School of Biological Sciences

Five disciplines are offered in the School of Biological Sciences: biochemistry, botany, genetics, microbiology and zoology.

The prerequisites for the School of Biological Sciences are passes at HSC level in at least two of chemistry, physics, biology or a branch of mathematics. Prospective students are advised that although the study of chemistry at sixth form level is not essential under these prerequisites, it would be of great assistance to their studies in the School.

Table II fully describes the course structure for the B Sc degree within the School of Biological Sciences. Students can elect to take subjects from other Schools provided that the essential criteria set out in Table II are fulfilled and that the choice is verified by a student adviser from the School of Biological Sciences.

Subjects available for the Degree of Bachelor of Science in the School of Biological Sciences

*Details of each individual subject are given in the section on the discipline concerned.
*A table showing the pre-requisites and the work value for each unit is included at the end of this handbook.

First Year Subjects

Four subjects to be taken from the following according to the course structure outlined on the previous page. Each subject listed has a work value of one unit.

Biology IA
Biology IB
Chemistry I
Geology I
Mathematics IA
Mathematics IC (cannot be taken in combination with Mathematics IA)
Physics IA
Physics IB
Physical Sciences IT
Psychology I (subject to quota)

Also available are subjects with a total work value of one unit from the School of Humanities or the School of Social Sciences. This includes the following disciplines:

art history	Italian	prehistory
economics	legal studies	politics
English	logic	sociology
French	music	Spanish
history	philosophy	

To complete the first year a student shall:

(a) pass in subjects which have a total work value of four units *or*
(b) be passed by the School in the year as a whole.

Normally, all students in the School of Biological Sciences must take Biology IA and Biology IB.

Second Year Subjects

Subjects which have a total work value of three units are to be taken from the following:

Applied Mathematics II
Biochemistry II
Botany II
Chemistry IIA
Genetics II
Geology II
Mathematical Statistics II
Microbiology II
Philosophy IIFA
Philosophy IIFB
Philosophy IILP
Philosophy IIPM
Philosophy IIPSS
Philosophy IISA
Psychology II
Physics II
Pure Mathematics II
Physical Sciences II
Zoology II

Two half-units, or one full unit, of Philosophy must be taken to be equivalent to a second-year science subject. Details of these units are in Volume I of the *Calendar.*

Students from the School of Biological Sciences must take at least two from Biochemistry II, Botany II, Genetics II, Microbiology II and Zoology II.

Third Year Subjects

Subjects which have a total work value of two units are to be taken from the following:

Applied Mathematics III
Biochemistry III
Botany III
Chemical Physics III
Chemistry IIIA
Chemistry IIIB
Computer Science III
Genetics III
Mathematical Statistics III
Microbiology III
Philosophy IIIFA
Philosophy IIIFB
Philosophy IIIFC
Philosophy IIIFG
Philosophy IIIKD
Philosophy IIILS
Philosophy IIIPM
Philosophy IIIPSS
Psychology III
Physics IIIA
Pure Mathematics III
Physical Sciences III
Zoology III

To form a third-year science unit, philosophy units to the value of one and one-half units must be taken (i.e. either three half-units, or one full unit and one half-unit). The philosophy units chosen must not have already been taken at second-year level. Details of the philosophy units can be found in Volume I of the *Calendar.*

School of Physical Sciences

The prerequisites for the School of Physical Sciences are passes in the higher school certificate examination in one of the following combinations of subjects:

(a) any two of chemistry, physics, pure mathematics, applied mathematics;
(b) general mathematics and either chemistry or physics.

Four disciplines are offered in the School of Physical Sciences: chemistry, geology, mathematics and physics.

The School of Physical Sciences, in conjunction with the department of economics, also offers a course leading to a B Sc degree in which economics can be taken with science subjects. The course consists of nine-and-one-half units, four in the first year, three-and-one-half in the second and two in the third year. Students interested in this course should discuss details with an adviser of studies of the School of Physical Sciences.

Subjects available for the Degree of Bachelor of Science in the School of Physical Sciences

*Details of each individual subject are given in the section on the discipline concerned
*A table showing the prerequisites and the work value for each unit is included at the end of this handbook.

First Year Subjects

In the first year a student is required to take four subjects. One of these may be a first-year course offered by the School of Biological Sciences (either Biology IA or IB) and one may be a subject from the School of Humanities or the School of Social Sciences or the department of psychology. Students enrolled in the School who wish to take a unit in mathematics are required to take Mathematics IA, or Mathematics IA and Mathematics IB. Mathematics IC is available only to students enrolled in other Schools. Students taking the combined science/economics course can choose three units from the physical sciences subjects with Economics I.

Second Year Subjects

At the second-year level three subjects are required, at least two of which must be selected from within the School of Physical Sciences (see Table II above). The third subject may then be : EITHER another second-year subject from within the School OR Physical Sciences II (see specific entry later in this handbook) OR the equivalent of one second-year subject from any other School of the University (provided the necessary prerequisites have been obtained).

Chemistry IIA and IIB cannot be taken in combination; the same applies to Physics IIA and IIB. Students taking the combined science-economics course should choose two units from physical sciences subjects and one-and-one-half economics units.

Third Year Subjects

At the third-year level two subjects are required, at least one of which must be selected from within the School of Physical Sciences (see Table II above). The second subject may then be : EITHER another third-year subject from within the School OR Physical Sciences III (see specific entry later in this handbook) OR the equivalent of 18 credit points* from any other School of the University.

*a full third-year subject from a School with a 4:3:2 system shall count 18 credit points; a full third-year subject from a School with a 3:3:3 system shall count 12 credit points. For example, in the latter case, three half units would be required.

Students taking the combined science-economics course should choose one unit from physical sciences and one economics unit.

Honours degrees in the Schools of Biological and Physical Sciences

Entry to the fourth year will be limited to those who have reached a satisfactory standard in the course for the pass degree. Graduates from other universities may also be admitted in special circumstances. To qualify for the honours degree, students should enrol on a full-time basis. Successful students will be awarded first-class, second-class (upper division), second-class (lower division), or third-class honours.

It is intended to allow specialization in a range of studies reflecting the academic interests of the Schools. The School of Physical Sciences will offer fourth-year courses in chemistry, geology, mathematics, and physics and one of an inter-disciplinary nature. The School of Biological Sciences offers honours courses in biochemistry, botany, genetics, microbiology and zoology. Entry to an honours-degree course in the School of Biological Sciences will be at the discretion of the chairman of the department concerned and will be decided on the results obtained in the pass-degree course taken in the School or elsewhere.

Academic Progress in the Schools of Biological and Physical Sciences

The results of a student who completes a pass or honours subject will be graded in four categories: A, B, C and D. A: 80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.

Each year the academic progress committees of the Schools review the academic progress of students. A student whose progress has been considered unsatisfactory may be informed that should he again seek enrolment in a course or in a subject he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to re-enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from that course or from that subject.

A student will not be allowed to continue his enrolment in any subject in which he is not making satisfactory progress. The final assessment of a student's progress may take into account his performance in tutorials, practical work, assignments and any other prescribed work.

A student who fails to meet the requirements established by each School may be considered not to have made satisfactory academic progress. In attempting to meet these requirements, a student will not normally be permitted to enrol for any subject more than twice.

A full-time student will normally be expected to obtain a work value of at least two units at the end of the annual examinations in his first year, at least four units within two calendar years, and at least seven units within four calendar years. A full-time student will be expected to complete the requirements for his degree within six calendar years of his first effective enrolment. A student having more than one unit outstanding shall not normally proceed to the next year's course.

The minimum rate of progress for a part-time student will be determined by the board of studies in each individual case.

Special Entry Scheme

Each year the School of Physical Sciences makes a number of places available on a part-time or full-time basis to non-matriculated students. Applicants to the Scheme must complete an application, write an essay, sit for a test, and attend an interview.

Students accepted under the Scheme are enrolled for a Bachelor of Science degree course. The main disciplines offered for study are chemistry, geology, mathematics and physics. Subjects from other Schools may be included in the course under certain conditions.

Those persons who are able to satisfy the following basic conditions may apply:

(a) Applicants must be 20 years of age or more on 1 January in the academic year prior to enrolment.
(b) Applicants must not have passed the HSC or its equivalent or be currently attempting to gain matriculation or its equivalent.
(c) Applicants must have reached at least a fifth form science level educational standard.
(d) Applicants are required to have been employed in a field of science for at least three years.

External Studies

The School of Physical Sciences offers an external studies program for the Bachelor of Science degree. In 1977, the subjects available will be Chemistry I, Geology I, Mathematics I and Physics I. To be eligible for selection applicants must satisfy normal Victorian university entrance requirements with passes in two of chemistry, physics or a branch of mathematics.

Selection will be made on the basis of academic merit. There are no residential restrictions but applicants must provide a valid reason as to why they cannot undertake internal studies. In 1977, the number of places offered will be limited.

The courses will in the main be by correspondence, but on-campus practical sessions will be held in May and August for the subjects chemistry, geology and physics. Occasional meetings between tutors and students may be held for each subject throughout the year.

Degree of Bachelor of Behavioural Science in the School of Behavioural Sciences

Students may take a Bachelor of Behavioural Science degree course in the School of Behavioural Sciences. Details are shown in the entry for that School; see Part III of this handbook.

PART V Graduate Studies

Graduates may apply at any time to be admitted as candidates for the degrees of Master of Science, or Doctor of Philosophy. An appropriate honours degree will normally be the preliminary requirement for admission to any postgraduate degree course. In some disciplines it may be possible to complete the work for the Master's degree by thesis, by course work or a combination of the two. In most disciplines it is possible to read for a Master's degree on a part-time basis. Persons seeking enrolment for a higher-degree course should first contact the professor of the appropriate discipline to discuss their particular research interests, as consideration of an application for a higher-degree course will depend on the availability of facilities and suitable supervisors. The candidature of each prospective student must be approved by the appropriate higher-degree committee before the student can be admitted to the University.

Further information on the fields of research pursued appears under the appropriate discipline.

Graduate Diploma in Agriculture

In addition to the higher degrees Master of Agricultural Science and Doctor of Philosophy, the School of Agriculture offers a one-year program leading to the Graduate Diploma in Agriculture (Grad Dip Agr). This consists of mostly formal courses selected to meet the students' interests. A candidate is required to complete at least 12 units. Of these three to six units must be selected from numerical studies (core area) with the remainder selected from the elective areas of plant-soil sciences (theme: crop and pasture development), animal sciences (theme: intensive animal production), and agricultural economics. In addition, candidates will work individually for about one term (one-third of the year) on a short project or case study and this work will be assessed by written thesis.

Graduate Diploma in Computer Science

In 1977, for the first time, the School of Physical Sciences offers a one-year course of full-time study leading to the Graduate Diploma in Computer Science.

The course is covered in four subjects, namely Programming, Computer Organisation, Information Systems, and Applications, each of which comprises about one quarter of the main course.

Further information may be obtained from Dr D. Woodhouse, department of mathematics.

Part VI Disciplines

The following pages contain details of the disciplines in which subjects are offered. Disciplines are listed in alphabetical order. Information on examination requirements, lectures, and other work requirements and postgraduate studies is included. Details of incompatible, companion and prerequisite subjects are set out in Part VII: Table of Subjects.

Booklists

The following symbols are used in booklists:
*available as a paperback.
†books which should be purchased by students.

Books are listed under the following categories.
Prescribed Reading:
basic textbooks essential to the course.
Preliminary Reading:
books to be read by the student before attending the first lecture of the course.
Recommended Reading:
Relevant books, in addition to prescribed textbooks, which the student will find useful.

The introduction of new courses will be subject to the availability of funds.

Details of disciplines offered in the Schools of Economics, Education, Humanities and Social Sciences are included in Volume 1 of the *Calendar.*

AGRICULTURE

For details of agriculture subjects see the School of Agriculture entry in this volume of the handbook.

BIOCHEMISTRY

The department of biochemistry offers courses which form part of the second and third year of the B Sc (pass) degree and may lead to a B Sc (honours) degree in biochemistry. Postgraduate training to the M Sc and Ph D levels is also available.

The courses available provide instruction in both theoretical and practical aspects of the subject and may be taken with other subjects offered by the School of Biological Sciences, the School of Physical Sciences and the School of Behavioural Sciences. It is thus possible to vary the course structure to obtain background experience suitable for different professional careers.

A sound biochemical training must be founded on a strong basis of chemistry as well as a good background in biological principles and techniques. The courses set out below incorporate these features.

First Year

Biological Sciences students:	Biology IA, Biology IB, Chemistry I, and one other subject.
Physical Sciences students:	Biology IA *or* IB, Chemistry I, and two other subjects.
Behavioural Sciences students:	Biology IB, Chemistry I, Psychology I, and one other subject.

Second Year

Biochemistry II and *two* of : Botany II, Genetics II, Microbiology II, Zoology II, Chemistry IIA or IIB, any other second-year physical sciences subject, Psychology II, Philosophy II.

Third Year

Biochemistry III and *one* of : Botany III, Chemistry IIIB, Genetics III, Microbiology III, Zoology III, Psychology III.

Details of the courses offered by the biochemistry department are described below. Further information may be obtained from the chairman of the department or from the adviser of studies.

Biochemistry II

Prerequisites

(1) Chemistry I;
(2) Biology IA *or* IB.

Class requirements

The course consists of three lectures and one afternoon (4 hours) of practical work per week throughout the year. The practical work will involve experiments in which quantitative biochemical techniques will be applied.

Preliminary Reading

Students are encouraged to do some reading in the long vacation prior to the commencement of the course (the presentation of courses will not, however, involve assumption of such background reading). The following books are recommended:

Nass, G. *The Molecules of Life,* World University Library 1970.
Rose, S. *The Chemistry of Life,* Penguin 1966.

Syllabus

The course is designed to provide an introduction to biochemistry — the chemistry

of living things. The course will be concerned with the chemical structure, function and biosynthesis of major cell constituents and how living cells maintain, repair and replicate themselves. The various chemical structural, functional and metabolic aspects of the course will be presented in an integrated fashion throughout the year and, where appropriate, presented in a physiological context.

The course will consist of : the chemistry of biological polymers and their constituent monomers; amino acids, proteins, protein structure and function; basic enzymology; nucleotides, polynucleotides, polynucleotide structure and function; fatty acids, lipids, membrane structure and function; monosaccharides, oligosaccharides, polysaccharide structure and function, bioenergetics; mitochondrial oxidations and oxidative phosphorylation; carbohydrate and lipid metabolism; photosynthesis; nitrogen metabolism; biosynthesis of polynucleotides and proteins; regulation of enzyme action and enzyme synthesis; digestion and absorption; nutritional biochemistry.

Prescribed Reading
One of:
Conn, E.E. and Stumpf, P.K. *Outlines of Biochemistry,* 4th edn, Wiley 1976.
Lehinger, A.L. *Biochemistry,* 2nd edn, Worth 1975.
or
Stryer, L. *Biochemistry,* Freeman 1975.

Recommended Reading
Rees, D.A. *The Shapes of Molecules,* Oliver and Boyd 1967.
Barker, R. *Organic Chemistry of Biological Compounds,* Foundations of Modern Biochemistry Series, Prentice Hall 1971.
Watson, J.D. *Molecular Biology of the Gene,* 2nd edn, Benjamin 1970.
Yudkin, M.D. and Offord, R.E. *Comprehensible Biochemistry,* Longman 1973.
Page, D.S. *Principles of Biological Chemistry,* Willard Grant 1976.
Bohinski, R.C. *Modern Concepts in Biochemistry,* Allyn and Bacon, 1973.
McGilvery, R.W. *Biochemistry – A Functional Approach,* Saunders 1970.
Mahler, H.R. and Cordes, E.H. *Biological Chemistry,* 2nd edn, Harper 1971.
White, A., Handler, P. and Smith, E.L. *Principles of Biochemistry,* 4th edn, McGraw Hill 1968.

Assessment
Candidates will be assessed by their performance in assignments and written tests held during the year and in written examinations given at the end of the course.

Performance in practical work will be assessed weekly.

Students must obtain a satisfactory standard in both the theoretical and practical aspects in order to pass the course.

Biochemistry III

Prerequisite
Biochemistry II.

Class Requirements
The course consists of four lectures per week throughout the year and an average of 10 hours per week of practical work or practice classes concerned with experimental methods in physical biochemistry, enzymology, plant and animal metabolism and the separation and quantitative analysis of metabolites and organelles.

Preliminary Reading
Students are encouraged to do some reading in the long vacation prior to the commencement of the course (presentation of the courses, however, will not involve assumption of such background reading). The following books are recommended:
Oparin, A.I. *The Origin of Life on Earth,* Academic Press 1957.
Monod, J. *Chance and Necessity,* Fontana 1974.
Watson, J.D. *The Double Helix,* Atheneum 1968.
Sayre, A. *Rosalind Franklin and DNA,* W.W. Norton 1975.

Syllabus
The Biochemistry III course is designed to provide a firm grounding in major areas of contemporary biochemistry including macromolecular chemistry, the regulation of gene expression and developmental biochemistry, the integrated operation of intermediary metabolism and the biochemistry of physiological processes.
Macromolecular chemistry
The purification and chemical characterization of proteins; the kinetics and mechanisms of enzymic catalysis; solution properties of proteins, polynucleotides and polysaccharides.
Integrated intermediary metabolism
The integrated operation and functions of metabolic pathways for the metabolism of carbohydrates, lipids, amino acids, purines and pyrimidines; the biochemistry of cell membranes in relation to energy transduction, transport phenomena, cell-cell recognition and hormone reception phenomena; the regulation of metabolism at the cellular, tissue and whole organism levels; metabolism in selected nutritional and abnormal states.
Gene expression and developmental biochemistry
Mechanisms and regulation of polynucleotide and protein synthesis; protein-polynucleotide recognition; differentiation, ontogeny of enzymes and organogenesis; the immune response; information transfer and biochemical evolution.
Biochemistry of physiological processes
Cellular and tissue specificity in metabolism; biochemistry of mammalian organs and muscle action, vision and nervous transmission; selected topics in the biochemistry of foods, drug metabolism and clinical biochemistry, photosynthesis and seed germination.

Prescribed Reading
One of the following:
Lehninger, A.L. *Biochemistry,* 2nd edn, Worth 1975.
Stryer, L. *Biochemistry,* Freeman 1975.

Recommended Reading
Portions of the following books cover most aspects of the courses. Other literature relevant to special sections of the course will be advised by the lecturers concerned.

McGilvery, R.W. *Biochemistry – A Functional Approach,* Saunders 1970.
Mahler, H.R. and Cordes, E.H. *Biological Chemistry,* 2nd edn, Harper 1971.
Kornberg, H.L., Phillips, D.C. and Gutfreund, H. (eds) *M.T.P. International Review of Science,* Biochemistry Series vols. 1-12, Butterworth 1974.
Dawson, R.M.C., Elliott, D.C., Elliot, W.M. and Jones, K.M. *Data for Biochemical Research,* 2nd edn, Oxford Univ. Pr. 1969.
Dixon, M. and Webb, E.C. *Enzymes,* 2nd edn, Longman 1964.

Bull, A.T. *et al. Companion to Biochemistry,* Longman 1974.
Bernhard, S. *The Structure and Function of Enzymes,* Benjamin 1968.
Van Holde, K.E. *Physical Biochemistry,* Prentice Hall 1971.
Tanford, C. *Physical Chemistry of Macromolecules,* John Wiley 1961.
Larner, J. *Intermediary Metabolism and its Regulation,* Prentice Hall 1971.
Frieden, E. and Lipner, H. *Biochemical Endocrinology of the Vertebrates,* Prentice Hall 1971.
Watson, J.D. *Molecular Biology of the Gene,* 2nd edn, Benjamin 1970.
Harris, H. *Nucleus and Cytoplasm,* 3rd edn, Clarendon Pr. 1974.
Gurdon, J.B. *The Control of Gene Expression in Animal Development,* Clarendon Pr. 1974.
Wold, F. *Macromolecules : Structure and Function,* Prentice Hall 1971.
Stewart, P.R. and Letham, D.S. (eds) *The Ribonucleic Acids,* Springer-Verlag 1973.
White, A., Handler, P. and Smith, E.L. *Principles of Biochemistry,* 4th edn, McGraw Hill 1973.
Lewin, B. *Gene Expression,* vols 1 and 2, Wiley, New York 1974.

Assessment
Candidates will be assessed by their performance in assignments and written tests held during the year and in written papers given at the end of the course.

Performance in practical work will be assessed continuously throughout the year. Students must obtain a satisfactory standard in both theoretical and practical aspects in order to pass the course.

Biochemistry IV
A one-year honours course in biochemistry is available to graduands from La Trobe, or from other universities with equivalent B Sc courses. The course consists of a research project, lectures, student seminars and such other work as may be required. As the research project is a major component of the course, students desiring to enrol are expected to have demonstrated a high standard in practical work, as well as having achieved a satisfactory overall performance in both Biochemistry III and their other third-year subject. Students intending to enrol in the honours courses should consult the chairman of the department.

Postgraduate Study
Prospective candidates for the M Sc or Ph D degrees should contact the chairman of the department.

Research by members of the department is currently in progress in the following areas : protein isolation and enzymology; enzymology of glycolysis; physical biochemistry of proteins, polynucleotides and polysaccharides; clinical biochemistry and biochemistry of congenital diseases; regulation of pyrimidine nucleotide and urea biosynthesis; plant cell wall development and biosynthesis; polysaccharide and glycoprotein chemistry; plant and animal tissue culture; regulatory functions of cyclic nucleotides; biochemistry of phytohormone action; molecular evolution; RNA and protein synthesis; regulation of gene expression in developing lymphoid tissue.

BIOLOGY
Biology IA and IB will be available in the first year. Biology IA is a course on the biology of autotrophic organisms and fungi; Biology IB is a course in zoology. Common to both subjects is a course on genetics and evolution. These subjects qualify students for a wide range of second-year biological subjects as set out in the

table in Part VII. Details of second-year and subsequent studies in the School of Biological Sciences can be found under the headings *Biochemistry, Botany, Genetics, Microbiology* and *Zoology.*

Prerequisites for 1977
Passes at HSC level in at least two of chemistry, physics, biology or a branch of mathematics. Prospective students are advised that although the study of chemistry at sixth form level is not essential under these prerequisites it would be of great assistance to their studies in the School.

Class Requirements (in Biology IA and IB)
Lectures – three a week in each subject for three terms.
Practical and tutorial classes – one 3-hour class a week in each subject for three terms. One excursion each in Biology IA and Biology IB.

The component of Biology IA entitled 'the biology of autotrophic organisms' and the zoological component of Biology IB each consist of 50 lectures with corresponding practical classes.

The genetical component is common to both subjects and consists of 25 lectures with corresponding practical classes and tutorials.

Biology IA

This is an introductory course for students wishing to pursue more advanced biological subjects in subsequent years, but is also designed as an integrated one-year terminal course for students who do not wish to pursue a biological subject into later years of their degree. The subject contains two components.

(1) Plant Sciences –

the biology of autotrophic organisms and fungi
(50 lectures)

Syllabus
This component is designed to introduce students to the biology of organisms which use carbon dioxide as a carbon source (i.e. plants, and various micro-organisms). Aspects of the biology of fungi are also included.

The following topics are covered:
the cellular and sub-cellular structures of eucaryotic and procaryotic organisms and their reproduction,
an evolutionary approach to the diversity of autotrophic organisms, their anatomy and morphology,
the biology of fungi,
autotrophic nutrition,
derivation of energy for cellular activity,
uptake and transport of metabolites,
regulation of growth and development,
competition between autotrophic organisms and adaptations to environmental stresses, the concepts of populations, communities and ecosystems; the effect of man on these systems.

Preliminary Reading
Students are assumed to have some knowledge of biology. Students whose school

record does not include HSC biology are encouraged to read the following book in the long vacation before the commencement of the course:
Biological Science: The Web of Life, 2nd edn, written and published by the Australian Academy of Science

Prescribed Reading

†Costermans, L.F. *Trees of Victoria,* 3rd edn, published by the author 1973.
†Raven, P.H., Everet, R.F. and Curtis, H. *Biology of Plants,* 2nd edn, Worth 1976.

Recommended Reading

Jensen, W.A. and Salisbury, F.B. *Botany : An Ecological Approach,* Wadsworth Publishing Co. Inc. 1972.
Keeton, W.T. *Biological Science,* 2nd edn, W.W. Norton and Co. 1972.
Weier, T.E., Stocking, C.R. and Barbour, M.G. *Botany: An Introduction to Plant Biology,* 5th edn, Wiley International Edn 1974.

Students are also required to purchase a special manual for use in conjunction with practical work. The practical manual (and other equipment necessary for the practical course) will be available before the beginning of the academic year. Details will be mailed to all students enrolled for Biology IA as soon as possible after enrolment. Additional reading will be provided during the lecture course.

Assessment

(1) Performance in practical reports, problems, tests, essays and any other assignments set throughout the year.
(2) A written examination at the end of the course.

(2) Genetics

(25 lectures)

Syllabus

Principles of genetics; introduction to population, quantitative and human genetics; genes and metabolism; the genetic code and protein synthesis; processes of organic evolution.

Prescribed Reading

Genetics notes by the department of genetics and human variation.

Preliminary Reading

*Baldwin, R.E. *Genetics,* Wiley 1973.

Recommended Reading

*Sinnott, E.W., Dunn, L.C. and Dobzhansky, T. *Principles of Genetics,* McGraw-Hill 1958.
*Stansfield, W.D. *Theory and Problems of Genetics,* Schaum's Outline Series, McGraw-Hill 1969.

Biology IB

This is an introductory course for students wishing to pursue more advanced studies in biological subjects in subsequent years. It may also serve as a one year terminal course. The subject contains two components, Zoology and Genetics. The genetics component is the same as that in Biology IA.

(1) Zoology component

(50 lectures)

Class Requirements

Lectures
Three hours per week in the first two terms.
Practical Classes
One three hour session per week and two field excursions in the first two terms.

Students should obtain a set of practical notes, practical record book and a dissecting kit before the first practical, which will be held in the first week of term. The practical course will involve dissections of animals.

Syllabus
This component is designed to introduce students to the biology of animals through an evolutionary approach.

The following topics are covered:

the origins of life, and of the first animals; an evolutionary approach to the diversity of animals; structure and function in the main groups of animals – protozoa, sponges, coelenterates, flatworms, nematodes, annelids, arthropods, molluscs, echinoderms and chordates; basic animal physiology illustrated by a study of the mammal reproduction in animals and their development; concepts in animal ecology, such as the community, ecosystem, food web, energy flow, competition; the behaviour of animals – instinctive behaviour, social behaviour, learning and memory, the development of behaviour in an individual.

Prescribed Reading
Weisz, P.B. *The Science of Zoology,* McGraw-Hill 1973.

Recommended Reading
Freeman, W.H., and Bracegirdle, B. *An Atlas of Invertebrate Structure,* Heinemann 1976.
Thornton, I.W.B. *Darwin's Islands,* Doubleday, New York 1971.

Assessment
Performance in practical reports, problems, tests, essays, and any other assignment set throughout the year. One 2-hour theory examination and one 2-hour practical examination.

(2) Genetics component

(25 lectures)

For syllabus and prescribed reading see part (2) of Biology IA.

Biology II

This is a special course for students enrolled in the School of Agriculture and consists of a botany course together with a course in agricultural genetics given by the genetics department.

The botanical component will deal with the anatomy and physiology of vascular plants with emphasis on plant growth and development, tissue differentiation, and the control of various aspects of growth and development by growth-regulating substances (26 lectures).

Prescribed Reading

†Fahn, A. *Plant Anatomy,* 2nd edn, Pergamon 1974.
†Leopold, A.C. and Kriedemann, P.E. *Plant Growth and Development,* 2nd edn, McGraw-Hill 1975.

Recommended Reading

Esau, K. *Plant Anatomy,* 2nd edn, J. Wiley and Sons, Inc. 1965.

The genetics component will comprise various topics of specific interest to agricultural scientists. It will include: genetic analysis of quantitative characters and characters controlled by major genes, selection theory, selection techniques in plants and animals, hybrid varieties, cytogenetic techniques in plant breeding, and genotype-environment interactions.

Prescribed Reading

*Bowman, J.C. *An Introduction to Animal Breeding,* Arnold 1974.

Recommended Reading

Falconer, D.S. *Introduction to Quantitative Genetics,* Oliver and Boyd 1960.
Lawrence, J.C. *Plant Breeding,* Arnold 1968.
Parker, R.E. *Introductory Statistics for Biology,* Arnold 1973.

Botany II
(75 lectures)

Prerequisites

(1) Biology IA.
(2) At least one of the following: Chemistry I, Physics I, or a branch of first-year mathematics.

Class Requirements

Lectures:
three hours a week for three terms.
Practical/tutorial classes:
one 4-hour class a week for three terms; and selected topics will be taught by audio-visual laboratory for an additional two hours a week in some sections.

A field trip of approximately five days' duration will be held in the first or second-term vacation. This is an essential part of the practical course and reports based on it will be used in the final course assessment. It will not be possible to set alternative work.

Assessment

(1) Performance in practical and field reports and any other assignments set throughout the year.
(2) Three 3-hour written examinations at the conclusion of the course.

Preliminary Reading

Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following books are recommended:

Greulach, V.A. *Plant Structure and Function,* Collier-Macmillan 1973.
Billings, W.D. *Plants, Man and the Ecosystem,* Macmillan, London 1971.

Syllabus and Prescribed Reading

(1) Anatomy of vascular plants with emphasis on plant development and tissue differentiation.

Prescribed Reading

†Fahn, A. *Plant Anatomy,* 2nd edn, Pergamon 1974.

Recommended Reading

Esau, K. *Plant Anatomy,* 2nd edn, J. Wiley and Sons, Inc. 1965.

(2) The physiology of higher plants with emphasis on the acquisition of materials and energy, the movement of materials within the plant and the capacity of plants to sustain growth by adapting to their environment.

Prescribed Reading

†Noggle, G.R. and Fritz, G.J. *Introductory Plant Physiology,* Prentice-Hall 1976.

Recommended Reading

Hall, J.L., Flowers, T.J. and Roberts, R.M. *Plant Cell Structure and Metabolism,* Longman 1974.

Leopold, A.C. and Kriedemann, P. *Plant Growth and Development,* McGraw-Hill 1975.

(3) The ecology of terrestrial plants with emphasis on their life cycles in relation to the environment and the effect of environmental and biotic factors on the distribution of individual plant species.

Prescribed Reading

Open University, Science 3rd level course, Block C, *Individuals and Communities,* Unit 11, *Edaphic factors; problems of dispersal,* Open Univ. Pr.

Preliminary Reading

Daubenmire, R. *Plants and Environment,* 3rd edn, Wiley, New York 1974.

(4) Aspects of the biology of fungi including their reproduction, classification, and ecology, their roles in lichens, mycorrhizas, soil processes and plant disease, and their impact on man.

Prescribed Reading

†Webster, J. *Introduction to Fungi,* Cambridge Univ. Pr. 1970 (also useful for Botany III).

or

†Ingold, C.T. *The Biology of Fungi,* Hutchinson Educational Ltd 1967.

†Hudson, H.J. *Fungal Saprophytism,* Studies in Biology No. 32, Edward Arnold 1972.

†Smith, D.C. *The Lichen Symbiosis,* Oxford Biology Reader No. 42 1973.

†Harley, J.L. *Mycorrhiza,* Oxford Biology Reader No. 12 1971.

(5) Aspects of the biology of autotrophic cryptogams (freshwater algae, bryophytes and spore-producing vascular plants).

(6) The principles of angiosperm taxonomy. Aspects of plant variation and speciation with reference to their taxonomic description. A practical introduction to the families of flowering plants.

Prescribed Reading

†Heywood, V.H. *Plant Taxonomy,* Studies in Biology No. 5, Edward Arnold 1967.

Recommended Reading
Radford, A.E. *et al. Vascular Plant Systematics,* Harper and Row 1974.

Botany III
(100 lectures)

Prerequisite
Botany II

Class Requirements
Lectures:
four 1-hour lectures a week for three terms.
Practical work:
one 4-hour and one 5-hour practical class a week for three terms.

Assessment
(1) Performance in practical and field reports and any other assignments set throughout the year.
(2) Written examinations at the end of the course.

Preliminary Reading
Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following book is recommended.

Daubenmire, R. *Plant Communities,* Harper and Row, New York 1968.

Syllabus
Although gaining a basic knowledge in all areas of Botany listed below, students will be provided the opportunity to specialize in certain selected areas.

(1) Plant biochemistry: bioenergetics, enzymology, intermediary metabolism of carbohydrates and lipids in plants; oxidative phosphorylation. The biochemistry of photo-synthesis, nitrate reduction, nitrogen fixation and sulphur reduction.

Prescribed Reading
†Hall, J.L., Flowers, T.J. and Roberts, R.M. *Plant Cell Structure and Metabolism,* Longman 1974.
or
†Conn, E.E. and Stumpf, P.K. *Outlines of Biochemistry,* 3rd edn, Wiley 1972.

Recommended Reading
Goodwin, T.W. and Mercer, E.I. *Introduction to Plant Biochemistry,* Pergamon 1972.
Whittingham, C.P. *The Mechanism of Photosynthesis,* Edward Arnold 1974.

(2) Aspects of plant cell physiology. Membrane phenomena and the movement of water and solutes. Bioenergetics.

Prescribed Reading
†Clarkson, D. *Ion Transport and Cell Structure in Plants,* McGraw-Hill 1974.

(3) Plant ecology, including studies of plant succession, vegetation dynamics and plant palaeogeography.

Prescribed Reading
Kershaw, K.A. *Quantitative and Dynamic Plant Ecology,* 2nd edn, Edward Arnold, London 1973.

(4) Advanced studies in the biology of fungi, concentrating on obligate plant parasites such as rusts, smuts and powdery mildews. Plant viruses.

Prescribed Reading
†Large, E.C. *Advance of the Fungi,* Dover 1962.
†Deverall, B. *Fungal Parasitism,* Studies in Biology No. 17, Edward Arnold 1969.

(5) Marine botany: emphasis on ecology, morphology, and systematics.

(6) The ultrastructure and function of plant cells. A survey of current views of the structure of cell membranes, the structure of cellular organelles and their ontogeny, interrelation and continuity, as well as a discussion of selected topics relating to the evolution of cellular organelles and cytological aspects of cell differentiation.

Prescribed Reading
†Hall, J.L. *et al. Plant Cell Structure and Metabolism,* Longman 1974.

(7) Development and comparative morphology of the seed plants. A detailed morphological survey of the families and genera of gymnosperms, their geographic distribution, evolution, reproduction and embryogeny. Reproduction in the angiosperms – sexual and asexual, including embryogeny, apomixis, aseptic culture of embryos and anthers. Evolutionary trends and differences between these two major groups will be discussed.

Prescribed Reading
†Sporne, K.R. *The Morphology of Gymnosperms,* 2nd edn, Hutchinson Univ. Library 1974.
†Foster, A.S. and Gifford, E.M. Jr. *The Comparative Morphology of Vascular Plants,* 2nd edn, Freeman and Co. 1974.

Recommended Reading
Chamberlain, C.J. *Gymnosperms: Structure and Evolution,* Dover reprint.

(8) Advanced taxonomy, with particular emphasis on chemical and numerical taxonomy.

Prescribed Reading
†Harborne, J.B. *Phytochemical Methods,* Chapman and Hall, London 1973.

Recommended Reading
Radford, A.E. *et al. Vascular Plant Systematics,* Harper and Row 1974.

(9) Plant physiology, including studies of higher plants and algae. (No prescribed reading).

Recommended Reading
Canny, M.J. *Phloem Translocation,* Cambridge Univ. Pr. 1973.

Botany IV (Honours Course)

A fourth-year course is available to students who have fulfilled the requirements of the B Sc degree at La Trobe or other universities provided that their previous academic record is of a high standard. The academic record should include Botany III but graduates whose record does not include Botany III can gain admission to Botany IV provided their application is approved by the board of studies of the School of Biological Sciences. The course consists of a research project together

with other prescribed work including essays and seminars. The course lasts approximately nine months beginning on 31 January.

Postgraduate Studies

The department offers research programs leading to the degrees of M Sc or Ph D. Prospective candidates should consult the chairman of the department for further details.

Research is currently in progress in the following fields: the ultrastructure and anatomy of plants; aspects of the physiology, biochemistry and biophysics of plants; plant pathology; plant taxonomy and plant ecology.

CHEMICAL PHYSICS

An interdisciplinary course of study within the School of Physical Sciences, chemical physics offers a coherent program leading to the B Sc (pass) and B Sc (honours) degree.

The course is designed to provide a solid grounding in the field of chemical physics, and will serve either as a suitable training for teachers of physics or chemistry and for industrial appointments, or as an introduction to postgraduate research. In addition, the structure is such that there is more flexibility for branching towards either physics or chemistry than is otherwise possible.

Students wishing to follow this course should, in any year after the first, discuss their choice of physics, chemistry or mathematics components with the respective student advisers.

Chemical Physics

First Year

Physics IA, Chemistry I, Mathematics IA and Mathematics IB are the subject units required for the first year of the course. This combination also leads to any second-year subject other than geology offered in the School of Physical Sciences.

Second Year

Physics IIA, Physical Sciences II (Chemistry IIA, Physical, $^1/_3$ unit; Mathematics II, $^2/_3$ unit) and Applied Mathematics II (AM201-204, 207, 208) form the recommended course units for enrolment. The suggested composition of Mathematics II is: PM201, PM203, AM205, plus one from PM209, AM206, ST208. This course is also suitable for students intending to major in pure physics.

An alternative course is Physics IIA, Chemistry IIA and Applied Mathematics II. With its equal emphasis on chemistry, this course also allows for a major in that subject (though committed pure chemistry majors would be advised to take Physics IIB).

Third Year

Chemical Physics III is a composite two-unit course comprising components from Physics IIIA, Chemistry III (physical), and Applied Mathematics III. It is open to students who have passed in either of the preceding courses, but those with the latter alternative may need to modify the applied mathematics segment. The recommended components (with credit points in brackets) are:

Physics IIIA
Quantum mechanics (2), nuclear physics (2), statistical mechanics (2), solid state (2), atomic physics and spectroscopy (2), laboratory (4).

Chemistry III
Computing (1), molecular structure (1), spectroscopy (1), mass spectroscopy (1), diffraction methods (1), information theory (1), laboratory (4).

Applied Mathematics III
Functions of a complex variable (2), calculus of variations (2), integral transforms (2), boundary value problems (2), special functions (2), quantum mechanics A (2) and B (2).

Students who do not have the necessary pure mathematics prerequisites for Hilbert space and distributions may substitute other components from either physics, chemistry, or in some instances Pure or Applied Mathematics II, provided the total of 36 credit points is maintained.

Fourth Year

Flexibility is a feature of the honours-year course. Chemical Physics IV has a nucleus which is common for all enrolled, and the remaining components may be chosen according to the particular interests of each student. Each of the lecture courses and the research project carries the same value (in terms of percentage of the total year's mark) as they represent in the overall courses of their respective department or division, and should be chosen so that the total course value is as close as possible to 100 per cent. The common components are:
Physics IV
Mathematics physics and statistical mechanics, scattering theory.
Chemistry IV
Group theory, spectroscopy, reaction rate theory.

Postgraduate Studies

Research programs leading to the degrees of M Sc or Ph D are available to holders of a good honours degree in chemical physics. Candidates of equivalent standing in related subjects may also be admitted. The divisions within the School co-operating in such programs are those of electron physics, physical chemistry, space physics, and in some instances applied mathematics. Degree requirements are similar to those existing in other areas of the School.

CHEMISTRY

The three departments of chemistry combine to offer courses leading to the B Sc (pass) and B Sc (honours) degrees. In the academic year 1977, Chemistry I, Chemistry IIA and IIB, Chemistry IIIA and IIIB and Chemistry IV will be available.

Courses are intended to provide a thorough and balanced training in chemistry which will serve as a satisfactory prelude either to postgraduate research, further courses in allied subjects, industrial appointments, or a career in teaching, and are organised so that a student may major solely in chemistry; jointly in chemistry and another discipline from the School of Physical Sciences; or in chemistry and either biochemistry, botany, economics, genetics, microbiology, philosophy or zoology.

Students intending to proceed to the honours degree in chemistry will be selected on the basis of their performance in the final year of the pass-degree course.

Chemistry I

Prerequisites
A student will normally be expected to have obtained a pass in chemistry at the higher school certificate examination or an approved equivalent, and to have reached at least leaving standard in physics and mathematics.

Inorganic and Analytical Chemistry

Syllabus
Chemistry of the more important metallic and non-metallic elements with particular reference to the periodic classification of elements; the electronic structure of atoms; the principles of valency theory and chemical bonding; introduction to the chemistry of coordination compounds; shapes and symmetry properties of inorganic molecules; analytical chemistry; nuclear and radiochemistry.

Prescribed Reading
†Dickerson, R.E., Gray, H.B. and Haight, G.P. *Chemical Principles,* 2nd edn, Benjamin 1974.
†Fritz, J.S. and Schenk, G.H. *Quantitative Analytical Chemistry,* 3rd edn, Allyn and Bacon 1975.

Recommended Reading
*Companion, A.L. *Chemical Bonding,* McGraw-Hill 1964.
Aylward, G.H. and Findlay, T.J.V. *SI Chemical Data,* 2nd edn, Wiley 1974.
Newton, G.W.A. and Ribinson, V.J. *Principles of Radiochemistry,* Macmillan 1971.
*Gray, H.B. *Electrons and Chemical Bonding,* Benjamin 1965.
Christian, G.D. *Analytical Chemistry,* Xerox 1971.
Garland, *Chemistry of Our World,* Macmillan.

Organic Chemistry

Syllabus
Elementary organic chemistry, with particular reference to electronic theory and reaction mechanism; isomerism and stereochemistry; preparation and reaction of aliphatic and aromatic hydrocarbons, alcohols, halides, ethers, aldehydes, ketones, carboxylic acids and derivatives and amines.

Prescribed Reading
†Davis, M., Deady, L.W. and Topsom, R.D. *Introductory Organic Chemistry,* Longman 1973.

Physical Chemistry

Syllabus
Thermodynamics, colligative properties, phase equilibria; reaction kinetics; chemical equilibria, ionic and heterogeneous equilibria in aqueous solutions; electrochemistry; properties of gases and kinetic theory; physical techniques for the study of molecular structure and energetics.

Prescribed Reading
†Dickerson, R.E., Gray, H.B. and Haight, G.P. *Chemical Principles,* 2nd edn, Benjamin 1974.

Recommended Reading
Aylward, G.H. and Findlay, T.J.V. *SI Chemical Data,* 2nd edn, Wiley 1974.

Laboratory Courses

Syllabus
The course includes the preparation and reactions of inorganic compounds; the preparation, purification, properties and reactions of typical organic compounds, and experiments related to the physical chemistry lecture course.

All students are required to purchase a Framework Molecular Models Kit, Prentice Hall, for use in laboratory courses and tutorials.

Class Requirements

Lectures:
three a week for three terms.
Tutorials and Problem Classes:
as arranged.
Practical:
one 3 or 3.5 hour period a week for three terms.

Examinations

Theory
Inorganic and Analytical: one 1½-hour written paper.
Organic: one 1½-hour written paper.
Physical: one 3-hour written paper.

Each of these three papers carry equal marks.

The performance of each student in the practical laboratory courses is assessed throughout the year and taken into account in determining the success of the student at the annual examinations.

Chemistry IIA

Prerequisites
Chemistry I; and Physics I or a first-year mathematics unit.

This course is intended for the students wishing to proceed to third year chemistry and for others enrolled in the School of Physical Sciences. The course is also suitable for students enrolled in the School of Biological Sciences.

Inorganic and Analytical Chemistry

Syllabus
Instrumental and separation techniques. Solution chemistry, electrochemistry and non-aqueous solvents. Chemistry of the p-block elements. Aspects of coordination chemistry.

Prescribed Reading
†Huheey, J.E. *Inorganic Chemistry — Principles of Structure and Reactivity,* Harper and Row 1972.
†Fritz, J.S. and Schenk, G.H. *Quantitative Analytical Chemistry,* 3rd edn, Allyn and Bacon 1975.

Recommended Reading

Ewing, G.W. *Instrumental Methods of Chemical Analysis,* 3rd edn, McGraw-Hill 1969.

*Cotton, F.A. and Wilkinson G. *Basic Inorganic Chemistry,* Wiley 1976.

Christian, G.D. *Analytical Chemistry,* Xerox 1971.

Organic Chemistry

Syllabus

Structure-reactivity relationships; stereochemistry and biological chemistry; reaction mechanisms S_N1 S_N2, S_NAr, S_EAr; electrophilic addition to alkenes and reactions of esters.

Prescribed Reading

†Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry,* 3rd edn, McGraw-Hill 1970, International Student edn.

†Sykes, P. *The Search for Organic Reaction Pathways,* Longman 1972.

Recommended Reading

Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* 4th edn, Longman 1975.

Dyer, J.R. *Applications of Absorption Spectroscopy of Organic Compounds,* Prentice-Hall 1965.

Physical Chemistry

Syllabus

Symmetry and bonding; spectroscopy; thermodynamics; reaction kinetics.

Prescribed Reading

†Daniels, F. and Alberty, R.A. *Physical Chemistry,* 4th edn, Wiley 1975.

†Aylward, G.H. and Findlay, T.J.V. *SI Chemical Data,* 2nd edn, Wiley 1974.

Recommended Reading

Salzberg, H.W., Morrow, J.I. and Cohen, S.R. *Laboratory Course in Physical Chemistry,* Academic Pr. 1966.

Laboratory Courses

Syllabus

The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments, based on the second-year lecture course.

Class Requirements

Lectures:
four a week for three terms.
Tutorials:
as arranged.
Practical:
a student taking Chemistry IIA will be required to work regularly in the laboratories for a minimum of four hours a week.

Examinations

Theory
Inorganic and Analytical: one 2-hour written paper.
Organic: written papers throughout the year as required.
Physical: written papers throughout the year as required.

The performance of each student in the practical laboratory course is assessed throughout the year and taken into account in determining the success of the student at the annual examination.

Chemistry IIB

This course is only available to students enrolled in the School of Agriculture.

Chemistry IIB is a terminal course.

Prerequisite
Chemistry I.

Inorganic and Analytical Chemistry

Syllabus
Analytical and radiochemistry. Aspects of coordination chemistry, structure and reactivity. Inorganic chemistry in biological systems. Solution chemistry. Aspects of the chemistry of the p-block elements.

Prescribed Reading
†Huheey, J.E. *Inorganic Chemistry – Principles of Structure and Reactivity,* Harper and Row 1972.
†Fritz, J.S. and Schenk, G.H. *Quantitative Analytical Chemistry,* 3rd edn, Allyn and Bacon 1975.

Recommended Reading
*Duncan, J.F. and Cook, G.B. *Isotopes in Chemistry,* Clarendon Pr. 1968.
*Cotton, F.A. and Wilkinson, G. *Basic Inorganic Chemistry,* Wiley 1976.
Christian, G.D. *Analytical Chemistry,* Xerox 1971.
Fifield, F.W. and Kealey, D. *Principles and Practice of Analytical Chemistry,* Intl. Textbook Co. Ltd. 1975.

Organic Chemistry

Syllabus
Structure-reactivity relationships; stereochemistry and biological chemistry; bio-organic mechanisms; natural product chemistry.

Prescribed Reading
†Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry,* 3rd edn, McGraw-Hill 1970; International Student edn.

Recommended Reading
Sykes, P. *The Search for Organic Reaction Pathways,* Longman 1972.
Dyer, J.R. *Applications of Absorption Spectroscopy of Organic Compounds,* Prentice-Hall 1965.

Physical Chemistry

Syllabus
Spectroscopy; reaction kinetics; bioenergetics.

Prescribed Reading
†Morris, J.G. *A Biologist's Physical Chemistry,* 2nd edn, Edward Arnold 1974.
†Whiffen, D.H. *Spectroscopy,* Longman 1966.
†Aylward, G.H. and Findlay, T.J.V. *SI Chemical Data,* 2nd edn, Wiley 1974.

Recommended Reading
Salzberg, H.W., Morrow, H.I. and Cohen, S.R. *Laboratory Course in Physical Chemistry,* Academic Pr. 1966.

Laboratory Courses

Syllabus
The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments based on the second-year lecture course (emphasis will be placed on the use of modern physical and analytical techniques and on applications of thermodynamics).

Class Requirements

Lectures:
a course of approximately 80 lectures.
Tutorials:
as arranged.
Practical:
a student taking Chemistry IIB will be required to work regularly in the laboratories for four hours a week.

Examinations

Theory
Inorganic and Analytical: one 1½-hour written paper.
Organic: written papers throughout the year as required.
Physical: written papers throughout the year as required.

The performance of each student in the practical laboratory course is assessed through the year and taken into account in determining the success of the student at the annual examinations.

Chemistry Courses for Physical Sciences II

The sections of the chemistry courses which may be taken in Physical Sciences II are: Inorganic Chemistry IIA, Organic Chemistry IIA and Physical Chemistry IIA. Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a value of one-third of a second-year unit.

Chemistry III

Two one-unit courses, Chemistry IIIA and Chemistry IIIB, will be offered.

Students taking only one unit of chemistry together with another subject will do Chemistry IIIB. Those students wishing to take two units of chemistry at the third-year level should do Chemistry IIIA and Chemistry IIIB.

Chemistry IIIB must be taken before Chemistry IIIA or concurrently with it.

Prerequisite
Chemistry IIA.

Inorganic and Analytical Chemistry

Syllabus
Chemistry IIIB students will be required to take the first four components listed below; students taking Chemistry IIIA and IIIB do all eight components:

(1) application of theories of coordination chemistry,
(2) organometallic chemistry and catalysis,
(3) advanced analytical chemistry (I) and statistical methods,
(4) biological and environmental chemistry,
(5) studies of the solid state,
(6) advanced analytical chemistry (II),
(7) selected topics from transition metal chemistry,
(8) general inorganic chemistry and inorganic techniques.

Prescribed Reading

†Huheey, J.E. *Inorganic Chemistry — Principles of Structure and Reactivity,* Harper and Row 1972.

†Fritz, J.S. and Schenk, G.H. *Quantitative Analytical Chemistry,* 3rd edn, Allyn and Bacon.

Recommended Reading

Jolly, W.L. *The Principles of Inorganic Chemistry,* McGraw-Hill 1976.

Tabe, M.L. *Reaction Mechanisms in Inorganic Chemistry,* Butterworth 1972.

Ewing, G.W. *Instrumental Methods of Chemical Analysis,* 3rd edn, McGraw-Hill 1969.

Angelici, R.J. *Synthesis and Techniques in Inorganic Chemistry,* Saunders 1969.

Christian, G.D. *Analytical Chemistry,* Xerox 1971.

Browning, D.R. *Spectroscopy,* McGraw-Hill 1969.

Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry,* 2nd edn, Reinhold 1969.

Cotton, F.A. and Wilkinson, G. *Advanced Inorganic Chemistry,* 3rd edn, Interscience 1972.

*Cotton, F.A. and Wilkinson, G. *Basic Inorganic Chemistry,* Wiley 1976.

Karger, B.L., Snyder, L.R. and Horvath, C. *An Introduction to Separation Science,* Wiley-Interscience 1973.

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

Skoog, D.A. and West, D.M. *Fundamentals of Analytical Chemistry,* 3rd edn, Holt, Rinehart and Winston 1976.

Organic Chemistry

Syllabus

Students taking Chemistry IIIA and IIIB will be required to take all eight components listed below; students taking Chemistry IIIB should select four options (consult with Professor Topsom if desired):

(1) theoretical organic chemistry and free radicals,
(2) orbital symmetry and photochemistry,
(3) spectroscopic methods (IR, UV, NMR),
(4) synthetic methods,
(5) organic reaction mechanisms – elimination and nucleophilic addition,
(6) polycyclic and heteroaromatic compounds,
(7) bio-organic chemistry,
(8) industrial organic chemistry.

Prescribed Reading

†Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry,* 3rd edn, McGraw-Hill 1970; International Student edn.

Recommended Reading

Woodward, R.B. and Huffman, R. *The Conservation of Orbital Symmetry,* Verlag Chemie 1970.
Young, D.W. *Heterocyclic Chemistry,* Longman 1975.
Dyer, J.R. *Applications of Absorption Spectroscopy of Organic Compounds,* Prentice-Hall 1965.
Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* 4th edn, Longman 1975.

Physical Chemistry

Syllabus

Students taking Chemistry IIIA should select four components which must include PC3.00 Computing; students taking Chemistry IIIB should select four components. Students taking Chemistry IIIA and IIIB together must select eight components including PC3.00 Computing. Students who choose to complete more than the required number of components will be assessed on their best results.

PC3.00 computing
PC3.01 quantum chemistry
PC3.02 molecular structure
PC3.03 spectroscopy
PC3.04 reaction kinetics
PC3.05 diffraction methods
PC3.06 mass spectrometry
PC3.07 statistical thermodynamics
PC3.08 polymer chemistry
PC3.09 surface chemistry
PC3.10 information theory

Prescribed Reading

†McCracken, D.D. *A Guide to Fortran IV Programming,* Wiley 1968.

Recommended Reading

Barrow, G.M. *Physical Chemistry,* 3rd edn, McGraw-Hill 1973.
Moore, W.J. *Physical Chemistry,* 4th edn, Prentice-Hall 1972.
Phillips, L.F. *Basic Quantum Chemistry,* Wiley 1965. (PC3.01).
Levine, I.N. *Quantum Chemistry,* vol. 1: *Quantum Mechanics and Molecular Electronics Structure,* Allyn and Bacon 1970. (PC3.01 and PC3.02)
Gray, H.B. *Electrons and Chemical Bonding,* Benjamin 1965. (PC3.02)

Davidson, G. *Introductory Group Theory for Chemists,* Elsevier 1971. (PC3.02)
Hollas, J.M. *Symmetry in Molecules,* Chapman and Hall 1972. (PC3.03)
Banwell, C.N. *Fundamentals of Molecular Spectroscopy,* McGraw-Hill 1966. (PC3.03)
Dixon, R.N. *Spectroscopy and Structure,* Methuen 1965. (PC3.03)
Laidler, K.J. *Chemical Kinetics,* 2nd edn, McGraw-Hill 1965. (PC3.04)
Laidler, K.J. *Theories of Chemical Reaction Rates,* McGraw-Hill 1969. (PC3.04)
Wormald, J. *Diffraction Methods,* Clarendon 1973. (PC3.05)
Sands, D.E. *Introduction to Crystallography,* Benjamin 1969. (PC3.05)
Johnstone, R.A.W. *Mass Spectrometry for Organic Chemists,* Cambridge 1972. (PC3.06)
Nash, L.K. *Elements of Statistical Thermodynamics,* 2nd edn, Addison-Wesley 1972. (PC3.07)
Seymour, R.B. *Introduction to Polymer Chemistry,* McGraw-Hill 1971. (PC3.08)
Shaw, D.J. *Introduction to Colloid and Surface Chemistry,* 2nd edn, Butterworth 1970. (PC3.09)
Brillouin, C. *Science and Information Theory,* 2nd edn, Academic Pr. 1962. (PC3.10)

Class Requirements

Lectures:
students taking two units of chemistry attend approximately eight lectures a week for three terms; students taking Chemistry IIIB attend an average of four lectures a week for 3 terms.
Tutorials/Seminars:
as arranged.
Practical:
students taking two units of chemistry will be required to work regularly in the laboratories for a minimum of 12 hours a week; students taking Chemistry IIIB are required to do six hours a week.

Examinations
The various sections of the Chemistry III course will be examined either during the year by projects or written papers, or at the end of the year by written papers.

Chemistry Courses for Physical Sciences III

Six segments for Chemistry III may be taken in Physical Sciences III: Inorganic Chemistry IIIA and IIIB, Organic Chemistry IIIA and IIIB, and Physical Chemistry IIIA and IIIB.

Each of the six segments may be taken singly or in combination provided that a IIIB segment is taken before the corresponding IIIA segment or concurrently with it. Each has a value of one third of a third-year unit and Physical Sciences III may be made up entirely of three segments of chemistry. The prerequisite for each course is the appropriate course from Chemistry II. Students taking Chemistry IIIB and Physical Sciences III cannot offer more than a total of two thirds of a third year unit from any one of the Departments of Chemistry.

Students should note that completion of sections of the Chemistry III course in Physical Sciences III does not qualify them for admission to the honours year of chemistry, but that Physical Chemistry III may qualify them for admission to Chemical Physics IV.

Chemistry IV: Honours Course

Prerequisite
Normally, an average grade of at least C in Chemistry IIIA and IIIB or in Chemistry IIIB and another suitable third-year subject is required.

Syllabus
The fourth-year course comprises more advanced study with lectures in all three branches: inorganic, organic, physical. All students are required to take nine units normally selected from the following list of courses, with the restriction that not less than one or more than five may be taken from those of any one group. Courses must be approved by the head of the department (inorganic and analytical, organic, physical) in which the student is undertaking the research project, and that marked with an asterisk (*) is obligatory for students undertaking the research project in inorganic chemistry. Students may, with the approval of the appropriate departmental heads, also take fourth-year courses offered by other departments such as biochemistry, geology, mathematics or physics.

On the experimental side, the value of training in research is recognised. There are no formal or set experiments, but each student is required at the beginning of the fourth-year course to opt for the branch of chemistry in which he wishes to undertake a research investigation. At the conclusion of the academic year, the student is required to write an original dissertation on the results of his work.

Inorganic and Analytical Chemistry

**Theorectical and the Determination of Molecular Structure* (one unit)*
Elements of symmetry and group theory. Absorption spectroscopy – atomic spectra, spectroscopic terms; advanced ligand field theory (effect of crystal fields on spectroscopic terms); Orgel diagrams, Tenable-Sugano diagrams, correlation diagrams, selection rules, band intensities, etc. Theory of magnetism. Magnetic behaviour of inorganic substances; magnetic properties of free ions; effect of crystal fields – orbital contributions; variation with temperature. Applications of molecular orbital theory in inorganic chemistry. Electron spin resonance and infrared spectroscopy of inorganic species.

Modern Techniques in Inorganic Analytical Chemistry (two units)
Solvent extraction, theory and application. Ion exchange, theory and application. Atomic absorption spectroscopy. Ion selective electrodes. Gas chromatography of metal chelates. Advanced electrochemical techniques. Radioanalytical Methods.

Chemistry and Society (one unit)
Of considerable interest today in chemistry courses, is the need for relevance and indication of the great impact that chemistry has on our modern society. In this course, emphasis is placed on the application of chemistry and chemical principles to technology, ecology, the environment and the problems of society.

Reaction Mechanisms (one unit)
Techniques and results of investigation of rapid reactions in solution. Rates of substitution of labile metal complexes; proton transfer reactions, enzyme kinetics. Mechanisms of redox reactions, inner and outer sphere reactions.

Stereochemistry (one unit)
Stereochemistry of coordination numbers 3 to 12 and absolute configuration of optically active metal complexes.

Bioinorganic Chemistry (one unit)
Background – homogeneous catalysis, amino acids, peptides, proteins and nucleotides; oxygen carriers – porphyrins, haemoglobin, myoglobin, hemerythrin and hemocyanin; Redox enzymes – iron-sulphur proteins, cytochromes b and c; nitrogen fixation – molybdoprotein photosynthesis – chlorophyll; coenzymes – vitamin B_{12}.

Modern Spectroscopic Techniques in Inorganic Chemistry (one unit)
(a) Mossbauer spectroscopy, (b) nuclear quadrupole resonance spectroscopy, (c) photoelectron spectroscopy and ESCA.

Chemical Education (one unit)
(May not be taken in conjunction with *Chemistry and Society.*) The secondary scene in chemistry. Quest for relevance – objectives in tertiary chemistry courses. Keller Plan – objective testing. Chemical education and the needs of industry. New developments in chemical education – the open university.

Sociological aspects of chemical education.

Organic Chemistry

It is hoped to offer the following courses and also some additional courses by visiting professors.

Details of courses are given in the departmental brochure, available on application.

Theoretical Organic Chemistry
Physical Organic Chemistry
Organic Synthesis
Heterocyclic Chemistry
Applications of NMR Spectroscopy
Biosynthesis
Organometallic Chemistry
Drug Architecture and Action

Physical Chemistry

PC4.01 Group Theory
Elements of group theory, groups, symmetry in molecules, matrix representation of groups, character table; applications of group theory in chemistry, molecular vibration, molecular orbitals, spectroscopic selection rules.

PC4.02 Photoelectron Spectroscopy
Theory of photoelectron spectroscopy; instrumental methods; high resolution spectra of atoms and small molecules; low resolution spectra of large molecules; chemical applications.

PC4.03 Reaction Rate Theory
Kinetic theory of gases; unimolecular gas reactions at low and moderate pressures; quasi-equilibrium theory of mass spectral fragmentation; bimolecular gas reactions and collision theory; classical trajectory calculations; empirical schemes for rate calculation; quantum mechanical effects.

PC4.04 Reaction Kinetics
Elementary radical reactions in the gas phase; theoretical estimation of rate parameters; kinetic isotope effects.

PC4.05 Crystallography
Diffraction theory as applied to X-ray and neutron diffraction by single crystals;

the phase problem; vector and Fourier methods; direct methods of structure determination; structure refinement.

PC4.06 Fundamental Mass Spectrometry
Energetics of ionization-dissociation processes; theory of mass spectra; special application of mass spectrometry in organic and inorganic chemistry.

PC4.07 Modern Mass Spectrometry
Chemical ionization; ion-molecule interactions; field ionization and field desorption; ion translational energy spectroscopy.

PC4.08 Chemical Information Theory
The mathematical basis of information theory; experiments considered as a communication situation; noise, redundancy, coding; pattern recognition; Fourier transforms; deconvolution; chemical structure codes.

PC4.09 Molecular Electronic Structure
The general mathematical procedures which form the basis of the calculation of molecular wavefunctions and properties; exact and appropriate solutions of the Schrodinger equation for single particle systems, atoms, small molecules and large molecules.

Class Requirements

Practical:
each student is required to work on a research problem under the supervision of a member of staff of the department in a field of his own selection (inorganic/analytical, organic, physical). At the end of the research investigation, each student is required to write and submit a dissertation.
Seminars and Colloquia:
a feature of the honours course will be student seminars. All students are also expected to attend the departmental research colloquia.

Examinations
To be advised. Physical Chemistry examinations will normally be held within a few weeks of completion of the relevant lecture courses.

Prescribed and Recommended Reading
Inorganic and Analytical Chemistry: at the beginning of each lecture course, prescribed and recommended reading is advised by the lecturer concerned.

Organic Chemistry: prescribed reading to be advised for enrolling students.

Physical Chemistry: prescribed reading to be advised for enrolling students.

Postgraduate Studies

The department offers research programs leading to the degrees of M Sc or Ph D. For admission to candidature of the degree of Master of Science, applicants should normally have, or expect to receive, the degree of Bachelor of Science with honours in chemistry from this or an accredited university. Students with high standing in general-degree courses, or who hold a diploma, certificate or qualification recognized and approved by the University as equivalent to a degree or a suitable alternative to a primary degree may be granted admission after attending a preliminary course and attaining a grade of at least 60 per cent in a preliminary examination.

Admission to candidature for the degree of Doctor of Philosophy may be granted to applicants who hold the degree of Master of Science from this or an accredited university, have high standing in the degree of Bachelor with honours or hold the pass degree of Bachelor and have passed a preliminary examination in this University for the degree of Master not less than one academic year after having qualified for the pass degree of Bachelor.

Both the M Sc and Ph D degrees require the submission of a thesis reporting the results of original research carried out under supervision. In certain cases, the department may be prepared to consider applications from candidates for admission to candidature for the degree of M Sc by examination. In certain circumstances, the degrees may be obtained by part-time research study.

Prospective candidates for the M Sc or Ph D degrees should write in the first instance to the professor of the department concerned for further information:
Professor R.J. Magee, head, department of inorganic and analytical chemistry;
Professor R.D. Topsom, head, department of organic chemistry;
Professor J.D. Morrison, head, department of physical chemistry.
Excellent facilities are available for research in a wide range of specialist fields:

Inorganic and Analytical Chemistry

Preparative, spectroscopic (UV-visible, IR, ESR, NMR) and structural studies on metal chelates of transitional metals. Sulphur ligand complexes: metal xanthates, dithiocarbamates, thiocarbamates and related compounds. Electrochemistry: polarographic, cyclicvoltammetric and chronopotentiometric studies on inorganic systems. Solvent extraction studies using neutral and acidic alkyl phosphoric acid esters and high molecular weight amines. Radiation and radio-chemistry. Inorganic analytical chemistry. Magnetochemistry of inorganic species. Gas chromatography of metal chelates. Ion selective electrode studies. Thermochemical and thermo-analytical studies on coordination and organometallic compounds: titration and capsule calorimetry. Inter and intra-molecular rearrangements of four and six-coordinate transition metal complexes in solution. Design of stereo-specific ligands in four and six-coordinate metal complexes. Studies of metal complexes having biological significance. Studies of oxidation-reduction and acid-base reactions of transition metal compounds in molten salts – nitrates, nitrites and acetates of alkali metals. Synthetic and catalytic chemistry of transition metal ions. Stabilization of unstable species by transition elements. Molecular nitrogen compounds. Kinetics and mechanism of inorganic reactions in solution, especially reactions involving labile metal ions.

Organic Chemistry

Physical organic chemistry including effects of steric and electronic factors on the reactivity and properties of aromatic and heteroaromatic compounds; use of C-13, F-19 and H-1 NMR to study molecular electronic distribution in organic and biological molecules; theoretical and spectroscopic studies on molecular structure of organic compounds; relation between biological and drug activity and molecular structure; infrared intensity studies; mechanisms of aromatic and heterocyclic reactions; effects of micellar catalysis on reaction mechanisms; synthesis, reactivity and stereochemistry of aromatic molecules; chemistry of naturally occurring compounds; synthesis and properties of polycyclic hydrocarbons; mechanisms of mass spectral fragmentations.

Physical Chemistry

X-ray crystal structure analysis of natural products and small organic molecules of biological interest. Experimental and theoretical determination of angular distributions and energies of photoelectrons from gaseous polyatomic molecules. Energy shifts of valence electrons in absorbed molecules. Theory of relaxation processes. Radiationless transitions, mass spectral fragmentation, unimolecular gas reactions. Self-consistent-field molecular orbital calculations on molecules containing heavy atoms.

The study of molecular energetics by examination of mass spectroscopic ionization-dissociation products. Lifetimes by molecular excited states formed by electron impact in gases.

The study of ionization and ionization fragmentation processes in molecules induced by monoenergetic electron and photon impact in a mass spectrometer. The photo-dissociation of ions induced by the radiation from a tunable laser, and the detection of the excited states of ionic species. The application of the computer-controlled gas chromatograph mass spectrometer to the analysis of complex mixtures such as food flavours and odours. The development and application of micro computers to the control of experiments. Computer-aided instruction on the development of programs for 1st year teaching of physical chemistry. Water pollution studies – the development of methods for the detection of subnanogram levels of organic pollutants in water. Field ionization, field desorption and field ionization kinetics. Picosecond kinetics and mechanisms of ion decomposition. Ion kinetic energy spectroscopy. Sequencing of biological polymers and structure determination of macromolecules through mass spectrometry. Kinetics and mechanism of gas phase radical reactions including recombination of radicals using intermittent illumination. Measurement of Arrhenius parameters and deuterium isotope effects for hydrogen abstraction reactions. Theoretical rate calculations by the BEBO and LEPS method.

COMMUNICATION ENGINEERING

The emergence of silicon integrated circuits and associated solid state devices in the past 10 to 15 years has made communication systems of hitherto unachievable performance into economic realities. Broadband satellite communication systems now link continents, provide information for people in remote areas, and maintain a continual monitoring of our environment. Centres of population are linked by means of cables, waveguides, and radio repeaters. Television and radio transmissions have been upgraded by the availability of colour and stereophonic options.

The pattern of technological development has been such that improvements in communication services have not imposed significant financial burdens on the community. For example, the dollar cost of international telephone calls is less now than ever before. In consequence, the community has an almost insatiable appetite for more comprehensive communication systems and so the demand for advanced communication equipment will continue to expand.

The primary objective of the two-year post-B Sc course in communication engineering is to train engineers for participation in the design and development of communication equipment and systems. The degree awarded will be that of Bachelor of Communication Engineering.

Outline of Course Structure

Lectures
Formal course-work is given wholly within the department of communication engineering and no options are available. Students are free to select options in the elective and practical activities discussed in following paragraphs. Academic staff from other departments provide some lectures within the prescribed course. The subjects available are as follows:

First Year	Second Year
Communication Components I	Communication Components II
Communication Circuits I	Communication Circuits II
Communication Systems I	Communication Systems II
Mathematics and Computation I	Communication Theory II

The lecture load will be about 12 hours a week, which is high by science degree standards but about normal for engineering degrees. Lectures will have a significant tutorial content.

Electives
Students are required to devote a total time of not less than five hours a week of term to an elective activity which is not related directly to communication engineering. Great freedom is available in the choice of electives from within the following framework of specific requirements:

(1) The student should be acquiring new knowledge or a new skill.
(2) Some quantitative indication of success or failure in the enterprise should be available.
(3) Independent evidence needs to be available to show that the enterprise consumes the required five hours a week of term total time.

Each case will be looked at on its own individual merits; the student is expected to take the initiative by submitting possible electives for consideration by the department.

Students will be expected to give a verbal report on their elective activities to the rest of the department of communication engineering.

Practical Work
Students are required to devote 10 hours a week of term to practical work. This comprises working in supervised project teams on a series of design tasks.

Prerequisites
The broad requirement is that applicants should hold the degree of Bachelor of Science (or equivalent) with Physics II and a Mathematics II subject. Applicants with a different scientific background may apply for admission to the course by special permission of the Board of Studies of the School of Physical Sciences.

Prescribed Reading
*Millman, J. and Halkias, C.C. *Integrated Electronics,* McGraw-Hill 1972.
*Carroll, J.E. *Physical Models for Semiconductor Devices,* Edward Arnold 1974.
Blakeslee, T.R. *Digital Design with Standard M.S.I. and L.S.I.,* Wiley 1975.
*Carlson, A.B. *Communication Systems: An Introduction to Signals and Noise in Electrical Communication,* McGraw-Hill 1975.

Preliminary Reading

*Pierce, J.R. *Electrons, Waves and Messages,* Hanover House 1956.
*Pierce, J.R. *Symbols, Signals and Noise,* Harper 1961.
Communication, Scientific American 1972.

Recommended Reading

Hamsher, D.H. *Communication System Engineering Handbook,* McGraw-Hill 1967.
I.T.T. *Reference Data for Radio Engineers,* Howard W. Sams 1973.
Students should obtain an updated book list from the departmental secretary.

Examinations

Overall results will be assessed from contributions of the following four components:

(1) About four 3-hour written papers will be set at the end of each year (30 per cent contribution).
(2) Test examinations will be given in specific topics at intervals during the year (25 per cent contribution).
(3) Practical project work will be assessed throughout the year (35 per cent contribution).
(4) Performance on electives will be assessed (10 per cent contribution).

Subject Details

Communication Components I

Carrier statistics and ballistics. Theory of amplifying, switching and storage devices. Introduction to sources of noise. Introduction to reliability. Magnetic, dielectric, piezoelectric materials. Theory of passive components and low-frequency transducers. Power sources. Review of electromagnetic theory. Antenna theory and practice.

Communication Circuits I

Elements of amplifier and pulse circuits. Power supplies. Conversion between analogue and digital quantities. Counting. Logic circuits. Tuned, regenerative, and associated analogue circuits. Analogue filter techniques.

Communication Systems I

Elements of signal theory. Principles of modulation and demodulation, coding and decoding. Multiplexing and demultiplexing. Line communication systems, including modulation methods, sources of errors, telephone multiplexing and switching, and an introduction to the design and management of line communication systems. Point-to-point radio communications for narrow-band signals including modulation methods, sources of noise, and an introduction to the design and management of radio systems.

Mathematics and Computation I (primarily revisional)

Elements of network technology – trees, tree branches, links etc. Formal solution of network equations. Laplace and Fourier transformation methods. Complex frequency, root locus techniques. Z transformation. Elements of stored program computation. Approaches to programming. Outline of various programming languages.

Communication Components II

Waveguides and transmission lines (including microstrip) as transmission media and for component realization. Solid state and electron beam devices as microwave

sources and amplifiers. Sources, sensors, transmission media, etc., for optical and infra-red communication.

Communication Circuits II
Complex digital building blocks including random-access memories, serial memories, read-only memories (programable and fixed-program types), programable logic arrays, microprocessors. Sampled-analogue circuit techniques using surface acoustic waves and charge-transfer devices. Imaging techniques. Microwave circuit techniques.

Communication Systems II
An introduction to computer science with special emphasis on the application of processors to communication systems. Point-to-point radio communications for wide-band signals including video techniques, the use of satellites, etc. Telemetry. Navigation systems. Communication systems which include passive reflectors — radar, sonar.

Communication Theory II
Measures of information. Channel capacity. Coding. Effect of noise on channel capacity. Matched and inverse filters. Detection theory.

Postgraduate Studies

Candidates with appropriate first-degree qualifications in communications and/or electronics will be accepted for the degrees of Master of Communication Engineering and Doctor of Philosophy. These will be research, rather than course work, activities.

The broad technical area available for postgraduate research work will involve the exploitation of advanced components in communication systems. Prospective candidates should approach the department for detailed information.

COMPUTER SCIENCE

Undergraduate Study

Computer Science III is a full third-year subject, taught principally by the departments of mathematics. The lecture course is divided into a number of components, each with a value expressed in terms of credit points, and students are allowed some freedom in their choice of components.

A student must select component totalling at least 18 credit points from Computer Science III, Applied Mathematics III, Mathematical Statistics III or Pure Mathematics III. At least 12 of the points must be within Computer Science III, and must include CS301A; CS302; one of CS301M and CS301C; and one of CS303 and CS304.

Students should note that if 18 credit points of Computer Science III components are studied, then a pass in this subject satisfies the knowledge pre-requisite for Associate membership of the Australian Computer Society.

Computer Science III components may also be taken as part of the subject Physical Sciences III.

Prerequisites:
A first-year mathematics subject.

Components

These are likely to be offered as follows:
Term 1: CS301A, CS302, CS305.
Term 2: CS301M (Weeks 1-8), CS301C (weeks 9,10), CS302, CS303, CS306, CS308.
Term 3: CS301C, CS305, CS307, CS309.

CS301 Practical Programming
Prerequisite:
A working knowledge of one programming language. This will involve one 2-hour practical session a week, which students will spend either studying languages, coding problems, or debugging programs.
CS301 ALGOL 60 two credit points
CS301M MACRO 10 and LSIP 1.5 two credit points
CS301C COBOL and SNOBOL4 two credit points.

CS302 Computer Design
Three credit points. This component is identical with AM309, and includes Physics 406. Boolean algebra and its application to the design of circuits. Computer logic and arithmetic. Memory systems. Structure and design of a simple processor. Design of generalized logic systems.

CS303 Compilers and Assemblers
Two credit points. Assemblers, loaders, compilers. Data structures. Syntax. Compiling techniques.

CS304 Operating Systems
Two credit points. Supervisors and operating systems. Multi-programming and time-sharing. Space allocation and scheduling. Data management and file handling.

CS305 Numerical Analysis
Two credit points.
Prerequisite:
AM205 and either AM201 or PM203. This component is identical with AM308. Calculation of eigenvalues and eigenvectors of matrices. Perturbation theory. Error analysis. Ordinary differential equations: solution of initial value problems.

CS306 Information Theory
Two credit points. This component is identical with Physical Chemistry 3.09. Statistical definition of information. Information content of various storage media. Transfer of information; channel capacity. Design of noise filters. Pattern recognition and information processing.

CS307 Control Theory
Two credit points.
Prerequisite:
ST201 is desirable but not essential. This component is identical with ST310 and AM318. Optimal prediction, interpolation and filtering in linear and nonlinear systems. System identification and state estimation. Signal detection. Adaptive control problems.

CS308 Error-Correcting Codes
One credit point. Information channels; binary symmetric channel; maximum

likelihood decoding. Block codes. Linear (group) codes; Hamming codes. Finite fields; burst-error-correcting codes.

CS309 Systems Analysis
Two credit points. Real time systems: the analysis and design of large commercial systems will be studied by means of several case studies. Computer selection. Social implications of computers.

Class Requirements
An 18 credit point course involves about six classes per week.

Examination Requirements
A maximum of about three 3-hour written papers. This maximum is not normally reached, as several components are assessed by class work through the year.

Graduate Diploma in Computer Science

This course involves one year of full-time study. Its objectives are (i) to increase the number of people in society with expertise at a high level in both computing and another discipline; (ii) to impart a wide knowledge and understanding of computers and their applications, and of the benefits and disadvantages associated with their use; (iii) to give extensive practical experience in using computers; (iv) in doing the above, to provide an appropriate base for a career with computer systems.

In particular, the course should cater for four categories of students: (the categories are not mutually exclusive).

(1) Those who were trained in another discipline, but have since discovered an interest in computing.
(2) Those who wish to re-train in an area offering greater job opportunities.
(3) Those whose present employment is involving them in increasing contact with computers and their use.
(4) Those who have just graduated and wish to continue full-time study.

Prerequisites:
The prerequisites are (i) a pass degree; (ii) a mathematics subject to first-year university level; and (iii) an elementary knowledge of one programming language; or equivalent qualifications.

A three to four week course in basic mathematics and FORTRAN programming may be mounted in February for students lacking qualifications (ii) and/or (iii).

Subjects
The course is covered in four subjects, namely Programming, Computer Organization, Information Systems and Applications, each of which comprises about one quarter of the main course. Some students will also study the Preliminary Course (see above).

Further information may be obtained from Dr D. Woodhouse, department of mathematics.

ECONOMICS
For details see Volume 1 of the Calendar containing disciplines offered by the School of Economics.

EDUCATION
For details see Volume 1 of the Calendar containing subjects offered by the School of Education.

GENETICS II

Genetics II is a general course based on the genetics component of Biology IA and IB. It is divided into five units of equal length: analytical genetics, introductory cytogenetics, population and quantitative genetics, biochemical genetics, and microbial genetics.

The course is both complete in itself and serves as an introduction to Genetics III. Disciplines which are recommended to be taken with Genetics II include biochemistry, botany, microbiology, zoology, chemistry, and mathematical statistics.

The course consists of three lectures and one practical class a week plus tutorials. Tutorial, practical and essay assignments contribute appreciably to the final grade for this subject. A formal examination may be held on the first two units of the course early in second term.

Prerequisites

(1) Biology IA or IB with a pass in their genetics component.
(2) Chemistry I, or a first-year physics or mathematics subject.

It may be necessary to impose a quota on enrolments in this subject.

Prescribed Reading

*Goodenough, U. and Levine, R.P. *Genetics,* Holt, Rinehart and Winston 1974.
*Parker, R.E. *Introductory Statistics for Biology,* Arnold 1973.
†*Smith-Keary, P.F. *Genetic Structure and Function,* Macmillan 1975.
Srb, A.M., Owen, R.D. and Edgar, R.S. *General Genetics,* 2nd edn, Freeman 1965.
*Stansfield, W.D. *Theory and Problems of Genetics,* Schaum's Outline Series, McGraw-Hill 1969.

Recommended Reading

Davis, B.D., Dulbecco, R., Ginsberg, H.S., Eisen, H.N. and Wood, W.B. *Microbiology,* 2nd edn, Harper and Row 1973.
* Falconer, D.S. *Introduction to Quantitative Genetics,* Oliver and Boyd 1960.
*Maynard Smith, J. *The Theory of Evolution,* 3rd edn, Penguin 1975.
*Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution,* Prentice Hall 1969.
Parsons, P.A. *The Genetic Analysis of Behaviour,* Methuen 1967.
*Sinnott, E.W., Dunn, L.C. and Dobzhansky, T. *Principles of Genetics,* McGraw-Hill 1958.
Stent, G. *Molecular Genetics,* Freeman 1971.
Strickberger, M.W. *Genetics,* 2nd edn, Macmillan 1976.
Sokal, R. and Rohlf, F.S. *Introduction to Biostatistics,* Freeman 1973.
*Swanson, C.P., Merz, T. and Young, W.J. *Cytogenetics,* Prentice-Hall 1967.
*Watson, J.D. *Molecular Biology of the Gene,* 3rd edn, Benjamin 1967.
*Whitehouse, H.K.L. *Towards an Understanding of the Mechanism of Heredity,* 3rd edn, Arnold 1973.
Wolfe, S. *Biology of the Cell,* Wadsworth 1972.

Genetics III

A course of 100 lectures and associated practical classes based on Genetics II. Four units of 50 lectures each are offered and each student will take two of these units. Units 1 and 2 will run concurrently in the first half of the year and units 3 and 4 in the second half of the year. These four units are outlined below. They are

independent of one another and the only prerequisite for any is Genetics II. Thus four combinations of units are available: 1 + 3; 1 + 4; 2 + 3; 2 + 4. Enrolling students should discuss their choices with the genetics department's adviser of studies.

Unit 1: Molecular and Microbial Genetics
An advanced course in the biochemical and molecular genetics of micro-organisms, including the following topics: mutation and mutagenesis; the genetic and molecular basis of suppression; DNA replication and repair; chromosome replication; DNA restriction and modification; gene exchange in prokaryotes; plasmids and plasmid genetics; mechanisms of drug resistance; phage transcription and development; molecular basis of transcription and its regulation; regulation of enzyme synthesis; mitochondrial and chloroplast genetics.

Prescribed Reading
This will be given during the course.

Recommended Reading
Davis, B.D., Dulbecco, R., Ginsberg, H.S., Eisen, H.N. and Wood, W.B. *Microbiology,* 2nd edn, Harper and Row 1973.
*Goodenough, U. and Levine, R.P. *Genetics,* Holt, Rinehart and Winston 1974.
Hayes, W. *The Genetics of Bacteria and Their Viruses,* 2nd edn, Blackwell 1968.
Stent, G. *Molecular Genetics,* Freeman 1971.
*Watson, J.D. *Molecular Biology of the Gene,* 3rd edn, Benjamin 1976.

Unit 2: Evolutionary Genetics
Topics considered include: the ecological genetics of single locus and quantitative variation in natural populations; the genetics of speciation; the evolution of genetic systems, chromosome number and form, and breeding systems; the principles and practices of artificial selection in different organisms; the evolutionary genetics of *Drosophila.*

Prescribed Reading
This will be given during the course.

Recommended Reading
*Briggs, D. and Walters, S.M. *Plant Variation and Evolution,* Weidenfeld and Nicolson 1969.
*Falconer, D.S. *Introduction to Quantitative Genetics,* Oliver and Boyd 1960.
*Lewontin, R.C. *The Genetic Basis of Evolutionary Change,* Columbia Univ. Pr. 1974.
Mather, K. *Genetical Structure of Populations,* Chapman and Hall 1973.
Mather, K. and Jinks, J.L. *Biometrical Genetics,* Chapman and Hall 1971.
*Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution,* Prentice Hall 1969.
Parsons, P.A. *Behavioural and Ecological Genetics: a Study in Drosophila,* Oxford 1973.
Wallace, B. *Topics in Population Genetics,* Norton 1968.
White, M.J.D. *Animal Cytology and Evolution,* 3rd edn, Cambridge Univ. Pr. 1973.

Unit 3: Human Variation and Behaviour Genetics
The first half of this unit is concerned with the evolution of man and the detection and maintenance of variation in present-day human populations. Particular attention will be paid to the study of different human groups, including the

Australian Aborigine, his origins, ecology and adaptation to the environment. The second half of the unit considers the genetical determinants of behaviour, how these are assessed and interpreted both in man and in other organisms (especially *Drosophila* and rodents) and how behaviour and evolution are interrelated.

Prescribed Reading

†*Mittler, P. *The Study of Twins,* Pelican 1971.

Further prescribed reading will be given during the course.

Recommended Reading

Cavalli-Sforza, L.L. and Bodmer, W.F. *The Genetics of Human Populations,* Freeman 1971.

Ehrman, L. and Parsons P.A. *The Genetics of Behaviour,* Sinauer 1976.

Morris, L.N. *Human Populations, Genetic Variation and Evolution*, International Textbook Co. 1972.

Hirsch, J. (ed.) *Behaviour-Genetic Analysis,* McGraw-Hill 1967.

McClearn, G.E. and DeFries, J.C. *Introduction to Behaviour Genetics,* Freeman 1973.

Stein, P.L. and Rowe, B.M. *Physical Anthropology,* McGraw-Hill 1974.

Van Abeelen, J.H.F. (ed.) *The Genetics of Behaviour,* North Holland 1974.

Unit 4: Gene Expression in Eukaryotes

This course will be concerned with the control of gene expression in the cells of higher organisms. Topics discussed will include: structure, replication and functional organization of the eukaryote chromosome, repeated DNA sequences, gain and loss of genes; transcription, hormone induction, chromosome inactivation; nucleo-cytoplasmic and cell-cell interactions; control of growth and gene expression in mammalian somatic cells; genetic analysis of differentiation.

Prescribed Reading

*Gurdon, J.D. *The Control of Gene Expression in Animal Development,* Clarendon 1974.

†*Lewin, B. *Gene Expression – 2 Eukaryotic Chromosomes,* Wiley 1975.

Recommended Reading

Cold Spring Harbour Symp. Quant. Biol. 38 1973.

Goodenough, U. and Levine, R.P. *Genetics,* Holt, Rinehart and Winston 1974.

*Markert, C.L. and Ursprung, H. *Developmental Genetics,* Prentice-Hall 1971.

Peacock, W.J. and Brock, R.D. *The Eukaryote Chromosome,* ANU Pr. 1975.

Honours

The course will consist of a specific research project, essays, discussion groups, prescribed reading and such other work as may be required by the chairman of the department.

For admission, students will normally be required to have obtained a C or better in Genetics III. Graduates from other universities will be admitted if they are of adequate standard. Students interested in doing Honours should consult the chairman of the department.

Postgraduate Studies

M Sc and Ph D (by research)

Prospective students consult the chairman of the department for further details.

Research is currently in progress in the following fields:

(1) Behavioural, ecological and physiological genetics of freshwater planarians, *Drosophila* and mice;
(2) Quantitative genetics of *Drosophila* and Man;
(3) Biochemical genetics of *Drosophila;*
(4) Ecogenetical studies of Australian plants and animals;
(5) Cytogenetical studies on Australian plants and animals;
(6) Radiobiology and radiation genetics in *Drosophila,* grasshoppers and bacteria;
(7) Physical anthropology of Australian Aborigines;
(8) Variation in Caucasoid and Aboriginal populations;
(9) Genetic regulation of enzyme synthesis in fungi;
(10) Bacterial genetics, detection of environmental mutagens, genetics and ecology of transmissible drug resistance, molecular mechanisms of mutagenesis;
(11) Somatic cell genetics.

GEOLOGY

Geology, Culture and the Environment

For twenty years Australia has had a succession of mineral 'booms'. The last one not only led to an extraordinary demand for trained geologists but it also showed that all Australians need to have an elementary knowledge of geology. The need for geology as a cultural subject is highlighted by the estimate that Australia's export earnings for 1980 from minerals and mineral products alone will exceed the record total export earnings for 1971-1972 ($1,289 million). Apart from economic aspects, geology provides an understanding of an environment in which we live.

Geology I is a suitable course fo those in other Schools (including Humanities) wishing to take some science subjects.

Majors in Geology

Geology draws heavily on other branches of science and hence the main aim of the La Trobe geology department is to provide courses that give a fundamental grounding in geology as well as allowing sufficient time in the undergraduate years for a student to obtain a sound grasp of science in general. Students intending to graduate in geology will normally take one of physics, chemistry or mathematics as well as geology to the third-year level.

Typical courses for those intending to take a geology major within the School of Physical Sciences for the B Sc (pass) and B Sc honours degrees are:

(1) First Year: Geology I, Chemistry I, Physics I, Mathematics IA.
Second Year: Geology II, Chemistry IIB, Physics II, (or Mathematics II or Physical Sciences II).
Third Year: Geology III, Chemistry IIIB.

(2) First Year: Geology I, Chemistry I, Mathematics IA, Mathematics IB.
Second Year: Geology II, Chemistry IIB, Mathematics II.
Third Year: Geology III, Chemistry IIIB (or Physical Science III).

(3) First Year: Geology I, Chemistry I, Mathematics IA, Physics IA.
Second Year: Geology II, Physics IIA, Mathematics II.
Third Year: Geology III, Physics III (or Physical Science III).

Postgraduate Geology

Applications will be considered from suitably qualified students wishing to take

postgraduate studies leading to the M Sc and Ph D degrees.

Preference will be given to those applicants wishing to do postgraduate work in the various fields of geochemistry.

Geology I

Prerequisites
There are no prerequisites for Geology I. No previous knowledge of geology is assumed. Those going on in geology will normally be expected to have obtained a pass in either chemistry or physics at the higher school certificate or an approved equivalent.

Syllabus
Fossils and the concept of geological time. Evolution of the planets. Gross composition of earth shells (crust, mantle, core). Crystals and minerals with special reference to silicate mineralogy. Volcanoes and igneous rocks. Sedimentary rocks and stratigraphy. Metamorphic rocks. Economic aspects of geology – ore deposits, ground water, coal etc. Structural geology (faults, folds etc.) and geological maps. Plate theory of the earth: continental drift and earth history in the plate theory context.

Class Requirements
Three lectures and one 3-hour practical period a week for three terms. Attendance at three field classes held on the following days are an essential part of the course: these field classes are given in place of tutorial classes and are compulsory.

Saturday (whole day), 2 April 1977, Batesford limestone quarry.
Saturday (morning), 9 July 1977, South Morang
Sunday (whole day), 10 September 1977, Anakie and Werribee Gorge.

Prescribed Reading
†*Dana, E.S. (Hurlbut) *Manual of Mineralogy,* Wiley (latest edn).

Recommended Reading
The following are referred to in lectures from time to time:
*Clark, S.P. *Structure of the Earth,* Prentice-Hall 1971.
*Eicher, D.L. *Geologic Time,* Prentice-Hall 1976.
*Ernst, W.G. *Earth Materials,* Prentice-Hall 1969.
Gilluly, J., Waters, A.C. and Woodford, A.O. *Principles of Geology,* 4th edn, Freeman 1975.
*Hills, E.S. *Elements of Structural Geology,* 2nd edn, Interscience 1972.
*Phillips, F.C. *The Use of Stereographic Projection in Structural Geology,* Arnold 1954. (Reference book for practical classes)
*Skinner, B.J. *Earth Resources,* Prentice-Hall 1976.
*Wedepohl, K.H. *Geochemistry,* Holt, Rinehart and Winston 1971.
*Wilson, J.T. (ed.) *Continents Adrift: Readings from Scientific American,* Freeman 1971.

Examinations
One 3-hour written paper to be arranged by administration: practical examination (2 hours) to be arranged by the department.

Students may accept their average through-the-year mark as their final examination mark. This means that a candidate who has passed all examinations and practical

tests through the year need not sit for the final examination unless that candidate wishes to try to improve his or her mark.

In all assessments 60 per cent is given for theory, 30 per cent for practical examination and 10 per cent for practical assignments conducted during the year.

Geology II

Prerequisites
Geology I is normally required.

Syllabus
Polarized light; isotropic and anisotropic media, the polarizing microscope; refractive index measurement by immersion and mineral identification; interference of light; the uniaxial and biaxial indicatrix; orthoscopic and conoscopic examination of uniaxial and biaxial crystals; interference figures. Practical applications of optical crystallography, particularly in mineralogy.

Vertical illumination in the study of opaque materials. Mineragraphy including hardness, reflectivity, colour anisotropism and chemical etch tests.

A study of those rocks formed from silicate melts, with particular reference to their chemical composition and mineral phase relationships. Classification of rocks according to their occurrence in space and time; phase equilibrium of silicate melts; optical study of igneous rocks in thin section; ore deposits of igneous origin.

A study of those rocks that have crystallized or recrystallized in the solid state. Discussions of the thermal, baric and chemical parameters affecting metamorphic rocks; graphical analysis; subsolidus phase relations. Metamorphism in space and time. The geological sources of heat and pressure. The optical study of suites of metamorphic rocks, well studied regional, contact and metasomatic environments. The spatial investigation of particular metamorphic terrains in southern Australia. Ore deposits associated with metamorphic rocks.

Analysis of ancient sedimentary environments approached by applying knowledge of modern environments of deposition to those preserved in the geological record. The genesis and characteristics of clastic sediments, evaporites, and carbonate sediments. Evolution of crust, oceans and atmosphere and the consequences of this evolution on environments of deposition through time.

Structural relationships and deformation of igneous, sedimentary and metamorphic rocks.

Prescribed Reading

†Bloss, D.F. *An Introduction to the Methods of Optical Crystallography,* Holt, Rinehart and Winston 1961.

*†Dear, W.A., Howie, R.A. and Zussman, J. *An Introduction to Rock Forming Minerals,* Longman 1966.

†Heinrich, E.W. *Microscopic Identification of Minerals,* McGraw-Hill 1965.

Joplin, G.A. *A Petrography of Australian Metamorphic Rocks,* Angus and Robertson 1967.

*†Pettijohn, S.J. *Sedimentary Rocks,* Harper International 1975.

Turner, F.J. *Metamorphic Petrology,* McGraw-Hill 1968.

Uytenbogaardt, W. and Burke, E.M. *Tables for Microscopic Identification of Ore Minerals,* Elsevier 1971.

Recommended Reading

Blatt, H., Middleton, G. and Murray, R. *Origin of Sedimentary Rocks,* Prentice-Hall 1972.
Cameron, E.N. *Ore Microscopy,* Wiley 1966.
Folk, R.L. *Petrology of Sedimentary Rocks,* Humphills 1965.
Garrels, R.M. and MacKenzie, R.T. *Evolution of Sedimentary Rocks,* Norton 1971.
Joplin, G.A. *A Petrography of Australian Igneous Rocks,* Angus and Robertson 1971
Sobolev, V.S. (ed.) *The Facies of Metamorphism,* trans D.A. Brown, ANU Pr. 1972.

Class Requirements

Three lectures and two 2-hour practical sessions per week for the whole year. The following compulsory field work is also required.
A field mapping camp, 4 to 12 March.
(2) Igneous petrology. Weekend excursion to western districts volcanoes, 26 and 27 March.
(3) Metamorphic petrology. Weekend excursion to Tallangata, 11 and 12 June.
(4) Sedimentology. Weekend excursion 23 and 24 July.

Examinations

Theory and practical examinations will be held at the end of each term. Students gaining passes in these examinations need not sit for the final examinations (two 3-hour written papers and practical) unless they wish to improve their grades.

Geology III

Field Geology (four credit points)

Syllabus

(1) Camp. Nine-day field-mapping camp before term starts, 4 to 12 March 1977 (10 per cent).
(2) Mapping Project. Each student will be allocated a field mapping problem by a staff supervisor at the beginning of the academic year. The report is to be submitted in final form on 3 August 1977.

The project will include at least five days of field work to be undertaken during the Easter and May vacation, the preparation of a base map, photogrametry and preparation of thin sections (90 per cent).

Assessment

There will be no formal examination. Marks will be alloted for the field maps, and reports produced.

Thermodynamics and Phase Equilibria for Geologists (three credit points)

Basic thermodynamics and its relation to mineral systems; activity, fugacity and chemical potential and their bearing on phase diagrams; uniary, binary and ternary systems involving complete, partial and no solid solution between phases; activity – activity, activity – fugacity, temperature – activity, etc.; diagrams and their use in understanding sedimentary, metamorphic and igneous rocks.

Prescribed Reading

†Broeker, W.S. and Oversby, V.M. *Chemical Equilibria in the Earth,* McGraw-Hill.
†Garrels, R.M. and Christ, C.L. *Solution, Minerals and Equilibria,* Harper and Row 1965.

†Wall, T.F. *Chemical Thermodynamics,* Freeman 1964.

Igneous Petrogenesis (two credit points)
Theoretical igneous petrology with particular reference to experimentation. Simple condensed systems and origin of magmas in the crust. High pressure studies and origin of magmas in the mantle.

Prescribed Reading
†Bowen, N.L. *Evolution of the Igneous Rocks,* Dover 1956.

Recommended Reading
Carmichael, I.S.E., Turner, F.J. and Verhoogen, J. *Igneous Petrology,* McGraw-Hill 1974.
Wyllie, P.J. *The Dynamic Earth: Textbook in Geosciences,* (especially Chapter 8) Wiley 1971.

Isotope Geology (three credit points)

Syllabus
Use of isotopes as tracers of geological processes and as sources of quantitative information via geochronology and geothermometry. Theory of the Rb-Sr, U-Pb and K-Ar decay schemes. Critical interpretation of geochronological results detailed for the Rb-Sr system. Isotopic evolution of Sr and Pb throughout earth history; meteorites and the age of the earth; chemical differentiation within the earth; isotopic parameters of modern igneous rocks, their bearing on petrogenetic theory and relevance to global tectonics. Stable isotope systems; oxygen as a tracer and geothermometer.

Recommended Reading
Barnes, H.L. *Geochemistry of Hydrothermal Ore Deposits,* Holt, Rinehart and Winston 1967.
Dalrymple, G.B. and Lanphere, M.A. *Potassium Argon Dating,* Freeman.
Doe, B.R. *Lead Isotopes,* Springer-Verlag 1970.
Faure, G. and Powell, J.L. *Strontium Isotope Geology,* Springer-Verlag 1972.
Hamilton, E.I. and Farquhar, R.M. *Radiometric Dating for Geologists,* Interscience 1968.
Hoefs, J. *Stable Isotope Geochemistry,* Springer-Verlag.

Solution Geochemistry and Ore Deposits (three credit points)

Syllabus
The interactions of solids and solutions in hydrothermal and metamorphic environments. Solubilities of minerals. Review of experimental work affecting the formation of carbonates, silicates and sulphides. The study of well-documented samples of fluid inclusions of minerals and drilled hydrothermal systems, hydrothermal steam generation, solution geochemistry and the formation of vein and skarn type mineral deposits.

Prescribed Reading
†Barnes, H.L. (ed.) *Geochemistry of Hydrothermal Ore Deposits,* Holt, Rinehart and Winston 1967.

Recommended Reading
Garrels, R.M. and Christ, C.L. *Solution, Minerals and Equilibria,* Harper and Row 1965.

Garrels, R.M. and Christ, C.L. *Evolution of Sedimentary Rocks,* Norton 1971.
Helgeson, H.C. 'Solution, Chemistry and Metamorphism', in *Researches in Geochemistry,* vol. 2, ed. P.H. Abelson, Wiley 1967.
Krauskopf, K.B. *Introduction to Geochemistry,* McGraw-Hill 1967.

Advanced Structural Analysis of Rocks (one credit point)

Syllabus
Structures in metamorphic rocks. Multiple deformation structures. Advanced exercises involving stereographic and equal area projections.

Recommended Reading
Ramsay, J.F. *Folding and Fracturing of Rocks,* McGraw-Hill 1967.

Sedimentary Rocks and Ore Deposits (two credit points)

Syllabus
Chemical sediments. Sedimentary processes in time –historical geology. Sedimentary ore deposits – iron ores. Sedimentary Cu-U ores.

Recommended Reading
Garrels, R.M. and Christ, C.L. *Evolution of Sedimentary Rocks,* Norton 1971.

Class Requirements for Geology III
A total of 10 formal teaching hours a week including at least six hours of practical work.

Examinations
Field geology will be examined by assessment of field mapping and reports. Other courses will either be examined during the year or at the end of the year. For all courses except field geology allocation of marks will be: laboratory assignments, 40 per cent; formal examinations, 60 per cent.

Geology IV (honours)

Prerequisites
Entrance to honours courses is by invitation only. Those students who have qualified for an ordinary B Sc with a C pass or better in Geology III, will automatically receive an invitation as soon as the 1976 results are available. Normally qualifications for ordinary B Sc must be obtained within four years of initial enrolment.

Students gaining D passes may be invited to enrol but this will be at the discretion of the department: complete undergraduate records will be taken into account before invitations to D pass students are made.

Coursework (10 credit points)
Courses in igneous and metamorphic petrology, geochemistry, sedimentology and ore genesis will be available in 1977. Other courses will be added in future years. Some students will be required to take courses in other departments. Course work including seminars will be assigned by a course supervisor nominated by the chairman.

Project (10 credit points)
A research project on some simple geological problem is required. The project will be selected by a course supervisor in conjunction with the student.

Examinations
Three 3-hour written papers or equivalent term papers will be given to examine course work. The project will be examined by a thesis and orally.

LOGIC

Logic is one of the oldest academic disciplines and in its modern developments one of the most wide-ranging. Generally speaking, it divides into two inter-related areas, formal and informal logic. Formal or symbolic logic studies by the use of special symbol systems the fundamental notions of argument and inference: When is an argument valid? What is a proof? How can the strength of an argument be measured? Techniques for finding and proving the laws of logic are developed, much as mathematicians have their techniques for finding and proving laws about, say, numbers.

Informal or philosophical logic concerns questions such as: What are the fallacies and tricks of argument that mislead us? What is truth? What is it for a word to have meaning? Are the laws of mathematics invented or discovered? How do we know that 2 + 2 = 4? What is infinity?

The department of philosophy offers about 15 units and half-units in logic and closely related areas, and the subject may be taken right up to Ph D level. For details of the units, see entries under *Philosophy* in Volume 1 of the *Calendar*. Logic I, detailed below, may be taken as the initial unit of a major or minor in the philosophy department in the School of Humanities. Students who wish to do a major or honours in logic should enrol in the School of Humanities for a major in philosophy. They should consult Dr Tom Richards, philosophy department, before enrolling, to discuss suitable course plans.

Science students already enrolled in the School of Physical Sciences or the School of Biological Sciences should note that it is possible for them to take a major sequence in philosophy, specialising in logic. To do this, they should take Logic I in their first year, philosophy subjects oriented towards logic totalling one unit in their second year, and totalling one and a half units in their third year.

Students of a mathematical bent who wish to concentrate on mathematics and logic for a first degree should note that all mathematics courses are available to students enrolled in the School of Humanities, and in that School they may even major in mathematics. Such students should take Pure Mathematics IA in their first year in addition to Logic I. However Logic I assumes no mathematical knowledge or aptitude, and progress in the discipline of logic does not assume that students need to take any Mathematics units. In the department of pure mathematics there are a number of components in second and third year in logic and closely related areas of mathematics which Logic students who take Pure Mathematics IA would be advised to take. For details see under *Mathematics* in Volume 1 or 2 of the *Calendar.*

Logic I:

Elementary Symbolic and Philosophical Logic (full unit, new course)
Dr Tom Richards

Note:
This unit is the same as Philosophy IL.
Philosophical Logic:
The nature of reasoning and some fallacies in reasoning. What are definitions,

meaning, truth, necessity? The nature of valid, probable, statistical and analogical reasoning. What are explanations, theories, hypotheses?

Symbolic Logic:
an introduction to the traditional Aristotelian logic, leading to an elementary study of the major branches of modern symbolic logic: truth-functions, quantifiers and modalities. Skill in handling these logics will be stressed rather than the theory behind them.

Prerequisite
None.

Class Requirements
Two lectures and one tutorial throughout the year.

Assessment
Half by regular exercises, and half by one 3-hour examination paper.
Note:
Logic I may not be taken with any other Philosophy I unit, and is acceptable as a prerequisite for any Philosophy subject that has a Philosophy I unit as a prerequisite. However a student who has passed in Logic I may not take Philosophy IIFA/IIIFA, but may take any subject that has Philosophy IIFA/IIIFA as a prerequisite.

Prescribed Reading
Richards, Tom *The Language of Reason,* Available from the philosophy department.
Barker, Stephen F. *The Elements of Logic,* 2nd edn, McGraw-Hill 1974.
Quine, W.V.O. *Elementary Logic,* 3rd edn, Harper 1965.

Recommended Reading
Copi, I.M. *Introduction to Logic,* 4th edn, Macmillan, New York 1972.
Quine, W.V. *Methods of Logic,* 3rd edn, Holt, Rinehart and Winston 1972.
Hughes, G.E. and Londey, D.G. *The Elements of Formal Logic,* Methuen 1965.
Jeffrey, R.C. *Formal Logic, its Scope and Limits,* McGraw-Hill 1967.

MAN AND ENVIRONMENT I
(one unit) (Formerly Biology I ME)

The course aims to enhance the student's interest in the living world through an introduction to biological concepts and processes. The course will be presented in such a way as to allow the student to extrapolate the principles of biology towards an appreciation of the interaction between man and his environment.

Syllabus
The conditions of life; living organization and activities; mechanisms of heredity and evolution; organic diversity and its consequences; control, maintenance and perpetuation of living activities; biological approaches to behaviour; human origins and the evolution of human societies; interaction between human societies and the environment; biology and society.

Prerequisites
None. Not a credited subject for the B Sc degree in the School of Biological Sciences.

Class Requirements
Three 1-hour lectures a week for three terms and an average of two hours a week allotted for demonstrations, tutorials, field trips, films etc.

Prescribed Reading
†Goldsby, A. *Cells and Energy,* Macmillan 1967.
†Genetics notes by the department of genetics.
†Postgate, J. *Microbes and Man,* Penguin 1969.
†*Biology Today,* CRM Books 1972.

Recommended Reading
Frye, B.E. *Hormonal Control in Vertebrates,* Macmillan 1967.
Stein, P.L. and Roe, B.M. *Physical Anthropology,* McGraw-Hill 1974.

Assessment
Throughout the year in the form of assignments, essays and tests.

Man and Environment II

(one unit, new course)
This course may be taken as one full unit consisting of two complementary halves or alternatively, the separate parts may be regarded as individual half units. The course is designed to expand on topics introduced in Biology I ME and to introduce new topics.

Part one : Human Ecology (half unit, first half year)
This part of the course aims to place man's development as a biological and cultural being in an evolutionary perspective. Emphasis will be given to man's ecological relationship with the environment in all phases of his development up to the present day. The implications of these principles will be discussed in considering man's present and future problems. Wherever possible Australian or Oceanic examples will be utilised.

Syllabus
Quarternary events; evidence for the evolution of man; human population variability in space and through time; protohominid ecology; ecology of hunter-gatherers — the case of the Australian aborigines; racial variation; impact of human cultures — hunter-gatherer, agricultural and urban-industrial; demographic aspects; limiting factors on population growth; urbanisation and its effects; the future ecology of man, world models.

Prerequisites
Man and Environment I (formerly Biology I ME) or Prehistory I. Not a credited subject for the B Sc degree in the School of Biological Sciences. For Human Ecology, taken as a half unit, Prehistory I is an alternative prerequisite to Biology I ME.

Class Requirements
Three 1-hour lectures a week for the first half of the year plus 1-2 hours a week for tutorials, demonstrations and films.

Assessment
By written assignments and an examination.

Recommended Reading
Weiner, J.S. *Man's Natural History,* Weidenfeld & Nicolson 1971.
Miller, G.T. *Living in the Environment : concepts, problems and alternatives,* Wadsworth 1975.

Note:
The offering of this course in 1977 is dependent upon financial considerations.

Part Two: Biological Functions (half unit, second half year)
The theme will be : Basic functions of man and of biological systems which contribute to man's needs. Emphasis will be placed on aspects of physiology such as hormones, defence mechanisms and the nervous system and on the supply of nutrients to man. Topics to be discussed include : defects in basic functions such as occur in infectious disease, cancer and obesity; biological aspects relating to food supply including fertilizers, pesticides and microbial ecology; the impact of human activities on the environment, including methods developed to control biological systems.

Prerequisites
Man and Environment I (formerly Biology I ME). Not a credited subject for the B Sc degree in the School of Biological Sciences.

Class Requirements
Three 1-hour lectures a week for the second half of the year plus one tutorial per week.

Assessment
By written assignments and an examination.

Reading
To be advised.

MATHEMATICS

A student who wishes to major in mathematics may do so in any one of the Schools of Humanities, Physical Sciences and Social Sciences. Which School such a student will seek to enter depends partly upon his preferences so far as supporting subjects (and possible alternative majors) are concerned. He will also need to take into account the way the different regulations of these Schools affect the choice and flexibility of the mathematics subjects he may wish to choose.

Subjects available in 1977 are Mathematics IA, IB and IC, Pure Mathematics II, III and IV, Applied Mathematics II, III and IV, Mathematical Statistics II, III and IV, and Computer Science III. There are three mathematics departments, namely pure mathematics, applied mathematics and mathematical statistics. In most cases a subject is taught by one of these departments: however, the first-year mathematics courses are the joint responsibility of all three departments.

The main feature of mathematics subjects at second and third-year level is the choice allowed each student in planning his syllabus. This is achieved by dividing each subject into a number of components; students are allowed some degree of freedom in choosing their components, in taking some third-year components in second year and vice-versa, and in taking some of their components outside the subject in which they are formally enrolled. The choice is necessarily restricted in second year, where many components are compulsory, but a wider choice will be available in third year.

Students wishing to obtain an honours degree in mathematics must complete one of the subjects Pure Mathematics IV, Applied Mathematics IV or Mathematical Statistics IV. In addition to course work and examinations in these subjects each student must write a thesis, the assessment of which will count towards his final result.

First-Year Subjects

Mathematics IA, IB and IC

The subjects offered in first year are Mathematics IA, Mathematics IB and Mathematics IC. Students intending to continue with mathematics beyond first year are strongly advised to take both Mathematics IA and Mathematics IB althought students who perform sufficiently well in Mathematics IA (a grade of C or better) are permitted to take any second-year Mathematics subject. Mathematics IC is a terminal course and is incompatible with both Mathematics IA and Mathematics IB.

Students enrolled in the School of Physical Sciences wishing to take only one unit of mathematics must take Mathematics IA. All students taking Mathematics IB are required to take Mathematics IA concurrently unless they already have credit for it.

All students who have passed two of the higher school certificate examinations in pure mathematics, applied mathematics or general mathematics or who have passed one of them with a grade of C or higher should enrol in Mathematics IA rather than Mathematics IC.

Mathematics IA

is an introductory course dealing with topics selected from calculus, linear algebra, computer programming, probability theory, modern algebra and mathematical models. About 110 lectures; plus one examples class a week.

Mathematics IB

is a mathematics course extending the ideas developed in Mathematics IA. The syllabus includes topics selected from mathematical methods, numerical analysis, mechanics, modern analysis, and statistics. About 100 lectures; plus one examples class a week.

Mathematics IC

is designed principally to meet the requirements of students who have done little or no mathematics at the higher school certificate level. It may also be useful to those seeking a general introductory course in mathematics.

Students should note that Physical Sciences IT is available to students not in the School of Physical Sciences.

Prerequisites for First-Year Mathematics

While there are no formal prerequisites for any first-year mathematics subject, students are warned that the levels of the subjects are determined under the assumptions that:

(1) Each student enrolled in Mathematics IA has passed the higher school certificate examination in pure mathematics or applied mathematics or general mathematics.

(2) Each student enrolled in Mathematics IB has passed the higher school certificate examination in pure mathematics or applied mathematics or general mathematics and is either currently enrolled in or has already gained credit for Mathematics IA.

(3) Each student enrolled in Mathematics IC has a good knowledge of calculus at fifth-form level.

Students in the School of Physical Sciences must take Mathematics IA rather than Mathematics IC, with Mathematics IB as an optional additional unit.

Prerequisites for Second and Third-year Mathematics

Students intending to take second-year mathematics subjects should note that:

(a) It is strongly recommended that students take both Mathematics IA and IB.

(b) Students who attain a satisfactory level of competence (a grade C or better) in Mathematics IA alone are permitted to take any second-year mathematics subjects, however it should be noted that there are several components (AM207, AM208, AM212, AM310, AM311, AM312, AM313) for which Mathematics IB is normally a prerequisite.

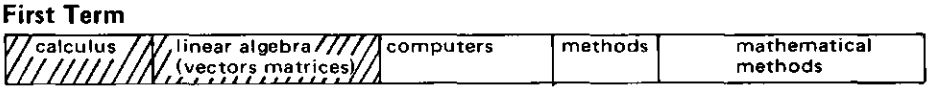
Students intending to take Mathematical Statistics III are strongly advised to take Pure Mathematics II.

Students intending to do Applied Mathematics III must pass Applied Mathematics II and are recommended to take an additional second-year mathematics subject.

In special cases prerequisites may be waived by the chairman of the appropriate mathematics department.

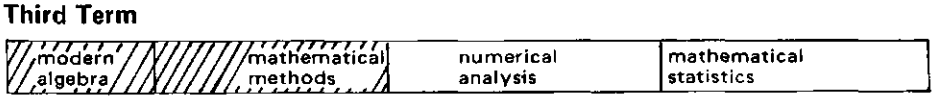
Syllabus for Mathematics IA and IB

First Term



Second Term

Third Term



Mathematics IA: shaded. Mathematics IB: the remainder.

Each block represents two lectures per week for one term with the exception of the blocks labelled computers, methods, computer programming and modern analysis, each of which represents only one lecture per week for one term. In addition there is one examples class per week in each of Mathematics IA and Mathematics IB. Mathematics IB students are required also to attend a weekly mathematics workshop in Terms 1 and 2.

Syllabus for Mathematics IC

Topics in finite mathematics, linear algebra, elementary programming, and some systematic calculus. Ideas and methods of mathematical statistics and the interpretation and design of experimental techniques.

There are five class hours a week in Mathematics IC, including tutorials, and regular written exercises.

Examination Requirements and Assessment in Each Subject

Six hours of written examinations. The results of written exercises and tests given during the year will be taken into account in the final assessment.

Second-Year Subjects

Pure Mathematics II, Applied Mathematics II, Mathematical Statistics II and General Mathematics II.

Four mathematics subjects are offered at the second-year level, namely Pure Mathematics II, Applied Mathematics II, Mathematical Statistics II and General Mathematics II. The lecture course in each subject is divided up into a number of components, each with a value expressed in terms of credit points, and students are allowed some measure of freedom in their choice of components. Subject to the restrictions listed below, a student taking one mathematics subject must select components totalling at least 12 credit points, for two mathematics subjects at least 24 credit points, and for three mathematics subjects at least 36 credit points. The restrictions applying in the various subjects are:

Pure Mathematics II:
at least eight credit points must be from pure mathematics. Components PM201, PM203 and PM204 are compulsory. PM202 is a prerequisite for Pure Mathematics III.

Applied Mathematics II:
at least eight credit points must be from applied mathematics. Components AM201, AM202 and AM203 are compulsory.

Mathematical Statistics II:
at least eight credit points must be from mathematical statistics. Components ST201 and ST202 are compulsory.

General Mathematics II:
any mixture of components from the subjects Pure Mathematics II, Applied Mathematics II and Mathematical Statistics II may be chosen. However for a student enrolled in General Mathematics II the *total* number of second year credit points taken from any one of these three subjects must not exceed 18, e.g. a student taking Pure Mathematics II and General Mathematics II can take no more than eighteen credit points of pure mathematics components as a part of second year.

To exemplify the above rules, the following is an allowable selection of components for a student enrolled in Pure Mathematics II: PM201, PM202, PM203, PM204, AM202, ST206. Although there is considerable flexibility in the choice of components for General Mathematics II students are warned to check third year prerequisites before selecting components in this subject.

Advisers will be available within the mathematics departments at times to be arranged to assist students in making their choice of components in all mathematics subjects.

Students should note that the subject Physical Sciences II is available. A student enrolled in this subject may select various second-year mathematics components to make up some of his workload in this subject.

Prerequisites
These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the chairman of the appropriate mathematics department. Students will be notified with their examination results if they have not reached this standard.

Subject	Prerequisite
Applied Mathematics II	Mathematics IA
Pure Mathematics II	Mathematics IA
Mathematical Statistics II	Mathematics IA

In addition to the subject prerequisites given above, note that each of the components listed below has its own prerequisites. These may be either a first-year subject or another second-year component or both.

In special cases prerequisites may be waived by the chairman of the appropriate mathematics department.

Students intending to take third-year subjects should consult the prerequisites for those subjects and the relevant components before choosing their second-year components. Students intending to take Applied Mathematics III must pass Applied Mathematics II and are recommended to take additional mathematics. Students intending to take Mathematical Statistics III must pass Mathematical Statistics II and are strongly recommended to take Pure Mathematics II also. Students intending to take Computer Science III are recommended to take AM205 and AM206.

Students intending to take final honours in mathematics should consult the prerequisites for fourth-year components. Students intending to take final honours in mathematical statistics must pass the subject Pure Mathematics II. Students intending to take final honours in applied mathematics must pass at least two second year mathematics subjects.

Preliminary and Prescribed Reading
A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1976. Further prescribed reading in various components may be given during the lectures in these components.

Components Available
The components available for 1977 are listed below. Each department may cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is taught by the department of pure mathematics (PM), applied mathematics (AM), or mathematical statistics (ST).

Mathematics

Pure Mathematics

The components in pure mathematics are normally offered as follows:
Term 1: PM201, PM204 and PM210
Term 2: PM202, PM203 and PM209
Term 3: PM206, PM205 and PM211

PM201 Analysis A
Two credit points.

Prerequisite
Mathematics IA.

Vector spaces; norms and innter products, open and closed balls. Continuity of maps between normed vector spaces. Basic theorems about continuous functions. Applications.

PM202 Analysis B
Two credit points.

Prerequisite
PM201.

Idea of a limit in a normed vector space. Limits of sequences. Cauchy sequences and completeness. Infinite series, bounds. Basic limit theorems. Applications.

PM203 Linear Algebra
Two credit points.

Prerequisite
Mathematics IA.

Finite dimensional vector spaces. Bases. Linear transformations and matrices. Dual spaces.

PM204 Abstract Algebra
Two credit points.

Prerequisite
Mathematics IA.

Introduction to groups and rings. Homomorphisms, normal subgroups and ideals, homomorphism theorems. Integral domains and fields. Congruences.

PM205 Analysis C
Two credit points.

Prerequisite
PM202.

Global properties of continuous functions: boundedness and extreme values. Compactness and the Heine-Borel theorem.

PM206 Abstract Algebra
Two credit points.

Prerequisite
PM204.

A continuation of PM204. Commutative rings, leading to field extensions. Ruler and compass constructions. Finite abelian groups.

PM209 Linear Programming
Two credit points.

Prerequisite
Mathematics IA.

Linear inequalities. Simplex computations. Duality. Matrix games. Transportation problems.

PM210 Geometry
Two credit points.

Prerequisite
Mathematics IA.

Ordered geometry in the plane from an axiomatic basis. Sylvester's theorem. Significance of the Euclidean 'parallelism' axiom.

PM211 Geometric Topology
Two credit points.

Prerequisite
Mathematics IA.

An introduction to the geometric aspects of topology. While basic topological notions will be introduced the emphasis will be on 'concrete' objects such as Mobius strips and Klein bottles. The description of Platonic solids and classification of surfaces will occupy most of the course but other topics such as map colouring problems and the Konigsburg bridge problem will also be mentioned.

Applied Mathematics

The components in applied mathematics are likely to be offered as follows:
Term 1: AM201, AM202, AM206, AM207*
Term 2: AM203*, AM204, AM205, AM207*, AM208*, AM211*
Term 3: AM203*, AM208*, AM210, AM211*, AM212.
Courses with an asterisk involve one lecture per week; the others involve two lectures per week.

AM201 Mathematical Methods A
Two credit points.

Prerequisite
Mathematics IA.

Functions of several variables, including partial differentiation, maxima and minima, Taylor's theorem. Matrix techniques. Applications. Summation of series. Difference equations.

AM202 Ordinary Differential Equations
Two credit points.

Prerequisite
Mathematics IA.

Standard methods of integration of differential equations. Theory, methods of solution and applications of linear differential equations. Special functions.

AM203 Partial Differential Equations
Two credit points.

Prerequisite
Mathematics IA.

First and second-order linear partial differential equations. Classification and methods of solution. Fourier series. Equations arising in physical, biological and social sciences.

AM204 Mathematical Methods B
Two credit points.

Prerequisite:
AM201.

Further calculus. Line integrals. Multiple integrals. Vectors and vector spaces. Grad, div and curl. Integral theorems. Differential geometry of curves. Applications.

AM205 Numerical Analysis
Two credit points.

Prerequisite
Mathematics IA.

A knowledge of elementary FORTRAN programming is desirable but not essential. Solution of systems of linear algebraic equations. Differences, difference equations, operator theory, interpolation. Review, theory and extension of numerical methods covered in Mathematics IB. Elementary error analysis.

AM206 Computer Organisation and Programming
Two credit points.

Prerequisite
Mathematics IA.

Brief review of FORTRAN programming. Programming techniques. Programming languages. Operating systems. File structure. Sorting algorithms.

AM207 Mechanics A
Two credit points.

Mathematics IB is desirable. Mechanics of particles. Motion of planets and satellites.

AM208 Mechanics B
Two credit points.

Mathematics IB is desirable. Statics and dynamics of rigid bodies. Lagrange's equations.

AM209 Linear Programming
Two credit points.

Prerequisite
Mathematics IA.

This component is identical with PM209.

AM210 Inequalities and Optimization
Two credit points.

Prerequisite
Mathematics IA.or Mathematics IB.

Convex sets and functions. Applications of inequalities. Introduction to optimal problems.

**AM211 Mathematical Ideas in Biology*
Two credit points.

Prerequisite
Mathematics IA.

Mathematical models for regulatory mechanisms in individual animals, animal populations and complete ecosystems.

AM212 Wave Propagation.
Not available in 1977.
Two credit points.

Prerequisites
Mathematics IB, AM203.

Vibrating systems. Wave propagation in continuous media. Reflection and transmission. Dispersion. Wave packets.

*to be given only if the demand is sufficient.

Mathematical Statistics

The components in mathematical statistics are normally offered as follows:
Term 1: ST201 and ST207
Term 2: ST202 and ST204 or ST206
Term 3: ST203, ST205 and ST208
Students are encouraged to take at least one of ST203 and ST205.

ST201 Introduction to Probability Theory
Three credit points.

Prerequisite
Mathematics IA.

Sample spaces, events, probability, random-variables, distribution and density functions. Moments, expectations, special distributions, central limit theorem.

ST202 Introduction to Statistics
Three credit points.

Prerequisite
ST201.

Application of the results of ST201 to problems of statistical inference; in particular chi-squared, t and F-tests, point and interval estimation, analysis of variance.

ST203 Regression Analysis
Two credit points.

Prerequisite
ST202.

The relationship between two or three random variables. The relationship between a random variable and one or more independent variates.

ST204 Non-parametric Methods
Two credit points.
Even numbered years only.

Prerequisite
ST202.

Order statistics. Sign test, Wilcoxon's test. Non-parametric confidence intervals.

ST205 Design and Analysis of Experiments
Two credit points.

Prerequisite
ST202.

The design of experiments and associated analyses of variance.

ST206 Sampling Theory
Two credit points.
Odd numbered years only.

Prerequisite
Mathematics IA.

Methods of analysis of sample surveys; simple random sampling; cluster sampling; stratified sampling.

ST207 Mathematical Ecology and Genetics
Two credit points.

Prerequisite
Mathematics IA.

Application of mathematical models to describe population dynamics and Mendelian inheritance.

ST208 Operations Research
Two credit points.

Prerequisite
Mathematics IA.

Optimization problems including linear programming and allocation problems. Critical path analysis. Applications to game theory.

Third-Year Subjects

Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III, Computer Science III, General Mathematics III.

Five mathematics subjects are offered at the third-year level, namely Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III, Computer Science III and General Mathematics III. A component system similar to that operating for second-year subjects will apply. Subject to the restrictions listed below, a student taking one mathematics subject must select mathematics components totalling at least 18 credit points and for two subjects at least 36. It may be possible in certain cases for students to select a small number of second-year components instead of third-year components.

Advisers will be available within the mathematics departments at times to be arranged to assist students in making their choice of components.

A student must take at least 12 credit points from the subject in which he is enrolled, and may make up the remainder from any third-year mathematics subject. However in the case of General Mathematics III any combination of third-year mathematics components is permitted provided *total* third-year enrolment in components from any one branch of mathematics (i.e. PM, AM, MS or CS) does not exceed 27. The components ST301 and ST302 are compulsory for Mathematical Statistics III. Compulsory components for Computer Science III are CS301A; CS302; one of CS301M and CS301C; one of CS303 and CS304. Students in the School of Physical Sciences enrolled in Philosophy III may not take PM316 as part of any third year mathematics subject. Students intending to take Mathematical Statistics IV are strongly advised to take PM302.

Students are also reminded that the subject Physical Sciences III is available. Students taking this subject may take some or all of their components from any of those listed below for which they have the required prerequisites.

Prerequisites
These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the chairman of the appropriate mathematics department. Students will be notified with their examination results if they have not reached this standard.

Subject	Prerequisites
Applied Mathematics III	Applied Mathematics II.
Pure Mathematics III	Pure Mathematics II, including PM202.
Mathematical Statistics III	Mathematical Statistics II.
Computer Science III	A first year mathematics subject (other than Mathematics IF).

In addition, students who intend to take Mathematical Statistics III are strongly advised to take Pure Mathematics II. Students intending to take Applied Mathematics III are strongly advised to take at least two second-year mathematics subjects.

Note:
Each component has its own prerequisite; in special cases prerequisites may be waived by the chairman of the appropriate mathematics department.
Students intending to take final honours in mathematics should consult the various prerequisites for final honours components before choosing their third-year components. Students intending to take final honours in mathematical statistics must have passed Pure Mathematics II and those intending to take final honours in applied mathematics must have passed at least one of Pure Mathematics II and Mathematical Statistics II.

Preliminary and Prescribed Reading
A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1976. Further prescribed reading in various components may be given during the lectures in these components.

Components Available
The components for 1977 are listed below. Each department reserves the right to cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is pure mathematics (PM), applied mathematics (AM), mathematical statistics (ST), or computer science (CS).

Pure Mathematics
The components in pure mathematics are likely to be offered as follows:
Term 1: PM303, PM305, PM307, PM310, PM314
Term 2: PM301, PM302, PM304, PM306, PM313, PM319
Term 3: PM308, PM309, PM311, PM312, PM315, PM318

PM301 Introduction to Hilbert and Banach Spaces.
Two credit points.

Prerequisites
PM203, PM305.

Infinite dimensional vector spaces. Zorn's lemma. Normed spaces. Bounded linear maps. Dual spaces. Hahn-Banach theorem. Orthogonality and orthonormal bases in Hilbert spaces. Linear operators.

PM302 Measure Theory
Three credit points.

Prerequisite
PM305.

General measures on σ-algebras. Measurable functions. Integration and convergence theorems.

PM303 Advanced Calculus A
Two credit points.

Prerequisites
PM202, PM203.

Differentiation of maps between normed vector spaces, modern version of the chain rule. Computational recipes in finite dimensional spaces: Componentwise differentiation, partial derivatives, Jacobian matrices.

PM304 Advanced Calculus B
Two credit points.

Prerequisites
PM303, PM305.

Norms on various function spaces. The mean value theorem. Inverse and implicit function theorems via the contraction map theorem.

PM305 Topology A
Two credit points.

Prerequisite
PM205.

Metric spaces, limits, continuity, and completeness. Topological spaces. A discussion of general topological properties.

PM306 Group Theory
Two credit points.

Prerequisite
PM204.

Topics in group theory selected from the following: the Jordan-Holder theorem, the structure of finite groups via the Sylow theorems, finitely generated abelian groups, free groups and representations of groups.

PM307 Rings and Modules
Three credit points.

Prerequisites
PM203 and either PM206 or a grade of at least a middle C in PM204.

Principal ideal domains. Elementary theory of modules, leading to finitely generated modules over a principal ideal domain. Application to abelian groups and linear transformations.

PM308 Topology B
Three credit points.

Prerequisite
PM305.

Separation properties and existence of continuous functions. Connectedness. Baire's theorem. Products and Tychonoff's theorem.

PM309 Field Theory
Two credit points.

Prerequisite
PM204.

Field extensions: algebraic, transcendental, simple multiple. Normal extensions and splitting fields. Algebraic closure. Galois theory: Galois groups, solution of polynomial equations by radicals.

PM310 Lattice Theory
Two credit points.

Prerequisite
PM207.

This course is a continuation of PM207. The topics covered include complete lattices, congruences on lattices, free lattices and the proof of the M_5-N_5 theorem, Boolean algebras.

PM311 Category Theory
Two credit points.

Prerequisites
PM204, PM305.

An introduction to some of the important concepts of category theory, including categories, functors, natural transformations, duality, universal arrow, limits, colimits and adjoints.

PM312 Logic
Two credit points.

Prerequisite
PM204 (PM207 or PM310 would be of assistance.)

An algebraic approach to logic leading to the completeness theorem of propositional calculus. The completeness theorem for predicate calculus is discussed.

PM313 Number Theory
Two credit points.

Congruences. Fermat's theorem. Quadratic residues. Representation of integers as sums of squares.

PM314 Functions of a Complex Variable
Three credit points.

Prerequisite
PM201.

This component is incompatible with AM301. Differentiation and integration of functions of a complex variable. Cauchy's integral theorem. Laurent series. Residues. Introduction to contour integration.

PM315 Game Theory
Two credit points.

Prerequisite
PM209.

Two person non-zero sum games, n-person games, infinite games.

PM316 Philosophy of Mathematics
Six credit points.

Prerequisite
PM211, or Mathematics IA and Philosophy IIFA/IIIFA, or Philosophy IIFB/IIIFB.

This component is identical with Philosophy IIPM/IIIPM. A study of some problems in the foundations of mathematics including a study of the logicist, formalist and intuitionist views, and an examination of some mathematical concepts such as number, set and infinity.

PM318 Linear System Theory
Two credit points.

This course covers elementary topics in linear theory. The syllabus includes control theory, optimization and system structure and description with relation to linear systems. Special emphasis will be placed on the control system properties of controllability, observability, stability and realizations.

PM319 History of Mathematics
Two credit points.

Some landmarks in the development of mathematical ideas from early times to the nineteenth century. (This component is the same as AM319 and ST319).

Applied Mathematics

The components in applied mathematics are likely to be offered as follows:
Term 1: AM301, AM304, AM308, AM309, AM311, AM312, AM314
Term 2: AM307, AM309*, AM310, AM313*, AM315, AM319
Term 3: AM302, AM303, AM306, AM313*
Courses with an asterisk involve one lecture per week; the others involve two lectures per week.

AM301 Functions of a Complex Variable
Three credit points.

Prerequisite
AM201 or PM201.

This component is identical with PM314. Differentiation and integration of functions of a complex variable. Cauchy's integral theorem. Introduction to contour integration.

AM302 Calculus of Variations
Two credit points.

Prerequisites
AM201, AM202.

Euler-Lagrange equations. Optimality principles. Applications.

AM303 Integral Transforms and Boundary Value Problems
Two credit points.

Prerequisites
AM201, AM202, AM203.

Laplace and Fourier transforms. Applications. Green's functions. Sturm-Liouville theory. Comparison and oscillation theorems. Asymptotic expansions.

AM304 Hilbert Space and Distributions
Two credit points.

Prerequisites
either AM201 or both PM201 and PM203. All three are desirable.

Linear operators in Hilbert space. Applications to differential equations. Schwartz distributions and generalized functions.

**AM305 Linear Systems Theory*
Two credit points.

Prerequisites
AM201, AM202.

This component is identical with PM318.

**AM306 Applied Group Theory*
Two credit points.

Applications. Symmetries. Representations.

**AM307 Special Functions*
Two credit points.

Prerequisites
AM201, AM203, AM301.

Topics selected from various special functions including: Orthogonal polynomials. Bessel functions. Applications to partial differential equations. Lie groups.

AM308 Numerical Analysis
Two credit points.

Prerequisites
AM205 and either AM201 or PM203. This component is identical with CS305.
Calculation of eigenvalues and eigenvectors of matrices. Perturbation theory. Error analysis. Ordinary differential equations. Solution of initial value problems.

AM309 Computer Design
Three credit points.

This component is identical with CS302.

AM310 Relativity
Two credit points.

Prerequisites
AM307, AM208.

Lorentz transformation. Minkowski space-time, particle kinematics and ray optics, mechanics of a particle, Maxwell field.

**AM311 Dynamics*
Two credit points.

Prerequisites
AM202, AM207, AM208.

Three dimensional dynamics. Rotating coordinate systems. Lagrange's and Hamilton's equations.

AM312 Quantum Mechanics A
Two credit points.

Prerequisites
AM201, AM202, AM203, AM204, AM207, AM208.

Hamiltonian systems. Vector spaces and linear operators, wave functions and wave equations. One-dimensional problems.

AM313 Quantum Mechanics B
Two credit points.

Prerequisites
as for AM312.

Atoms and molecules. Angular momentum. Many body problems.

AM314 Potential Theory
Two credit points.

Prerequisites
AM201, AM202, AM203.

Gravitation. Solution of Laplace's equation. Conformal mapping techniques with applications. Electrostatics and magnetostatics.

AM315 Fluid Mechanics
Two credit points.

Prerequisite
AM314.

Irrotational fluid mechanics.

AM316 Applied Graph Theory.
Not available in 1977.
Two credit points.

AM317 Elasticity.
Not available in 1977.
Two credit points.

Prerequisites
AM201, AM202, AM203, PM201, PM202, PM203, AM314.

Stress and strain quadrics. Compatibility conditions. Navier equation in isotropic media. Boundary value problems.

AM318 Control Theory
Two credit points.

Prerequisite
Mathematics IA; ST201.

This component is identical with CS307 and ST310.

AM319 History of Mathematics
Two credit points. (This component is the same as PM319 and ST319).

Some landmarks in the development of mathematical ideas from early times to the nineteenth century.

*to be given only if the demand is sufficient.

Mathematical Statistics

The components in mathematical statistics are normally offered as follows:
Term 1: ST301 and ST307
Term 2: ST302, ST308 and ST304 or ST306
Term 3: ST303, ST310 and ST305 or ST309.

ST301 Techniques of Mathematical Statistics
Four credit points.

Prerequisite
ST201.

Conditional probability distributions. Transformations in one and many dimensions, derivation and sampling distributions for t and F; characteristic functions, the central limit theorem and the weak law of large numbers; the multivariate normal distribution, order statistics.

ST302 Inference
Four credit points.

Prerequisites
ST301, ST202.

Estimation, concepts of sufficiency and maximum likelihood, confidence intervals, hypothesis testing, the Neyman-Pearson lemma, asymptotic methods. Bayes' methods.

ST303 Linear Hypothesis Theory
Four credit points.

Prerequisite
ST302.

A general treatment, using the multivariate normal distribution, of problem of estimation and hypothesis testing with linear models.

ST304 Non-parametric Inference A
Two credit points.
Even numbered years only.

Prerequisites
ST202.

Ranks, order statistics; sign test, Wilcoxon test, Kolmogorov-Smirnov test; non-parametric estimation.

ST305 Non-parametric Inference B
Two credit points.
Even numbered years only.

Prerequisite
ST304.

Tests of symmetry and independence; Kendall and Spearman rank correlation.

ST306 Sampling Theory
Two credit points.
Odd numbered years only. This component is identical to ST206.

Prerequisite
Mathematics IA.

Methods of analysis of sample surveys; simple random sampling; cluster sampling, stratified sampling.

ST307 Stochastic Processes
Three credit points.

Prerequisite
ST201.

Probability models for dependent random variables. Markov chains in discrete time: transience, recurrence, limit behaviour, stationary distributions. Markov chains in continuous time.

ST308 Operations Research
Three credit points.

Prerequisite
ST307.

Queueing theory, inventory and replacement theory, reliability theory, introduction to dynamic programming.

ST309 Sequential Analysis
Two credit points.
Odd numbered years only.

Prerequisite
ST302.

Wald's lemma and identity; the sequential probability ratio test and its properties. Other sequential procedures. Sequential estimation and fixed-width confidence intervals.

ST310 Control Theory
Two credit points.

Prerequisite
ST201.

Discrete time linear stochastic systems. Determination of optimum control. Prediction and filtering.

ST319 History of Mathematics
Two credit points.

Some landmarks in the development of mathematical ideas from early times to the nineteenth century. (This course is the same as AM319 and PM319).

Honours Courses

Pure Mathematics IV, Applied Mathematics IV and Mathematical Statistics IV

A student wishing to enrol in one of the subjects Pure Mathematics IV, Applied Mathematics IV or Mathematical Statistics IV should apply to the chairman of the appropriate department as soon as the results of his third-year examinations are known. As in earlier years, a component system is available to offer choice. A student's choice is not restricted to the components in the subject in which he is enrolled; subject to the detailed requirements below he may select one or more components from the other two subjects. Each student must take components totalling at least 30 points.

In addition to his work in these components, each student will be required to write a thesis which will be taken into account in his final assessment. The thesis will be supervised by a staff member in the appropriate mathematics department.

Prerequisite

Pure Mathematics IV

The prerequisite is Pure Mathematics III, normally with grade B or better. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from pure mathematics. The thesis counts as approximately one-third of the year's work.

Applied Mathematics IV

The subject prerequisite is a pass in Applied Mathematics III with a grade B or better. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from applied mathematics. The thesis counts as approximately one quarter of the year's work.

Mathematical Statistics IV

The prerequisite is Mathematical Statistics III, with a grade B or better. Students are also strongly advised to have taken Pure Mathematics III, especially the component PM302. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from mathematical statistics. The components from Mathematical Statistics IV must include ST401, and at least one of ST402 and ST403. The thesis counts as approximately one-third of the year's work.

The components offered in fourth year are listed below: each department reserves the right to withdraw any component in which insufficient interest is shown, or to offer further components.

In special cases prerequisites may be waived by the chairman of the appropriate department.

PM401 Universal Algebra
Six credit points.

Prerequisites
PM306 or PM310.

Desirable background: PM306, PM310, PM311. The fundamentals of universal algebra are developed; the role of lattice theory is stressed throughout. Topics covered: subalgebras, homomorphisms, congruences, polynomials, algebraic lattices, subdirect and direct decomposition, adjoint functors, free algebras, equational classes, ultra products and congruence distributive equational classes.

PM402 Differentiable Manifolds
Six credit points.

Prerequisite
PM304.

Charts and atlases, submanifolds and the implicit function theorem, differentiability of maps between manifolds, tangent spaces.

PM403 Noncommutative Rings
Six credit points.

Prerequisite
PM307.

Selected topics from the theory of noncommutative rings.

PM404 Nonlinear Programming
Six credit points.

Prerequisite
PM205 (after 1977 PM209).

Quadratic and convex programming. Duality. Integer and fractional programming. Programming in complex space.

PM405 Topology and Normed Spaces
Six credit points.

Prerequisite
PM308.

Recommended: PM301, PM302. A continuation of topics from PM308 merging into a study of normed linear spaces.

PM406 Topics in Algebraic Topology
Six credit points.

Prerequisite
PM311.

Homotopy theory. The fundamental group functor. Limit and colimits in the categories of groups and topological spaces, covering spaces and lifting theorems.

PM407 Topological Groups
Six credit points.

Prerequisites*
PM306, PM308, PM314†.

The course is a pleasant mixture of topology and algebra with an application to diophantine approximation (Number Theory.) The material covered includes a general introduction to topological group theory, a proof of the Pontryagin duality theorem, and a complete description of the structure of locally compact abelian groups.

*Students who do not have the prerequisites will be allowed into the course only if they (a) see Dr S. Morris by the end of 1976, and
(b) agree to do extra reading in the summer vacation.

†After 1977.

PM408 Banach Algebras
Six credit points.

Prerequisite
PM301.

Desirable background: PM302, PM308. Banach Algebras. Algebras of operators on Hilbert spaces. Gelfand representation of commutative C*-algebras. Representations of C*-algebras on Hilbert spaces.

PM409 Mathematical Logic
Six credit points.

Prerequisite
Philosophy IIFA/IIIFA or Philosophy IIFB/IIIFB.

This component is identical with the mathematical logic component in Philosophy IV. Students are referred to the Philosophy entry in Volume 1 of the *Calendar*. Any student queries should be directed to Dr T. Richards of the Philosophy department.

PM410 Linear System Theory
Six credit points.

Prerequisite
PM318.

Continuation of topics from PM318.

PM411 Group Theory
Six credit points.

Prerequisite
PM306.

An introduction to the theory of finite and infinite permutation groups. Emphasis will be placed on orbit configurations of permutation groups, and, in the latter part of the course, on recent developments in infinite permutation groups.

PM412 Nonlinear Analysis
Six credit points.

Prerequisite
PM304, PM305.

Implicit function theorems including the method of accelerated convergence. Applications to differential equations.

AM401 Mathematical Methods
Eight credit points.

Prerequisites
at least three of AM301, AM302, AM303, AM304, AM305, AM307.

Topics selected from: Generalized functions. Asymptotic methods. Integral transforms. Integral equations. Applications of functional analysis. Special functions. Lie groups. Complex variables. Lebesgue integral.

AM402 Continuum Mechanics
Eight credit points.

Prerequisite
AM315.

Topics selected from: Motion of Newtonian fluid. Boundary layer theory. Lubrication theory. Hydrodynamic stability. Compressible flow. Elasticity.

AM403 General Relativity
Eight credit points.

Prerequisite
AM310.

Tensor analysis, Riemannian geometry, Einstein's theory of gravitation, Schwarzchild's solution, gravitational red-shift, perihelion advance, bending of light ray, cosmological models.

AM404 Analytical Mechanics
Eight credit points.

Prerequisite
AM311.

Hamiltonian systems, global dynamics, transformation theory, stability and perturbation theory.

AM405 Quantum Mechanics
Eight credit points.

Prerequisites
AM301, AM310, AM312, AM313.

Angular momentum, electron spin, scattering theory, perturbation and variational methods, Dirac equation.

AM406 Maxwell Fields
Eight credit points.

Prerequisites
AM310, AM315.

Maxwell's equations; polarization; wave guides; radiation from point charge.

AM407 Language and Compiler Theory
Eight credit points.

Prerequisites
CS301A, CS303.

Languages and decidability. Algebraic preliminaries (e.g. properties of strings, semi-groups of regular languages), finite automata, Turing machines, predicate calculus, recursive function theory, automata and languages (precedence grammar, productions, etc.), parsing techniques, programme verification. Compiler techniques. A case-study of compiler-writing using the theory of languages and parsing techniques discussed in the first part.

AM408 Numerical Analysis
Eight credit points.

Prerequisite
AM308 is desirable.

Intending students without this prerequisite should consult Dr Andrew. Topics from: Ordinary differential equations. Boundary value problems. Function approximations and interpolation. Numerical Quadrature. Iterative methods. Error analysis. Partial differential equations. Projection methods. Application of elementary functional analysis to numerical analysis.

AM409 Statistical Mechanics
Eight credit points.

Prerequisites
AM312, AM313.

Maxwell-Boltzmann statistics, ideal gas, quantum statistics, thermodynamics, specific heats.

AM410 Artificial Intelligence
Eight credit points.

Prerequisites
CS301A, CS303 are most desirable.

Intending students without these prerequisites should consult Dr Woodhouse. Studies in artificial intelligence: LOGO, discourse systems, algebraic manipulation, computer graphics, heuristic problem solving, frames, compilation and analysis.

AM411 Applied Quantum Mechanics
Eight credit points.

Prerequisites
AM312, AM313.

Angular momentum. Time dependent perturbation. Radiation. E.S.R. Many electron atoms. Thomas Fermi and W.K.B. approximation.

ST401 Probability Theory
Four credit points.

Prerequisite
PM302 is very strongly recommended.

Probability theory as part of measure theory. Standard theorems and techniques.

ST402 Inference A
Four credit points.

Decision theory, estimation theory.

ST403 Inference B
Four credit points.

Advanced theory of hypothesis testing.

ST404 Non-parametric Inference A
Two credit points.
Even numbered years only.

This component is identical with ST304.

ST405 Non-parametric Inference B
Two credit points.
Even numbered years only.

This component is identical with ST305.

ST406 Probability and Stochastic Processes
Four credit points.

Prerequisite
ST401.

Topics from: Martingales, Brownian motion, diffusion processes.

ST407 Applied Stochastic Processes
Four credit points.

Prerequisite
ST307.

Topics from: Markov processes, branching processes, renewal theory.

ST408 Operations Research
Four credit points.

Prerequisite
ST308.

Dynamic programming, Markov decision processes, advanced topics in optimization and inventory control.

ST409 Sequential Analysis
Two credit points.
Odd numbered years only.

This component is identical with ST309.

ST410 Multivariate Analysis
Four credit points.

Prerequisite
ST303.

Estimation of hypothesis testing with the multivariate normal distribution. Generalised analysis of variance.

ST411 Foundations of Statistical Inference
Three credit points.

Study of various schools of thought in statistical inference and their logical foundations.

ST412 Stationary Processes
Two credit points.

Prerequisite
ST401.

Introduction to ergodic theory. Spectral theory of covariance stationary processes. Minimum mean squared error prediction.

ST413 Time Series
Two credit points.

Prerequisite
ST412.

Estimation and hypothesis testing for time series.

ST414 Sampling Theory
Three credit points.

Simple random sampling, ratio and regression estimators, stratified and cluster sampling, theory of K-statistics.

Postgraduate Studies

Qualified candidates will be accepted for the degree of MA, M Sc and Ph D in a number of branches of mathematics, and for a Graduate Diploma in computer science. More detailed information can be obtained from the chairman of the appropriate mathematics department, or (for computer science) from Dr D. Woodhouse (see also the entry, 'Computer Science' in the disciplines section of this handbook). Research interests of members of the departments comprise abstract algebra, including group theory and ring theory, lattice-ordered groups, combinatorial theory, mathematical programming, functional analysis, topology, approximation theory, differential equations, numerical methods, computing, astrophysics, fluid mechanics, hydrodynamic stability, statistical mechanics, quantum mechanics, symmetry algebras, general relativity, electrochemistry, electromagnetism, probability theory and stochastic processes, mathematical ecology, regression analysis, mathematical epidemiology, biological cell kinetics, queueing and storage theory, non-parametric statistics, mathematical genetics and the statistical analysis of stochastic processes.

MICROBIOLOGY

The department of microbiology offers courses leading to a B Sc (pass) degree and to a B Sc (honours) degree in microbiology. Postgraduate training leading to degrees at the M Sc and Ph D level is available to suitably qualified candidates.

The microbiology courses are intended to provide a basic education and training in fundamental aspects of general microbiology and the necessary practical skills required for careers in such fields as research, industry or teaching.

Students intending to study microbiology should have performed well in first-year biology and chemistry courses.

Microbiology II

A general course covering the major areas of microbiology which will provide an introduction to the biology of micro-organisms and form a basis for Microbiology III.

Syllabus

Introduction to the biology of micro-organisms with special reference to the bacteria and the viruses: their structure, functioning, biochemistry, ecology, control and classification. Micro-organisms and disease.

Prerequisites

Biology IA or IB and Chemistry I. It may be necessary to impose a quota on enrolment in this subject.

Class Requirements

Three lectures a week for three terms and one 3-hour practical period a week for three terms.

Students are required to wear laboratory coats and to comply with appropriate safety rules in the teaching laboratories.

Prescribed Reading

†Brock, T.D. *Biology of Micro-organisms,* 2nd edn, Prentice-Hall 1974.

Preliminary Reading

*Postgate, J. *Microbes and Man,* Pelican 1969.
*Rose, S. *Chemistry of Life,* Pelican 1966.

Recommended Reading

Davis, D.B., Dulbeco, R., Eisen, H.N., Ginsberg, H.S. and Wood, W.B. *Microbiology,* 2nd edn, Harper International 1973.
*Knight, C. *Molecular Virology,* McGraw-Hill 1974.
*Levy, J., Campbell, J.J.R. and Blackburn, T.H. *Introductory Microbiology,* Wiley International 1973.
*Stanier, R.Y., Doudoroff, M. and Adelberg, E.A. *General Microbiology,* 3rd edn, Macmillan 1971.

Assessment

Students will be assessed by their performance in written tests, practical work and assignments set during the year, as well as in written papers given at the end of the course.

Microbiology III

Syllabus

Five separate courses of 20 lectures and associated practicals:
Microbial biochemistry:
regulation of biosynthesis, biotransformations and antimicrobial action.
Virology and biochemical virology:
virus replication and interaction with host replication system, animal virus genetics, viral pathogenesis, animal viruses and cancer.
Environmental microbiology:
soil and water microbiology, biology of decomposition, microbial transformations of inorganic materials, micro-organisms and pollution.

Microbial ultrastructure:
Ultrastructure and function of microbial cells.
Microbial taxonomy:
Survey of the major groups of micro-organisms.

Prerequisite
Microbiology II. It may be necessary to impose a quota on enrolments in this subject.

Class Requirements
Four lectures and three 3-hour practical or tutorial classes a week for three terms.

Students are required to wear laboratory coats and to comply with appropriate safety rules in the teaching laboratories.

Prescribed Reading
†Brock, T.D. *Biology of Micro-organisms,* 2nd edn, Prentice-Hall 1974.

Recommended Reading
Davis, B.D., Dulbeco, R., Eisen, H.N. Ginsberg, H.S. and Wood, W.B. *Microbiology,* 2nd edn, Harper International 1973.
*Franklin, T.J. and Snow, G.A. *Biochemistry of Antimicrobial Action,* 2nd edn, Chapman and Hall 1975.
Hawker, L.E. and Linton, A.H. *Micro-organisms: Function, Form and Environment,* Edward Arnold 1971.
*Hudson, H.J. *Fungal Saprophytism,* Edward Arnold 1972.
Mandelstam, J. and McQuillen, K. (eds) *Biochemistry of Bacterial Growth,* 2nd edn, Blackwell Scientific 1973.
*Primrose, S. *Introduction to Modern Virology,* Blackwell Scientific 1974.
Richards, B.N. *Introduction to the Soil Ecosystem,* Longman 1974.

Assessment
Students will be assessed by their performance in written tests, practical work and assignments set during the year, as well as in written papers given at the end of the course.

Microbiology IV (Honours)
The one-year honours course in microbiology will be available to graduates from La Trobe or from other universities with equivalent B Sc courses. For admission students will be required to have obtained a good standard in Microbiology III. The course will consist of a research project under the supervision of a member of the staff, together with other prescribed work including essays and seminars. The honours course will begin in the first week of February and continue for approximately 10 months. Students intending to enrol in the honours course should consult the chairman of the department.

Students are required to wear laboratory coats and to comply with appropriate safety rules in the teaching laboratories.

Postgraduate Study
Prospective candidates for the M Sc or Ph D degrees should consult the chairman of the department.

PHILOSOPHY

A student in a science School may major in philosophy, by taking either any first-year philosophy unit, or else any two first-year science subjects, and then in second year taking a suitable second-year philosophy unit, and in third year, taking one-and-a-half philosophy units (equivalent in workload to one third-year science unit). Philosophy subjects suitable for students in the science Schools are listed in the course table at the back of this handbook. It may be possible for students in the science Schools to obtain permission to take other subjects offered by the philosophy department. Full details of all philosophy courses are given in Volume 1 of the *Calendar*, which deals with the Schools of Education, Social Sciences and Humanities.

The attention of students is also drawn to the entry for Logic in this handbook.

PHILOSOPHY OF SCIENCE AREA OF STUDY

The philosophy of science area of study is a course bridging the humanities and the sciences, and students intending to major in this area should normally be qualified for admission to either the School of Physical Sciences or the School of Biological Sciences.

The first year of the course will normally consist of: Philosophy I, and any two subjects selected from the School of Physical Sciences or the School of Biological Sciences.

In the second year students majoring in philosophy of science must enrol in Philosophy IISA and either one additional second-year philosophy unit and one second-year science unit, or two second-year science units.

The third year of the course will consist of an approved combination of logic, science and philosophy of science units. Students wishing to take a major in philosophy of science with a view to completing a B Sc degree should consult the adviser of studies of the appropriate science School before enrolling.

Any queries relating to the philosophy of science area of study should be directed, in the first instance, to the chairman of the philosophy of science area of studies, Professor B.D. Ellis of the philosophy department.

Physical Sciences

Physical Sciences IT

This is a one-year terminal course in physical sciences and consists of components from mathematics and physics.

As distinct from Physical Sciences II and III, Physical Sciences IT is not available to students enrolled in the School of Physical Sciences.

Prerequisites

Although a knowledge of mathematics and physics to higher school certificate level is desirable, a student who has obtained a good pass at leaving school level would be accepted. In such cases the preliminary reading suggested should be carefully studied.

Preliminary Reading

Courant, R. and Robbins, H. *What is Mathematics?* Oxford Univ. Pr.

Selected topics from one or other of the following books:
Messell, H. (ed.) *Modern Introduction to Physics,* vols 1 and II,
Horowitz and Graham Physical Sciences Study Committee *Physics,* Heath and Co.

Mathematics Component
Differentiation and integration of simple algebraic and trigonometric functions, partial differentiation, elementary properties of complex numbers, simple differential equations and linear programming:

Text: Sylvan P. Thompson, *Calculus Made Easy,* Macmillan.

Physics Component (36 lectures plus one term laboratory)
Elasticity, stress and strain in solids, hydrostatics, surface tension, capillarity; hydrodynamics, Bernouilli's equation, viscosity, Poiseuille's equation, Stokes' law; heat and thermodynamics, radiation from the sun and earth, composition and temperature effects in the atmosphere, energy balance at the earth's surface; thermionic emission, photoelectric effect, radioactivity, effect of radiation on living tissue.

PH127 Electrical Circuit Theory (15 lectures)
DC circuits, resistances in series and parallel, Kirchoff's Laws and Thevenin Theorem. AC circuits, sinusoidal voltages and currents. Resistive loads, instantaneous and average power, differential properties of R, L and C, phasor concept; L, LC and LRC circuits; p-n junctions.

Class Requirements
Approximately four lectures a week for three terms. Tutorial classes each week in physics and mathematics and one term of physics laboratory work in electronics.

Prescribed Reading
Sears F.W. and Zemansky, M.W. *University Physics,* 4th edn, Addison-Wesley 1970.

Physical Sciences II and III

These two subjects are designed to provide flexibility within the academic structure of the School of Physical Sciences. A student should choose his component units thoughtfully to give the type of course that suits his particular needs and preferences. The subjects are *not* intended as 'easy' options or an opportunity to proceed aimlessly, and to this end it has been found necessary to formulate a number of rules. Students are encouraged to discuss these subjects with advisers-of-studies; Dr Jenkin (physics, room 210) has been appointed as the adviser in the School with special responsibility for all enrolments in Physical Sciences II and III. For Physical Sciences II and III, 12 and 18 credit points respectively are required.

The following general rules apply:

(1) The subject must be completed in one year.
(2) Provided a student takes two full second-year subjects from within the School, he may take Physical Sciences II as his third subject. (Physical Sciences II composed entirely of units from within the School cannot be regarded as one of the two full subjects).
(3) At least one half of Physical Sciences II (6 credit points) must be taken from within the School.
(4) Students may not include in a physical sciences enrolment any components from another subject in which they are enrolled. Thus, a student undertaking Pure Mathematics II cannot take other Pure Mathematics components in Physical Sciences II.
(5) Chosen units should be specified at enrolment time; a limited number of changes may be made up to the end of second term (see Dr Jenkin).

(6) Up to one half (6 credit points) of Physical Sciences II may be chosen from another School of the University.

(7) Analogous rules apply to Physical Sciences III (18 credit points). In particular, provided a student takes one full third-year subject from within the School, Physical Sciences III may be taken as his second subject; half (9 credit points)* must be taken from within the School.
(* A full third-year subject from a School with a 4:3:2 system shall count 18 credit points, but a full third-year subject from a school with a 3:3:3 system shall count only 12 credit points). See also items (1), (4), (5) and (6) above.

Segments of subjects from within the School of Physical Sciences which may be included in the subjects Physical Sciences II and III are detailed below.

Physical Sciences II

Segments from second-year subjects which may be included in Physical Sciences II can be chosen from the following. The total work value of the subject must be (at least) 12 credit points.

Chemistry
Inorganic Chemistry IIB, Organic Chemistry II and Physical Chemistry IIA. Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a work value of four credit points.

Geology
Crystal optics (three credit points) may be taken by itself *or* crystal optics together with igneous petrology or metamorphic petrology or sedimentology may be taken for six credit points.

Mathematics
A student may take any second-year mathematics component for which he has the prerequisite (but see rules above). Advice on the choice of components may be obtained from the advisers in the mathematics departments.

Physics
Second-year physics components may be chosen in one of the following ways:

(1) Four credit points: four points from PH201 to PH208, together with two laboratory courses.

(2) Six credit points: six points from PH201 to PH208, together with three laboratory courses.

(3) Eight credit points: eight points from PH201 to PH208, together with four laboratory courses.

Students must discuss their choice of components in physics with one of the advisers of studies in physics.

Physical Sciences III

Segments from third-year subjects which may be included in Physical Sciences III can be chosen from the following. The total work value of the subject must be (at least) 18 credit points.

Chemistry
Six segments of Chemistry III may be taken in Physical Sciences III: Inorganic Chemistry IIIA and IIIB, Organic Chemistry IIIA and IIIB, and Physical Chemistry IIIA and IIIB.

Each of the six segments may be taken singly or in combination provided that a IIIB segment is taken before the corresponding IIIA segment or concurrently with it. Each has a value of one third of a third-year unit and Physical Sciences III may be made up entirely of three segments of chemistry. The prerequisite for each course is the appropriate course from Chemistry II.

Students contemplating an enrolment of Chemistry IIIB and Physical Sciences III should note that they are not permitted to do more than one third of the total year's work from any one of the three departments of Chemistry.

Students should also note that completion of sections of the Chemistry III course in Physical Sciences III does not qualify them for admission to the honours year of chemistry, but that Physical Chemistry III may qualify them for admission to Chemical Physics IV.

Geology
Geology II is recommended as a prerequisite for any course taken from those listed for Geology III. Field geology is only available to those students taking a full course so that the following will be available to those students taking Physical Sciences III: isotope geology, three credit points; solution geochemistry and ore deposits, three credit points; igneous petrogenesis, two credit points, thermodynamics and phase equilibria for geologists, three credit points; advanced structural analysis of rocks, one credit point; sedimentary rocks and ore deposits, two credit points.

Mathematics
A student may take any component from Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III or Computer Science III for which he has the prerequisite (but see rules above). Advice on the choice of components may be obtained from advisers in the mathematics departments.

Physics
Third-year physics components may be chosen in one of the following ways:

(1) Two credit points from PH301 to PH308 and one laboratory credit point (three points).
(2) Four credit points from PH301 to PH308 and two laboratory credit points (six points).
(3) Six credit points from PH301 to PH308 and three laboratory credit points (nine points).
(4) Eight credit points from PH301 to PH308 and four laboratory credit points (twelve points).

Alternatively, students enrolled in Physics IIIA may choose components from Physics IIIB together with mathematics or chemistry components to meet the requirements for Physical Sciences III.

Students must discuss their choice of components in physics with the physics adviser of studies.

PHYSICS

A student majoring in physics for the B Sc degree takes the sequence: Physics IA, Physics IIA, Physics IIIA. A mathematics subject is required in first and second year to proceed to the next year and Physical Sciences III is recommended as the second subject in third year for those students intending to go on to Physics IV for

an honours B Sc degree. (See under Physics IIIA later). Physics IB and Physics IIB are alternative courses to Physics IA and Physics IIA respectively and are designed for students who do not intend to take physics as one of their major subjects in later years.

Physics IIB is a terminal course and students completing it will not normally be permitted to proceed to either Physics IIIA or Physics IIIB without consultation with the chairman of the physics department. Similar consultation is required for transfer from Physics IB into Physics IIA. Certain components of Physics IIIA and IIIB will normally be available to students who have completed Physics IIB for the purposes of forming a Physical Sciences III course. Certain components of Physics IIA and IIB will also be available to students who have completed Physics IB for the purposes of forming a Physical Sciences II course.

Physics IIIB is intended to give a broader view of physics and can only be taken with Physics IIIA.

Physics IA and IB

Prerequisite
Physics IA will be conducted on the assumption that students have a thorough knowledge of physics and mathematics at the higher school certificate level (or its equivalent). Students who do not have such a background are advised to take Physics IB.

Physics IA Components

PH100 Mathematical Introduction (16 lectures)
Differential and integral calculus. Vector algebra. Complex numbers. Linear differential equations.

PH101 Electrical Circuit Analysis (12 lectures)
D.C. Circuits: resistances in series and parallel; circuit theorems (Kirchoff, Thevenin, Norton, maximum power transfer) and circuit analysis; measuring instruments and circuits. A.C. circuits; sinusoidal voltage and current. Resistive load, instantaneous power, average power, properties of R, L and C; transformer, vector representation and complex notation; measuring bridge and the C.R.O.; LCR circuits and associated properties (frequency response, filters, resonance, transients).

PH102 Wave and Field Propagation (12 lectures)
General wave phenomena and their inter-relationships, superposition of waves, applications to mechanical, sound, and electromagnetic waves, interference, diffraction, dispersion, group and phase velocities, Doppler effect, amplitude and frequency modulation, geometrical optics, coherence, phasor addition of waves, multiple slit interference, Fraunhofer diffraction, resolving power, diffraction grating.

PH103 Electricity and Magnetism (12 lectures)
Topics include: electrostatics, Coulomb's law, electric field, Gauss' law, potential, capacitance, dielectric materials. Magnetism: moving charges, Ampere's law, Biot-Savart law, Faraday's law of induction, inductance, dipoles and susceptibility, Lenz's law and time varying magnetic fields.

PH104 Atomic Physics (8 lectures)
Brief historical introduction. De Broglie relationships. Wave particle dualism. Electrons as waves. Electron diffraction, wave packets. Phase and group velocities. Heisenberg's uncertainty principle, the wave equation. Characteristics of X-rays (production, theory).

PH105 Mechanics and Special Relativity (12 lectures)
Statics. Dynamics. Energy. Gravitation. Simple harmonic motion. Rotational dynamics. Special relativity theory. Lorentz Fitzgerald contraction. Time dilation. Variation of mass with velocity. Relativistic energy.

PH111, PH112, PH113
A three-term introductory course in electronic measurement techniques.

Class Requirements

Lectures
three a week for three terms.

Tutorials
one a week for three terms.

Laboratory
four hours a week for three terms.

Examination Requirements
Each unit course, as outlined above, will be examined during the year or at the end of the year as appropriate. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final results.

Preliminary Reading
Victorian University and Schools Examination Board, form VI physics texts (PSSC Physics, 3rd and 4th edns.

Prescribed Reading
†Tipler, P.A. *Physics,* Worth Publishers, NY 1976.

Physics IB Components

PH121 Electrical Circuits (12 lectures) see PH101

PH122 Mathematical Introduction (12 lectures)
Differentiation, integration, vectors; dot and cross products, complex numbers, differential equations and examples.

PH123 Optics (8 lectures)
Nature and propagation of light, Huygen's principle, dispersion, thin lenses, interference.

PH124 Electricity and Magnetism (10 lectures)
This course discusses basic ideas in electricity and magnetism. Electrostatics: Coulomb's law, electric fields, Gauss' law, potential, capacitance and dielectrics: Magnetism: moving charges, Ampere's law, induction and inductance.

PH125 Mechanics (10 lectures)
Translational and rotational equilibrium (statics). Kinematics. Dynamics of systems of particles and rigid bodies. Rotational dynamics. Frames of reference.

PH126 Properties of Matter and Environmental Physics (21 lectures)
Elasticity, stress and strain in solids; hydrostatics, surface tension, capillarity; hydrodynamics, Bernouilli's equation, viscosity, Poiseuille's equation, Stoke's law; heat and thermodynamics, radiation from the sun and earth, composition and temperature effects in the atmosphere, energy balance and the earth's surface, thermionic emission, photoelectric effect of radiation on living tissue.

PH111, PH112, PH113
A three-term laboratory course in electronic measurement techniques.

Class Requirements

Lectures
three a week for three terms.

Tutorials
one a week for three terms.

Laboratory
four hours a week for three terms.

Examination Requirements
Each unit course, as outlined above, will be examined during the year and at the end of the year as appropriate. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final results.

Preliminary Reading
Victorian Universities and Schools Examination Board, form VI physics texts (PSSC Physics, 3rd and 4th edns.)

Prescribed Reading
†Sears, F.W. and Zemansky, M.W. *University Physics,* 4th or 5th edn, Addison-Wesley.

Physics IIA and IIB

Prerequisites
Physics IA and Mathematics IA or IB are normal prerequisites for Physics IIA. Physics IA or IB and Mathematics IA or IB are prerequisites for Physics IIB. Students who have completed Physics IB and who wish to enrol for Physics IIA must consult with the chairman of the physics department before the end of Physics I in order that vacation reading may be set.

Physics IIA Components

12 credit points constitute Physics IIA.

PH200 Mathematical Methods (two credit points)
Grad, div, curl. Green's lemma. Stoke's theorem series. Kronecker delta. Dirac delta. Fourier series and integrals. Special functions. Partial differential equations.

PH202 Physical Optics (one credit point)
Description production and analysis of polarized light; Jones matrices. Geometrical optics; thick lenses.

PH203 Classical Mechanics and Relativity (two credit points)
Generalized co-ordinates, velocities and momenta, Lagrangian function and Lagrange's equation. Conservation laws. Central field; collision problems; system of particles. Conservation systems. Hamiltonian function and Hamilton's equation. Poisson bracket. Rigid-body dynamics; inertia tensor, Minkowski's space-time; geometric representation of space time. Four-vector formulation of special relativity; four-velocity, four momenta, four-force. Transformation of dynamic quantities.

PH204 Thermodynamics (two credit points)
Classical thermodynamics with applications.

PH205 Quantum Mechanics (two credit points)
Magnitudes of physical quantities in quantum mechanics. Uncertainty principle. Fourier transforms. Schroedinger equation. Barrier-well problems. Harmonic oscillator. Average values in quantum mechanics: Legendre, Laguerre polynomials. One-electron atoms. Angular momenta. Introductory matrix mechanics.

PH206 Solid State Physics (one credit point)
Crystal structure, crystal diffraction, crystal binding.

PH207 Electromagnetic Theory (two credit points)
Mathematical preparation, Maxwell's equations in differential form, method of solution in Laplace's equation, the wave equation and electrodynamic potentials.

PH211, PH212, PH213, PH214, PH215, PH216
Associated laboratory courses.

Class Requirements

Lectures
four a week for three terms.

Laboratory
four hours a week for three terms.

Examination Requirements
Each unit course as outlined above will be examined at the end of the year. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final result.

Preliminary Reading
See prescribed reading for Physics I.

Prescribed Reading

†Grant, I.S. and Phillips, W.R. *Electromagnetism,* 1st edn, John Wiley & Sons 1976.
†Leighton, R.B. *Principles of Modern Physics,* McGraw-Hill (paperback) 1959.
†Hart-Davis, A. *Solids: An Introduction,* 1st edn, McGraw-Hill 1975.
†Pippard, A.B. *Classical Thermodynamics,* Cambridge 1966.
†Millman, R.M. and Halkias, I. Mc. *Integrated Electronics,* McGraw-Hill 1972.

Physics IIB Components

PH221 Electronic Devices (two credit points)
Conduction in solids, intrinsic and extrinsic semi-conductors, pn junction, diode circuit applications, SCR's, junction transistor, transistor configurations, transistor biasing, h-parameter and hybrid-π models, analysis of amplifier circuits, class A, B, C operation, frequency response, feedback amplifiers, uses of negative feedback, operational amplifiers, analogue computation, introduction to digital circuits, logic gates, multivibrators.

PH222 Mechanics (one credit point)
Rotational dynamics (equations of motion, moment of inertia, Euler's equations and the top, the gyroscope). Harmonic motion (simple, damped and driven). Special relativity (speed of light, Michelson-Morley experiment, Lorentz transformations of length and time, relativistic dynamics, and principle of equivalence).

PH223 Elements of the Kinetic Theory of Gases (one credit point)
Derivation of gas laws, equipartition of energy. Maxwellian distribution, mean free path phenomena, transport phenomena, equations of state.

PH224 Quantum Mechanics and Atomic Spectroscopy (three credit points)
Classical vs quantum. De Broglie relationships. Wave packets. Uncertainty principle. Schrodinger wave equation. Free particle. Barrier-well problems. Harmonic oscillator. One electron atom. Multi-electron atoms. Atomic spectra.

PH225 Materials Science (1.5 credit points)
Structure and bonding in materials. Crystal imperfections. Dislocations. Diffusion. Alloys. Phase diagrams. Steels. Heat treatment. Ceramics. Glasses. Polymers. Strength and fracture of materials. Surface properties. Adsorption.

PH226 Electromagnetic Theory and Optics (2.5 credit points)
Development of Maxwell's Equations in differential form. Wave equation. Interaction of light with matter. Dielectric and magnetic properties of matter. Polarized light.

PH227 Nuclear Physics (one credit point)
Objectives, hierarchy of forces, nomenclature and units, nuclear radius, nuclear mass and binding energy, stability considerations and decay processes, energy level diagrams.

PH211, PH212, PH213, PH214, PH215, PH216
Associated laboratory courses.

Class Requirements

Lectures
four a week for three terms.

Laboratory
four hours a week for three terms.

Examination Requirements
Each unit course as outlined above will be examined during the year and at the end of the year. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final result.

Preliminary Reading
See prescribed reading for Physics I.

Prescribed Reading
†Flinn, R.A. and Trojan, P.K. *Engineering Materials and their Applications,* Houghton Mifflin Co. 1975.
†Leighton, R.B. *Principles of Modern Physics,* McGraw-Hill (paperback) 1959.
†Smith, R.J. *Electronics : Circuits and Devices,* Wiley International 1973.
†Wert, C.A. and Thomson, R.M. *Physics of Solids,* McGraw-Hill International Student Edn, 2nd edn 1964.

Physics IIIA

Students who intend going on to the fourth year (honours) in physics are advised to make the following enrolment in their third year – Physics IIIA and Physical Sciences III, provided they have the correct prerequisites. Physics IIIA consists of PH301 to PH307 inclusive, plus the laboratory courses PH351 to PH356 inclusive. Physical Sciences III for intending Physics IV students should include some applied mathematics units together with appropriate units selected from Physics IIIB to make a total of 18 credit points. The selection of units for the above Physical Sciences III course should be done in consulation with an adviser of studies in physics, Dr J.G. Jenkin or Dr E.C. Butcher.

Prerequisites
Physics IIA and Mathematics II; or Physics IIB plus Mathematics II or Physical Sciences II in certain circumstances are determined by consultation with the chairman of the department of physics.

Physics IIIA Components

Eighteen credit points constitute Physics IIIA.

PH301 Quantum Mechanics (two credit points)
Operator formalism. Commutator brackets. Angular momentum. Perturbation theory: spin-orbit coupling. Stark effect, Zeeman effect, indistinguishability: Pauli exclusion principle; exchange degeneracy and the Helium atom. Variational principle.

PH302 Electronics (one credit point)
FET's and MOSFET's, feedback amplifiers, properties of negative feedback, operational amplifiers, analogue computation, stability, sinusoidal oscillators, relaxation oscillators, multivibrators, integrated circuits, introduction to digital circuits, logic gates.

PH303 Electromagnetic Theory (two credit points)
Maswell's equations and e.m. waves in vacuo. Retarded and Hertz polarization potentials. Poynting's theorem. Application of Maxwell's equations; transmission lines, wave guides, cavities and aerials, accelerated charges, scattering and dispersion, reflection, refraction and transmission. Electromagnetism, special relativity and quantum theory.

PH304 Nuclear Physics (two credit points)
Introduction (forces, terminology and units, angular momentum, cross-section Rutherford scattering). Mass and binding energy. Semi-empirical mass formula and nuclear stability. Nuclear decay and parity. Independent particle model. Single-particle shell model.

PH305 Statistical Mechanics (two credit points)
Quantum statistical mechanics. Statistical description of ensembles of a large number of particles and its application to metals, gases and He^4.

PH306 Optics (one credit point)
Reflection from dielectric and metallic surfaces, and thin films.

PH307 Solid State Physics (two credit points)
Free electron Fermi gases, energy bands in solids. Semiconductor materials and transport properties of semiconductors.

Laboratory Courses: PH351, PH352, PH353, PH354, PH355, and PH356
Each one credit point.

Class Requirements

Lectures
four a week for three terms.

Laboratory
eight hours a week for three terms.

Examination Requirements
Four 3-hour papers. The laboratory work of each student is assessed continually.

Preliminary Reading
See prescribed reading for second year.

Physics IIIB

This course is a terminal course and may only be taken with Physics IIIA. The course is designed to provide a broader view of physics.

In special circumstances students who complete Physics IIIB (as well as Physics IIIA) may be permitted to enrol in Physics IV.

Components of Physics IIIB are available for selection as Physical Sciences III course units.

Physics IIIB Components

18 credit points constitute Physics IIIB

PH308 Atomic Physics and Spectroscopy (two credit points)
Vector model of atom, spectral states, perturbation theory. Selection rules. Atoms in a magnetic field. Complex spectra. Introduction to molecular spectra.

PH309 Plasma Physics (one credit point)
Charged particles in electromagnetic fields treated individually and *en masse.*

PH310 Physics of the Earth (four credit points)
Seismology Dynamics of the atmosphere, solar terrestrial physics, Seismology.

PH311 Low Temperature Physics (one credit point)
Low temperature phenomena, liquid helium, first and second sound, superconductivity; magnetic resonance.

PH312 Electron Emission from Solids (one credit point)
Thermionic emission, field emission, photoemission, Auger electron process, secondary electron emission.

PH313 Ionic Solids (one credit point)

PH314 Materials Science (one credit point)
Structure and bonding in materials. Crystal imperfections. Dislocations. Diffusion. Alloys. Phase diagrams. Steels. Heat Treatment. Ceramics.

PH315 Ionization Physics (one credit point)
The properties of weakly ionized gases. Interaction of charged particles with surfaces. Electrical breakdown of gases.

Class Requirements

Lectures and reading courses as arranged.
Four hours a week for three terms.

Laboratory
eight hours a week for three terms.

Laboratory
Laboratory work consists of projects supervised by a member of staff. Six credit points of laboratory are available.

Examination Requirements
Performance in the course will be assessed either by examination or during the year.

Physics IV

Prerequisites
A student enrolling in this subject will be expected at least to have completed the Physics IIIA course or its equivalent. Admissions to this course is at the discretion of the chairman of the department of physics. Physics IV is suitable for both

experimental and theoretical students. The course consists of 16 credit points selected from the syllabus listed below and a research project. Choice of course and project must be discussed with the Year IV coordinator, Dr I. McLaughlin.

Physics IV Components

PH401 Mathematical Physics and Statistical Mechanics (three credit points)
Elementary transport theory. Boltzmann equation for gases and solids. Applications. Radial distribution functions. Fluctuations, correlations, Wiener-Khichin Theory, Nyquist relation. Kubo coefficients. Brownian motion. Electrical noise. Green's functions in many body theory. Applications to superconductivity and superfluids.

PH402 Elementary Particles (one credit point)
Particles and antiparticles, invariance principles, Yukawa's hypothesis. Interactions. Weak interaction, strange particles.

PH403 Nuclear Physics (one credit point)
Nuclear reactions. The compound nucleus. Resonant reactions. Optical model. Direct reactions, isobaric analog states.

PH404 Quantum Mechanics (three credit points)
Relativistic quantum mechanics, Klein-Gordon equation. Dirac equation, field quantisations, Feynman diagrams.

PH405 Solid State Physics (two credit points)
Diamagnetism. Paramagnetism. Ferro, ferri and antiferromagnetism. Magnetic resonance. Group theory and the solid state.

PH406 Digital Techniques (one credit point)
Introduction to digital logic and the design of logic systems.

PH407 Upper Atmosphere Physics (six credit points)
Physics of the atmosphere and ionosphere. Electrodynamics of the magnetosphere. Radio waves in the ionosphere.

PH408 Electron Physics (five credit points)
Solid state phenomena concerned with electron emission from solids; photoelectron spectroscopy, secondary emission. Metal surface studies: adsorption of gases, work function measurements. Gas discharge physics. Surface waves on solids. Rayleigh waves, surface wave transducers. Magnetic resonance studies: ESR, NMR, NQR, PQR.

PH409 Atomic Collisions (one credit point)
Quantum theory of scattering: plane wave as sum of partial waves, scattered amplitude in terms of partial waves and phase shifts: cross-sections, evaluation of phase shifts, examples. Born approximation.

PH410 Relativity (two credit points)
Tensors, Einstein's gravitational equations. Schwarzchild space-time. Three tests of gravitation theory.

PH411 Advanced Statistical Mechanics (two credit points)
Use of Green's functions in the many-body problem. Feymann diagrams. Quasi-particles. Dyson's equation approximations. Applications to super-conductivity, electron gas in metals, superfluids, liquid state.

PH412 Symmetry and Particle Physics (two credit points)

PH413 Plasma Physics (one credit point)
Motion of charged particles in force fields. Macroscopic motion of plasma in force fields. Waves in a plasma.

PH414 Electrodynamics (one credit point)

PH415 Ionization Physics (one credit point)
The properties of weakly ionized gases. Interaction of charged particles with surfaces. Electrical breakdown of gases.

PH416 Magnetohydrodynamics (one credit point)

Options
Certain units in advanced mathematics courses may be taken in place of some of the units listed above. Any such interchange must be approved by the chairman of the department of physics.

Project
Students are required to choose either an experimental or theoretical research project which shall carry 30 per cent of the total assessment for the year.

Class Requirements

Lectures
eight a week till completed.

Project
16 hours a week for two terms.

Examination Requirements
Up to eight 3-hour papers.

Postgraduate studies

Postgraduate studies and research are conducted in the division of physics of which there are at present two. Entry qualifications are a good honours degree in physics, theoretical physics, applied mathematics, physical chemistry, molecular science or any other related subject. Students may proceed to the degree of M Sc or Ph D.

Division of Electron Physics – Professor D.E. Davies

Photoelectron spectroscopy in a wide variety of solids and measurements of electron mean-free-path and photoelectron cross-sections. Surface adsorption measurements. Electron coincidence spectroscopy. Solid state phenomena studied by electron – and ion – induced electron emission. Electron spin resonance and nuclear spin resonance. Laser interferometry of solid surfaces, and surface acoustic waves. Ionization phenomena in gases, in particular the study of the plasma surface interface.

Division of Theoretical and Space Physics – Professor K.D. Cole

Theoretical
Theory of the earth's upper atmosphere, ionosphere and magnetosphere. General relativity. Statistical mechanics, theory of liquids. Molecular quantum mechanics.

Experimental
Studies relating to the properties of the ionosphere and magnetosphere using radio and optical techniques. Auroral physics. Solar terrestrial relations. The division of theoretical and space physics operates a field station in Kilmore Shire and encourages collaborative projects with outside agencies.

PHYSIOLOGY AND NUTRITION

Physiology and Nutrition II One Unit
Dr D.D. Leaver, Professor R.L. Reid, Mrs K.M. Towns, Mr P.D. Cranwell, Dr W.N.M. Foster, and outside lecturers.

This course provides a general introduction to the principles of mammalian physiology and nutrition; outside lecturers contribute up to 10 lectures to deal with specific aspects of human physiology.

Introductory lectures on mammalian embryology and histology are followed by a consideration of basic cell functions. The course then progresses to analyse the concept of the body's internal environment, the nature of biological control systems – such as neural and hormonal control mechanisms – and the properties of the major specialised cell types – nerve, muscle and gland. Coordinated body functions such as circulation, respiration, reproduction, regulation of water and electrolyte balance and defence mechanisms are then discussed in terms of the principles developed in the discussion of basic cell function and control systems.

The final part of the course deals with human nutrition and includes physiology of digestion, regulation of energy metabolism, chemistry and composition of foods, nutrient requirements and allowances, nutritional problems – deficiencies and excesses, and economics of nutrition.

Prerequisite
Any course at first-year level in the School of Biological Sciences or the School of Physical Sciences.

Class Requirements
Three lectures and one 4-hour practical class a week for three terms.

Assessment
Performance in written tests, practical work and assignments set during the year, together with a written paper given at the end of the course.

Prescribed Reading
†Vander, A.J., Sherman, J.H. and Luciano, Dorothy S. *Human Physiology : The Mechanisms of Body Function,* 2nd edn, McGraw-Hill 1975.
†*Fisher, Patty and Bender, A. *The Value of Food,* 2nd edn, Oxford Univ. Pr. 1975.

Recommended Reading
Beck, F., Moffat, D.B. and Lloyd, J.B. *Human Embryology and Genetics,* Blackwell 1973.
Ham, A. *Histology,* J.B. Lippincott 1974.
McCollum, C.V. *A History of Nutrition,* Riverside Pr. 1957.

PSYCHOLOGY

Availability of Psychology I

The subject, Psychology I, is available to students enrolled in the Schools of Behavioural Sciences, Biological Sciences, Humanities, Physical Sciences and Social Sciences. Quotas will apply to all of these groups, and entry will be determined largely by academic merit. Based on the experience of past years, entry is likely to be very competitive. Students intending to work as psychologists and who seek a more balanced training in the behavioural sciences are advised to enrol in the School of Behavioural Sciences (LBV).

Psychology I (one unit)

Dr B. McKenzie and Professor R. Over

The topics covered in Psychology I include: introduction to psychology; development; love; fear and anger; perception; learning and memory; intelligence; thought and language; social behaviour; personality and abnormal behaviour; biochemistry of behaviour.

Psychology I involves two 1-hour lectures each week, intended to introduce the student to the content of psychology and to guide and supplement his reading; and one 3-hour laboratory class each week. The laboratory course, in which half of each student's assessment is made, includes films, demonstrations, laboratory experiments and field studies. It is intended to illustrate some of the content of the lectures, and to introduce the student to the methods used in psychological research.

In addition, integrated with the laboratory course is a one-hour class on introductory statistics designed to introduce the student to techniques for testing out hypotheses about behaviour. Contrary to popular belief, competence in statistics does not require a deep mathematical background, only a willingness to try, and to seek help when it's needed.

Class Requirements

Three 1-hour lectures and one 3-hour laboratory class a week.

Prescribed Reading

The Course Manual for Psychology I (providing a detailed reference list together with information on preliminary reading) will be available within the department of psychology after 24 January 1977.

†Mendenhall, W. and Ramey, M. *Statistics for Psychology,* Duxbury 1973.

†Beaver, R. and Mendenhall, W. *Study Guide: Statistics for Psychology,* Duxbury 1973.

Psychology II (one unit)

Dr Geoff Cumming

While Psychology I provides an overview of the techniques and content of psychology as a science, Psychology II and III are intended to treat in more detail the major content areas and techniques. Psychology II and III are complementary courses and no student who takes only Psychology I and II can be said to have completed his undergraduate training in psychology.

Psychology II consists of four hours of lectures a week, three hours of laboratory work and one hour of tutorials. Students will receive the equivalent of one 1-hour lecture a week on each of the following areas: motivation, perception, and learning.

The remaining hour of lectures will be on the design of experiments and analysis of data; the one hour a week tutorial will be used in conjunction with this series of lectures.

Prerequisite
Psychology I.

Prescribed Reading
*Bower, T.G.R. *Development in Infancy,* Freeman 1974.
*Hulse, S.H., Deese, J. and Egeth, H. *The Psychology of Learning,* 4th edn, McGraw Hill 1975.
*Keele, S.W. *Attention and Human Performance,* Goodyear 1973.
Korman, A.K. *The Psychology of Motivation,* Prentice Hall 1974. (Korman and Valle are alternative texts)
Mendenhall, W. and Ramey, M. *Statistics for Psychology,* Duxbury 1973.
Valle, F.P. *Motivation: Theories and Issues,* Brooks Cole 1975. (Korman and Valle are alternative texts)

Recommended Reading
*Beaver, R. and Mendenhall, W. *Study Guide for Statistics for Psychology,* Duxbury 1973.
*Champion, R.A. *Learning and Activation,* Wiley 1969.
Cofer, G. and Appley, M. *Motivation: Theory and Research,* Wiley 1964.
*Hays, W. *Statistics for Social Science,* 2nd edn, Holt, Rinehart, Winston 1973.
Horton, D.L. and Turnage, T.W. *Human Learning,* Prentice-Hall 1976.
*Murch, G.M. *Visual and Auditory Perception,* Bobbs-Merrill 1973.
Rock, I. *Introduction to Perception,* Macmillan 1973.
*Siegel, S. *Nonparametric Statistics,* McGraw Hill 1956.

Psychology III

Mr R.D. Francis

Psychology III consists of five lectures each week, one on each of the following areas:
(1) design and analysis of experiments/history and philosophy of psychology;
(2) social behaviour;
(3) abnormal behaviour;
(4) individual differences in personality and intelligence;
(5) cognitive processes.

These lectures will be complemented by three hours a week of laboratory work and one hour a week tutorial work.

Students will also be required to carry out an experimental project in an area of research currently engaged in by a staff member, and under the supervision of that person. The nature of this project would be open to choice by the student within the range of research options currently available. Time involvement should average about three hours per week.

In order to give students a good basic grounding the course is run as a whole, without options for any part of the course.

Assessment is by way of laboratory reports, an essay, term tests and a report on the project.

Prerequisite
Psychology II.

Prescribed Reading

Baron, R., Byrne, D. & Griffitt, W. *Social Psychology: Understanding Human Interaction,* Allyn & Bacon, Boston 1974.

†*Maher, B. *Principles of Psychopathology,* McGraw-Hill, New York 1966.

Marx, M. and Goodfun, F.E. *Theories in Contemporary Psychology,* 2nd edn, Macmillan, New York 1976.

†*Posner, M.I. *Cognition: An Introduction,* Scott, Foresman 1974.

†*Secord, P.F. and Backman, C.W. *Social Psychology,* McGraw-Hill, New York 1974.

Tyler, L.E. *The Psychology of Human Differences,* (latest edn), Appleton-Century-Croft, New York.

Recommended Reading

Anderson, J., Durston, S.L. and Poole, M. *Thesis and Assignment Writing,* Wiley, Syd. 1970.

Brown, R. *Social Psychology,* Collier Macmillan, NY 1965.

Bryan, P. *Perception and understanding in young children,* Basic Books, NY 1974.

Butcher, H.J. *Human Intelligence,* Methuen, London 1972.

Chomsky, N. *Language and Mind,* Harcourt Brace, NY 1972.

Coltheart, M. (ed.) *Readings in Cognitive Psychology,* Holt Saunders, NY 1972.

Crano, W. and Brewer, M. *Principles of Research in Social Psychology,* McGraw-Hill, NY 1973.

Danziger, K. *Socialisation,* Penguin, NY 1970.

Guilford, J.P. *The Nature of Human Intelligence,* McGraw-Hill, NY 1967.

Keele, S.W. *Attention and Human Performance,* Goodyear, Pacific Palisades, Calif. 1973.

Kintsch, W. *Learning, Memory and Conceptual Processes,* Wiley, NY 1970.

Norman, D.A. *Memory and attention,* Wiley, NY 1976.

Ross, A. *Psychological Disorders of Young Children,* McGraw-Hill, NY 1973.

Psychology IV Honours

Professor Ray Over

This course is available for selected candidates who have already qualified for a pass Bachelor's degree with a major sequence in psychology. All enrolments in Psychology IV require approval by the chairman of the department and normally students will be expected to have attained a B average in undergraduate psychology courses. Students will also be expected to have performed satisfactorily in all other subjects.

The course consists of the following:

(1) An empirical research project carried out independently by the candidate. The proposed hypotheses, design and analysis of the project must be presented at a seminar. This seminar, the literature survey relating to the area of research, and the thesis constitute one major requirement of the fourth-year program.

(2) Two essays, at least one of which should be on a topic of theoretical importance in psychology. The topics of these essays will be decided in consultation with the supervisor. These essays constitute the second major requirement.

(3) Participation in colloquia and seminars, which will normally be held each week and will include staff and visiting speakers. Assessment is based on the thesis, seminar papers and essays.

SOCIOBIOLOGY

Sociobiology II/III (half unit, new course)

Dr D.A. Hay, Dr R.A. Zann

A second or third-year half unit for students enrolled in the School of Behavioural Sciences or a second-year half unit for students completing a Prehistory major in the School of Humanities.

This course examines the approach of zoologists and geneticists to behaviour in humans and other animals and especially to an understanding of the evolutionary influences on behaviour. The course centres on the current controversies over sociobiology and racial differences in intelligence, but with an adequate general introduction to the fields of ethology and behaviour genetics, so that the students can see these two issues in a realistic context.

Syllabus
Introduction to the two controversies; principles of ethology; social evolution; social mechanisms; some social species (especially insects and primates); human ethology. Introduction to behaviour genetics; invertebrate behaviour genetics and the evolution of behaviour patterns; behaviour genetics in animals other than man; population genetics and behaviour; genetic variation in human behaviour; race, socio-economic status and intelligence.

Prerequisites
Biology IA or IB or Man and Environment I (formerly Biology I ME) or Prehistory I.

Class Requirements
Three 1-hour lectures a week for the second half of the year, plus 1-2 hours a week for tutorials, demonstrations and films. Sociobiology III students will each be involved in the running of a seminar and some additional reading and written work.

Assessment
By written assignments and an examination.

Prescribed Reading
*Wilson, E.O. *Sociobiology: the New Synthesis,* Bellknap/Harvard 1975.

Preliminary Reading
Tinbergen, N. *Social Behaviour in Animals,* Methuen 1966.

Recommended Reading
Ehrman, L. and Parsons, P.A. *The Genetics of Behaviour,* Sinauer 1976.
Loehlin, J.C., Lindzey, G. and Spuhler, J.N. *Race Differences in Intelligence,* Freeman 1975.

Additional Recommended Reading for Sociobiology III Students
Eibl-Eibesfeldt, I. *Ethology, the Biology of Behaviour,* Holt Rinehart and Winston 1975.
Hinde, R.A. *Biological Basis of Human Social Behaviour,* McGraw-Hill 1974.
Hirsch, J. (ed.) *Behaviour-Genetic Analysis,* McGraw-Hill 1967.
Jensen, A.R. and others. *Environment, Heredity and Intelligence,* Harvard Educ. Rev. 1969.
Kamin, L.J. *The Science and Politics of I.Q.,* Wiley 1975.
Richardson, K. and Spears, D. (eds) *Race, Culture and Intelligence,* Penguin 1972.

SOCIAL WORK

Outline of Course Structure
The formal course-work will be given within the department of social work. Academic staff from other departments may provide some lectures within the prescribed course. The following subjects are available:

First Year
Social-Personal Systems and Human Problems
Development of Social Welfare
Contexts of Helping
Social Work Practice
Field and Laboratory Learning
Elective Seminars

Second Year
The Family and Social Work
Law in Social Work Practice
Ethnic Background, Class and Sex in Social Work Practice
Social Work Practice
Field and Laboratory Learning
Research Project
Elective Seminars

Class Requirements
The course-work load will be a minimum of nine to twelve hours per week. In addition students will participate in practical work which includes the development of social work practice skills, the supervised application of practice and methodology in the community, and seminars in which the students will integrate theory and practice.

In second year, an additional minimum of two hours per week will be devoted to a research project on social work or social welfare.

Field Placements
Field instruction is a vital part of the degree program. Field placements will be made throughout the academic year and during a special period of eight weeks at the end of the third term of each year of the course.

For details of subjects available, see disciplines entry in volume 1 of the Calendar.

ZOOLOGY

Zoology II

The course is designed to expand on topics introduced in the Zoology component of Biology IB and introduce new topics, so that students not continuing to Zoology III will have a general appreciation of the subject and those continuing to Zoology III will have sufficient exposure to enable them to make an informed choice between Zoology IIIA and Zoology IIIB.

Prerequisites
Biology IB is essential. Chemistry I and any one of Mathematics IC, IA or Physical Sciences IT are recommended.

Class Requirements

Lectures
Three hours per week for three terms.

Practical/Tutorial Classes
Six hours a week for three terms.

A field course of about five days duration, probably to the Grampian Highlands, will be an essential part of the course, and reports of the field work will contribute to the final course assessment. All students enrolled in Zoology II are expected to attend the field course.

The vertebrate course will involve dissection in the practical classes.

Preliminary Reading
Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following books are recommended:
Oldroyd, H. *Collecting, Preserving and Studying Insects,* 2nd edn, Hutchinson 1970.
Clapham, W.B. Jr *Natural Ecosystems,* Macmillan (soft cover) 1973.

Syllabus

Ecology:
History and scope of ecology; concept of the ecosystem; food chains and trophic levels; energy in ecosystems; biogeochemical cycles; community structure and measurement; ecological succession; plant/animal interactions (14 lectures).

Prescribed Reading
Krebs, C.J. *Ecology,* Harper and Row 1972.

Recommended Reading
Odum, E.P. *Fundamentals of Ecology,* 3rd edn, Saunders 1971.

Animal Behaviour:
Evolution: genes and behaviour, microevolution, sexual isolation. Development: ontogenetic interactions between parental endowment and the environment. Control: external stimuli and internal control mechanisms. Social behaviour: types of social behaviour and organisation; methods of communication and cooperation (10 lectures).

Prescribed Reading
Manning, A. *An Introduction to Animal Behaviour,* Arnold 1972.

Recommended Reading
Price, E.O. and Stokes, A.W. *Animal Behaviour in Laboratory and Field,* 2nd edn, Freeman 1975.

General and Environmental Physiology:
Examination of the variety of ways in which animals cope with environmental factors such as oxygen supply, food and energy, temperature, water; mechanisms of control of movement, sensory systems and neural integration (15 lectures).

Prescribed Reading
Schmidt-Nielsen, K. *Animal Physiology,* Cambridge Univ. Pr. 1975.

Entomology:
Insect origins and fossil records; origin of flight; adaptive radiation; evolution of insect orders and such phenomena as metamorphosis, mimicry and social behaviour; phenology of insects (10 lectures).

Prescribed Reading
Ross, H.H. *A textbook of Entomology,* 3rd edn, Wiley (soft cover) 1965.

Recommended Reading
Chapman, R.F. *The Insects : Structure and Function,* The English Univ. Pr. 1969.
CSIRO, *Insects of Australia,* Melbourne Univ. Pr. 1970, *Supplement* 1974.
Imms, A.D. *A General Textbook of Entomology,* Methuen 1964.
Romoser, W.A. *The Science of Entomology,* Macmillan 1973.

Vertebrates:
Aspects of the evolution, comparative morphology and systematics of fish, amphibians, reptiles, birds and mammals, including a treatment of vertebrates known only from fossils (20 lectures).

Prescribed Reading
Hildebrand, M. *Analysis of Vertebrate Structure,* Wiley International 1974.
Saunders, J.T., Manton, S.M., and Brown, M.E. *A Manual of Practical Vertebrate Morphology,* Clarendon Pr. 1975.

Recommended Reading
Parker, T.J. and Haswell, W.A. (eds) *Textbook of Zoology : Vertebrates vol. 2,* Macmillan 1972.
Romer, A.S. *The Vertebrate Body,* 4th edn, Saunders 1970.

Zoogeography:
Zoogeographical realms and regions, dispersal, barriers; continental drift, plate tectonics and their biogeographical implications, particularly on the origins and evolution of the biota of the Australian region (6 lectures).

Recommended Reading
Keast, A. (ed.) *Biogeography and Ecology in Australia,* Junk 1959.
Tarling, D. and Tarling, M. *Continental Drift,* Doubleday, NY (soft cover) 1972.
Williams, W.D. (ed.) *Biogeography and Ecology in Tasmania,* Junk 1974.

Assessment
Practical and field reports and other assignments set throughout the year; three 3-hour theory examinations; one 2-hour practical examination on the vertebrate segment of the course.

Zoology III

The third year in Zoology is designed to cater for students who wish to follow one of two main lines of study. Zoology IIIA emphasises ecological zoology and includes both laboratory work and field studies. Zoology IIIB is a course with a strong physiological emphasis, and has a higher content of laboratory experimental work. A number of subjects are included in both courses. Students should select either Zoology IIIA or Zoology IIIB and should indicate their choice at the time of enrolment.

Prerequisite
Zoology II.

Class Requirements

Lectures
Four hours a week for three terms.

Practical/Tutorial Classes
Nine hours a week for three terms. There will be field courses of about five days duration, probably to Wilson's Promontory (Zoology IIIA) and the NW arid region of Victoria (Zoology IIIB). Reports of the field projects will contribute to the final course assessment, and all third year students are expected to attend.

Preliminary Reading
Zoology IIIA. Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following books are recommended:
Dakin, W.J. *Australian Seashores,* Angus and Robertson 1969.
Kormondy, E.J. *Concepts of Ecology,* Prentice-Hall 1976.
Nicol, J.A.C. *The Biology of Marine Animals,* Pitman, London 1968.
Solomon, M.E. *Population Dynamics,* Edward Arnold 1970.
Stephenson, T.A. and Stephenson, A. *Life Between the Tidemarks on Rocky Shores,* Freeman and Co. 1972.

Syllabus
Zoology IIIA.

Embryology:
The egg, oogenesis and gene activity; fertilization, immunological studies on eggs and sperms; cleavage; morphogenetic movements, nucleic acids and protein synthesis during gastrulation; organogenesis; induction, inducing substances; differentiation, nucleo-cytoplasmic interaction; hybridization; nuclear transplantation; cancer and ageing; regeneration (10 lectures).

Prescribed Reading
Balinsky, B.J. *An Introduction to Embryology,* Saunders 1975.

Recommended Reading
Davidson, E.H. *Gene activity in early development,* Academic Pr. 1968.
Hamburgh, M. *Theories of differentiation,* Edward Arnold 1971.

Reproductive Biology:
Cycles and seasons, breeding cycles, seasonal cycles, mating and birth; oestrous cycles, menstrual cycle; ovulation, implantation, gestation; hormones in reproduction, hormone transport, target organs; spermatogenesis and steroidogenesis; hormonal control of reproduction in the female sheep, rat and human (10 lectures).

Recommended Reading
Austin, C.R. and Short, R.V. (eds) *Reproduction in Mammals,* Books 1-5, Cambridge Univ. Pr. 1972.
Turner, C.D. and Bagnara, J.T. *General Endocrinology,* Saunders 1971.

Animal Ecology:
Properties of populations; population growth models; innate rate of increase; effects of environmental factors on the growth, regulation and interaction of

populations; qualitative changes in populations; theories of population regulation; dispersal and migration; population estimation; construction and analysis of life-tables, examples of population studies of vertebrates and invertebrates and their application. The ecosystem; the description of animal communities – indices of diversity and affinity; ecological energetics and the construction of energy budgets (28 lectures).

Prescribed Reading

Dempster, J.P. *Animal Population Ecology,* Academic Pr. 1975.
Krebs, C.J. *Ecology,* Harper and Row 1972.
Miller, G., Tyler Jr *Living in the Environment : Concepts, Problems, and Alternatives,* Wadsworth 1975.
Parker, R.E. *Introductory Statistics for Biology,* Edward Arnold 1973.

Recommended Reading

Andrewartha, H.G. and Birch, L.C. *The Distribution and Abundance of Animals,* Univ. of Chicago Pr. 1954.
Andrewartha, H.G. *Introduction to the Study of Animal Populations,* 2nd edn, Methuen (soft cover) 1973.
Open University, *Block B. Population Dynamics,* The Open University Pr. 1974.
Pianka, E.C. *Evolutionary Ecology,* Harper and Row 1974.
Southwood, T.R.E. *Ecological Methods,* 2nd edn, Chapman and Hall 1966.
Varley, G.C., Gradwell, G.R. and Hassell, M.P. *Insect Population Ecology : an analytical approach,* Blackwell 1973.

Sociobiology:

Evolution of social behaviour in relation to the biology of populations. Problems of group selection and altruism in the evolution of societies. Mechanisms of communication, aggression, spacing, dominance, sex and parental care. Particular attention will be paid to societies of insects and non-human primates (8 lectures).

Recommended Reading

Wilson, E.O. *Sociobiology,* Harvard Univ. Pr. 1975.

Marine Ecology:

Ecological factors such as light, salinity, temperature, tides, pressure, nutrients, wave action, currents, oxygen content, dessication, and their significance for pelagic, benthic and littoral communities. The distribution of marine organisms in space and time. Economic aspects of marine ecology (10 lectures).

Prescribed Reading

Tait, R.V. *Elements of Marine Ecology,* Butterworth 1972.

Recommended Reading

Moore, H.B. *Marine Ecology,* Wiley, NY 1958.
Newell, R.C. *Biology of Intertidal Animals,* Logos Pr. 1970.

Applied Insect Ecology:

Beneficial insects; insect and acarine pests in agriculture, public health, forestry, and stored products; development of pest populations in crops; biological, physical, cultural, mechanical, chemical, and other methods of pest control; problems associated with pest control methods and the concept of integrated control (pest management) (12 lectures).

Prescribed Reading
Cherret, J.M., Ford, J.B., Herbet, I.V. and Probert, A.J. *The Control of Injurious Animals,* English Univ. Pr. 1971.

Recommended Reading
Busvine, J.R. *Insects and Hygiene,* Methuen 1966.
Metcalf, C.L. and Flint, W.P. *Destructive and Useful Insects,* 4th edn, McGraw Hill 1962.
Price Jones, D. and Solomon, M.E. (eds) *Biology in Pest and Disease Control,* Blackwell 1974.
Reay, R.C. *Insects and Insecticides,* Oliver and Boyd 1969.

Marsupial Studies:
The characteristics, classification, evolution and distribution of marsupials, and aspects of their reproduction, embryology and ecology (10 lectures).

Prescribed Reading
Tyndale-Biscoe, H. *Life of Marsupials,* Edward Arnold 1973.

Habitat and Wildlife Conservation:
Destruction and disruption of natural ecosystems; habitat alteration; release of pollutants; management and exploitation of wildlife populations. Emphasis will be on SE Australian examples, and legislative controls will be discussed (12 lectures).

Prescribed Reading
Miller, G.T. Jr *Living in the Environment : Concepts, Problems, and Alternatives,* Wadsworth 1975.

Recommended Reading
Bayly, I.A.E. and Williams, W.D. *Inland Waters and their Ecology,* Longman 1973.
Costin, A.B. and Frith, H.J. *Conservation,* Penguin 1974.
Costin, A.B. and Groves, R.H. *Nature Conservation in the Pacific,* ANU 1973.
Frith, H.J. *Wildlife Conservation,* Angus and Robertson 1973.
Marshall, A.J. *The Great Extermination,* Heinemann 1966.
Routley, R. and Routley, V. *The Fight for the Forests,* ANU Pr. 1975.

Assessment
Reports of practical and field projects and other assignments, such as student seminars, set throughout the year; four 3-hour theory examinations and one 3-hour practical examination.

Syllabus
Zoology IIIB.

Physiological Instrumentation and Techniques:
Elementary electronic recording and control circuits, light microscopy, electron microscopy, electron probe X-ray microanalysis, flame photometry, colorimetry, respirometry, osmometry. Chemistry of fixation and staining for light and electron microscopy, cytochemistry (4 lectures).

Recommended Reading
Haggis, G.H. *The Electron Microscope in Molecular Biology,* Longman 1966.
Lenhoff, E.S. *Tools of Biology,* Macmillan 1966.

Cellular Ultrastructure and Tissue Structure:
Structure and function of cell organelles and cell types; morphological changes associated with biosynthesis, secretory cycles, degradative processes and other metabolic activities. Structure and function of tissues and selected organ systems (12 lectures).

Prescribed Reading
Dyson, R.D. *Cell Biology,* Allyn and Bacon 1974.

Recommended Reading
Haggis, G.H. *The Electron Microscope in Molecular Biology,* Longman 1966.

Cell Physiology:
Elementary physiological chemistry of proteins, enzymes and metabolic pathways, cellular respiration and energetics, membrane transport processes, bioelectricity (8 lectures).

Prescribed Reading
Dyson, R.D. *Cell Biology,* Allyn and Bacon 1974.
Florey, E. *An Introduction to General and Comparative Animal Physiology,* Saunders 1976.
Levin, R.J. *The Living Barrier : A Primer on Transfer across Biological Membranes,* Heinemann 1969.
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.

Recommended Reading
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Oxford Biology Readers, Oxford Univ. Pr. 1972, No. 19: Mitochondria.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

General Physiology:
Nature of the nerve impulse, neuronal conduction and integration, mechanisms of photoreception, chemoreception, mechanoreception and proprioception, muscle contraction and primitive motile systems (8 lectures).

Prescribed Reading
Florey, E. *An Introduction to General and Comparative Animal Physiology,* Saunders 1976.
Levin, R.J. *The Living Barrier : A Primer on Transfer across Biological Membranes,* Heinemann 1969.
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.

Recommended Reading
Case, J. *Sensory Mechanisms,* Macmillan 1966.
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

Comparative Physiology:
Respiration and metabolism, circulation, digestion and nutrition, nitrogen excretion, in various animal groups (8 lectures).

Prescribed Reading
Florey, E. *An Introduction to General and Comparative Animal Physiology,* Saunders 1976.

Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.
Schmidt-Nielsen, K. *Animal Physiology,* Cambridge Univ. Pr. 1975.

Recommended Reading
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Mill, P.J. *Respiration in Invertebrates,* Macmillan, (soft cover) 1972.
Wood, D.W. *Principles of Animal Physiology,* Edward Arnold 1974.

Environmental Physiology:
Water and ion balance, oxygen transport and storage, temperature regulation and adaptation, biological rhythms. Physiology of animals of arid zones (10 lectures).

Prescribed Reading
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.
Schmidt-Nielsen, K. *Animal Physiology,* Cambridge Univ. Pr. 1975.

Recommended Reading
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Mill, P.J. *Respiration in Invertebrates,* Macmillan (soft cover) 1972.
Oxford Biology Readers, Oxford Univ. Pr. 1971. No. 14 : Control of Water Balance by the Kidney.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

Insect Physiology:
Selected physiological topics of particular relevance to insects (4 lectures).

Prescribed Reading
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.
Schmidt-Nielsen, K. *Animal Physiology,* Cambridge Univ. Pr. 1975.

Recommended Reading
Chapman, R.F. *The Insects : Structure and Function,* English Univ. Pr. 1971.
Mill, P.J. *Respiration in Invertebrates,* Macmillan (soft cover) 1972.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

Endocrinology:
Principles of the endocrine system; control of endocrine secretion; integration of endocrine and nervous systems; structure, function and control of endocrine glands. Hypophysis, thyroid, parathyroid, adrenal, pancreas; hormones of the alimentary system. Parahormones and hormone-like secretions (8 lectures).

Prescribed Reading
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.
Turner, C.D. and Bagnara, J.T. *General Endocrinology,* Saunders 1971.

Recommended Reading
Bentley, P.J. *Comparative Vertebrate Endocrinology,* CUP 1976.
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Highnam, K.C. and Hill, L. *The Comparative Endocrinology of the Invertebrates,* Edward Arnold 1969.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

Reproductive Biology:
Cycles and seasons, breeding cycles, seasonal cycles; mating and birth; oestrous cycle, menstrual cycle; ovulation, implantation, gestation; hormones in reproduction,

hormone transport, target organs; spermatogenesis and steroidogenesis; hormonal control of reproduction in the female sheep, rat and human (10 lectures).

Prescribed Reading
Prosser, C.L. *Comparative Animal Physiology,* Saunders 1973.
Turner, C.D. and Bagnara, J.T. *General Endocrinology,* Saunders 1971.

Recommended Reading
Austin, C.R. and Short, R.V. (eds), *Reproduction in Mammals,* Books 1-5, Cambridge Univ. Pr. 1972.
Ganong, W.F. *Review of Medical Physiology,* Lange Medical Publications 1976.
Wood, D.W. *Principles of Animal Physiology,* Arnold 1974.

Embryology:
The egg, oogenesis and gene activity; fertilization, immunological studies on eggs and sperms; cleavage; morphogenetic movements in gastrulation, nucleic acids and protein synthesis during gastrulation; organogenesis; induction, inducing substances; differentiation, nucleo-cytoplasmic interaction; hybridization; nuclear transplantation, cancer and ageing; regeneration (10 lectures).

Prescribed Reading
Balinsky, B.J. *An Introduction To Embryology,* Saunders 1975.

Recommended Reading
Davidson, E.H. *Gene activity in early development,* Academic Pr. 1968.
Hamburgh, M. *Theories of differentiation,* Edward Arnold 1971.

Ecological Physiology:
Types of environmental variables; macro, micro and internal environments; respiration and its significance in ecological energetics and in metabolic heat loss; effects of fluctuating environments; acclimation; conformity and regulation; heat and balance in mammals and its metabolic consequences; phylogeny and ontogeny of the acquisition of endothermy; water balance and adaptation in nitrogen excretion; tissue water and ions; metabolic adaptation in man (10 lectures).

Prescribed Reading
Schmidt-Nielsen, K. *Animal Physiology,* Cambridge Univ. Pr. 1975.

Recommended Reading
Mill, P.J. *Respiration in Invertebrates,* Macmillan (soft cover) 1972.
Vernberg, F.J. and Vernberg, W.B. *The Animal and the Environment,* Holt, Rinehart and Winston 1970.

Control and Development of Behaviour:
Control : Movements, effective stimuli, motivational states, hormones; diversity of control systems; conflict-threat and courtship. Development : nature of interactions between parental endowment and the individual's environment, development of movements, perceptual abilities, integration, motivation and learning. Genes and behaviour (8 lectures).

Recommended Reading
Hinde, R.A. *Animal Behaviour,* 2nd edn, McGraw-Hill 1970.
Klopfer, P. *An Introduction to Behaviour : Ethology's First Century,* Prentice-Hall 1974.

Price, E.O. and Stokes, S.W. *Animal Behaviour in Laboratory and Field,* 2nd edn, Freeman 1975.

Assessment
Reports of practical and field projects and other assignments set throughout the year; four 3-hour theory examinations and one 3-hour practical examination.

Honours Course

Honours students are required to undertake a research project under supervision, complete prescribed courses of reading, prepare essays on selected topics, attend tutorials and give seminars. There is no formal course of lectures, and hours of study are unlimited. Students who do not have qualifications in statistics may be required to complete a statistics course during their honours year. Prospective honours students should see the chairman of the department during third term of their final year for a discussion of possible research topics available in the department.

Assessment
The assessment of the research topic report will constitute 50 per cent of the total, essays throughout the year 25 per cent, and a theory examination in October on the general field of the research topic, 25 per cent.

Postgraduate Studies : M Sc and Ph D

Research leading to the degree of M Sc or Ph D may be carried out in the following fields. Prospective students should contact the chairman of the department for further details. Copies of the departmental research report are available from him on request.

Speciation on oceanic archipelagos; zoogeography of Pacific insects; zoogeography, conservation, physiological ecology and evolution of SE Australian reptiles; ecology, taxonomy and morphology of insects; structure of insect communities; population ecology of plant-feeding insects, particularly agricultural pest species; insect dispersal; biological, chemical and integrated control of insect pests; physiological and ultrastructural studies of mechanisms of salt and water regulation in insects; methods of analytical electron microscopy and electron probe X-ray microanalysis; physiological ecology of invertebrates; behaviour of Australian birds; reproductive biology of dasyurid marsupials; endocrine control of salt and water metabolism in vertebrates and invertebrates, the mechanism and control of muscular contraction.

Part VII Table of Subjects

School of Agriculture

Subject	Code No.
First Year	
Agriculture I	630.10
Biology IA	570.10
Chemistry I	540.10
Physical Sciences IT	500.10
Second Year	
Agriculture IIA	630.20
Agriculture IIB	630.21
Agriculture IIC	630.22
Chemistry IIB	540.21
Biology II	571.20
Third Year	
Agriculture IIIA	630.30
Agriculture IIIB	630.31
Agriculture IIIC	630.32
Fourth Year	
Agriculture IVA	630.40
Agriculture IVB	630.41
Agriculture IVC	630.42

Schools of Behavioural, Biological and Physical Sciences

Subject	Code	Unit Value	Prerequisite Subjects
Biochemistry II	574.20	1	Chemistry I and Biology IA or Biology IB
Biochemistry III	574.30	1	Biochemistry II
Biochemistry IV	574.40	1	Biochemistry III
Biology IA (botany and genetics)	570.10	1	Any two of chemistry, biology, physics or a branch of mathematics at HSC level.
Biology IB (zoology and genetics)	570.11	1	
Man and Environment I	571.10	1	Nil
Man and Environment II ME II HE : Human Ecology	571.21	0.5	Man and Environment I or Prehistory I
ME II BF : Biological Functions	571.22	0.5	Man and Environment I
Botany II	580.20	1	Biology IA and one of Chemistry I, Physics I or a first-year mathematics subjects
Botany III	580.30	1	Botany II
Botany IV	580.40	1	Botany III or special approval of the Board of Studies
Chemical Physics III	535.30	2	Applied Mathematics II, Chemistry IIA (Physical) and Physics II
Chemical Physics IV	535.40	—	Chemical Physics III or an approved equivalent
Chemistry I	540.10	1	Assumes HSC level in chemistry and at least leaving level in Physics and Mathematics.
Chemistry IIA	540.20	1	Chemistry I, Physics I or first-year mathematics unit (incompatible with Chemistry IIB)
Chemistry IIB	540.21	1	Chemistry I (incompatable subject — Chemistry IIA). Available only for students enrolled in the School of Agriculture.
Chemistry IIIA	540.30	1	Chemistry IIA (prior or concurrent study of Chemistry IIIB)
Chemistry IIIB	540.31	1	Chemistry IIA[1]
Chemistry IV	540.40	—	Chemistry IIIA and Chemistry IIIB[2]
Communication Engineering			
Communication Components I	626.10	1	B Sc degree including Physics II and Mathematics II
Communication Circuits I	626.11	1	
Communication Systems I	626.12	1	
Mathematics and Computation I	626.13	1	

Subject	Code	Unit Value	Prerequisite Subjects
Communication Components II	626.20	1	
Communication Circuits II	626.21	1	
Communication Systems II	626.22	1	
Communication Theory II	626.23	1	
Economics I MA	330.10	0.5	Nil
Economics I MI	330.11	0.5	Nil
Economics II MA	330.20	0.5	Economics I MA
Economics II MI	330.21	0.5	Economics I MI
Economics II IM (introductory mathematics for economists)	331.22	0.5	Economics II MA and Economics II MI. These may be co-requisites.
Economics II IR (industrial relations)	330.25	0.5	Economics II MA and Economics II MI.
Economics II SS (economic systems simulation)	330.27	0.5	Economics II ES or Economics II ME
Accounting II CR (corporate reporting)	330.28	0.5	Grade C or better in Accounting I AC
Econometrics II ES (economic statistics)	331.21	0.5	Social Sciences IC or a first-year mathematics subject
Econometrics II ME (mathematical economics)	330.29	0.5	First-year mathematics subject or Social Sciences IC or a good pass in Social Sciences IB with a special background course or Econometircs II ES
Economics History II EH	331.23	0.5	Economics I MA and Economics I MI
Economics III MA	330.30	0.5	Economics II MA
Economics III MI	330.31	0.5	Economics II MI
Accounting III IT (the Australian income tax system)	331.37	0.5	Nil
Econometrics III EK	331.34	0.5	Econometrics IIES or Econometrics IIME
Econometrics IV EK (Econometric models and stabilization)	–	1	Econometrics III EK or Econometrics III ME
Econometrics IV ME (Mathematical economics)	–	1	Any third year Econometrics subject.
Economics IV AM (applied microeconomics)	–	1	Nil
Genetics II	570.20	1	Biology IA or IB (including a pass in the genetics component), and a subject from the School of Physical Sciences.
Genetics III	570.30	1	Genetics II
Genetics IV	570.40	1	Genetics III
Geology I	550.10	1	Nil
Geology II	550.20	1	Geology I
Geology III	550.30	1	Geology II

Subject	Code	Unit Value	Prerequisite Subjects
Geology IV	550.40	–	Geology III
Logic I (Elementary Symbolic and Philosophical Logic)	101.10	1	Nil.
Mathematics IA	512.10	1	Nil (incompatible with Mathematics IC)
Mathematics IB	512.11	1	Nil (incompatible with Mathematics IC)
Mathematics IC	512.12	1	Nil (incompatible with Mathematics IA and Mathematics IB)
Applied Mathematics II	515.20	1	Mathematics IA
Mathematical Statistics II	519.20	1	Mathematics IA
Pure Mathematics II	510.20	1	Mathematics IA
Applied Mathematics III	515.30	1	Applied Mathematics II
Mathematical Statistics III	519.30	1	Mathematical Statistics II, Pure Mathematics II[3]
Pure Mathematics III	510.30	1	Pure Mathematics II
Computer Science III	520.30	1	A first-year mathematics subject except Mathematics IF. (Some second-year components are recommended but not required.)
Applied Mathematics IV	515.40	–	Applied Mathematics II and Pure Mathematics II
Mathematical Statistics IV	519.40	–	Mathematical Statistics III and Pure Mathematics II
Pure Mathematics IV	510.40	–	Pure Mathematics III
Microbiology II	576.20	1	Biology IA or Biology IB and Chemistry I
Microbiology III	576.30	1	Microbiology II
Microbiology IV	576.40	1	Microbiology III
Philosophy IA (An introduction to Philosophy)	100.10	1	Nil
Philosophy IC (History of Philosophy)	100.12	1	Nil
Philosophy ID (Contemporary Analytical Philosophy)	100.13	1	Nil
Philosophy IE (Philosophy and Society)	100.14	1	Nil
Philosophy IL (See Logic I)	101.10	1	Nil (Incompatible with Philosophy IIFA/IIIFA)
Philosophy IISA (Philosophy of Science A)	101.27	1	Any first year Philosophy unit or any two units from the Schools of Physical or Biological Sciences.
Philosophy IIFA/IIIFA (Formal Logic A)	100.24 100.34	0.5*	Any first-year philosophy unit or any two units from the Schools of Biological or Physical Sciences, or Linguistics I. Incompatible with Logic I.
Philosophy IIFB/IIIFB (Formal Logic B)	100.25 100.35	0.5*	Philosophy IIFA/IIIFA. Incompatible with Pure Mathematics 211.

Subject	Code	Unit Value	Prerequisite Subjects
Philosophy IILL/IIILL (Logic, Linguistics and Thought Processes)	102.28 103.38	0.5*	A first year unit of Logic, Linguistics or Psychology
Philosophy IILP/IIILP (Logic and Psychology)	100.28 100.38	0.5*	A first year unit of Logic, Linguistics or Psychology.
Philosophy IIPM/IIIPM (Philosophy of Mathematics)	101.24 101.34	0.5*	Either: (a) Mathematics PM211 or (b) Mathematics IA, and Philosophy IIFA/IIIFA or (c) Philosophy IIFB/IIIFB. Incompatible with Philosophy IIIHPM, History and Philosophy of Mathematics.
Philosophy IIIFC (Metalogic)	102.31	0.5*	Philosophy IIFA/IIIFA or Logic I.
Philosophy IIIFG (Modal Logic)	102.34	0.5*	Philosophy IIFA/IIIFA or Logic I Incompatible with Philosophy IIILS.
Philosophy IIIHPM (History and Philosophy of Mathematics)	102.37	0.5*	A second-year Mathematics subject, and either Mathematics PM211, or Philosophy IIFA/IIIFA, or Logic I. Incompatible with Philosophy IIPM/IIIPM.
Philosophy IIIKD (Kant's Dialectic)	103.39	0.5	A second year Philosophy unit (preferably one with an orientation towards epistemology or metaphysics)
Philosophy IIILS (Philosophy of Logic and Science)	103.30	1	Philosophy IIFA/IIIFA or Philosophy IISA, or Logic I. Incompatible with Philosophy IIIFG.
Philosophy IIIPSS (Philosophy of Social Science)	101.36	0.5*	Any first year Philosophy, Sociology or Psychology unit.
Physical Sciences IT	500.10	1	Nil
Physical Sciences II	500.20	1	As for each segment
Physical Sciences III	500.30	1	As for each segment
Physics IA	530.10	1	Assumes HSC level in physics and mathematics.
Physics IB	530.11	1	Assumes HSC level in physics and mathematics
Physics IIA	530.20	1	Physics IA and Mathematics IA or IB
Physics IIB	530.21	1	Physics IA or IB and Mathematics IA or IB
Physics IIIA	530.30	1	Physics IIA and Mathematics II, or Physics IIB and Mathematics II or Physical Sciences II
Physics IIIB	530.31	1	Physics IIA and Mathematics II, or Physics IIB and Mathematics II or Physical Sciences II
Physics IV	530.40	–	Physics IIIA

Subject	Code	Unit Value	Prerequisite Subjects
Physiology and Nutrition II	630.23	1	Any course at first year level in the Schools of Biological or Physical Sciences
Psychology I	150.10	1	Nil
Psychology II	150.20	1	Psychology I
Psychology III	150.30	1	Psychology II
Psychology IV	150.40	—	A pass in a bachelors degree with a major sequence in psychology
Sociobiology II/III	140.20 140.30	0.5	Biology IA or IB or Man and Environment I (formerly Biology IME) or Prehistory I
Zoology II	590.20	1	Biology IB and (recommended) Chemistry I and any one of Mathematics IA, Mathematics IC, Physical Sciences IT.
Zoology IIIA	590.30	1	Zoology II
Zoology IIIB	590.31	1	Zoology II
Zoology IV	590.40	1	Zoology IIIA or IIIB

*The unit value is 0.5 if presented as part of a second-year unit and is 0.33 if presented as part of a third-year unit.

1. In special circumstances, the Board of Studies may accept Chemistry IIB as a prerequisite for Chemistry IIIB.
2. Students who have performed well in Chemistry IIIB and another third year science subject may be admitted to the course. Anyone proposing to follow this sequence should consult with a chemistry adviser of studies.
3. Only for students intending to proceed to honours.