The University of Sydney

Faculty of Agriculture

Handbook
1995

Editors
Robert F. Jeffs
Harley A. Rose

The University of Sydney
N.S.W. 2006
Telephone 351 2222
Fax 351 2945 (Faculty)

Further information about examinations, appeals and other matters can be found in the *University of Sydney Diary* which is available free on request from the Student Centre and University of Sydney Union outlets.

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Semester and vacation dates 1995

Semester	Day	1995
First Semester and lectures begin	Monday	27 February

Easter recess
    Last day of lectures
    Lectures resume
	Thursday
	Monday
		13 April
		24 April

Study vacation—1 week beginning	Monday	12 June
Examinations commence	Monday	19 June
Second Semester and lectures begin	Monday	24 July

Mid-semester recess
    Last day of lectures
    Lectures resume (for courses
        offered by Agriculture)
	Friday
	Tuesday
		22 September
		3 October

Study vacation—1 week beginning	Monday	6 November
Examinations commence	Monday	13 November

* There may be variations to the semester dates for some courses.

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The management of our natural resources so as to ensure the sustainable production of food and fibre is vital to the future of the planet. Vision, care and highly trained and dedicated graduates will be crucial to ensure that we conserve and protect our natural resources while meeting the needs of an expanding global community.

Australian agriculture is highly efficient and environmentally aware. It is an industry based on a renewable energy source, solar radiation, and is supported by an excellent research and technological infrastructure. Agricultural economists and agricultural scientists help ensure that we are efficient and effective users of our resources. Our graduates have outstanding employment rates, together with diverse career opportunities in the rural and related industries and in the management and conservation of our natural resources.

There remain many challenges and problems which will require attention in the decade ahead. Molecular genetics, for example, offers great potential for facilitating the incorporation of genes for resistance to disease and insect pests into new plant cultivars, one form of biological control. The successful exploitation of these new techniques will require intensive research by well-trained plant geneticists and breeders. Furthermore, there is significant scope for the application of molecular biology in animal science in the improvement of our genetic stocks of animals and poultry, and in the development of vaccines. Current research on animal nutrition will enhance animal welfare and productivity.

There is considerable concern about the impact of pesticides on the environment and the presence of residues in food. Therefore, we have an urgent need for more research to reduce pesticide use through the adoption of alternative control measures designed to minimise disruption to natural ecosystems. Biological control measures will have an expanding role through integrated pest management.

The conservation of our soils depends on research by soil physicists, chemists and biologists and effective information transfer systems. All these are areas in which graduates in agricultural science can play vital roles. These scientists also have a key role in conserving and protecting our water resources and national parks.

The development of efficient processes for adding value to our primary products for export offers a major challenge to graduates in agricultural chemistry and food technology.

The sound management of agriculture requires more than good science. Economic research is needed to assess the social costs and benefits of alternative agricultural practices and to establish appropriate policies for utilising our natural resources. Agricultural economists are also needed to identify the opportunities for value-adding created by new technology in agricultural production, processing and marketing and in researching and developing market institutions that ensure that such opportunities are recognised and grasped. There are exciting challenges ahead for graduates interested in agricultural marketing and exports with the successful conclusion of the GATT Agreement and new opportunities in Asia.

New curricula for both degrees, the Bachelor of Science in Agriculture and the Bachelor of Agricultural Economics, have recently been introduced and reflect advances in the various disciplines.

The range of excursions which students elect has been increased to provide opportunities for students to undertake excursions to the three major agroclimatic regions of New South Wales, to the Northern Territory and to the tropical areas of Queensland and Southeast Asia. The Faculty also has an established Undergraduate Achievers' Program. These special programs, together with professional work experience, provide students with first-hand knowledge of our natural resources and rural enterprises.
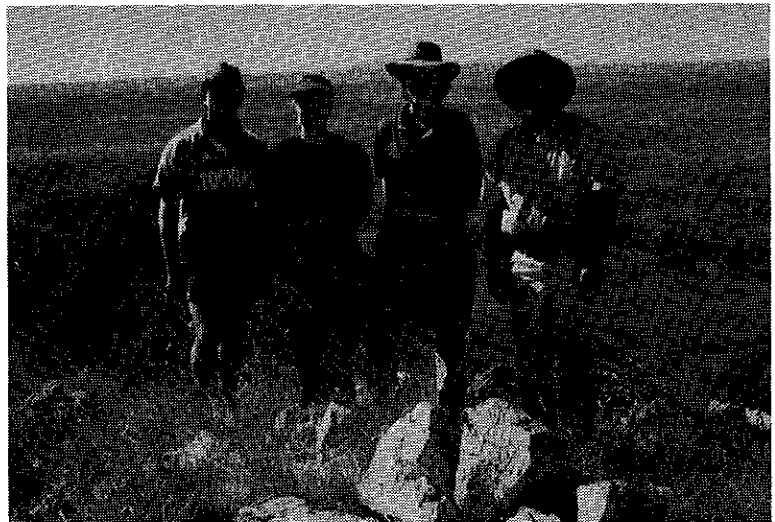
Undergraduate Achievers Research Program at Finke Gorge National Park, Northern Territory. Left to right: Adrian Taylor (2nd Year BAgrEc), Nerida Donovan (3rd Year BScAgr), Julie Cavanagh (2nd Year BScAgr) and Professor Lester W. Burgess, Dean.

Undergraduates receive training in the basic sciences or economics, and it is this foundation which is a prerequisite for later years, when challenging courses are selected from various professional disciplines. Indeed, this thorough training in the basics, combined with specialisation in the final year, is a
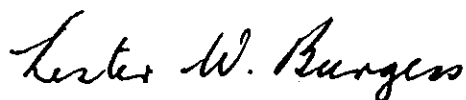
feature of our degrees which is well recognised by employers.

The Faculty of Agriculture has an outstanding international reputation for its teaching and research. It has extensive resources on the Sydney campus and at Camden where facilities are located for poultry and large animal research and for horticultural and agronomic research. In addition, a new Plant Breeding Institute at Camden provides teaching in advanced plant biotechnology. Teaching and research is also undertaken at the I.A. Watson Wheat Research Centre, Narrabri and Livingston Farm, Moree.

The Faculty is the largest Faculty of Agriculture in Australia, but is relatively small by University of Sydney standards. Students have greater access to staff than in larger faculties and the student body is an active and socially cohesive group. These features promote a warm and friendly atmosphere which is conducive to intellectual and social development. Students are encouraged to take advantage of the wide range of extracurricular activities available on campus.

This handbook provides general information about the Faculty and more specific details concerning courses available in each of the degree programs. Further information and advice can be obtained from the Faculty advisers and you are encouraged to make use of these various resources.

It is with great pleasure that I welcome you to the Faculty of Agriculture and extend my best wishes to each of you in your chosen career.

Lester W. Burgess
Dean

Introduction

Undergraduate study

In this Faculty of Agriculture Handbook you will find most of what you need to know about the Faculty.

In particular, it will help you find out who the people in your Faculty are; the requirements for the bachelor degrees, and the ways these can be satisfied; what courses are offered and the books required for these courses; where to turn for more information, advice and help.

When making up your mind about your course of study, look at the first part of Chapter 2 for an overview of the Faculty, and then at Chapter 3, which sets out the requirements for the bachelor degrees.

Once you have a general impression of the requirements and courses available, refer to Chapter 4 on courses of study. You may need help in deciding on the best courses to take—and advice is available at the Faculty Office and from departments.

Chapter 5 contains special information relating to the Faculty. This section should be read in conjunction with the *University of Sydney Diary*. Included are the special enrolment instructions for Agriculture. You will see that when you enrol you will have the opportunity to consult a Faculty adviser before your enrolment is finally approved.

Postgraduate study

Information about postgraduate study within the Faculty is given in Chapter 6. Further information about the University generally is given in the *Postgraduate Studies Prospectus*, available from the Student Centre.

Central Australia excursion

FACULTY

Dean
Lester W. Burgess

Pro-Dean
Peter R. Reeves

Associate Deans
Fredoun Z. Ahmadi-Esfahani
Robert L. Batterham
Robert A. Caldwell
Lindsay C. Campbell
Les Copeland

Secretary to the Faculty
Robert Jeffs, BA *Waterloo Lutheran University*

Administrative Officer (Development)
Michele Hird, DipAppSc(Agr) *Wagga Agric.Coll.* DipEd

Secretary to the Dean (Faculty Office)
Veronica Moschione

Administrative Assistant
Michelle Dugay

DEPARTMENTS

Agricultural Chemistry and Soil Science

Agricultural Chemistry

Reader
Ivan R. Kennedy, BSc(Agric) PhD DSc(Agric) *W.Aust.*

Associate Professor
*Les Copeland, BSc PhD

Senior Lecturers
Robert A. Caldwell, MSc PhD
Edith M. Lees, BSc PhD *Lond.*

Soil Science

Professor in Soil Science (Pedometrics)(Personal Chair)
Alexander B. McBratney, BSc PhD *Aberd.*
Appointed 1995

Associate Professor
Anthony J. Koppi, BSc PhD *Aberd.*

Senior Lecturer
Harold R. Geering, MS *Cornell*

Honorary Appointment

Emeritus Professor
N. Collis-George, BSc *Manc.* PhD *Camb.* HonDScAgr, FRSChem

Agricultural Economics

Professor
*T. Gordon MacAulay, MAgrSc *Melb.* PhD *Guelph*
Appointed 1992

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* *(Those marked with asterisks are heads of departments)*
[1] Information correct as at December 1994

Associate Professors
Robert L. Batterham, BAgEc *N.E.* MS PhD *Ill.*
Ross G. Drynan, BAgrSc *Qld* PhD *N.E.*

Senior Lecturers
Fredoun Z. Ahmadi-Esfahani, BS *Oregon* MA *San Francisco State* PhD *Manit.*
David P. Godden, BAgEc BA MEc *N.E.* PhD *Lond.*
Carolyn Tanner, BScAgr

Lecturer
Guang Hua Wan, BAgEc *Nanjing Agric.Univ.* MEc PhD *N.E.*

Associate Lecturers
John L. Brakey, BAgrEc
Lynn A. Henry, BEc DipAgEc *N.E.*
Shauna L. Phillips, BAgrEc

Honorary Appointment

Emeritus Professor
K.O. Campbell, AM PhD *Chic.* MPA *Harv.* HonDEc *N.E.* BScAgr, FASSA

Animal Science

At Sydney

Professor
David Ross Fraser, PhD *Camb.* BVSc
Appointed 1986

Associate Professors
Gareth Evans, BA *Oxf.* PhD
Christopher Moran, PhD *A.N.U.* BSc
Frank W. Nicholas, PhD *Edin.* BScAgr
*Grant M. Stone, PhD BScAgr

Senior Lecturers
David L. Evans, BVSc PhD
Lindsay H. Heywood, BVSc PhD *Qld*
W.M. Chisholm Maxwell, BScAgr PhD
John R. Mercer, BSc *W.Aust.* PhD *Camb.*

Associate Lecturer
Rosanne M. Taylor, BVSc PhD

Honorary Appointments

Emeritus Professors
Clifford Walter Emmens, PhD DSc *Lond.* HonDVSc, FSS FAA HonFACVSc FIBiol CBiol
Donald Alexander Titchen, MA PhD ScD *Camb.* BVSc

Honorary Associates
Peter J. Healy, BVSc PhD
Yun Cheung Kong, DSc *Bruxelles*, BSc *Guangzhou*
Ian C.A. Martin, BVSc PhD
Bruce L. Sheldon, BAgrSc PhD

Research Associate
Elizabeth J. Post, BSc PhD

At Camden

Associate Professor and William McIlraith Fellow
Roy C. Kellaway, BSc(Hort) *Lond.* PhD *N.E.* DTA *W.I.*

Associate Professors
Derick Balnave, PhD DSc *Belf.*, FRSChem

Wayne L. Bryden, MRurSc DipEd *N.E.* PhD
James M. Gooden, BAgSc *Adel.* PhD

Garland Senior Lecturer
Bevan G. Miller, BVSc PhD

Senior Lecturers
Ian J. Lean, BVSc PhD *Calif.*
Peter C. Wynn, MRurSc DipEd *N.E.* PhD

Senior Research Fellow
Roger Giles, PhD

Professional Officer
Yasin Mollah, BSc MSc(Chem) *Dhaka* MRurSc *N.E.* PhD

Honorary Appointment
Honorary Associate
Ernest Frank Annison, PhD DSc *Lond.*

Crop Sciences
Agricultural Genetics and Plant Breeding
Professor of Plant Breeding
*Donald Robert Marshall, PhD *Calif.* BScAgr
Appointed 1991

Senior Lecturers
Norman L. Darvey, PhD *N.S.W.* BSc
Peter J. Sharp, BAgSc PhD *Adel.*

Agronomy
Professor
Craig John Pearson, BSc(Agric) *W.Aust.* MSc *Guelph* PhD
    Macq., FAIAS
Appointed 1985

Senior Lecturers
Lindsay C. Campbell, BSc PhD
Dennis R. de Kantzow, BScAgr DipAgrEc, FIAIS

Lecturer
Brent C. Jacobs, BScAgr PhD

Biometry
Associate Professor
Michael E. O'Neill, BA PhD

Lecturer
Peter C. Thomson, MSc MAppStat *Macq.* PhD

Entomology
Associate Professor
Frederick J.D. McDonald, MSc *Tas.* PhD *Alta,* FRES

Senior Lecturer
Harley A. Rose, MAgrSc *Qld* PhD *Cornell*

Horticulture
Adjunct Professor in Urban Horticulture
Peter Marcus Martin, MScAgr PhD DipEd, FLS FAIAS
Appointed 1993

Reader
Peter B. Goodwin, PhD *Nott.* MScAgr

Senior Lecturer
Bruce G. Sutton, BScAgr *Qld* PhD *A.N.U.*

Plant Pathology
Professors
Lester W. Burgess, BScAgr PhD DipEd
Appointed 1993

Brian James Deverall, BSc *Edin.* PhD DIC *Lond.*
Appointed 1972

Senior Lecturer
John W. Bowyer, BAgrSc PhD *Qld*

Honorary Appointments
Emeritus Professor
B.D.H. Latter, PhD *Edin.* BScAgr

Honorary Associates
G.M. Cunningham, BScAgr
N.F. Derera, AM DipAgrSc *Royal Jozef Nador* DipPlt Breeding
    U.of Tech. Budapest, FAIAS
J.M. Fisher, BScAgr PhD
S.C. Morris, BScAgr PhD N.S.W.
E.S. Neilsen, MSc PhD Copenhagen
L.W. Smith, BAgSc *Melb.* MSc PhD *Calif.*
B.A. Summerell, BScAgr PhD

Research Affiliates
G. Constable, PhD *N.E.* MScAgr
P.S. Cornish, PhD *N.E.* MScAgr
J.L. Davidson, MAgSc *Adel.* PhD *Nott.*
D.J. Fletcher, MSc PhD *S'ton*
P.W. Michael, BAgSc PhD *Adel.*

Microbiology
Professor
*Peter Richard Reeves, BSc PhD *Lond.,* MASM
Appointed 1985

Reader
Thomas Ferenci, BSc *Lond.* PhD *Leic.*

Senior Lecturers
Trevor Duxbury, BSc PhD *Liv.,* MASM
Peter B. New, BAgrSc *Tas.* PhD *Adel.*

Lecturers
Deidre A. Carter, BSc *Otago* PhD *Lond.*
Ilze Dalins, MSc
Ian Humphery-Smith, BSc PhD *Qld*

Associate Lecturers
Helen M. Agus, MSc *N.S.W.*
Kerrie A. Lawson, BSc PhD *N.S.W.*

Honorary Appointments
Honorary Associates
Kai Yip Cho, BSc *N.S.W.* PhD *A.N.U.*
W.G. Murrell, PhD *Oxf.* DScAgr, FAIFST MASM

Plant Breeding Institute
Director and Professor of Plant Breeding
Donald R. Marshall, PhD *Calif.* BScAgr

At Narrabri
Director, I.A. Watson Wheat Research Centre
Lindsay O'Brien, MSc DipEd *Melb.* PhD *Manit.*

Senior Plant Breeder
Frank W.H. Ellison, MScAgr PhD

Principal Research Fellow
Daryl J. Mares, BSc PhD *Melb.*

Professional Officer Grade III
Stephen G. Moore, BSc *N.E.*

At Cobbitty

Professor in Cereal Genetics and Cytogenetics (Personal Chair) and Director of Rust Research
Robert A. McIntosh, MScAgr PhD

Senior Lecturers
Norman L. Darvey, PhD *N.S.W.* BSc
Peter J. Sharp, BAgSc PhD *Adel.*

Research Fellow
Robert F. Park, BSc *LaT.* PhD *Qld*

Professional Officer Grade IV
John D. Oates, BScAgr

TEACHING STAFF FROM OTHER FACULTIES

Economics
Consult Faculty of Economics.

Science

Chemistry
Director of First Year Studies
Raymond K. Pierens, MSc PhD, MRSChem ARACI
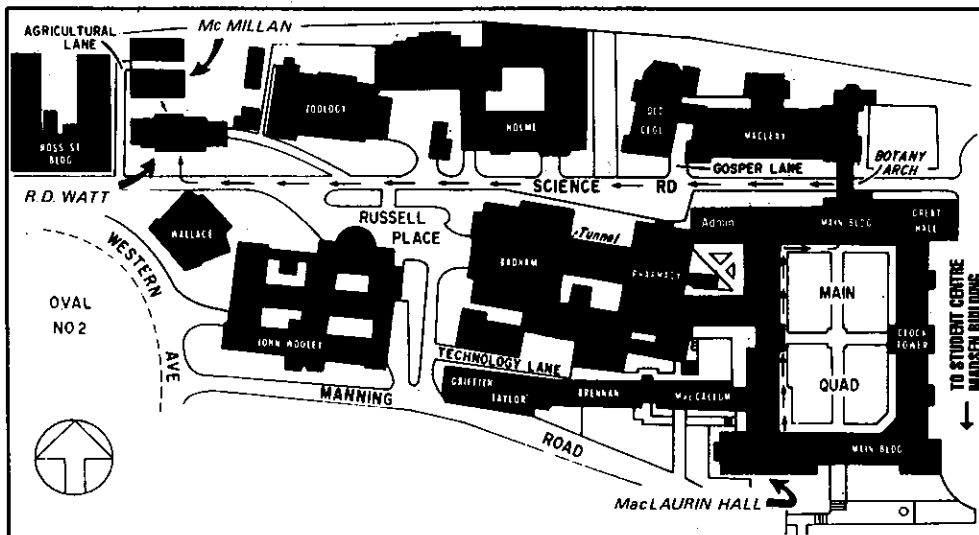
Biology
Director of First Year Biology
Mary Peat, BSc *Birm.* PhD *Brist.*

Veterinary Science
Consult Faculty of Veterinary Science.

R.D. Watt Building

Careers for graduates of the Faculty

The Faculty of Agriculture has maintained remarkably high graduate employment rates of 90 per cent for both the BScAgr and BAgrEc degrees.

Four-year degrees and a required minimum of eighteen weeks of professional work experience are very attractive to prospective employers. These applied degrees provide for both flexibility and specialisation, a background suitable for a diversity of career options.

Graduates of the BScAgr degree gain employment as:
- research scientists in both private and public sectors, e.g. CSIRO, Departments of Agriculture, Forestry Commissions, soil conservation, national parks, museums, universities, Ciba-Geigy, wine making, environmental projects, and overseas with FAO, WHO and other international organisations concerned with the development of agriculture in Third World countries (scientific research absorbs half of the BScAgr graduates);
- biometricians, statisticians, computing professionals;
- consultants, agronomists and extension personnel for Departments of Agriculture, in biosoil programs, water authorities, environmental protection groups, trainee managers in horticultural businesses;
- university lecturers, TAFE and secondary educators;
- banking, finance, agribusiness management, marketing;
- plant and animal breeders, biotechnologists;
- journalism, researchers/producers of science documentaries, politicians;
- quality control, quarantine and vaccine preparation officers.

Graduates of the BAgrEc degree gain employment as applied economists with:
- merchant and trading banks;
- international agencies such as FAO, OECD and the World Bank;
- stock, commodity and futures broking firms;
- consulting, accounting, marketing and agribusiness firms;
- Australian Bureau of Agricultural and Resource Economics;
- State and Commonwealth government departments concerned with the rural sector;
- Australian Meat and Livestock Corporation and the Australian Wheat Board;
- Industry Commission;
- resource industries and the wider business community.

In some fields the possession of a higher degree is a decided advantage, especially where the work concerned is of a specialised nature. This applies particularly to research, in which positions are available in the CSIRO, the universities, government departments, research institutions and private industry. Many graduates continue their training by accepting scholarships to study for higher degrees and postgraduate diplomas. Often such postgraduate training is undertaken in overseas universities and institutions.

Undergraduate Scholarship Progam

The Undergraduate Scholarship Program is designed to encourage and assist talented school leavers, especially from rural areas, to choose Agricultural Science or Agricultural Economics at the University of Sydney and to focus attention on career opportunities which stem from these degrees. A Talented Students Programme is also offered. Further information is available from the Faculty Office.

Communication skills

As a result of completing any undergraduate course in the University of Sydney, graduates are expected to: (i) be able to identify, access, organise and communicate knowledge in both written and oral English; and (ii) be able to collect, correlate, display, analyse and report observations. These skills are valued highly by employers and will be generally included as part of the evaluation of assessment tasks. In particular, completion of professional experience reports will be evaluated against criteria designed to assess the level of written and presentation skills. The Faculty aims to teach such communication skills within the context of the various academic disciplines.

University farms

The University has fifteen farms within 65 km of Sydney, which support the teaching and research activities of the Faculties of Veterinary Science and Agriculture. They total over 1500 ha and consist of three main centres. The Corstorphine Centre of 717 ha on which most of the teaching and research facilities are located, and the Bringelly Centre of 466 ha, which includes three farms, Wolverton, Coates Park and John Bruce Pye Farm, are only 10 km apart and complement each other. The third centre, which is situated 25 km from Corstorphine at Badgerys Creek, includes the McGarvie Smith Farm and Fleurs.

The *Corstorphine Centre*, about 6 km west of Camden, began in 1954 by donations of the farms Corstorphine and Mayfarm to the University by the Meat, Wool and Dairy Product Boards. The Centre has been enlarged by the purchase of adjoining land and five additional nearby properties. Lansdowne Farm is the horticultural field unit of the School of Crop Sciences. Two research units (Horse and Animal Reproduction) have been developed on another of these properties. The Plant Breeding Institute is also located at the Centre.

The *Bringelly Centre*, 5 km from Bringelly and 10 km from Corstorphine, began in 1962 by a donation from the late Colonel John Bruce Pye of two separate but
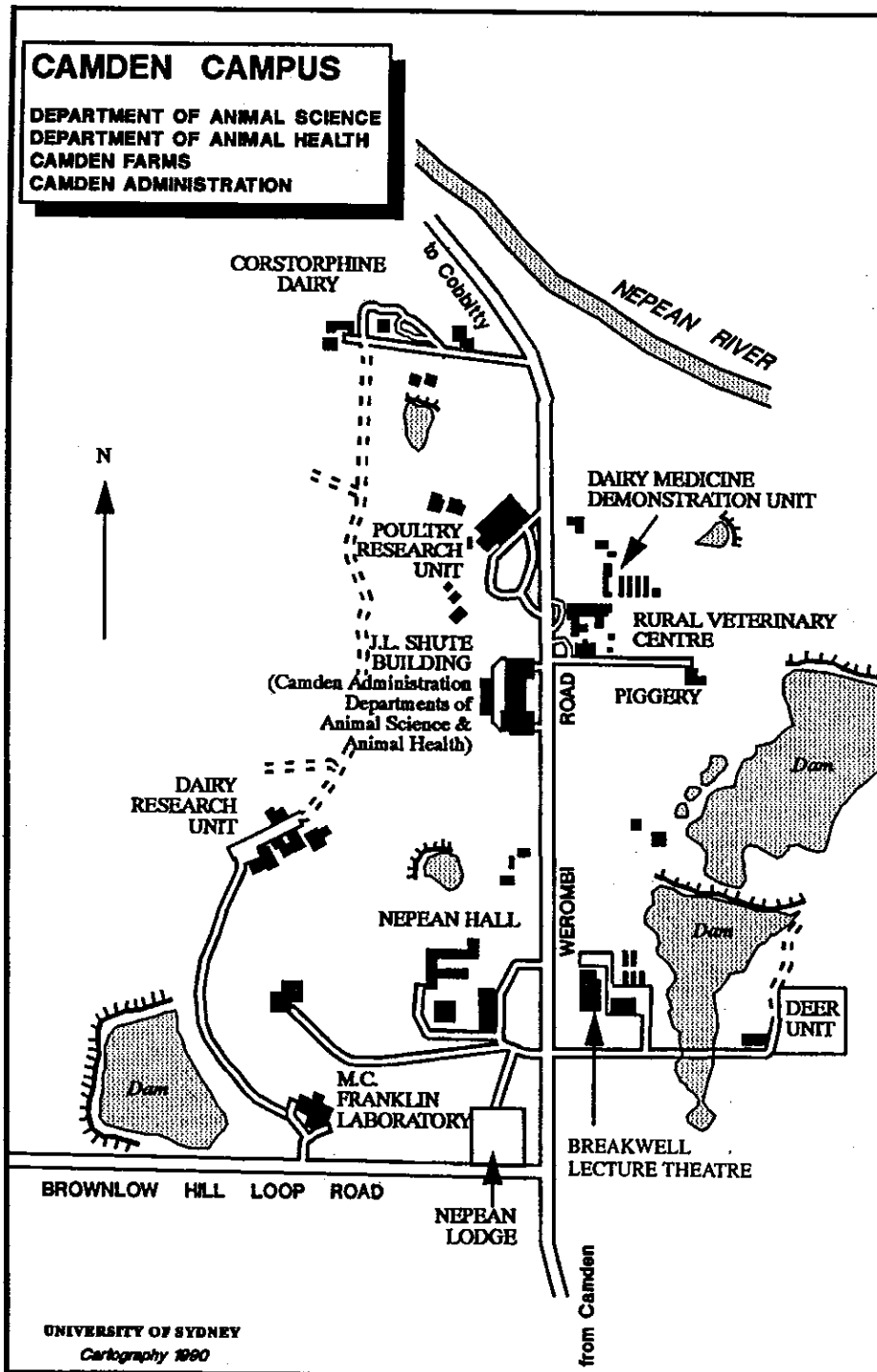
nearby properties that totalled 354 ha. Further purchases by the University in 1974 of the original Coates Park homestead and additional small blocks, brought all the Bringelly farms into a single parcel of 466 ha with a much shorter access route to Corstorphine.

The *Badgerys Creek Centre* includes the McGarvie Smith Farm, which was the first farm acquired by the University of Sydney. It was purchased in 1936 with funds provided by the McGarvie Smith Trust. In 1977 the University purchased 153 ha surrounding the Fleurs synthesis radiotelescope, a facility developed by the Department of Electrical Engineering.

Together these farms carry more than 400 milking cows and, with beef cattle and replacement stock, a total of more than 1200 cattle. They also carry up to 2000 sheep, 30 horses, 170 deer, 3000 hens, 3500 broilers, 100 goats and 400 pigs.

Almost all this stock is used in one way or another for teaching or research purposes, but in addition it produces a commercial income that defrays the basic costs associated with holding the farms, and provides some funds for farm development, research and teaching.

As well as providing basic land, water and animal resources for a wide range of teaching and research in

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CAMDEN CAMPUS
DEPARTMENT OF ANIMAL SCIENCE
DEPARTMENT OF ANIMAL HEALTH
CAMDEN FARMS
CAMDEN ADMINISTRATION

CORSTORPHINE DAIRY

to Cobbitty

NEPEAN RIVER

N

POULTRY RESEARCH UNIT

DAIRY MEDICINE DEMONSTRATION UNIT

RURAL VETERINARY CENTRE

J.L. SHUTE BUILDING
(Camden Administration Departments of Animal Science & Animal Health)

ROAD

PIGGERY

Dam

DAIRY RESEARCH UNIT

WEROMBI

Dam

NEPEAN HALL

Dam

DEER UNIT

M.C. FRANKLIN LABORATORY

BREAKWELL LECTURE THEATRE

Dam

BROWNLOW HILL LOOP ROAD

NEPEAN LODGE

from Camden

UNIVERSITY OF SYDNEY
Cartography 1990

different departments, the farms serve the plant and animal industries by frequently acting as commercial testing sites for new plants, new fertilisers, new vaccines and antibiotics and new whole-farm management systems.

A student accommodation unit, *Nepean Hall*, is situated on Corstorphine. This gives students easy access to the many University departments conducting research on different farms in that area.

The progressive development of research facilities makes it possible for postgraduate as well as undergraduate students to be trained on the farms.

Livingston Farm, a 4766 ha property on the banks of the Meehi River about 8 km from Moree, came to the University as a bequest from the estate of K.S. Livingston. This farm is a commercial crop-growing venture, which earns income for the K.S.H. Livingston Cancer Research Fund, and provides a means of examining new farming practices and procedures on a large commercial scale. Currently about 3800 ha of dryland crops are grown each year. Additionally, there are 320 ha of irrigated land used for cereals in winter and soybeans in summer. This farm cooperates closely with the I.A. Watson Wheat Research Centre at Narrabri, both in testing of new lines under field plot and farm scale conditions and in increasing seed of new varieties for the benefit of local farmers.

Arthursleigh (5200 ha) and *Mount Pleasant* (2600 ha) at Marulan, 200 km south of Sydney, came to the University as a bequest from the estate of Eric Thomas William Holt in July 1979. They are being developed as large-scale sheep and beef properties. The farms are operated as a commercial venture and are also used by students for teaching and research in pasture agronomy.

The University Farms at Camden are under the control of a director, who is a member of both rural faculties and is responsible to the Director, Properties and Investments for the management of commercial farming enterprises and the support of teaching and research activities.

Nepean Hall

Since 1959 the University has provided limited accommodation for students at the Camden Farms. During 1964, additional accommodation was completed so that students from the Faculty of Agriculture completing their final year in the Department of Animal Science (formerly Animal Husbandry) could be accommodated for the entire year.

In 1964 the Senate resolved that the accommodation for students at the Camden Farm be a hall of residence and be known as Nepean Hall. The management of the Hall is vested in a Council appointed by the Senate.

Addresses

University of Sydney (Camden),
    425 Werombi Rd, Camden,
    N.S.W. 2570 .... (046) 55 2300
Nepean Hall, University of Sydney,
    Camden Campus, 345 Werombi Rd,
    Camden, N.S.W. 2570 .... (046) 55 0262
    (Resident students) Old block .... (046) 55 0282
    .... (046) 55 0283
    .... (046) 55 0284
    .... New block (046) 55 2201
    .... (046) 55 0281
    .... (046) 55 0278
Corstorphine, 445 Werombi Road, Camden,
    N.S.W. 2570 .... (046) 55 0213
Plant Breeding Institute, 107 Cobbitty Road, Cobbitty
    N.S.W. 2570 .... (046) 51 2600
Mayfarm, Mayfarm Road, Mt Hunter, Camden,
    N.S.W. 2570 .... (046) 54 5213
John Bruce Pye Farm, Greendale Road, Bringelly,
    N.S.W. 2570 .... (047) 74 8212
McGarvie Smith Animal Husbandry Farm,
    Elizabeth Drive, Badgerys Creek,
    Bringelly, N.S.W. 2171 .... (047) 71 8184
Wolverton Dairy Farm, Greendale Road,
    Bringelly, N.S.W. 2171 .... (047) 74 8013
Livingston Farm, Moree,
    N.S.W. 2400 .... (067) 52 2855
Arthursleigh, Mount Pleasant, Marulan,
    N.S.W. 2580 .... (048) 57 5161
I.A. Watson Wheat Research Centre, Narrabri,
    N.S.W. 7490 .... (067) 92 1588

Student membership of the Faculty

There is provision for up to four students enrolled for courses in the Faculty of Agriculture to be elected for one year to membership of the Faculty. Of the four, two must be enrolled as full-time candidates for either the degree of Bachelor of Science in Agriculture or Bachelor of Agricultural Economics and two, who are not otherwise eligible for membership of the Faculty, must be enrolled as full-time candidates for a postgraduate degree or diploma offered by the Faculty.

Open meetings

Any student enrolled for a degree or diploma in the Faculty or any member of its teaching or research staff, who is not a member of the Faculty is eligible to attend, but not to speak at or vote at, any meeting of the Faculty.

Students who intend to be present at a meeting must register that intention at the Faculty Office no more than seven days prior to the meeting, and complete a declaration. The Faculty Office may then issue an authority to attend. Only twenty such authorities will be issued in respect of any one meeting and authorities are valid for one meeting only. The agenda may have been edited to remove confidential items.

Bachelor of Science in Agriculture

The Bachelor of Science in Agriculture degree covers the whole field of agricultural science.

Regulations governing candidature for the BScAgr degree are set out in resolutions of the Senate and published in *Statutes and regulations*. In addition, candidature for the BScAgr is governed by Faculty resolutions which are set out in this handbook.

Progress through the years
If you fail to achieve a satisfactory standard in any course or courses, you may repeat that course or courses once before you have to show cause why you should not be excluded, provided that your overall progress for the year has been satisfactory (see 'satisfactory progress' under 'Exclusion' in Chapter 5). Students repeating courses which belong to the First, Second or Third Year groups of courses may, with the permission of the Faculty, enrol in one or more courses prescribed for the next higher year. The Faculty will normally grant permission for you to undertake courses from the next year when:
(i) the timetable arrangements are such that you can attend all lectures, practical classes, tutorials, seminars and excursions in all of the courses undertaken;
(ii) you have fulfilled all of the prerequisites; and
(iii) you can satisfy the corequisites for the courses belonging to the higher year group of courses.

Prerequisites are courses which you must pass before proceeding to another course.

Corequisites are courses which should be studied in the same year as another course if you have not already passed in them.

In the year groupings which follow, prerequisites and corequisites for each of the specified courses are listed. There are circumstances, however, in which the Faculty may waive the formal prerequisite and corequisite requirements if you are otherwise suitably qualified to enrol for a course. The onus is on students to consult the various departments as to the waivers which may be granted for each course. The approval of the Head of Department must be obtained before you can proceed to a course unless you have passed the necessary prerequisites.

Course structure

Courses	Unit values	Prerequisites	Corequisites	Assumed knowledge
First Year				
Agricultural Science	12	—	—	
Biology	12	—	—	
Chemistry (Agriculture or 1A)	12	—	—	
Biometry 1	6	—	—	
Economic Environment of Australian Agriculture	6	—	—	
Second Year				
Agricultural Chemistry 2	16	Chemistry (Agriculture or 1A)	—	
Animal Science 2	12	—	—	
Crop Science 2	10	—	Soil Science 2	
Agricultural Microbiology 2	8	Agricultural Chemistry 2		
Soil Science 2	6	Agricultural Physics Biometry 1	Agricultural Chemistry 2	
Third Year				
Agricultural Entomology and Mycology 3	6	—	—	
Agricultural Genetics 3	6	—	—	
Biometry 3	6	Biometry 1	—	
and a *minimum* of 30 units from				
*Agribusiness Management	8	Economic Environment of Australian Agriculture	—	
Agricultural Chemistry 3 (Chemistry and Biochemistry of Ecosystems)	8	Agricultural Chemistry 2	—	
Agricultural Chemistry 3 (Agricultural and Food Products)	8	Agricultural Chemistry 2	—	
Agricultural Microbiology 3	8	Agricultural Microbiology 2		
Agronomy 3	8	—	—	Crop Science 2
Animal Anatomy	6	—	—	

Courses	Unit values	Prerequisites	Corequisites	Assumed knowledge
Animal Physiology	9	Agricultural Microbiology 2 Animal Science 2	—	
Animal Science 3	7	Animal Science 2	—	
Horticultural Science 3	6	Crop Science 2	—	
Plant Pathology 3	4	Agricultural Chemistry 2 Crop Science 2 Agricultural Genetics 3 Agricultural Microbiology 2	Agricultural Entomology and Mycology 3	
*Production Economics	8	Economic Environment of Australian Agriculture	—	
Crop Protection	4	Agricultural Entomology and Mycology 3	—	
Soil Science 3	8	Soil Science 2		

*Students may not count both courses Agribusiness Management and Production Economics.

Fourth Year
One of

		3 Third Year core courses plus		
Agricultural Chemistry 4		Agricultural Chemistry 3L	—	
Agricultural Economics		Agribusiness Management or Production Economics	—	
Agricultural Entomology 4		—	—	
Agricultural Genetics 4		Data Management 3	—	
Agricultural Microbiology 4		—	—	
Agronomy 4		—	Agronomy 3	
Animal Production		Biometry 3 Animal Anatomy Animal Physiology Animal Science 3 Data Management 3		
Biometry 4		Data Management 3	—	
Farming Systems		Agribusiness Management or Production Economics	Agronomy 3	
Horticultural Science 4		Horticultural Science 3 Data Management 3	—	
Plant Pathology 4		Plant Pathology 3	—	
Soil Science 4		Data Management 3 Soil Science 3	—	
Special Program		TBA by Dean or Head of Department	—	

Faculty resolutions relating to courses

In the BScAgr degree
(1)   A candidate who has successfully completed a course prescribed in sections 1, 2 or 3 of the Senate resolutions may be granted exemption by the Faculty from taking the course of instruction and examination in such course again.
(2)   A candidate who has not completed all courses in the First or the Second Year may be permitted by the Faculty to take one or more courses from the next year, provided that the total unit load should not normally exceed 52 units.
(3)   A candidate in the Third Year may be granted permission by the Faculty to take one or more Fourth Year courses, provided that the candidate's complete Fourth Year course of study is approved by the Head of Department/School who will supervise the candidate's work in the Fourth Year.
(4)   A candidate who has not completed all courses in the Third Year may, in circumstances approved by the Faculty, be granted permission to enrol in the Fourth Year together with the remaining course or courses of the Third Year provided such courses do not exceed eight units.
(5)   The prescribed Fourth Year subjects shall be those set out in the preceding course structural chart.

Third Year Course Combinations for entry to Fourth Year subjects
All students must take the following core courses:
Agricultural Entomology and
Mycology 3	6 units
Agricultural Genetics 3	6 units
Biometry 3	6 units
	18 units

In addition, all students choose a total of 30 to 34 units in optional courses according to the following guidelines:

Fourth Year subject	Prerequisite		Additional units	Preferred options	
Agricultural Chemistry 4	Agricultural Chemistry 3L	(18u)	14 to 18		
Agricultural Economics	Agribusiness Management	(8u)	24 to 28		
Agricultural Entomology 4	—		32 to 36		
Agricultural Genetics 4	Data Management 3	(4u)	28 to 32	Horticultural Science 3	(6u)
Agricultural Microbiology 4	—		32 to 36		
Agronomy 4	Agronomy 3 *(coreq)*	(8u)	20 to 24	Horticultural Science 3	(6u)
	Data Management 3 *(coreq)*	(4u)		Plant Pathology 3 (4u)	
Animal Production	Animal Anatomy	(6u)	4 to 8		
	Animal Physiology	(10u)			
	Animal Science 3	(8u)			
	Data Management 3	(4u)			
Biometry 4	Data Management 3	(4u)	28 to 32		
Farming Systems	Agribusiness Management	(8u)	24 to 28	Agronomy 3	(8u)
	or Production Economics	(8u)			
Special Program	—		30 to 34		
Horticultural Science 4	Horticultural Science 3	(6u)	22 to 26	Crop Protection	(4u)
	Data Management 3	(4u)			
Plant Pathology 4	Plant Pathology 3	(4u)	28 to 32		
Soil Science 4	Data Management 3	(4u)	20 to 24		
	Soil Science 3	(8u)			

The combination of courses chosen must be permitted by the timetable.

Bachelor of Agricultural Economics

The degree of Bachelor of Agricultural Economics is available for those wishing to specialise in the field of agricultural economics. Regulations governing candidature for the BAgrEc degree are set out in resolutions of the Senate and published in *Statutes and*

Regulations 1994-95.
The degree requires a minimum time of four years. The courses prescribed are summarised below.

Course structure

Courses	Unit values	Prerequisites	Corequisites
First Year			
Agricultural Economics I	12	—	—
Econometrics I	12	—	—
Economics I	12	—	—
and one of:			
Accounting I	12	—	—
Biology	12	—	—
Geography I	12	—	—
Government I	12	—	—
Commercial Law I	12	—	—
Mathematics I (Life Sciences)	12	—	—
The Australian Economy	12	—	—
Second Year			
Applied Commodity Modelling	8	Econometrics I	—
or			
Econometrics IIB	8	—	Econometrics IIA
Commodity Price Analysis	8	Agricultural Economics I	—
Economics II	16	Economics I	—
Production Economics	8	Agricultural Economics I	—
and a minimum of 12 units from Table 1			
Third Year			
Agricultural and Resource Policy	8	Production Economics Commodity Price Analysis	—
Economics III	16	Economics II	—

Courses	Unit values	Prerequisites	Corequisites
Quantitative Business Management and Finance	8	Production Economics	Applied Commodity Modelling *or* Econometrcs IIB
Research Methods and a *minimum* of 12 units from Tables 2 and/or 3	4	—	—

Fourth Year

Courses	Unit values	Prerequisites	Corequisites
Agricultural Economics IV	52		

Students may count no more than two of the following subjects toward the degree: Accounting I, Biology, Commercial Law I, Geography I, Government I, Mathematics I (Life Sciences), The Australian Economy. Students may not count Accounting I and either Financial Accounting Concepts or Management Accounting Concepts towards their degree.

TABLE 1: Courses from which Second Year students select optional units

Courses	Unit values	Prerequisites	Corequisites
Accounting I	12	—	—
Animal Science	6	—	—
Asian Studies 1	16	—	—
Asian Studies 2	16	Asian Studies 1	—
Commercial Transactions I	6	—	—
Corporations Law	8	—	Commercial Transactions I
Crop and Pasture Agronomy	6	—	—
Crop Science I	8	—	—
Econometrics IIA	8	Econometrics I	—
Econometrics IIB	8	—	Econometrics IIA
Financial Accounting A	8	Accounting I	—
Financial Accounting Concepts	6	—	—
Forecasting for Economics and Business	8	—	—
Geography I	12	—	—
Geography II	16	Geography I	—
Government I	12	—	—
Government II	16	Government I	—
Management Accounting A	8	Accounting I	Econometrics I
Management Accounting Concepts	6	—	—
Sample Design and Analysis	8	—	—

TABLE 2: Courses from which Third Year students select optional units

Courses	Unit values	Prerequisites	Corequisites
Accounting I	12	—	—
Agronomy	8	Crop and Pasture Agronomy	—
Animal Science	6	—	—
Any Semester Course in Economic History*	8		—
Any Semester Course in Finance*	8	Consult Faculty of	—
Any Semester Course in Government*	8	Economics Handbook	—
Any Semester Course in Commercial Law*	8		—
Any Semester Course in Marketing*	8		-
Applied Econometrics	8	Econometrics IIB	Econometrics IIIA
Asian Studies 1	16	—	—
Asian Studies 2	16	Asian Studies 1	—
Asian Studies 3	16	Asian Studies 2	—
Crop and Pasture Agronomy	6	—	—
Econometrics IIA	8	Econometrics I	—
Econometrics IIB	8	—	Econometrics IIA
Econometrics IIIA	8	Econometrics IIA	
Economics III Additional	16	—	Economics III
Economics III Supplementary	8	Economics II	Economics III
Financial Accounting A	8	Accounting I	—
Financial Accounting Concepts	6	—	—

* Subject to the approval of the Head of Department of Agricultural Economics.

Courses	Unit values	Prerequisites	Corequisites
Forecasting for Economics and Business	8	—	Econometrics IIA
Geography II	16	Geography I	—
Geography III	16	Geography II	—
Government II	16	Government I	—
Government III	16	Government II	—
Horticultural Science	6	Crop and Pasture Agronomy	—
Management Accounting A	8	Accounting I	Econometrics I
Management Accounting Concepts	6	—	—
Operations Research A	8	Econometrics IIA	—
Operations Research B	8	—	Operations Research A
Sample Design and Analysis	8	—	Econometrics IIA
Any other Semester Course in Econometrics*			
Courses from the BScAgr degree*			

* Subject to the approval of the Head of Department of Agricultural Economics and the Head of the Department concerned.

TABLE 3: Optional courses offered by the Department of Agricultural Economics

Courses	Unit values	Prerequisites	Corequisites
Agribusiness Management	8	Production Economics	—
Applied Commodity Trade†	8	Commodity Price Analysis	—
Applied Marketing†	8	Commodity Price Analysis	—
Natural Resource Economics	8	Production Economics Commodity Price Analysis	—

†These courses may be offered in alternate years. Contact the Department for specific information.

Faculty resolutions relating to courses

In the BAgrEc degree

(1)   A candidate who has successfully completed a course prescribed in sections 1, 2 or 3 of the Senate resolutions may be granted an exemption by the Faculty from taking the course of instruction and examination in such course again.

(2)   A candidate who has not completed all courses in the First or the Second Year may be permitted by the Faculty to take one or more courses from the next year, provided that the total unit load should not normally exceed 56 units.

(3)   A candidate in the Third Year may be granted permission by the Faculty to take one or more Fourth Year courses, provided that the candidate's complete Fourth Year course of study is approved by the Head of the Department of Agricultural Economics.

(4)   A candidate who has not completed all courses in the Third Year may, in circumstances approved by the Faculty, be granted permission to enrol in the Fourth Year together with the remaining course or courses of the Third Year.

Northwest excursion

Courses are subject to alteration

Courses and arrangements for courses, including staff allocated, as stated in this or any other publication, announcement or advice of the University are an expression of intent only and are not to be taken as a firm offer or undertaking. *The University reserves the right to discontinue or vary such courses, arrangements or staff allocations at any time without notice.*

Books

You are expected to own all books listed as *Textbooks*. However, you are not required to buy books listed as *Reference books*.

Changes sometimes occur in the selection of prescribed textbooks, or reference books, owing to supply difficulties, or the publication of new and more suitable works. Such changes will be announced by lecturers and it is prudent to check with the relevant lecturer before buying the books you expect to need.

Bachelor of Science in Agriculture

FIRST, SECOND AND THIRD YEAR COURSES

Agribusiness Management   8 units
Prereq Economic Environment of Australian Agriculture
Classes Sem 2: (3 lec & 2 workshop)/wk
Assessment one 3hr exam, assignments

This course is designed to introduce the economic principles and techniques of business management as they apply to farm and agribusiness firms. The first part of the course will include: domestic and international agricultural product marketing; the functions of marketing; the opportunities to influence market outcomes; and marketing strategies. The topics covered in the second part will include: management goals and objectives; budgeting; gross margins analysis; parametric budgeting; sources of management information and its analysis; simple systems simulation; applications of linear programming to farm and agribusiness planning; financial management; risk in planning and management; cash, credit, debt and taxation management; evaluation of investment and firm growth alternatives; acquisition and transfer of assets; the role of financial institutions in the rural credit market.

An integrated set of workshops is used to provide experience in firm planning utilising budgeting, gross margins analysis, linear programming, simulation methods and other techniques of analysis.

Textbooks
P.J. Barry *et al. Financial Management in Agriculture* (Interstate, 1989)

R.L. Kohls and J.N. Uhl *Marketing of Agricultural Products* (Macmillan, 1990)
P. Kotler *et al. Marketing: Australia and New Zealand* (Prentice Hall, 1994)
J.P. Makeham *et al. Best Bet Farm Decisions* (U. of New England Press, 1968)
A.N. Rae *Agricultural Management Economics* (CAB, 1994)
P.A. Rickards and D.J. McConnell *Budgeting, Gross Margins and Programming for Farm Planning* (U. of New England Press, 1967)
R. Turvey *Complan Handbook No. 8: Enterprise Budgets for North West N.S.W.* (N.S.W. Department of Agriculture, 1988)

Agricultural Chemistry 2   16 units
Lecturers Dr Caldwell, Assoc. Prof. Copeland, Dr Lees
Prereq Chemistry
Classes Yr: (3 lec & 5 prac)/wk
Assessment two 3hr exams, prac, assignments

The course introduces students to topics in biophysical, bioorganic and biological chemistry. These topics include: energy in the biosphere, the interaction of radiation and matter, the physical characterisation of large biomolecules, surfaces and interfaces; the organic chemistry of carbohydrates, amino acids and proteins, nucleotides and polynucleotides, vitamins, steroids, and plant pigments; principles of enzyme action; catabolism of proteins, carbohydrates and lipids; respiration and energy metabolism; intermediary metabolism; nucleic acid metabolism and protein synthesis. Emphasis is also given to the theory, principles and practice of the basic analytical techniques which are a necessary prerequisite for the more advanced instrumental methods found in many laboratory-based disciplines.

Textbooks
R. Chang *Physical Chemistry with Applications to Biological Systems* (Macmillan, 1981)
R.T. Morrison and R.N. Boyd *Organic Chemistry* (Allyn and Bacon, 1983)
L. Stryer *Biochemistry* 3rd edn (Freeman, 1988)

Agricultural Chemistry 3 (Chemistry and Biochemistry of Ecosystems)   8 units
Coordinator Dr Kennedy
Lecturers Dr Kennedy, Dr Caldwell, Dr Lees, Assoc. Prof. Copeland
Prereq Agricultural Chemistry 2
Classes Sem 1: (3 lec & 5 prac)/wk
Assessment one 3hr exam, prac, assignments

This is a course in environmental chemistry designed for students who intend to specialise in their Fourth Year in Agricultural Chemistry or Soil Science, or in environmentally-related areas of crop and animal sciences, entomology, horticulture, microbiology, plant and animal genetics and plant pathology. The specific objectives of the course are to (i) provide students with an understanding of chemical and

biochemical processes in ecosystems, in particular the various elemental cycles, inclusive of environmental impacts arising from disturbances in natural processes and contamination from other human activity; and (ii) teach students practical skills in chemical and biochemical methods of analysis used in environmental chemistry.

The lecture topics will include: the biological/ environmental carbon cycle; bioenergetics of autotrophy and heterotrophy, photosynthesis, fermentation, eutrophication; the mineral nutrient cycles, uptake and utilisation by organisms, pH balancing; the biological/environmental nitrogen cycle; ammonification, nitrification of ammonia, denitrification of nitrate, nitrogen fixation, ammonia and nitrate assimilation; the biological/environmental sulphur cycle; sulphate assimilation, sulphate reduction and dissimilation in soil and water; the role of the nitrogen and sulphur cycles in the acidification of ecosystems; effects of acidification on plants and animals; pesticides and herbicides, chemistry, modes of action, metabolism and detoxification; environmental chemistry and fate of pesticides; design of new pesticides and means of pest control; heavy metals and plants, mechanisms of tolerance, hyperaccumulators, halophytes.

The laboratory exercises will include sample preparation and analyses of environmental samples for organic and inorganic nutrients, products and contaminants including heavy metals and pesticides. Skills will be acquired in gas, liquid and ion chromatography, atomic adsorption spectroscopy, electrochemical methods and the use of immunoassay.

Reference books
To be advised.

Agricultural Chemistry 3 (Agricultural and Food Products)   8 units
Coordinator Assoc. Prof. Copeland
Lecturers Assoc. Prof. Copeland, Dr Caldwell, Dr Lees, Dr Kennedy
Prereq Agricultural Chemistry 2
Classes Sem 2: (3 lec & 5 prac)/wk
Assessment one 3hr exam, prac, assignments

This is a course in agricultural biochemistry designed for students who intend to specialise in their Fourth Year in Agricultural Chemistry, or in areas of crop and animal sciences, entomology, horticulture, microbiology, plant and animal genetics, and plant pathology. The course covers the chemistry and biochemistry of agricultural and food products and aims to (i) develop in students an understanding at the molecular level of biosynthetic processes, including their regulation; (ii) provide students with knowledge of the biochemistry of agricultural products; and (iii) teach students practical skills in chemical and biochemical methods of analysis used in laboratories of enterprises concerned with agricultural production, the processing of agricultural products, and in the food and beverage industries.

The lecture topics will cover biosynthetic processes including photosynthesis, sucrose and other oligosaccharides, and starch and other storage and structural polysaccharides, amino acids, fatty acids and lipids; mechanisms of metabolic regulation, bioenergetics and transport processes, signal transduction pathways; post-harvest biochemistry of animal and plant products; seed biochemistry, seed storage proteins, mobilisation of reserves, nutritional and anti-nutritional constituents of cereal and legume seeds; characteristics of constituents in relation to quality of products; physical biochemistry of macromolecules, including properties in solution and physical methods of study, natural fibrous and gel-forming macromolecules, uses in foods and other commercial products.

The laboratory exercises will include sample preparation and analyses of foods and other biological materials using spectroscopic, enzymic, and chromatographic (including GC and HPLC) methods; analysis and structural studies of polysaccharides; techniques for separating biological macromolecules (includng chromatography and electrophoresis); radiochemical methods.

Reference books
To be advised.

Agricultural Entomology and Mycology 3   6 units
Coordinator Dr Rose
Lecturers Dr Rose, Prof. Burgess
Classes Sem 1: (2 lec & 1 prac)/wk
Assessment one 3hr theory exam, prac

An introduction to pests and fungal diseases and their importance to agriculture.

The entomological component of this course will give students a brief introduction to insects and related animals. Lectures will cover morphology and classification, physiology, ecology and behaviour, principles of control and toxicology of insecticides. Practical classes will deal briefly with the classification and identification of insect pests.

The mycology component will include an introduction to the fungi, and the principles of disease control in relation to typical disease cycles. A brief introduction to mycotoxicoses also will be included.

Textbooks and reference books
To be advised.

Agricultural Genetics 3   6 units
Coordinator Dr Sharp
Lecturers Dr Sharp, Dr Darvey, Prof. Marshall, Assoc. Prof. Moran, Assoc. Prof. Nicholas
Classes Sem 1: (3 lec, 1 tut & 2 prac)/wk
Assessment one 3hr theory exam & one 2hr prac exam, tests

This lecture and practical course provides an introduction to the genetics and breeding of plants and animals. It provides an understanding for parallel and following courses. Lectures cover the basics of gene transmission and interaction, cytogenetics, molecular genetics, population and quantitative genetics, as well as the more applied aspects of plant and animal breeding and biotechnology. Practicals emphasise, with agricultural examples, the procedures of genetic and cytogenetic analysis, and the use of

computers in simulation procedures in population genetics, quantitative inheritance and selection programs, and provide exposure to current plant and animal breeding and biotechnology.

Textbook
R. Tamarin *Principles of Genetics* 3rd edn (W.C. Brown)

Agricultural Microbiology 2 8 units
Coordinator Dr New
Lecturers Mrs Dalins, Dr Duxbury, Dr Humphery-Smith, Dr New, Prof. Reeves
Coreq Agricultural Chemistry 2
Classes Sem 1: (3 lec, 4 prac & 1 tut)/wk
Assessment one 3hr exam, one 3hr prac exam, prac, 2 assignments

This course aims to give students an understanding of the relevance of microorganisms to agriculture, as well as to introduce them to the main areas of agricultural microbiology.

The topics covered include history and scope of microbiology; methodology; comparison of major groups of microorganisms; detailed study of bacteria including structure, growth, death and metabolism; bacterial genetics, leading on to genetic engineering.

Textbook
L.M. Prescott *et al. Microbiology* (W.C. Brown, 1993)

Agricultural Microbiology 3 8 units
Coordinator Dr New
Lecturers Mrs Dalins, Dr Duxbury, Dr Ferenci, Dr Humphery-Smith, Dr New
Prereq Agricultural Microbiology 2
Classes Sem 2: (3 lec, 4 prac & 1 tut)/wk
Assessment one 3hr exam, one 3hr prac exam, prac, 2 assignments

This is a course mainly in applied microbiology for students wishing to gain more knowledge in microbiology or those wishing to specialise in Microbiology in Fourth Year.

Microorganisms in the environment, including soil microbiology and nitrogen fixation; bacterial metabolism; human and animal health and disease; food microbiology; industrial microbiology.

Textbook
As for Agricultural Microbiology 2.

Agricultural Science 12 units
Coordinator Dr Jacobs
Lecturers Dr Jacobs, Dr Sharma, Mr de Kantzow, Prof. Burgess, Dr Maxwell
Classes Yr: (3 lec & 3 prac)/wk
Assessment two 2hr exams, prac, plant collection, reports

This course provides a general introduction to agriculture with a particular emphasis on the role of climate, and provides a scientific basis for the study of agricultural science.

Reference books
V. Squires and P.Tow (eds) *Dryland Farming: a Systems Approach* (Sydney University Press, 1992)
C.J. Pearson *et al. A Plain English Guide to Agricultural Plants* (Longman Cheshire, 1993)
M.W. Denny *Air and Water: The Biology and Physics of Life's Media* (Princeton University Press, 1993)

Agronomy 3 8 units
Lecturers Mr de Kantzow, Dr Campbell
Prereq Crop Science 2, Soil Science 2
Classes Sem 1: (3 lec & 2 tut/prac)/wk
Assessment one 2hr exam, one 4000w essay, class work

An analysis of dryland and irrigated pasture and cropping systems with recognition given to regional farming systems in Australia. This examines the historical development and current constraints to farming practice in identifiable regions of Australia where common farming systems exist. The future potential of each of these areas, the sustainability of current practices and changes necessary to achieve this are discussed.

Students will write a report for a suitable property of the student's choice. This requires: analysis of resources for cropping, including climatic, edaphic, biological and social constraints; selection of suitable crops; nomination of sound cropping practices and development of a sustainable system of dryland crop rotations for the farm. The progress of the report is supported by relevant material in the lectures and practicals. A second major section of the report develops an irrigated cropping area on the farm. This requires: selection of suitable crops, estimation of the benefits in moving from dryland to irrigated cultivation for this crop, crop water requirements and selection and operation of a suitable irrigation system.

Reference books
P.S. Cornish and J.E. Pratley *Tillage. New Directions in Australian Agriculture* (Inkata, 1987)
M.E. Jensen *Design and Operation of Farm Irrigation Systems* (ASAE, 1980)

Animal Anatomy 6 units
Lecturers Prof. Bryden, Dr Shea
Classes Sem 1: 3 lec/wk; Sem 2: 3hr of prac/wk
Assessment one 3hr written exam, one 30min prac exam

The anatomy of farm animals with particular emphasis on animal production. The course includes lectures with associated demonstrations of anatomical structure, and a series of practical classes involving dissection of calves, pigs and chickens.

Textbooks
K.M. Dyce *et al. Textbook of Veterinary Anatomy* (Saunders, 1987)
J.E.M. Smallwood *An Introductory Study of Bovine Anatomy* (Smallwood, 1973)

Animal Nutrition 4 units
Lecturers Prof. Fraser, Dr Mercer
Prereq Agricultural Chemistry 2, Animal Science 2
Classes Sem 1: 1 lec/wk; Sem 2: 3 prac/wk
Assessment one 1hr exam, assignments

This course of lectures and practical classes is an extension of the Second Year course. The lecture course will complement the practical course and will be directed toward the assessment of nutritional adequacy and with solving nutritional problems.

Reference book
P. McDonald *et al. Animal Nutrition* 4th edn (Longman Scientific and Technical, 1988)

Animal Physiology   9 units

Lecturer Dr Taylor
Prereq Agricultural Chemistry 2, Animal Science 2
Classes Sem 1: (1 lec & 2-4 prac)/wk; Sem 2: (1 lec & 2-4 prac)/wk
Assessment one 3hr exam/Sem 1, one 3hr exam/Sem 2

This course will extend the introductory lectures given during Second Year. Special attention will be paid to the physiology of production animals. Practical classes will amplify principles covered in the lecture course. Students will work in pairs or teams and keep detailed records of experiments. It is expected that students will purchase a course handbook during the first practical class of the year.

Textbook
B.C. Currie *Structure and Function of Domestic Animals* (Butterworths, 1988)

Animal Reproduction   4 units

Lecturers Dr Evans, Dr Maxwell
Prereq Animal Science 2
Classes Sem 2: (2 lec & 3 prac)/wk
Assessment one 2hr exam

An advanced course on mammalian reproduction and its control, with particular reference to farm animals. Topics covered will include cycles in reproduction, oogenesis, spermatogenesis, fertilisation, pregnancy, parturition, artificial control of reproduction.

Practical classes are designed to provide students with an understanding of the anatomy of the male and female reproductive organs, fertilisation and embryonic development, semen collection and handling, artificial insemination.

Textbooks and reference books
C.R. Austin and R.V. Short (eds) *Reproduction in Mammals* (Cambridge U.P., 1983)
E.S.E. Hafez (ed.) *Reproduction in Farm Animals* (Lea & Febiger, 1987)
G. Evans and W.M.C. Maxwell *Salamon's Artificial Insemination of Sheep and Goats* (Butterworths, 1987)
Others to be advised.

Animal Science 2   12 units

Coordinator Dr Maxwell
Classes Sem 1: (4 lec & 9 prac)/wks 5-14; Sem 2: 4 lec/wk
Assessment two 2hr exams

The course is an integrated one designed to cater for students terminating studies in animal sciences at the end of Second Year and to provide the bases for students intending to specialise in animal production in later years. Instruction in Animal Anatomy, Animal Physiology, Animal Reproduction, Animal Production and Principles of Nutrition will be as outlined briefly below.

Animal Anatomy
Lecturer Mr Milner

This series of lectures is a short introduction to the structure of farm animals.

Introduction to Animal Physiology
Lecturer Dr Taylor

This course of lectures provides a general introduction to animal physiology with special attention to production animals.

Animal Reproduction
Lecturer Dr Evans

An introductory course of lectures in the principles of reproduction in farm animals with particular emphasis on breeding strategies.

Principles of Nutrition
Lecturer Dr Mercer

A course of lectures on the functional basis of nutrition in homeostasis and in production by farm animals.

Animal Production
Lecturer Dr Gooden (plus Camden staff)

A course of lectures which describes the characteristics of the animal production industries. Lectures will be reinforced by practical classes, to be held at Camden.

Textbooks and reference books
To be advised.

Animal Science 3   7 units

Coordinator Dr J. Mercer
Prereq Agricultural Chemistry 2, Animal Science 2
Assessment one 1hr exam, assignments (nutrition), one 2hr exam, assignments (reproduction)

Nutrition
This part of the course comprises lectures and practical classes and is an extension of the Second Year course. The lecture course will complement the practical course and will be directed toward the assessment of nutritional adequacy and with solving nutritional problems.

Reference book
P. McDonald *et al. Animal Nutrition* 4th edn (Longman Scientific and Technical, 1988)

Reproduction
This is an advanced course on mammalian reproduction and its control, with particular reference to farm animals. Topics covered will include cycles in reproduction, oogenesis, spermatogenesis, fertilisation, pregnancy, parturition, artificial control of reproduction.

Practical classes are designed to provide students with an understanding of the anatomy of the male and female reproductive organs, fertilisation and embryonic development, semen collection and handling, artificial insemination.

Reference books
C.R. Austin and R.V. Short (eds) *Reproduction in Mammals* (Cambridge U.P., 1983)
E.S.E. Hafez (ed) *Reproduction in Farm Animals* (Lea & Febiger, 1987)
G. Evans and W.M.C. Maxwell *Salamon's Artificial Insemination of Sheep and Goats* (Butterworths, 1987)
Others to be advised.

Biology   12 units
Lecturers Biological Sciences staff
AKn HSC Science, Biology 2-unit core course
Classes Yr: (3 lec & 3 prac)/wk
Assessment exam/sem, prac, assignments

Several main areas of biological investigation are covered: cell biology, structure and function of plants (mainly flowering plants) and animals, organisms and environment, genetics, and some agricultural topics.

Textbook
W.K.Purves *et al. Life: The Science of Biology* 3rd edn (Freeman, 1992)

Notes to accompany the lectures are issued each semester. Notes for semester 1 should be obtained from the Carslaw Building, during the Orientation period. For further information, consult *Information for Students in First Year Biology*, available from the Faculty of Agriculture office during the Orientation period.

Biometry 1   6 units
AKn HSC Mathematics, 2 units
Classes Yr: (1 lec & 2 tut/prac)/wk
Assessment one 3hr exam (open book), class work

This course explores methods for collecting, describing and analysing biological data from agricultural experiments. It includes a discussion of biological variability and of simple statistical techniques available for comparing treatments. It examines mathematical techniques useful in agricultural science, such as differentiation and integration as applied to growth curves and simple modelling. It considers methods of data plotting and curve fitting.

Practical classes will involve extensive use of personal computers. There will be general introductions to computers, file management and software as they relate to agriculture. The package Minitab will be used for data and mathematical analyses. Practice with word processors, spreadsheets and databases will be achieved using Microsoft Word, Excel and Access.

Biometry 3   6 units
Prereq Data Management 1
Classes Sem 2: (3 lec, 2 prac & 1 tut)/wk
Assessment one 3hr exam (open book), class work

This course extends the techniques considered in Data Management 1, and considers problems of statistical design and analysis encountered in research in the biological, agricultural and veterinary sciences. In practical classes the computer packages Minitab, Microsoft Works and Excel are used extensively to analyse and summarise experimental data.

The first part of the course covers: describing biological data and variability in statistical terms; some theory of sampling and estimation, with practical considerations such as randomisation and replication; framing biological hypotheses; theory of hypothesis testing; estimating and testing a single treatment via a t-test, and extending to tests of two or more treatment means via an F-test; practical experimental design; the concept of experimental units; controlling variability in experimental material by pairing and blocking;

applications of the analysis of variance: completely random, randomised complete block and latin square designs; extending treatment designs to simple factorial designs; examining the linear relationships (regression, correlation) between two biological measurements.

The second part of the course examines the practical aspects of agricultural experimentation in detail. The underlying analytical tool is the General Linear Model which is basically a multiple linear regression model relating a biological variable to a number of predictor variables. This will provide a general framework for analysing data from a variety of more complex experimental and treatment designs.

Textbook
R. Mead *et al. Statistical Methods in Agriculture and Experimental Biology* 2nd edn (Chapman & Hall, 1993)

Chemistry   12 units
AKn HSC 2-unit Chemistry or Chemistry component of 3- or 4-unit Science
Classes Yr: (3 lec & 3 prac)/wk
Assessment theory exam at end of each semester, other assessment to be advised

The course Chemistry is offered at two levels:
• **Chemistry 1 Advanced** (advanced level) is available to students with a good school record in Science or Chemistry, and who could subsequently pursue in-depth studies in areas such as Agricultural Chemistry or Soil Science.
• **Chemistry 1** (ordinary level) provides a sound foundation for any chemically-based course in subsequent years of the Faculty. This chemistry course is built on a satisfactory prior knowledge of the HSC 2-unit Chemistry course or the Chemistry component of the 3- or 4-unit Science course.

Both Chemistry 1 Advanced and Chemistry 1 cover chemical theory, inorganic, physical and organic chemistry. The practical work and the theory syllabuses for the two courses are similar. The level of treatment in the 1 Advanced course is more detailed and presupposes a good grounding in the subject at the secondary level.

Fully detailed information about the courses is available from the Chemistry School.
• **Chemistry (Agriculture)** is the same as Chemistry 1 (ordinary level). Students receive a different percentage of their final mark from regular assignments than do the Chemistry 1 students.

Textbooks
• Chemistry 1 Advanced and 1
Students should obtain a booklist from the School during the Orientation period.

Crop Protection   4 units
Coordinator Dr Rose
Lecturers Dr Rose, Assoc. Prof. Burgess, Prof. Deverall, Dr Bowyer
Classes Sem 2: 4 lec/wk
Assessment one 3hr exam, one 2000w essay

The course covers weeds, diseases and insect pests of crops. The topics covered in this introductory course on the principles of crop protection are population

dynamics; loss assessment; strategies, including thresholds; biocontrol; legislation, including quarantine; pesticide use; resistance to pesticides; future directions. There will be contributions from invited speakers.

Crop Science 2   10 units
Coordinator Dr Bowyer
Prereq Biometry 1, Agricultural Science
Coreq Agricultural Chemistry 2, Soil Science 2
Classes Sem 2: (5 lec & 5 prac)/wk
Assessment one 3hr exam, prac reports, assignment

This course introduces students to aspects of structure and function at the cellular and whole plant levels and how this knowledge relates to the production of crops. It also introduces the use of simulation models in agricultural systems and considers crops as components of these systems within the context of environmental issues.

The major sections of the course deal with:
(i)   the sowing, establishment and ecology of crops, including competition among crop plants and between crops and weeds;
(ii)   the cellular structure of crop plants and the anatomy of plant tissues and their relevance to crop production;
(iii)   the processes of crop growth, including the capture of light, nutrients and water;
(iv)   the physiology of reproductive development, including control of fruit quality.

The practical classes include laboratory, glasshouse and field activities. They are designed to complement the lecture topics and to enable students to acquire skills in the design, analysis and reporting of experiments.

Reference books
To be advised.

Economic Environment of Australian Agriculture   6 units
Classes Yr: (2 lec & 1 tut)/wk
Assessment one 1hr exam/Sem 1, one 2hr exam/Sem 2, class work, one 1500w essay

This course is designed to give students an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. After outlining the historical setting of Australian agriculture, the current market, business management and political environments in which agriculture operates are discussed. The topics discussed include: the historical development of Australian agriculture; the changing nature of Australian agriculture over time; agricultural adjustment in the world economy; the place of agriculture in the Australian economy; the place of Australian agriculture in the world economy; factors affecting the location of agricultural production; factors affecting the demand, supply and price of agricultural products; trends in agricultural prices; market structure; agricultural marketing; the nature of international markets; problems in agricultural trade; introductory principles of farm management and production economics; the farm business; taxation;

constitutional, political and administrative institutions affecting Australian agriculture; the Australian agricultural policy setting; means of achieving government objectives for the farm sector.

Textbooks
K.O. Campbell and B.S. Fisher *Agricultural Marketing and Prices* (Longman Cheshire, 1991)
K.O. Campbell and J.W. Bowyer (eds) *The Scientific Basis of Modern Agriculture* (Sydney U.P., 1988)

Horticultural Science 3
6 units
Coordinator Dr Goodwin
Prereq Crop Science 2 or Crop and Pasture Agronomy
Classes Sem 2: (2 lec, 2 workshops & 2 prac)/wk
Assessment one 2hr exam (60%), assignments (30%), class quiz (10%)

The course introduces students to the scientific basis of perennial fruit and annual horticultural crop production. Lecture topics include: factors which determine fruit crop locations, training systems and rootstocks; the physiology of propagation, flowering and fruit growth; time of harvest and postharvest handling of fruit; the establishment of annual horticultural crops; water management; micro-environmental modification and the strategic management of fertilisers and pesticides. The practical classes include: the training and pruning of fruit trees; propagation by cuttings, budding and grafting; the objective assessment of fruit quality; an introduction to plant tissue culture; the manipulation of greenhouse environments, and the modification of the field environment by windbreaks and mulches.

Plant Pathology 3   4 units
Coordinator Dr Bowyer
Lecturers Dr Bowyer, Prof. Burgess, Prof. Deverall
Prereq Agricultural Chemistry 2, Crop Science 2
Coreq Agricultural Entomology and Mycology 3, Agricultural Microbiology 3A, Agricultural Genetics 3
Classes Sem 2: (2 lec & 2 prac)/wk
Assessment one 2hr theory exam & one 1hr prac exam, class work

Introduction to the nature of plant diseases as limiting factors in agricultural production. Introduction to bacteria, viruses and nematodes as causes of plant disease. Physiology of infection and the nature of host resistance. Parasitic specialisation. Epidemiology. Principles of disease control.

Textbook
G.N. Agrios *Plant Pathology* 3rd edn (Academic Press, 1988)

Production Economics   8 units
Prereq Economic Environment of Australian Agriculture
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, class work

Production economics is concerned with production decisions on resource allocation at the firm, industry and economy levels. The topics include: the nature of agricultural resource industry protection; production functions; factor substitution; principles of enterprise combination and multi-product production; firm

objectives; constrained and unconstrained maximisation; cost function and other duality relationships; economies of scale and size in farming; input demands and dual relationships; production over time; productivity and technical change; production under risk and the illustration of the principles involved through the use of practical applications and exercises involving both the agricultural and resource industries. In addition, basic decision analysis will be introduced including basic concepts of probability; concepts of utility; utility functions and elicitation of preferences.

Textbooks
D.L. Debertin *Agricultural Production Economics* (Macmillan, 1986)
J.P. Doll and F. Orazem *Production Economics: Theory with Applications* (Wiley, 1984)

Reference book
J.R. Anderson *et al. Agricultural Decision Analysis* (Iowa State U.P., 1977)

Soil Science 2   6 units
Coordinator Assoc. Prof. Koppi
Lecturers Assoc. Prof. Koppi, Mr Geering, Prof. McBratney
Prereq Agricultural Physics, Biometry 1
Coreq Agricultural Chemistry 2
Classes Sem 1: (3 lec & 3hr prac)/wk
Assessment one 3hr exam, coursework and prac book

This course is concerned with the fundamental properties of soil, the factors of soil formation, and the processes that operate in the soil system. The components of the course are: pedology; soil physics and soil chemistry. These components are synthesised by reference to common soil profiles. The study of soil in the field starts with field description and assessment of essential characteristics. The physics of water and gas movement, temperature, density, swelling and strength are considered. Soil chemistry includes properties of organic matter, cation exchange capacity, nitrogen, phosphorus, potassium and acidity. Common soil types of N.S.W. are studied in relation to their formation, properties and classification.

Reference books
N.C. Brady *The Nature and Properties of Soils* 10th edn (Macmillan, 1990)
K.O. Campbell and J.W. Bowyer (eds) *The Scientific Basis of Modern Agriculture* (Sydney U.P., 1988)
G.W. Leeper and N.C. Uren *Soil Science: An Introduction* 5th edn (Melbourne U. P., 1993)
M.J. Singer and D.N. Munns *Soils: An Introduction* 2nd edn (Macmillan, 1991)
R.E. White *Introduction to the Principles and Practice of Soil Science* 2nd edn (Blackwells Scientific, 1987)
A. Wild (ed.) *Russell's Soil Conditions and Plant Growth* 11th edn (Wiley, 1988)

Soil Science 3   8 units
Coordinator Mr Geering
Lecturers Assoc. Prof. Koppi, Prof. McBratney, Mr Geering & staff from Geography Department
Prereq Soil Science 2
Classes Sem 2: (4 lec & 3hr prac)/wk; 5 days in the field in last week mid-year break
Assessment one 3hr exam, reports on field and lab work

Lectures on classification of soil, soil survey, pedological processes, geomorphology and soil stratigraphy, aerial photography, geostatistics and their application to land evaluation for rural purposes, the forms of land degradation occurring in Australia, the management of the soil environment and processes and management conducive to sustainable soil husbandry.

Five days' field work in the last week of the mid-year break will take place at a country location and involves landscape description and the description, mapping and sampling of soil profiles for the purpose of assessing land-use capability and field variability of soil properties. The field-work component is a compulsory part of the course.

Thirty-six hours of laboratory work involves routine physical, chemical and statistical analyses of samples taken in the field relevant to assessment of the land use potential and the quantification of the soil variability and soil degradation at the survey site.

Reference books
T.J. Marshall and J.W. Holmes *Soil Physics*, 2nd edn (Cambridge U.P., 1988)
D. Dent and A. Young *Soil Survey and Land Evaluation* (Allen & Unwin, 1981)
FAO *A Framework for Land Evaluation* FAO Soil Bulletin No. 32 (FAO, 1976)
E.A. FitzPatrick *Soils* (Longman, 1980)
R.H. Gunn *et al. Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys* (Inkata, 1988)
E.G. Hallsworth *Anatomy, Physiology and Psychology of Erosion* (Wiley, 1987)
R.P.C. Morgan *Soil Erosion and Conservation* (Longman, 1986)
A. Wild (ed.) *Russell's Soil Conditions and Plant Growth*, 11th edn (Wiley, 1988)

FOURTH YEAR COURSES

Agricultural Chemistry 4
Prereq Agricultural Chemistry 3L

The course will include:

Research Methods in Agricultural and Biological Chemistry   8 units
Students prepare a discussion paper and short essays on topics of their choice selected from a reading list which covers a wide range of basic and applied areas of biological and environmental chemistry.

Chemistry and Biochemistry of Agricultural and Food Products and the Environment   16 units
Lectures and laboratory classes cover topics which include organic and biological chemistry, the physical behaviour, structure and function of polysaccharides and proteins, chemistry and biochemistry of nucleic acids and gene expression, aspects of food science.

Research Project   24 units
Students carry out a short research project under close supervision of a member of the staff. Projects are usually available in one of the following areas of research interest within the Department: carbohydrate and nitrogen metabolism in a variety of crop plants; symbiotic nitrogen fixation; biochemistry of herbicides and pesticides; nutritional aspects of seed proteins;

organic and inorganic residues in agricultural products. Students who are interested in working in another area are invited to discuss their ideas with a member of the staff. As an alternative to the research project, students may elect to undertake an extended program of advanced laboratory experiments in biological chemistry, the analysis of food and agricultural products and soil chemistry.

Agricultural Economics
Prereq Agribusiness Management or Production Economics

In addition to completing five courses from those listed below, students undertake a small research project, on which they write a report, and attend seminars as required.

Agricultural and Resource Policy
The topics discussed include: the basic theoretical frameworks for the economic evaluation of policy formation (including Pareto welfare economics and public choice theory), market and government failure; the institutional structure of agricultural and resource policy formulation in Australia; microeconomic issues in agricultural and resource policy arising from linkages between agriculture and the resource industries and with the rest of the economy. Students will be expected to read widely for this course.

Applied Commodity Modelling
The application of applied econometric methods to the agricultural and resource sectors is the focus of this course. Topics covered will include: estimation of production relationships; demand; supply; expectations models and simple simultaneous representations of commodity sectors using multiple regression techniques; time series forecasting applied to commodity and futures markets; and a suitable selection from an introduction to dynamic multipliers, dynamic elasticities, and econometric simulation. Use will be made of a variety of data analysis and econometric computer packages. Emphasis will also be placed on electronic and graphical approaches to data analysis along with consideration of the limitations and problems of the particular techniques.

Commodity Price Analysis
The topics covered will include: the nature of agricultural and resource commodity markets, market supply relationships, market demand relationships, price determination, marketing margin relationships, spatially related markets, market dynamics, derived demand for inputs, price expectations, non-competitive market forms and contestable markets. Applied examples from agriculture and the resource industries will be used throughout the course as illustrations of the principles involved.

Natural Resource Economics
A course in natural resource economics of relevance to agriculture and the resource industries. Issues discussed are: the environment as a source of environmental services; socially efficient resource allocation and Pareto welfare economics; market

failure and characteristics of environmental services; benefit cost analysis of public projects, including the modification of environmental services; non-depletable resources and pollution; depletable resources; irreversibility; sustainability. Applications include land degradation, fisheries, forestry, land-use planning, greenhouse effect.

Quantitative Business Management and Finance
The application of applied optimising methods to decision-making in the agricultural and resource sectors is the focus of this course. Topics covered include: an overview of the applications of optimising models; the mathematical basis for constrained optimisation; basic linear, quadratic and nonlinear programming; farm modelling; agricultural sector models; transport and location models; spatial equilibrium systems; introduction to general equilibrium models; and model validation and verification. Issues of financial analysis and control, financial relationships, investment, capital budgeting, risk management and risk in investment decision making will also be covered.

Applied Commodity Trade
In this course the basic economic principles underlying international trade in agricultural and resource commodities and the policies involved will be presented. Issues related to trade and development will also be considered. The main topics covered will include: trends in agricultural and resources trade; trade policies of importing and exporting nations, including issues such as food aid and surplus disposal programs; economic integration and impacts on international commodity trade; international trade policy making, including GATT; trade policies of the centrally-planned economies and developing countries; the impact of exchange rates and other macroeconomic variables on international trade in commodities.

Applied Marketing
Applied Marketing relates to the basic economic concepts involved in the marketing of products into the food and fibre system. Topics covered will include: the marketing function including transportation, storage, processing, market development, advertising, market information, standardisation and grading; marketing management and planning; market efficiency; futures markets and other risk sharing devices; types of market and industry organisation; marketing boards and corporations and their role in administered pricing; private trading corporations and their roles in agriculture and the resources sector.

Optional course
With the approval of the Head of the Department of Agricultural Economics, students may undertake a course, such as Economics I, offered by the Faculty of Economics.

Agricultural Entomology 4
A full-year specialisation which is comprised of the following courses:

Anatomy and Taxonomy of Insects

The internal and external structure of insects is studied in detail. The anatomy of major orders is compared and contrasted. Classification to family level of all orders is included in the practical course.

Textbook
I.D. Naumann (ed.) *Systematic and Applied Entomology* (Melbourne U.P., 1994)

Ecology

This course is given by the School of Biological Sciences

Economic Entomology

This deals with the biology of economically important arthropod pests of the major crops grown in New South Wales. There is also a reading list which covers topics in this area.

Reading course

This list covers areas in entomology that are not covered in other sections of the course and allows students to concentrate on areas of interest.

Project

Students undertake research projects throughout the year under supervision by staff members.

Insect collection

Students are required to make a small but representative collection of insects.

Agricultural Genetics 4

The coursework is designed for students wishing to concentrate on those areas of genetics or breeding which are seen as most relevant to their present interests and career prospects. Students should consult with the relevant departments in determining course combinations. Courses at Cobbitty may be run as intensive either during or between semesters.

(a) Cytogenetics (Cobbitty)   6 units

Lectures in cytology and cytogenetics, with special emphasis on cereals and the application of chromosome engineering to plant breeding. The laboratory course includes routine cytological procedures and tissue culture technology.

(b) Plant Breeding (Cobbitty)   6 units

Lectures and practical work devoted to the theory, philosophy and practice of plant breeding, screening techniques, conservation of genetic variability, breeding for disease resistance, the use of tissue culture in breeding, with examples from both field and horticultural crops.

(c) Population Genetics and Animal Improvement (Camden)   8 units

A course of lectures and practical periods, dealing with population genetics, quantitative inheritance and animal breeding given by the Department of Animal Science.

(d) Molecular Genetics (Main Campus)   12 units

Lectures and laboratory classes given in the School of Biological Sciences.

(e) Plant Genetic Engineering (Cobbitty)   6 units

Lectures and laboratory work covering the structure and functions of plant genomes and genes, the technology and results of DNA transformation, and the analysis of agronomic traits by both molecular techniques and by genetic mapping using RFLP and other genetic markers.

(f) Animal Genetics (Main Campus)   4 units

A course of lectures covering those aspects of genetics that are relevant to animals, with particular emphasis on the genetic basis of animal disease. Topics include biochemical disorders, chromosomal abnormalities, non-Mendelian disorders, immunogenetics, pharmacogenetics, genetic variation in pests, parasites and pathogens, and genetic and environmental control of disease.

(g) Project (compulsory)   6-18 units

(h) Any other 6-unit course with the approval of the Head of Department.

Agricultural Microbiology 4

The coursework for this subject follows substantially the same syllabus as the senior course for science students, Microbiology 3, which comprises 108 lectures, 189 hours of practical work, and 32 hours of a variety of other course-related activities. The course is organised into four themes:
Molecular Microbiology – prokaryote evolution and taxonomy, bacterial physiology, structure and function, and bacterial and phage genetics.
Applied Microbiology and Biotechnology – industrial and food microbiology, pollution microbiology, recombinant DNA, and biotechnology.
Environmental Microbiology – microbial ecology, and plant-microbe interactions.
Medical Microbiology – medical bacteriology, virology, and serology.

In the second semester there are several specialist lecture courses, based on the research interests of the academic staff of the Department.

The practical course complements the lecture course and includes project work and excursions to industrial, medical and research institutions. As far as possible, agriculture students will be given essays and other assignments on topics of importance to agriculture.

In addition to the coursework, valuable experience is gained by undertaking a research project in conjunction with a member of staff, the project accounting for roughly half of the final mark of the course.

Reference books
To be announced.

Agronomy 4

Coreq Agronomy 3, Biometry 3

Agronomy is the science of growing plants — from creating on-farm opportunities to developing policies for ecosystem management. This course provides a substantially deeper appreciation of particular fields

such as plant physiology, nutrition and experimentation. Extensive opportunities are provided for field work on our own research units at Camden and Forbes, on commercial properties and at Orange Agricultural College. There will also be residential study periods in rural locations where studies of crop and pasture industries are applied to active field situations. A personal research project is part of the program. This contributes approximately one-third of the course units for the year and can be selected from a wide variety of topics; data may be gathered before or during the academic year itself.

Core courses:

Crop Agronomy	6 units
Crop Physiology	6 units
Crop Nutrition	6 units
Pasture Agronomy	6 units
Research Project	6, 12 or 24 units

plus courses to total 48 units as approved by the Head of Department. Recommended options are Agribusiness Management or Methods in Horticultural Research, although students with particular interests may choose a course in Farming Systems, Plant Breeding, Soil Biology, or courses in Agricultural Economics.

Crop Agronomy 6 units
Coordinator Mr de Kantzow
Classes Yr
Assessment one 3hr exam, review paper

A field-based course on crop management with particular reference to grain legume and fibre crops. Analyses will be in the context of (i) their ecology: underlying physiology and nutrition; (ii) their farming system, including technical and economic analysis of their management and their roles and restrictions within existing and imaginable farming systems; and (iii) their end uses, and how to better meet the technical needs of markets. Remote sensing and geographic information systems technology are used to monitor crop area production, computer-based decision support systems to assist crop management, and professional diagnosis of hypothetical problems in crop production to develop analytical skills.

Crop Physiology 6 units
Coordinator Dr Campbell
Classes Sem 1
Assessment: one 2 hr exam, and assignments

Why do plants behave as they do? An intensive course examining some of the major elements of crop physiology and nutrition, e.g. crop photosynthesis, why weeds compete, root growth and ion uptake, water relations, and nutrient relations. Aspects of postharvest physiology are briefly covered. Emphasis is given to instrumentation, biological and physical assumptions underlying measurement, applications of the data and sensitivity analysis of the measurements.

Textbook
R W Rearcy *et al.* (eds) *Plant Physiological Ecology. Field Methods and Instrumentation* (Chapman & Hall, 1989)

Crop Nutrition 6 units
Coordinator Dr Campbell
Classes Yr
Assessment assignments, seminars and professionalism

Can plants obtain their nutrients from waste? Students will undertake an experimental program on compost of urban waste and present their results for a client, e.g. local government. Other waste streams will be examined, e.g. sewerage sludge, recycling by waste management authority. Field visits to sites will be arranged. Environmental compliance. The role of C/N ratio, heavy metal uptake by plants and quality of nutrient inputs for plant growth will also be examined. The scope of plant nutrition for the production of food quality is discussed. Field experimental design.

Pasture Agronomy 6 units
Classes Yr
Assessment one 3hr exam, consultancy report

Pasture ecology and management with particular emphasis on plant adaptation and the management of plant communities and their long-term dynamics. Identification of management problems and opportunities within farming systems taking account of both ecological and social aspects of grazing systems in the coast, tablelands and central west of N.S.W. Classes may be based in Sydney, Camden or Orange, with a field trip of approximately 4 days.

Turf Management 6 units
Coordinators Prof. Martin, Prof. Pearson
Classes Sem 1
Assessment one 2hr exam, assignments

Lectures, workshops and field visits centred on the theme of 'turf: a self-contained system'. Students address the scientific issues underlying the design, construction, grassing and maintenance of turf facilities: construction of desired soil profiles, nutrition, micro- and macroenvironment of turf, water management, physiology of growth under turf conditions. Environmental legislation and emerging issues for turf management.

Research Project and Thesis 6, 12 or 24 units
Supervised research on a topic chosen by the student in the area of cropping systems, cereals production, plant nutrition, or pasture and weed ecology.

Animal Production
Coordinator Assoc. Prof. Gooden
Location Werombi Road, Camden

The year is devoted to advanced Animal Production and a certain degree of specialisation by medium of project work is compulsory. Students are in residence at the University Farms, Camden, for a whole year, where advanced lecture and practical courses are taken in the following subjects: meats, poultry, genetics, dairying, wool, and control of animal diseases. About 20 per cent of the time available is spent on project work, for which students undertake projects in the various sections of the Department of Animal Science at Camden.

Reference books

Agricultural Research Council *The Nutrient Requirements of Farm Livestock,*

—*No. 1: Poultry* 2nd edn (1975)

—*No. 2: Ruminants* (1980)

—*No. 3: Pigs* (1981)

G. Alexander and O.B. Williams *The Pastoral Industries of Australia* (Sydney U.P., 1979)

P.B. English *et al. The Sow, Improving her Efficiency* (Farming Press. 1977)

D.C. Falconer *Introduction to Quantitative Genetics* 2nd edn (Longman, 1981)

C.W. Holmes and G.F. Wilson *Milk Production from Pastures* (Butterworths, 1984)

R.A. Lawrie *Meat Science* 3rd edn (Pergamon Press, 1979)

D.R. Lindsay and D.I. Pearce *Reproduction in Sheep* (Australian Academy of Sciences, 1984)

T.R. Preston and R.A. Leng *Matching Ruminant Production Systems with Available Resources in the Tropics and Sub-Tropics* (Penambul Books, Armidale, 1987)

I.M. Roit *Essential Immunology* 2nd edn (Blackwell, 1974)

D. Sainsbury *Poultry Health & Management* 3rd edn (Blackwell, 1992)

G.W. Salisbury and N.L. van Denmark *Physiology of Reproduction and Artificial Insemination of Cattle* 2nd edn (Freeman, 1978)

Other textbooks to be advised.

Biometry 4

Prereq Data Management 3

This course trains people for careers as biometricians or statisticians. Much of the applied work encountered in Data Management 1, 2 and 3 is synthesised into a more formal statistical framework. Some of the Fourth Year courses are undertaken in the School of Mathematics and Statistics, and supplemented with additional work in Biometry.

The program consists of a 12- to18-unit project, a selection of courses offered in the Department of Crop Sciences, and a selection of courses offered in the School of Mathematics and Statistics.

Core courses:

Research Project	6, 12 or 18 units
Biometrical Methods	6 units
Matrix Algebra and Linear Models	6 units
Statistical Consulting	6 units

plus 12 to 24 units chosen from:

Biometrical Computing	6 units
Experimentation	6 units
Multivariate Analysis	6 units

or from other courses approved by the Head of Department.

Biometrical Computing   6 units
Coordinator Assoc. Prof. O'Neill
Classes Sem 2
Assessment assignments

This course delves into a number of computing packages, languages and systems useful to a consulting or research biometrician. Statistical packages include Minitab, Genstat, SAS, S, Word and Excel. Programming languages such as Basic, Fortran, Pascal and C are studied as they relate to biometrical problems.

Biometrical Methods   6 units
Coordinators Assoc. Prof. O'Neill, Dr Thomson
Classes Sem 1
Assessment assignments

This course introduces students to essential statistical and mathematical theory that should be at the fingertips of practising statisticians. Topics include bivariate and multivariate distribution theory, maximum and residual maximum likelihood estimation, likelihood ratio tests and Taylor expansions. The theory is extended to more difficult design problems, such as nearest neighbour designs and intercropping experiments.

Matrix Algebra and Linear Models   6 units
Coordinator Dr Thomson
Classes Sem 1
Assessment assignments

This course provides the necessary matrix knowledge underlying many of the standard statistical tests. A general linear model approach is adopted as the underlying framework for tests such as t-tests, analysis of variance F-tests and regression F-tests.

Multivariate Analysis   6 units
Coordinator Dr Thomson
Classes Sem 2
Assessment assignments

This course generalises univariate tests to multivariate situations. Topics include multivariate regression, multivariate analyses of variance, principal component analyses and canonical variate analyses. Emphasis in this course is on applications to agricultural problems.

Statistical Consulting   6 units
Coordinators Assoc. Prof. O'Neill, Dr Thomson
Classes Yr
Assessment reports

Students are exposed to problems in agricultural and veterinary science that are referred to the professional officer in Biometry. Students work with the scientist involved to provide, under supervision, appropriate biometrical advice. In addition, students are placed in a government department or statutory body one day per week for a period of time to gain first-hand experience with these organisations.

Farming Systems

Prereq Production Economics or Agribusiness Management
Coreq Agronomy 3

This is an interdisciplinary program offered jointly by the Department of Agricultural Economics and the Department of Crop Sciences. It is designed for students with a general training in agricultural science who seek to understand farming systems and their managerial aspects within the wider agribusiness environment. Students will complete a minimum of 48 units including a project.

Core courses:

Crop Agronomy	6 units
Pasture Agronomy	6 units
Agricultural and Resource Policy	8 units

| Natural Resource Economics | 8 units |
| Project | 8 units |

plus units from the following courses:

Accounting I *or*	12 units
Financial Accounting Concepts and Management Accounting Concepts	12 units
Advanced Soil Chemistry	6 units
Agribusiness Management	8 units
Applied Commodity Trade	8 units
Applied Marketing	8 units
Crop Protection	4 units
Plant Pathology 3	4 units
Research Methods	4 units
Soil Science 3	8 units

and other courses approved by the Head of Department concerned, up to 8 units.

The project will involve an evaluation of an agribusiness/farming systems/farm management proposal and result in a 10 000-word report. Students will be assisted in the selection of a suitable project.

To pass the year, students must perform satisfactorily in the project, in subjects of an economics nature and in subjects of a science nature.

Course and component descriptions

For those of an economics nature, see under Agricultural Economics. For those of a science nature, see under Agronomy 4, Horticulture 4, Soil Science 4, or the specific course or component stated above.

Horticultural Science 4

Prereq Horticultural Science 3, Data Management 3

A full-year course offering an advanced treatment of the scientific and technical basis of horticultural production. The application of current scientific developments to the improvement of the efficiency of production is discussed, with some emphasis on a physiological approach and on the mastery of appropriate scientific techniques.

Core courses:

Ornamental Horticulture	6 units
Methods in Horticultural Research	6 units
Research Project	18 units

plus any others courses approved by the Head of Department.

Ornamental Horticulture   6 units

Coordinator Dr Goodwin
Classes Sem 1: (3 lec & 1hr prac)/wk & three 5hr prac; Sem 2: 1hr prac/wk
Assessment class work, assignments, one 2hr exam

A lecture and practical course on the production and postharvest handling of nursery and cut flower crops, the identification and properties of ornamental plants, and the analysis of an ornamental farm via the development of calendars of operation for each competing enterprise, and their optimisation using linear programming. The practical component emphasises the measurement of plant characteristics related to propagation efficiency, and of media characteristics related to plant performance.

Methods in Horticultural Research   6 units

Coordinator Dr Goodwin
Classes Sem 1: (2 lec & 6hr prac)/7wks, 4-day residential short course in mid-sem break
Assessment two 1hr exams (50%), assignments

Lectures and practicals on methods used in research on the physiology of ornamental and fruit crops. The course covers the use of controlled environment rooms to elucidate the control of flowering; and advanced tissue culture methods, including *Agrobacterium*-mediated genetic transformation. The fruit crop segment of the course (2 units) will be given as a one-week residential course at Yanco in the MIA.

Postharvest Horticulture   6 units

Coordinator Dr W.B. McGlasson (University of Western Sydney, Hawkesbury, where the course will be given)
Classes Sem 1: 13 lec & thirteen 5hr class (1 day/wk)
Assessment lab report, assignment, seminar

This course will develop the skills required to ensure integration of postharvest needs with production and marketing requirements of fruit, vegetables, cut flowers and florists stocks. Students will conduct experiments and a case study within the system Market-Grower-Market. A representative range of seasonal products will be used and where possible students will undertake all operations from harvesting to consumer evaluation. Assessment will be by means of laboratory reports (50%), a take-home examination paper (30%) and a seminar on a selected postharvest topic (20%).

Plant Pathology 4

Coordinator Prof. Deverall

A full-year specialisation comprising the following component courses:

Mycology and Fungal Physiology

A lecture and practical course on the fungi with reference to their activities as plant pathogens. Comprises lectures and associated practicals on classification, systematics, population analysis, variability and problems of nomenclature with special emphasis on pathogenic members of the following groups: Fungi Imperfecti, *Fusarium* spp., *Colletotrichum* spp., Ascomycetes, the lower fungi, rusts, smuts and other Basidiomycetes. Also lectures and practicals on fungal nutrition and the physiology of reproduction and spore germination.

Soil Biology

A lecture and practical course on the ecology of the soil with special reference to the activities of plant-pathogenic fungi and nematodes. Includes consideration of the effect of physical factors such as water potential and temperature on the survival, growth, and infectivity of fungi in soil.

Bacteriology and Virology

A course of lectures and associated practical work on the plant-pathogenic bacteria and viruses and their interactions with plants. Includes symptoms of disease, the purification, transmission, characterisation,

detection, ecology and taxonomy of plant viruses, and principles of control. The practical work emphasises advanced analytical techniques in virology.

Physiology of Plant Disease
A course of lectures, tutorials and practicals on the processes involved in the interaction between plant cells and parasitic fungi and bacteria. Includes an introduction to the genetic basis of host resistance and parasitic specialisation. Covers the physiology of infection, host responses, roles of enzymes and toxins in parasitism, defence mechanisms of plants and the physiological basis of specificity.

Research Project
The majority of the second semester will be devoted to a research project in an aspect of one of the above subjects. Time would be available for students to attend the 52-hour optional course Crop Protection, which normally forms part of the third year for undergraduates in Agricultural Science.

Textbooks
L. Bos *Introduction to Plant Virology* (Longman, 1983)
D.M. Griffin *Ecology of Soil Fungi* (Chapman & Hall, 1972)
S. Issac *Fungal-Plant Interactions* (Chapman & Hall, 1992)

Reference books
R.I.B. Francki *et al. Atlas of Plant Viruses* vols 1 & 2 (CRC Press, 1985)
R.E.F. Matthews *Plant Virology* 3rd edn (Academic Press, 1991)
R.E.F. Matthews *Fundamentals of Plant Virology* (Academic Press, 1992)

Soil Science 4
The soil science specialisation trains people for careers in professional soil science and extension. It provides an excellent background for entry into all aspects of soil science research ranging from physics through mineralogy and chemistry to pedology. Increasing emphasis is being given to aspects of soil sustainability and environmental soil science in order that graduates can meet the growing national demands in this area.

The prerequisites for this course are Soil Science 3 and Data Management 3. Students are required to complete a relevant 24-unit research project and take at least three of the following four modules: Advanced Soil Chemistry, Advanced Field and Laboratory Soil Physics, Advanced Methods of Soil Analysis and Advanced Pedology and any other 6-unit modules approved by the Head of Department.

Reference books
Division of Soils, CSIRO *Soils: an Australian Viewpoint* (CSIRO/Academic, 1983)
A. Wild (ed.) *Russell's Soil Conditions and Plant Growth* 11th edn (Longman, 1988)

Advanced Field and Laboratory Soil Physics
6 units
Coordinator Prof. McBratney
Lecturer Prof. McBratney
Classes Sem 1: (2 lec, 1 tut & 5hr prac)/7wks, 5 days in the field (1st half)
Assessment one 2hr exam, field and prac reports, problem sets, essay

The emphasis is to examine the quantitative aspects of soil physics particularly in relation to the transfer of energy, gas, water, solids and solutes in soil.

Lecture and lab topics include heat flow, gas movement, soil water energetics, saturated and unsaturated flow of soil water, infiltration, solute movement, water and wind erosion as well as the fundamentals of numerical computer modelling of soil physical processes.

Five days' field-work, in the week prior to the beginning of Semester 1, involves field measurement of soil physical properties such as shear and tensile strength, electrical resistivity, hydraulic conductivity and infiltration rates and moisture content.

Reference books
G.C. Campbell *Soil Physics with BASIC* (Elsevier, 1985)
R.J. Hanks and G.L. Ashcroft *Applied Soil Physics* (Springer, 1980)
P. Koorevaar *et al. Elements of Soil Physics* (Elsevier, 1983)
T.J. Marshall and J.W. Holmes *Soil Physics* 2nd edn (Cambridge U.P., 1988)
J. Richter *The Soil as a Reactor* (Catena, Cremlingen, 1987)

Advanced Pedology
6 units
Coordinator Assoc. Prof. Koppi
Lecturer Assoc. Prof. Koppi
Classes Sem 1: (3 lec, 1 tut & 8hr prac)/7wks, 5 days in the field (2nd half)
Assessment one 2hr exam, prac reports, essay

This course centres on a weathering study which traces the changes from a rock parent material up through the soil profile. The methods of study include particle-size analysis and extraction of a fine-sand fraction for optical identification and quantification of the mineral species present. Thin sections of the rock and profile are prepared, examined and the main features identified and quantified. The data from the sand analysis, micromorphological investigations and clay mineral assessments are used to provide an understanding of the pedogenesis of the particular soil. A field trip to study the variety of soil types in their environmental setting is made in the mid-semester break.

A detailed study, including exercises, is made of the USDA soil classification system, Soil Taxonomy.

Reference books
G.W. Brindley and G. Brown (eds) *Crystal Structure of Clay Minerals and their X-ray Identification* (Mineralogical Society, London, 1980)
E.A. FitzPatrick *Soils* (Longman, 1980)
E.A. FitzPatrick *Micromorphology of Soils* (Chapman & Hall, 1984)

Advanced Methods of Soil Analysis
6 units
Coordinator Mr Geering
Lecturers Mr Geering, Dr Kennedy
Classes Sem 2: (3 lec, 1 tut & 8hr prac)/7wks (2nd half)
Assessment one 2hr exam, lab report, problem sets, essay

Approaches to scientific investigation and methods of literature survey followed by tutorial on computer search techniques.
Physical. Particle Size Analysis (PSA) of clay fraction and fractionation by centrifugation techniques, specific surface area measurements by BET Thermocouple

methods for field measurements of moisture. Thermal conductivity methods for soil moisture content, gamma and neutron probe methods for field measurements of moisture content and bulk density and time-domain reflectometry.

Physico-chemical. Measurement of oxidation-reduction status, O_2 diffusion rate and O_2, CO_2 concentrations in soil, selective ion-electrodes for measurements of ion activities in soil solution.

Geotechnical. Mechanical measurements of soil properties including Atterberg limits, unconfined compression, penetrometer, Proctor and compaction, torsion shear box, dynamometer, rupture-test and drop shatter test, sampling and testing procedures for determining physical properties of swelling soils. *Soil structural.* Soil structure and stability tests in relation to aggregate size and soil micro-aggregates. Fractionation of soil organic matter and determination of principal functional groups COOH, OH involved in CEC and complexation of heavy metals.

Reference books
A. Klute (ed.) *Method of Soil Analysis. Part 1. Physical and Mineralogical Methods* 2nd edn (American Society of Agronomy Monograph No.9, Madison, Wisconsin, 1986)
J. Loveday (ed.) *Methods of Analysis for Irrigated Soils* Technical Communication No. 54 (Commonwealth Agricultural Bureaux, 1974)
A.L. Page *et al.* (eds) *Methods of Soil Analysis. Part 2. Chemical and Microbiological Methods* 2nd edn (American Society of Agronomy Monograph No. 9, Madison, Wisconsin, 1982)

Advanced Soil Chemistry   6 units
Coordinator Head of Department
Lecturers Mr Geering, Prof. McBratney, Assoc. Prof. Koppi, Assoc. Prof. Copeland
Classes Sem 2: (3 lec, 1 tut & 8hr prac)/6wks (1st half)
Assessment one 2hr exam, lab report, problem sets, essay

Topics include clay mineralogy, cation exchange capacity and pH dependent charge, soil charge characteristics, soil chemical analyses and their interpretation, formation of acid soil – Al and Mn toxicities, chemistry and adsorption/desorption of K, P and S in soil, soil solution and speciation of ionic components, soil salinity, oxidation/reduction reactions in soil and chemistry of soil organic matter and nitrogen.

Reference books
S.A. Barber *Soil Nutrient Bioavailability* (Wiley, 1984)
N.J. Barrow *Reactions with Variable Charge Soils* (Martinus, Nijhoff, Dordrecht, 1987)
D.J. Greenland and M.H.B. Hayes *The Chemistry of Soil Constituents* (Wiley, 1978)
A.D. Robson (ed.) *Soil Acidity and Plant Growth* (Academic, 1989)
G. Sposito *The Chemistry of Soils* (Oxford, 1989)

Special Program
Students may enrol in Special Program after consultation with, and with the approval of, the Dean. This interdisciplinary course structure is available for students who wish to undertake Fourth Year optional course combinations which are not offered by any individual department.

Bachelor of Agricultural Economics

FIRST, SECOND, THIRD AND FOURTH YEAR COURSES

Accounting I   12 units
This course consists of two parts, Accounting IA and Accounting IB. BAgrEc students *must* enrol in Accounting I, not in each part separately.

Accounting IA
Classes Sem 1: (2 lec, 1 tut & 2 prac)/wk
Assessment one 3hr exam, 2 tests/sem, weekly assignments

An introduction to accounting and the double entry system of financial recording. Coverage of both mechanical and computerised accounting systems. Introduction to spreadsheet applications on computer for financial accounting. Examination of assumptions underlying conventional accounting practice. Professional environment of accounting. Nature and role of generally accepted accounting principles. Designed as an introduction to the accounting sequence. Emphasis given to developing students' written and oral communication skills. No prior knowledge assumed.

Accounting IB
Classes Sem 2: (2 lec, 1 tut & 2 prac)/wk
Assessment one 3hr exam, 2 tests/sem, weekly assignments

Follows on from Accounting IA and examines the detailed disclosure of information derived from the accounting information system; that is, it introduces key issues in financial accounting. Covers accounting for partnerships, companies and basic financial statement analysis. Accounting standards. Continued work on spreadsheet applications on computer for financial accounting. Further development of written and oral communication skills.

Reference books
References to be advised in class.

Agribusiness Management   8 units
Prereq Production Economics
Classes Sem 2: (3 lec & 2 workshop)/wk
Assessment one 3hr exam, assignments

The course is designed to introduce the economic principles and techniques of business management as they apply to farm and agribusiness firms. The first part of the course will include: domestic and international agricultural product marketing; the functions of marketing; the opportunities to influence market outcomes; and marketing strategies. The topics covered in the second part will include: management goals and objectives; budgeting; gross margins analysis; parametric budgeting; sources of management information and its analysis; simple systems simulation; applications of linear programming to farm and agribusiness planning; financial management; risk in planning and management; cash, credit, debt and taxation

management; evaluation of investment and firm growth alternatives; acquisition and transfer of assets; the role of financial institutions in the rural credit market.

An integrated set of workshops is used to provide practical experience in firm planning utilising budgeting, gross margins analysis, linear programming, simulation methods and other techniques of analysis.

Textbooks

P.J. Barry *et al. Financial Management in Agriculture* (Interstate, 1989)

R.L. Kohls and J.N. Uhl *Marketing of Agricultural Products* (Macmillan, 1990)

P. Kotler *et al. Marketing: Australia and New Zealand* (Prentice Hall, 1994)

J.P. Makeham *et al. Best Bet Farm Decisions* (U. of New England Press, 1968)

A.N. Rae *Agricultural Management Economics* (CAB, 1994)

P.A. Rickards and D.J. McConnell *Budgeting, Gross Margins and Programming for Farm Planning* (U. of New England Press, 1967)

R. Turvey *Complan Handbook No 8: Enterprise Budgets for North West N.S.W.* (N.S.W. Department of Agriculture, 1988)

Agricultural and Resource Policy   8 units
Prereq Production Economics and Commodity Price Analysis
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam and assignments

The topics discussed include: the basic theoretical frameworks for the economic evaluation of policy formation (including Pareto welfare economics and public choice theory); market and government failure; the institutional structure of agricultural and resource policy formulation in Australia; microeconomic issues in agricultural and resource policy arising from linkages between agriculture and the resource industries and with the rest of the economy. Students will be expected to read widely for this course.

Reference books

D.B. Williams (ed.) *Agriculture in the Australian Economy* (Sydney U.P., 1990)

D.B. Johnson *Public Choice* (Mayfield, 1991)

R. Smith and L. Watson (eds) *Politics in Australia* (Allen & Unwin, 1993)

A. Moran *et al.* (eds) *Markets, Resources and the Environment* (Allen & Unwin, 1991)

N. Wallace (ed.) *Natural Resource Management: An Economic Perspective* (Australian Bureau of Agricultural and Resource Economics, 1992)

R.E. Just *et al. Applied Welfare Economics and Public Policy* (Prentice-Hall, 1982)

Agricultural Economics I   12 units
Classes Yr: (3 lec & 1 tut)/wk
Assessment one 1.5hr exam/Sem 1, one 3hr exam/Sem 2, assignments

An introductory course serving as a foundation for other units in agricultural and resource economics. The basic structure and nature of the resource and agricultural industries are outlined and the principles underlying economic analysis for these industries are considered. Topics will include: the structure of the

Australian agricultural and resource sectors; the changing nature of these industries; their international context; problems of structural adjustment and technical change; and government intervention. Other topics will include material illustrating basic economic principles, both graphically and mathematically, as they relate to the management of farm firms, the operation of agricultural and resource industry markets and impacts of macroeconomic factors on the agricultural and resource sectors. Students may be expected to make use of microcomputers in preparing class work submitted for assessment.

Textbooks

R.C. Buse and D.W. Bromley *Applied Economics: Resource Allocation in Rural America* (Iowa State U.P., 1975)

K.O. Campbell and B.S. Fisher *Agricultural Marketing and Prices* (Longman Cheshire, 1991)

V.J. Pollard and W.J. Obst *Practical Farm Business Management* (Inkata Press, 1986)

Agricultural Economics IV   52 units
The fourth year of the BAgrEc degree is comprised of the following:
- Research Project (16 units)
- Contemporary Issues in Agricultural Economics (4 units)
- Optional coursework as approved by the Head of the Department of Agricultural Economics (with no more than 16 units being components taught outside the Department of Agricultural Economics) (32 units).

The components of Agricultural Economics IV taught by the Department of Agricultural Economics are:

Contemporary Issues in Agricultural Economics
A series of 54 hours of seminars during the year on the following topics: recent developments in agricultural economic theory; current economic issues in the Australian and world agricultural and resource industries; appraisal of current Australian agricultural and resource policy.

Agribusiness Management
See course description.

Applied Commodity Trade
See course description.

Applied Marketing
See course description.

Natural Resource Economics
See course description.

Research Project
Details supplied by Department of Agricultural Economics.

Agronomy   8 units
This course is the same as Agronomy 3. (See alphabetically under First, Second and Third Year courses for the BScAgr degree.)

Animal Science
6 units

Classes Sem 1: 2 lec/wk & 9 prac/wk in wks 5-14
Assessment one 2hr exam

A course of lectures which describes characteristics of the animal production industries – locations, breeds of animals, management practices, products, marketing. Lectures will be reinforced by practical classes, to be held at Camden. Lectures and practical classes form a portion of the course Animal Science 2 undertaken in the BScAgr degree.

Applied Commodity Modelling
8 units

Prereq Econometrics I
Classes Sem 1: (3 lec & 1 tut/lab session)/wk
Assessment one 3hr exam, assignments

The application of applied econometric methods to the agricultural and resource sectors is the focus of this course. Topics covered will include: estimation of production relationships; demand; supply; expectations models and simple simultaneous representations of commodity sectors using multiple regression techniques; time series forecasting applied to commodity and futures markets; and a suitable selection from an introduction to dynamic multipliers, dynamic elasticities, and econometric simulation. Use will be made of a variety of data analysis and econometric computer packages. Emphasis will also be placed on electronic and graphical approaches to data analysis along with consideration of the limitations and problems of the particular techniques.

Textbook
R.S. Pindyck and D.L. Rubinfeld *Econometric Models and Economic Forecasts* (McGraw-Hill, 1991)

Reference book
C. Dougherty *Introduction to Econometrics* (Oxford U.P., 1992)

Applied Commodity Trade
8 units

Prereq Commodity Price Analysis
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

In this course the basic economic principles underlying international trade in agricultural and resource commodities and the policies involved will be presented. Issues related to trade and development will also be considered. The main topics covered will include: trends in agricultural and resources trade; trade policies of importing and exporting nations, including issues such as food aid and surplus disposal programs; economic integration and impacts on international commodity trade; international trade policy making, including GATT; trade policies of the centrally planned economies and developing countries; the impact of exchange rates and other macroeconomic variables on international trade in commodities.

Textbooks
J.P. Houck *Elements of Agricultural Trade Policies* (Macmillan, 1986)
R. Tyers and K. Anderson *Disarray in World Food Markets* (Cambridge U.P., 1992)

Reference book
N. Wallace and J. Evans (eds) *International Commodity Markets: An Australian Perspective* (Australian Bureau of Agricultural and Resource Economics, 1993)

Applied Econometrics
8 units

Prereq Econometrics IIB
Coreq Econometrics IIIA
Classes (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

Application of simultaneous and multivariate equation models to various aspects of economics. Research papers involving empirical research will be examined and students will be required to undertake related empirical work. Topics may include: systems of consumer demand functions, systems of factor demand and output supply functions, macroeconomic models, empirical general equilibrium models and Monte Carlo experiments.

Applied Marketing
8 units

Prereq Commodity Price Analysis
Classes Sem 2: (3 lec & 1 tut/excursion)/wk
Assessment one 3hr exam, assignments

Applied Marketing relates to the basic economic concepts involved in the marketing of products into the food and fibre system. Topics covered will include: the marketing function including transportation, storage, processing, market development, advertising, market information, standardisation and grading; marketing management and planning; market efficiency; futures markets and other risk sharing devices; types of market and industry organisation; marketing boards and corporations and their role in administered pricing; private trading corporations and their roles in agriculture and the resources sector.

Textbook
R.L Kohls and J.N. Uhl *Marketing of Agricultural Products* (Macmillan, 1990)
P. Kotler *et al. Marketing: Australia and New Zealand* (Prentice-Hall, 1994)

Asian Studies 1
16 units

Classes Yr: two 1hr classes/wk, 2wk full-time intensive course/July vacation. Attendance is required at all lectures and classes.
Assessment assigned exercises and quizzes 15%, 2hr exam/semester 40%, intensive course component 25%, book review 20%.

The course is designed as the first in a three-year course series in Asian studies. As such, the emphasis will be on establishing the basic language skills without which a higher level of proficiency, including familiarity with applied Japanese for specific purposes, cannot be attained. Japanese culture will be introduced through reading materials and lectures.

Textbooks
C. Kano *et al. Basic Kanji Book* Vol. I (Bonjinsha, 1991)
Y.K. Mitamura *Let's Learn Hiragana* (Kodansha International, 1985)
Y.K. Mitamura *Let's Learn Katakana* (Kodansha International, 1985)
Tsukuba Language Group *Situational, Functional Japanese* (Bonjinsha, 1991)

Asian Studies 2   16 units

Prereq Asian Studies 1

Classes Yr: two 1hr classes/wk, 3wk study tour of the country being studied/July vacation. Students unable to participate in the study tour will have alternative class work assigned. Attendance is required at all lectures and classes.

Assessment assigned exercises and quizzes 20%, 2hr exam/ sem 40%, oral presentation 20%, written report on study tour of Japan 20%.

As with Asian Studies 1, this course will focus predominantly on language acquisition. Japanese business culture will be dealt with in more depth than in the previous year. A three-week in-country training program in Japan in the semester break will provide students with a first-hand look at the way the Japanese culture operates today.

Textbook

Tsukuba Language Group *Situational, Functional Japanese* (Bonjinsha, 1991)

Asian Studies 3   16 units

Prereq Asian Studies 2

Classes Yr: business culture 1 hr/wk, reading 1.5 hr/wk, business conversation 1.5 hr/wk

Assessment business culture 30%, reading 30%, business conversation 30%, class performance 10%

This course builds on the first two years of the Asian Studies program. Language classes will enhance students' skills in technical reading as well as promoting proficiency in Japanese conversation in business contexts. Tutorials on Japanese business culture form an integral part of the course.

Textbooks

A.N. Nelson *The Modern Reader's Japanese English Character Dictionary* (Charles E. Tuttle, 1974)

E. Daub *et al. Basic Technical Japanese* (U. of Tokyo Press, 1990)

H. Takamizawa *Office Japanese* (ALC Press, 1991)

Selected contemporary readings on Japanese business.

Biology   12 units

(See alphabetically under First, Second and Third Year courses for the BScAgr degree.)

Commercial Law

Any semester course in Commercial Law. Refer to the *Faculty of Economics Handbook*. Students cannot repeat courses completed previously.

Commercial Law I   12 units

This course consists of two parts, Commercial Transactions I and Trade Practices and Consumer Law. First Year BAgrEc students *must* enrol in Commercial Law I, not in the parts separately. Students in higher years may enrol in Commerical Transactions I separately.

Commercial Transactions I

Classes Sem 1: (3 lec & 1 tut)/wk

Assessment one 3hr exam, one test, one 1500w essay, class work

This course is concerned with the fundamental elements of business law. It commences with an overview of the Australian legal system (sources of law, parliament, courts, statutory interpretation, doctrine of precedent), including an examination of those provisions in the Commonwealth Constitution relevant to business and commercial activities. Other topics include basic elements of criminal law and the law of torts (in particular, negligence and negligent misstatement), agency, partnerships, trusts and a detailed study of the law of contract.

Trade Practices and Consumer Law

Classes Sem 2: (3 lec & 1 tut/wk)

Assessment one 3hr exam, one 2000w essay, classwork

This course is primarily concerned with the provisions in the Trade Practices Act 1974 (Cwth) dealing with restrictive trade practices, unconscionable conduct, consumer protection and liability for defective goods. Topics to be studied in depth include: anti-competitive agreements, misuse of market power, exclusive dealing, resale price maintenance, price discrimination, mergers and acquisitions, unfair practices, product safety and product information, conditions and warranties in consumer transactions, liability of manufacturers and importers, unconscionable conduct. The consumer sale provisions of the Sale of Goods Act 1923 (N.S.W.) are also studied as are the other provisions of that Act dealing with, inter alia, implied conditions and warranties, transfer of property from seller to buyer, transfer of title by a non-owner, remedies. In the latter part of the course, business and consumer credit will be looked at along with basic financial instruments such as bills of exchange and cheques.

Corporate Finance   8 units

Coreq Accounting I or Financial Accounting Concepts and Management Accounting Concepts, Economics I, Econometrics I

Classes Sem 1: (3 lec & 1 tut)/wk

Assessment one 3hr exam and assignments

This course provides an introduction to corporate finance, including investment decision-making. The first part of the course deals with the analytical techniques necessary to make investment decisions, both when cash flows are known and when they are uncertain. The second part of the course deals with the corporation and the Australian capital market, the raising of capital, including equity versus debt, and allocating capital, including dividends, internal investments and takeovers. As far as possible, the course will attempt to link theory to practical applications via examples, exercises and assignments.

Corporations Law   8 units

Prereq Commercial Transactions I

Classes Sem 2: (3 lec & 1 tut)/wk

Assessment one 3hr exam, one assignment, tut participation

This course examines the law relating to modern corporations. After exploring the background to the Australian legislation and the current administrative framework, the topics discussed include the concept

of corporate personality, the procedures for incorporation, the company in its relations with outsiders, the postion of shareholders, the duties of directors, company meetings and accounts, methods of financing, securities regulations and takeovers.

Commodity Price Analysis 8 units
Prereq Agricultural Economics I
Classes Sem 1: (3 lec & 1 tut/excursion)/wk
Assessment one 3hr exam, assignments

The topics covered will include: the nature of agricultural and resource commodity markets, market supply relationships, market demand relationships, price determination, marketing margin relationships, spatially related markets, market dynamics, derived demand for inputs, price expectations, non-competitive market forms and contestable markets. Applied examples from agriculture and the resource industries will be used throughout the course as illustrations of the principles involved.

Textbooks
W.G. Tomek and K.L. Robinson *Agricultural Product Prices* (Cornell U.P., 1990)
R.S. Pindyck and D.L. Rubinfeld *Microeconomics* (Macmillan, 1992)

Crop and Pasture Agronomy 6 units
Classes Sem 2: (2 lec & 1 tut)/wk
Assessment one 2hr exam, one 1800w essay

Lectures cover the agronomic and ecological principles of crop and pasture production, together with farming systems in summer and winter rainfall zones and semi arid areas. Broad scale resource and environmental issues such as soil acidification, agricultural pollution and salinity amelioration will be discussed. The tutorials will lead students through their own consultant's report on the agronomic and management opportunities provided by a farm or region of their choice. The students will be required to identify the soil and climate resources and the supporting infrastructure and bring these together to create and recommend farming and grazing enterprises for the future.

References
C.J. Pearson and R.L. Ison *Agronomy of Grassland Systems* (Cambridge U.P., 1987)
J.E. Pratley (ed.) *Principles of Field Crop Production* (Sydney U.P., 1988)
P.V. Charman and B.W. Murphy *Soils: Their Properties and Management* (Sydney U.P., 1991)

Crop Science 1 8 units
Coordinator Dr Goodwin
Lecturers Mr de Kantzow, Mr Cunningham, Dr Goodwin, Dr Jacobs
Classes Sem 1: (2 lec & 1 prac)/wk; one full-day excursion; Sem 2: (3 lec & 3 prac)/wks 1-5
Assessment one 2hr exam, reports

This course deals with the botany and ecology of important agricultural and horticultural plants. Students will learn to:

- recognise common crops, pastures, weeds, vegetables and fruit and ornamental trees; know where these plants originated, where they are now grown in Australia, and what they are used for;
- know botanical terms with which we describe plant parts, e.g. the fine structure of a flower and a grass inflorescence;
- know how to use a botanical key to identify a plant not seen before;
- understand patterns of crop and pasture development: the development of organs of plants and particularly how grains and fruits develop, and why an understanding of the environmental control of these things is so important to Australian agriculture.

Students will work in small teams to develop these skills to a professional level to report on the plants and their ecology within one chosen system, e.g. a wheat farm or native grasslands of the N.S.W. tablelands. Each student will be required to make a collection of 20 plants, including agricultural and horticultural crops, pastures and weeds, and carry out a personal experiment on plant growth and development. Teamwork, personal experimentation and reporting will develop students' investigative and communication skills.

All students should purchase a copy of the handbook, *What crop is that?* which will be available at the first practical class.

Textbooks
Crop Science Handbook, available from the Department
C.J. Pearson *et al. A Plain English Guide to Agricultural Plants* (Longman Cheshire, 1993)

Econometrics 8 units
Any other semester course in Econometrics. Refer to the *Faculty of Economics Handbook.*

Econometrics I 12 units
Classes Yr: (3 lec & 2 tut/prac)/wk
Assessment one 3hr exam, assignments, tests

An introduction to quantitative methods used in economics and related disciplines is provided. Two separate, but related, quantitative methods are developed. The first is mathematics, which provides a very efficient and instructive way of formulating and analysing models of behaviour. Topics include: review of algebra, functions and logic, mathematics of finance, matrices, differential calculus, and integral calculus. The second is the methodology of statistics, which is concerned with the analysis of data. Methods available for handling, analysing, and interpreting economic and social data are presented. Topics include: probability, random variables, probability distributions, sampling theory, descriptive statistics (including time series and price indices), estimation, hypothesis testing, simple regression models, multiple regression and applications. Instruction and experience are also provided in the use of computers and statistical software as an aid in the analysis of data. Applications to economics and related disciplines in the social sciences are provided.

Econometrics IIA 8 units

Prereq Econometrics I
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

This course is concerned with regression theory and its application to problems in economics. An essential component is the development of various mathematical methods. Importantly, matrix algebra is used extensively to present the classical multiple regression model and its extensions. Those extensions that are particularly relevant in the economic sphere include the treatment of autocorrelation, lagged relationships, qualitative variables, multicollinearity and heteroscedasticity. Practice will be given in the application of various methods to realistic problems through the use of the computer and statistical software.

Econometrics IIB 8 units

Coreq Econometrics IIA
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

This course illustrates how regression models can be applied to economic data to estimate relationships, forecast, and test hypotheses that arise in economics. The links between the economics and the econometrics are stressed. Consequently, it is necessary to develop mathematical models for the behaviour of economic agents and to illustrate how they can be translated into econometric models. A fundamental component of this development is the discussion of unconstrained and constrained optimisation problems and of comparative statics. The theoretical and data aspects of various empirical research papers will be discussed, and students will be required to undertake related empirical work. Topics may include consumption, investment, production and cost, consumer demand, labour supply, money demand and import functions.

Econometrics IIIA 8 units

Prereq Econometrics IIA
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

In this course the theory of simultaneous equations and multivariate regression models is developed. Central to this development is a significant component of statistics especially as it relates to principles of estimation and hypothesis testing and the distinction between finite sample and asymptotic theory. This facilitates the discussion of issues such as: identification, structural versus reduced form, single and simultaneous equation estimation, small and large sample properties, testing procedures, simulation and forecasting, dynamic models, and policy evaluation. Practice will be given in the application of various methods to economic problems.

Economic History 8 units

Any semester course in Economic History II/III. Refer to the *Faculty of Economics Handbook*.

Economics I 12 units

AKn HSC Mathematics 2-unit course
Classes Yr: (3 lec & 1 tut)/wk–lectures are repeated

Economic issues are pervasive in contemporary Australian society, politics and public debate. Indeed some would contend that economic theory provides the unifying basis for explaining all social phenomena and, therefore, also for all public policy. Hence, whatever one's career intentions, coming to grips with economic ideas is essential for understanding society, business and government. Economics I provides a comprehensive introduction to these ideas and also prepares the student for the advanced study of economics in subsequent years.

Beginning with an historical account of how, during the last three centuries, sometimes contradictory economic ideas were generated by economists working in the evolving economic environment, the student is introduced to the dominant contemporary theory. The examination of this theory begins with a behavioural model of how individuals, firms, institutions, etc. make choices concerning the allocation of scarce resources among competing uses. On the basis of this model, a comprehensive explanation of price determination and income distribution is built. This account is interspersed with discussion of criticisms of this approach and alternative views of the economic problem and the determinants of income distribution and prices. This is followed by an examination of the determination of overall levels of production and employment in an economy, including the influence of the public sector and foreign trade. This analysis is then integrated with a treatment of money, interest rates and financial markets which enables a deeper consideration of inflation, unemployment and economic policy. Finally, the course examines fundamental controversies in economic policy and theory; for example, the respective roles of markets and governments, causes of and cures for inflation, the explanation of income distribution.

A summary of the course is as follows:

Introduction (1 week) including:
• the historical background to modern economics
• overview of the course.

IA.1 Constrained optimisation and the foundations of demand and supply (5 weeks) including:
• the concept of constrained individual optimisation
• optimal consumer choice and individual commodity demand curves
• income and substitution effects; normal and inferior commodities; elasticity
• production and optimal choice of technique
• production and cost
• applications and policy
• controversies and alternative views.

IA.2 Firms, market structures and industry supply and demand (5 weeks) including:
- industry demand and supply curves; supply elasticity
- short run and long run cost curves
- profit maximisation and supply curves
- perfect competition and monopoly; introduction to oligopoly and imperfect competition
- applications and policy
- controversies and alternative views.

IA.3 Income distribution, factor pricing and employment (3 weeks) including:
- price flexibility, competition and equilibrium in factor markets
- marginal productivity theory and Euler's theorem
- wage determination and labour markets
- capital, interest and profits; introduction to expectations
- the microeconomics of factor pricing and employment, in relation to macroeconomics
- applications and policy
- controversies and alternative views.

IB.1 Aggregate expenditures, outputs and employment (4 weeks) including:
- national accounting identities
- 2, 3, 4 sector income expenditure models
- macroeconomic equilibrium balances
- fiscal policy and other multipliers
- inflation and income–expenditure models
- applications and policy
- controversies and alternative views.

IB.2 Output, employment, interest and money (5 weeks) including:
- product market equilibrium (IS)
- money demand, money supply and interest (LM)
- money supply multipliers
- IS–LM and inflation
- introduction to Phillips Curve analysis (see Module IIB.1)
- introduction to open economy IS–LM (see Module IIB.2)
- applications and policy
- controversies and alternative views.

IB.3 Fundamental issues in economic analysis and policy (4 weeks) including:
- role of markets in relation to resource allocation; competing claims and their reconciliation
- role of government and governmental agencies in production, distribution, demand and inflation.

Textbooks and reference books
Information will be provided at the beginning of the year.

Economics II   16 units
Prereq Economics I
Classes Yr: (3 lec & 1 tut)/wk — lectures are repeated once

The first semester is primarily *microeconomics* and covers applications and extensions of the theory of consumer choice; firm behaviour and market structure; factor demand and supply; general equilibrium; welfare economics; intertemporal choice; behaviour under uncertainty; and the role of government. Applications of the theory will be developed during the course to allow students to gain an appreciation of the way in which microeconomic theory provides insights into economic behaviour and market phenomena. Some emphasis will be given to trade theory, drawing upon its microeconomic foundations. The microfoundations of macro-economics are explained in a way that may help you to understand the widespread interest and pitfalls in theorising about aggregate phenomena. Specific macroeconomic relationships, covering consumption, investment, money and employment, are explored.

The second semester is mainly concerned with *macroeconomics* and begins with an overview of first year analysis. This part of the course develops models of the goods, money and labour markets, and in this context examines issues in macroeconomic policy. Macrodynamic relationships, especially those linking inflation and unemployment, are considered in some detail. Exchange rates and open economy macro-economics are addressed so introducing questions of both theory and policy. The lectures include an examination of Australian economic policy in relation to balance of payments performance and foreign debt. In the last part of the course topics include the determinants and theories of economic growth, productivity and technology, the dynamics of the business cycle, countercyclical policy and the relationship between micro and macro policy in the context of recent Australian experience.

In each semester, you will receive separate handouts that give details on topics, readings and tutorial/seminar questions.

A summary of the course is as follows:

IIA.1 General equilibrium, welfare and international trade, including:
- recapitulation of Module 1A.1
- 2 x 2 general competitive equilibrium
- welfare axioms and market failure
- social choice and the Arrow Impossibility Theorem
- 2 x 2 x 2 general equilibrium with trade
- trade and welfare
- comparative advantage and H–O–S
- applications and policy
- controversies and alternative views.

IIA.2 Advanced topics in microeconomic theory, including:
- choice under risk and uncertainty
- expected utility theory
- interdependent economic decisions and strategic choice
- oligopoly and game theory
- applications and policy
- controversies and alternative views.

IIA.3 From microeconomics to macro-economics, including:
- microeconomics of consumption, saving and interest (intertemporal) choice

- theories of investment; the role of expectations
- consumption, investment and macroeconomics
- the microfoundations of macroeconomics
- applications and policy
- controversies and alternative views.

IIB.1 Unemployment and inflation, including:
- IS–LM and the labour market
- AD–AS models
- short run and long run Phillips Curves
- theories of unemployment
- the quantity theory, monetarism and other theories of inflation and deflation
- applications and policy
- controversies and alternative views.

IIB.2 International finance and the open economy, including:
- open economy IS–LM with fixed and flexible exchange rates (see 1.B.2)
- open economy AD–AS models
- foreign exchange markets and parities
- inflation and the open economy
- Keynesianism, monetarism and the open economy
- applications and policy
- controversies and alternative views.

IIB.3 Growth and economic policy, including:
- introduction to growth theory
- structural adjustment and micro policy, in an open economy
- pros and cons of counter-cyclical policy; rules vs. discretion
- micro policy, macro policy and economic growth
- the relation between micro and macro policy
- controversies and alternative views.

Textbooks and reference books.
Information will be provided at the beginning of the year.

Economics III   16 units
Prereq Economics II
Coreq as stated for individual options
Classes Semester options: 2 lec/wk per option

Candidates are required to take *four options* from the list of options approved for this course. The purpose of this course is to offer students scope for developing interests in particular spheres following required courses in the first two years. Each option comprises two one-hour lectures per week for one semester. Each candidate will be expected to satisfy examiners at an examination, held at the end of each semester.

Subject to restrictions imposed by prerequisites, a candidate may take the necessary number of options to qualify for completion of Economics III during one or other semester. The recommended procedure is to take two options in each semester.

Some options are linked by a prerequisite of an option in Semester 1 before attempting an option in Semester 2. Other options may be linked in a sequence but there is no compulsion to follow that pattern. The treatment of policy themes is a requirement for all the options wherever the subject lends itself to such

interpretations and development of ideas about policy. This approach is deemed central to the ways of looking at the application of concepts and techniques for analysis.

Not all of these options will be offered in any one year or repeated in both semesters of an academic year. The available options will be announced prior to the beginning of the academic year and any changes prior to the start of the second semester.

Options		*Coreq*
III.01	International Trade: Theory and Policy	—
III.02	International Finance and Open-Economy Macroeconomics	—
III.03	Business Enterprise	—
III.04	Corporate Structure and Strategy	—
III.05	History of Economics: Classical-Economics	
III.06	History of Economics: Modern Developments 1860-1960	—
III.07	Financial Economics	—
III.08	Applied Corporate Finance	III.07
III.09	Industrial Organisation	—
III.10	Australian Industry Policy	—
III.11	Contemporary Economic Issues	—
III.12	Capital and Distribution	—
III.13	Monetary Economics	—
III.14	Economic Growth	—
III.15	Public Finance A: Taxation and Revenue	—
III.16	Public Finance B: Public Expenditure	III.15
III.17	Labour Economics A	—
III.18	Labour Economics B	III.17
III.19	Economic Systems	—
III.20	Strategy, Risk and Rationality	—
III.21	Bargaining, Contracts and Social Choices	III.20
III.22	Health Economics	—
III.23	Housing Economics	—
III.24	Monetary Policy and the Australian Financial System	—
III.25	Financial Markets and Instruments	—
III.26	Financial Intermediation	III.25

Students who have completed Quantitative Economics I as a part of Economics II Honours may be permitted to take Quantitative Economics II, being part of Economics III Honours in lieu of two options for Economics III, should they not be enrolled in Economics III Honours. See *Faculty of Economics Handbook.*

Students may substitute one option in the list of options for Economics IIIP for two options in Economics III. See *Faculty of Economics Handbook* for description of Economics IIIP options.

These provisions for substitution apply for 1995 but may not apply in subsequent years.

The position with options in 1995 will be as follows: The number of options to be offered will be determined on an administrative basis reflecting priority in allocation of staff to maintain required courses at the undergraduate and postgraduate levels.

Economics III Options in 1995

Economics III.01: International Trade: Theory and Policy

This course provides a systematic analysis of the theory of international trade and trade policy. It addresses some fundamental questions: Why do countries trade and what are the gains from trade? Is there a role for protection? What is the role of GATT and what are the effects of the world dividing up into regional trading blocs such as the EC and possibly APEC?

Initially, differences between countries are emphasised as the source of trade and the gains from trade. Models which are examined include the Classical-Ricardian model, the Heckscher-Ohlin model and the Specific-Factors model. Next, economics of scale and imperfect competition are introduced as sources of trade and gains from trade. The section on the theory of international trade concludes with an examination of empirical studies aimed at testing trade theories. The analysis of trade policy begins with a discussion of the instruments of trade policy, in particular, tariffs and quotas and their effect on welfare. This discussion is then extended to the case of imperfect competition and strategic trade policy. The course concludes with an analysis of trading blocs.

Economics III.02: International Finance and Open-Economy Macroeconomics

This course examines the international economy with particular reference to:
1. the principles governing the operation of the international monetary system; and
2. the role, significance and methods of international finance.

It is designed to provide an understanding of macroeconomic analysis and policy in an internationally integrated economy; global economic adjustment; and international money and globally integrated financial markets. Current issues of significance for discussion may include: Australia's current account deficit and foreign debt; the choice of exchange rate regime; the European Monetary System and the international debt crisis. Topics covered include:
1. The variety of international financial instruments; the behaviour of international financial flows and their relation to foreign exchange markets and exchange rates;
2. The absorption, elasticities and monetary approaches to the determination of the balance of international payments, under fixed and flexible exchange rates;
3. Portfolio balance approaches to exchange rates and the current account balance;
4. The organisation of the international monetary system and the mechanism of international adjustment; and
5. Macroeconomic policy in an open economy and issues in international economic policy.

Economics III.03: Business Enterprise

This course is concerned with the economics of business enterprise. It begins with an examination of classical and modern analyses of the role of the entrepreneur and attributes of the entrepreneurial personality. It then considers theories of business organisation and the concept of agency, focusing on the resolution of conflicts between managers and shareholders. Contests for corporate control are the theme of the concluding section of the course, with emphasis on the motivation for and effect of hostile takeovers and leveraged buyouts.

Economics III.04: Corporate Structure and Strategy

This course commences with a discussion of the evolution of the modern business enterprise, with specific attention to U-form, M-form and conglomerate organisational structures. It then examines aspects of strategic decision-making, including issues of internal versus external growth and diversification versus strategic focus. The final section is devoted to Asian corporate structure and strategy. The major focus here is on distinctive features of the Japanese corporation, with attention also given to corporate forms and strategies in other Asian economies.

Economics III.05: History of Economics: Classical Economics

This course deals with the classical economics system as it emerged during the seventeenth and eighteenth centuries to come to fruition in England in the contents of Smith's *Wealth of Nations* (1776), Ricardo's *Principles of Political Economy* (1817) and ultimately, Marx's *Capital* (1867). Two weeks of lectures each are devoted to these major authors. The remaining fourteen lectures are devoted to the foundations of classical economics in mercantilism and in moral/political philosophy, to some specific forerunners (Petty, Locke, Cantillon and Hume, Quesnay, Turgot and Stuart) and some major writers between Smith and Ricardo (namely, Malthus and James Mill). Emphasis in lectures is on their contributions to the theories of value, distribution and growth. This course provides a useful introduction to History of Economics (Modern Developments 1860-1960) and supplements work done by students in European and English Economic History.

Textbook
There is no suitable text for this course. A detailed reading guide is provided at the start of lectures. Students intending to take the two History of Economics courses could usefully purchase William J. Barber *A History of Economic Thought* (Penguin, 1967) — still in print.

Economics III.06: History of Economics: Modern Developments 1860-1960

This course examines the modern developments in economics flowing from two major shifts in research programs which took place after 1860. The first is the marginalist theory which gained ascendancy from the 1890s; the second is the development of macroeconomics which grew out of the Keynesian revolution of the 1930s. The former attempted to provide a general theory of prices in the goods and factor markets as well as of the level of output as a whole within a general supply/demand framework. This was developed within a general equilibrium (Walras/Pareto) and partial equilibrium framework

(Marshall/Pigou). Its starting point in England was criticism of the classical system as developed by John Stuart Mill in his *Principles of Political Economy*, revealing some inconsistencies in that framework which became the point of departure for Jevons and Marshall. The course examines these developments and subsequent work in capital theory, distribution theory, welfare economics and the theory of the firm. In addition, it looks at the Keynesian revolution in its various manifestations and developments in growth and cycle theory by the writers (Schumpeter, Hicks/Harrod). Although History of Economics (Classical Economics) provides a useful introduction to this course, it is not a prerequisite. The course is free standing and suitable for all those interested in learning about the intellectual foundations of contemporary economics.

Textbook
There is no suitable text for this course. A detailed reading is provided at the start of lectures. Students taking the two History of Economics courses may usefully purchase William J. Barber *A History of Economic Thought* (Penguin, 1967) — still in print.

Economics III.07: Financial Economics
The semester will reflect the following topics:
1. Inter-temporal choice and capital markets: the certainty case
2. Investment decisions and capital budgeting: the certainty case
3. Theory of choice under uncertainty
4. State preference theory
5. Mean–variance uncertainty
6. Asset pricing models
7. Contingent claims
8. Futures contracts and markets.

Textbooks
Copeland and Weston *Financial Theory and Corporate Policy* 3rd edn (Addison-Wesley, 1988)
Copeland and Weston *Student Solutions Manual for Financial Theory and Corporate Policy* 3rd edn (Addison-Wesley, 1988)

Economics III.08: Applied Corporate Finance
Coreq Economics III.07
The semester will reflect the following topics:
1. Efficient capital markets
2. Tests of semi-strong and strong form capital market efficiency
3. Capital structure and the cost of capital
4. Dividend policy: theory and evidence
5. Mergers, restructuring and corporate control
6. International financial management.

Textbooks
Copeland and Weston *Financial Theory and Corporate Policy* 3rd edn (Addison-Wesley, 1988)
Copeland and Weston *Student Solutions Manual for Financial Theory and Corporate Policy* 3rd edn (Addison-Wesley, 1988)

Economics III.09: Industrial Organisation
The semester will reflect the following topics:
1. Theory of the firm
2. Competition, monopoly and externalities
3. Dominant firm with a competitive fringe
4. Cartels
5. Non-cooperative oligopoly

6. Product differentiation and monopolistic competition
7. Limit pricing, predation and strategic behaviour
8. Price discrimination
9. Nonlinear pricing
10. Vertical restrictions and vertical integration
11. Information, advertising and disclosure
12. Durability
13. Patents and technological change
14. Regulation and antitrust policy.

Textbook
D.W. Carlton and J.M. Perloff *Modern Industrial Organization* (Harper Collins, 1990)

Economics III.10: Australian Industry Policy
This course examines aspects of industry policy in the context of the international competitiveness of Australian industry. It examines industry assistance and the prevalence of foreign multinationals in Australia. Attention is also given to industry regulation, trade practices legislation, privatisation and microeconomic reform. A distinctive feature of the course is the strong emphasis on the changing structure of Australian industry and on policies aimed at developing high-technology industries.

Economics III.11: Contemporary Economic Issues
This option treats contemporary economic issues emphasising the Australian experience though not to the exclusion of international economic issues. Attention is devoted to policy issues and experiences so that economic performance is matched against policy prescriptions. This means a heavy reliance on official papers to explore the policy announcements and books and journals for critical appraisals.

Topics to be treated in this option reflect concerns for macroeconomic features of the Australian experience including historical perspectives on contemporary issues. With such a setting the current economic position may be placed in the context of policy developments over previous decades.

Other topics may include employment and unemployment, balance of payments on current account and capital account including matters about debt and equity financing, the role and function of international capital markets, the free trade and protection themes, investment and structural change, trading structures with exports and imports, issues in banking and financial markets, and immigration and population.

Economics III.12: Capital and Distribution
Throughout the history of economics, theories about the forces which govern income distribution in a capitalist economy have been intimately bound up with the concept of 'capital'; in particular, its definition and measurement and how this concept relates to the determination of prices in a capitalist economy. The purpose of this course is to examine the modern version of the classical approach to capital and distribution and also to draw out its wider implications for the theory of output and employment and for economic policy.

The major topics covered are:

1. The Modern Classical Approach to Capital, Distribution and the Rate of Profit: circular production processes; the relation between relative prices, the rate of profit and the real wage; income distribution and the choice of technique;
2. Extensions of the Modern Classical Approach to Capital and Distribution: rents and non-renewable resources; joint production, fixed capital and distribution; exogenous influences on distribution; disequilibrium pricing and stability of equilibrium in the classical approach to value and distribution;
3. Capital, Distribution and Economic Theory: A Wider Perspective: marginalist views of capital and distribution and the choice of technique; controversy in capital theory and the critique of demand and supply approaches to distribution; capital, distribution, effective demand and the theory of output and employment; value, distribution and economic policy.

Economics III.13: Monetary Economics

This course surveys the role of money in historical and modern theories of monetary economics. The main focus is on monetary aspects of macro economic modelling and policy. We begin with some micro foundations of money demand and supply. We describe popular macro models, showing how money manifests itself through interest rate, wealth and inflation effects. This leads to an analysis of the causes and consequences of inflation and then to a discussion of the theory of expectations and their use in various models, for example, Monetarist, New Classical and New Keynesian. Various issues may be considered such as debt neutrality, fiscal policy and inflation, credibility in the context of optimal monetary policy, the efficiency of asset markets, the theory of the term structure of interest rates, and the problem of instruments, targets and goals of monetary policy. The course integrates closed and open economy issues – for example, interest rate policy and foreign exchange intervention policy are analysed in tandem. Throughout this course, we relate the development of the theory of empirical studies and the evolution of financial institutions.

Textbooks

F. Mishkin *The Economics of Money, Banking and Financial Markets* 3rd edn Harper Collins, 1992)

M. Kohn *Money, Banking and Financial Markets* 2nd edn (The Dryden Press, 1993)

Reference book

B. McCallum *Monetary Economics, Theory and Policy* (Maxwell Macmillan International Editions, 1989)

Economics III.14: Economic Growth

This course deals critically with growth economics. The complexity of economic growth is so great that a single approach which tries to incorporate all the dynamic and structural complications would be incomprehensible. Accordingly, a variety of growth models have been constructed, each examining some small selection of dynamic forces. A critical review of some of those

economics and models will be provided with major emphasis on 'new' growth theories which attempt to accommodate structural change, innovation and human learning. The current revival of growth economics, after an eclipse of almost two decades, is both timely and important. It is now increasingly recognised that intelligent macroeconomic policies have to be formulated in the context of a growing economy over the medium or long-term period. The course is recommended to students interested in growth economics, structural change and macroeconomic policy.

Reference books

L.L. Pasinetti *Structural Economic Dynamics* (Cambridge U.P., 1993)

J. Halevi *et al.* (eds) *Beyond the Steady State* (Macmillan, 1992)

G.M. Crossman and E. Helpman *Innovation and Growth in the Global Economy* (MIT Press, 1991)

Economics III.15: Public Finance A: Taxation and Revenue

The semester will reflect the following topics:

1. Welfare economics and public finance
2. Taxation: theory
3. Public utility pricing
4. The Australian revenue system.

Textbook

J.E. Stiglitz *Economics of the Public Sector* 2nd edn (Norton, 1988)

Economics III.16: Public Finance B: Public Expenditure

Coreq Economics III.15

The semester will reflect the following topics:

1. Welfare economics and public finance;
2. Public goods;
3. Public choice theory;
4. externalities;
5. The Australian expenditure system.

Textbook

J.E. Stiglitz *Economics of the Public Sector* 2nd edn (Norton, 1988)

Economics III.17: Labour Economics A

This is a practically oriented course which aims to provide an understanding of labour markets issues – work conditions, pay and employment levels. Whether you are interested in the functioning of the individual firm, the national economy or issues of equity and social justice, an understanding of how labour markets work is essential. A range of economic theories will be examined, some of which also draw on industrial relations. The emphasis will be on practical issues, on the realities of the Australian situation, and current issues. Among these are the complex issue of enterprise bargaining, what role if any should more centralised wage fixing systems have, skill acquisition and access to jobs, efficiency and equity functions of labour unions and employer associations, and the question of how to design a sustainable highly productive work environment. Although the course centres on the Australian experience, overseas experience is addressed when relevant.

Economics III.18: Labour Economics B

Coreq Economics III.17

Using material introduced in Labour Economics A, this option develops a number of themes concerning the functioning of the Australian labour market and the relationship to the labour market of a range of demographic groups within Australian society. Particular attention is given to the problems of persistent unemployment and consequences flowing from it. A profile of unemployment in Australia since the 1950s is presented, as is an assessment of the competing theoretical explanations as to why unemployment has become such a persistent problem. This is followed by an examination of the labour market status of particular demographic groups, for example, youth, migrants, older workers, Aborigines, sole parents, and the links between labour market status and poverty.

The second part of the semester is devoted to examination of policy prescriptions designed to improve the functioning of the labour market and/or the labour market outcomes of disadvantaged individuals. Attention is given to, among other things: (i) the links between the education system and the labour market; (ii) the links between immigration policy and the labour market; and (iii) specific labour market programs designed to assist the process of skills acquisition and retraining of the labour force.

Economics III.19: Economic Systems

The primary purpose of this course is to show that an economy will function and perform in the way it does partly for reasons of the environment, partly as a result of policies, decisions and actions of its participants, and partly for 'systemic' reasons. Although much emphasis will be placed on systemic factors, the student will be made aware of the common features of modern economic systems in order to avoid the tendency in the conventional comparative economics literature of giving undue importance to those factors.

The course is divided into two major parts. Part I consists of a general theoretical framework for classifying and analysing economic systems, using as far as possible a system-free terminology (free from bias). The aims of this part of the course are to define precisely the nature and structure of contemporary economic systems and to develop an alternative classification of the world's economies to the conventional classifications which have become increasingly obsolete labels for describing the fundamental properties and *modus operandi* of modern economies. Part II examines the dynamic development of economic systems and their chronological relationship, focusing on the evolution of market economies and the transition from centrally planned to market-oriented economies.

The course is highly recommended for those students who wish to acquire a deeper understanding of the systemic changes that are currently taking place in Eastern Europe and elsewhere.

Reference books
As the lectures do not follow the general pattern of the conventional comparative economics literature no single textbook is set for this course. However, students are strongly advised to consult the following references:

J.M. Montias *The Structure of Economic Systems* (Yale, 1976)
S. Pejovich *The Economics of Property Rights: Towards a Theory of Comparative Systems* (Kluwer Academic Publishers, 1990)
J. Kornai *Anti-Equilibrium: on Economic Systems Theory and the Tasks of Research* (North-Holland, 1971)
F. Seton *Cost, Use and Value: The Evaluation of Performance, Structure and Prices Across Time, Space and Economic Systems* (Clarendon, 1985)
J.M. van Brabant *Remaking Eastern Europe: On the Political Economy of Transition* (Kluwer Academic Publishers, 1990)

Economics III.20: Strategy, Risk and Rationality

The semester course will reflect the following topics:
1. Introduction: history, role and uses of game theory. Its place in social theory.
2. The elements of game theory: agents' motivation, rationality and beliefs.
3. Risk: parametric and strategic uncertainty. Expected utility theory and alternatives.
4. The first models of equilibrium behaviour: dominance, stability and John Nash's equilibrium.
5. Unavoidable uncertainty: probabilistic strategies, bluffing, indeterminancy, hesitation and multiple equilibria.
6. Repeated games and backward induction: introducing time in interactions. Agents choosing strategies before and after they observe others' behaviour.
7. The prisoner's dilemma and the problem of cooperation: game theory and the debates in social theory about the role and necessity of collective agencies (for example, the State).
8. Evolutionary game theory: the emergence of conventions when social and economic interactions are repeated. The birth of norms and links with moral philosophy as well as evolutionary economics.
9. Laboratory experiments in game theory: evidence on how people choose between risky strategies.
10. Game theory: its place in social science.

Textbooks
S. Hargreaves-Heap and Y. Varoufakis *Game Theory: A Critical Guide for Social Scientists* (Routledge, 1993)
D. Kreps *Game Theory and Economic Modelling* (Clarendon, 1990)
E. Rasmusen *Games and Information: An Introduction to Game Theory* (Blackwell, 1989)
K. Binmore and P. Dasgupta *The Economics of Bargaining* (Blackwell, 1987)

Economics III.21: Bargaining, Contracts and Social Choice
Coreq Economics III.20

The option will reflect the following topics:
1. Introduction: (a) the bargaining problem, (b) contracts between individuals, (c) social contracts.
2. Axiomatic and procedural (that is, explicit) models of bargaining.
3. The first solutions to the bargaining problem: the early contributions of John Nash, Kalai and Smorodinski, and Luce and Raiffa.
4. A procedural approach to the bargaining problem: Rubinstein's solution.

5. Bargaining uncertainty of a parametric kind: the problem of 'not knowing' one's opponent.
6. Conflict and contract: What do game and bargaining theory have to offer in terms of a theory of why people, firms, countries, unions, etc. fight?
7. Game theory, the pure theory of contract and social choice: How does a collective agency (such as the State) mediate between competing interests? Arrow's impossibility theorem in the light of strategic analysis.
8. Voting strategies: Why vote? What does it mean to vote strategically? The limitations of democracy as a result of strategic voting.
9. Theories of Justice: the notion of justice within the framework of voluntary associations between citizens with conflicting objectives. John Rawls, Robert Nozick and Amartya Sen on fairness, entitlement and justice.
10. Social contracts, socialisation and the market: a reinterpretation of Rousseau's social contract and of Adam Smith's invisible hand (or its more modern version: general equilibrium) along the lines of game and bargaining theory.
11. The market, the bargaining process and liberty: liberal, conservative and Marxist perspectives.

Textbooks
S. Hargreaves-Heap and Y. Varoufakis *Game Theory: A Critical Guide for Social Scientists* (Routledge, 1993)
D. Kreps *Game Theory and Economic Modelling* (Clarendon, 1990)
E. Rasmusen *Games and Information: An Introduction to Game Theory* (Blackwell, 1989)
K. Binmore and P. Dasgupta *The Economics of Bargaining* (Blackwell, 1987)

Economics III.22: Health Economics
This course will provide a general introduction to health economics and to the use of economics in understanding current health issues in Australia. Amongst the topics covered will be the following: scope of health economics; health care as a commodity; market failure in health care; the Australian health care system; the concept of health and need; health care insurance and its failure; the utilisation of health care; demand for health; the supply of medical services; alternative methods of paying doctors; the hospital as a firm; paying hospitals; economic evaluation in health care; costing health care; measuring health effects (economics and epidemiology); valuing human life; QALY S – a measure of benefit; designing an economic evaluation; disease costing in policy; equity in health care; different approaches to health care systems; and the Australian health strategy review.

At the end of the course students should be able to describe the key features of health economics as a sub-discipline, discuss health care issues from an economics perspective and discuss some of the current controversial issues within health economics. During the course students will be introduced to some of the 'classic' articles in health economics and will learn something of the other disciplines with which economists have to become familiar when working in health.

Textbook
A. McGuire *et al*. *The Economics of Health Care: An Introductory Text* (Routledge & Kegan Paul, 1988)

Economics III.23: Housing Economics
This course will cover some of the economic analysis used to provide an understanding of housing markets and housing policy. Where possible the Australian situation will be placed in a broader context by comparing the outcomes here with those in other countries.

The first part of the course will concentrate on providing background information. It will cover such topics as the nature, structure and operation of housing markets, including the determinants of the demand for and supply of housing, factors affecting house prices, rents and tenure choice. The second part will focus on the interaction between housing and finance markets and on the nature and effect of the ways in which housing is financed. The third part of the course will concentrate on the institutional framework within which Australia's housing policies are implemented. It will examine the characteristics of the various housing tenures or sub-markets which exist; namely owner-occupation, private rental and public rental, provide an overview of the types of policies directed towards each of these tenures in the post war period in Australia, examine the outcomes of those policies and discuss the policy options being considered by, and available to the government.

At the end of this course, you should have a clear understanding of the complexities involved in analysing housing markets; you should have increased your ability to apply the theoretical constructs of first and second year to analysing real world issues; you should understand the meaning and implications of housing tenure; you should be able to critically evaluate current housing policies and policy proposals.

Textbook
Currently, there is no textbook which is suitable for this course. The two references below are recommended as a starting point:
National Housing Strategy *Australian Housing: The Demographic, Economic and Social Environment* NHS Issues Paper No.1 (Canberra: AGPS, 1991)
L. Smith *et al*. 'Recent Development in Economic Models of Housing Markets' *Journal of Economic Literature*, 1988, V26, pp. 29-64

Economics III.24: Monetary Policy and the Australian Financial System
Students are provided with an opportunity in this course to examine the impact and operation of monetary policy within the context of the Australian financial system. The course focuses on the institutions through which Australian monetary policy is affected.
Topics covered include:
1. Overview of the Australian monetary/financial system
2. The operation of monetary policy
3. The Reserve Bank of Australia
4. The short term money market and authorised dealers
5. The role of commercial banks

6. Other providers of investment finance
7. The impact of deregulation
8. Recent policy experience.

Economics III.25: Financial Markets and Instruments

The purpose of this course is to provide an analysis of the behaviour and performance of markets in financial assets and liabilities. This includes both direct and indirect forms of financing. The emphasis is on the microeconomic functioning of these markets with particular attention to the range and characteristics of instruments traded. The range of instruments considered includes basic instruments such as bonds contracts, options, swaps, etc. The types of markets considered include equity markets, debt markets and foreign exchange markets.

Topics covered include:
1. The nature and role of financial markets in the economy
2. The essentials of portfolio management
3. Basic or underlying instruments in financial markets
4. Derivative instruments in financial markets.

Economics III.26: Financial Intermediation

Coreq Economics III.25

Financial Intermediation attempts to examine the economic function and theory of the workings of the financial system from an institutional point of view. It begins with the theory of intermediation, how the size and form of financial flows are determined and why intermediaries emerge in the process of savings allocation among investment possibilities. The various types of intermediaries, their precise functions and behaviour, are considered within the context of the Australian economy. Some consideration is also given to the prudential regulation of these institutions and the problems regulation poses for them and the financial system as a whole.

Topics covered include:
1. Overview of the financial system
2. Theory of financial intermediation
3. Commercial banks and thrift institutions
4. Money market corporations and finance companies
5. Insurance and superannuation
6. Brokers, mutual funds and collective investments
7. Regulation
8. Information, disclosure and supervision.

Economics III Additional   16 units

Coreq Economics III

This course consists of four options (two hours each per week for one semester), not already taken, from the list of options provided for Economics III. One option from Economics III(P), which is equivalent to two options in Economics III, may be included.

Economics III Supplementary   8 units

Prereq Economics II
Coreq Economics III

This course consists of any two options (two hours each per week for one semester), not already taken, from the list of options provided for Economics III.

Finance 201: Corporate Finance I   8 units

Prereq Accounting I or Financial Accounting Concepts and Management Accounting Concepts, Economics I, Econometrics I
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

This course provides an introduction to corporate finance, including investment decision-making. The first part of the course deals with the analytical techniques necessary to make investment decisions, both when cash flows are known and when they are uncertain. The second part of the course deals with the corporation and the Australian capital market, the raising of capital, including equity versus debt, and allocating capital, including dividends, internal investments and takeovers. As far as possible, the course will attempt to link theory to practical applications via examples, exercises and assignments.

Finance 202: Corporate Finance II   8 units

Prereq As for Finance 201
Coreq Finance 201
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

This course builds on Finance 201: Corporate Finance, but is more applied in that it is concerned with the actual workings of financial markets. It examines the operation of financial markets from both a theoretical and practical perspective, concentrating mainly but not exclusively on Australian financial markets. The course deals with the economic role of capital markets and theories of capital market behaviour. The operations of equity and derivative markets in Australia, including options and futures, are examined along with foreign exchange and debt markets. A new and important area of study known as 'market microstructure' is introduced and a number of issues in corporate governance and take-overs are examined.

Financial Accounting A   8 units

Prereq Accounting I
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, one 1000w essay, weekly assignments, one test

Accounting and reporting practices of companies, particularly listed public companies. Emphasis is placed on developing an understanding of, and the ability to critically evaluate, the various regulatory requirements (professional and statutory) governing financial reporting. The economic significance of managements' ability to choose between alternative techniques for recording/reporting a given transaction or event are also considered from within a 'costly contracting' framework. Issues covered include accounting for taxes, intangibles, extractive industries. Consideration of off-balance sheet liabilities and owner's equity. Introduction to intercorporate investments.

Financial Accounting Concepts 6 units

Classes Sem 1: (2 lec, 1 tut & 1 workshop)/wk
Assessment one 3hr exam, mid-sem test

Provides an introduction to the theory and practice of accounting. Designed primarily for students who are not majoring in accounting. The aim is to develop skills in preparing and analysing financial statements. Topics include: the institutional arrangements in Australia and overseas, balance sheet equation, current assets (including inventory, accounts receivable), income measurement, financial statement preparation and analysis.

Forecasting for Economics and Business 8 units

Coreq Econometrics IIA
Classes Sem: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

The need to forecast or predict future values of economic time series arises frequently in many branches of applied economic and commercial work. It is, moreover, a topic which lends itself naturally to econometric and statistical treatment. The specific feature which distinguishes time series from other data is that the order in which the sample is recorded is of relevance. As a result of this, a substantial body of statistical methodology has developed. This course is intended to provide a first course in methods of time series analysis and forecasting. The material covered will be primarily time domain methods designed for a single series and will include the building of linear time series models, the theory and practice of univariate forecasting and the use of regression methods for forecasting. Throughout the course a balance will be maintained between theory and practical application.

Geography 1 12 units

Lecturers Dr Short, Assoc. Prof. Connell, Assoc. Prof. Warner
Classes Yr: (3 lec & 2hr prac)/wk
Assessment (one 3hr exam, 1500w report or another 3hr prac exam)/sem

Morning or afternoon course

The course extends over two semesters with three lectures and two hours of laboratory work weekly. Morning lectures are repeated in the afternoon. All students do the same course.

First semester: A systematic approach to the understanding of physical environmental processes

A systematic approach to modern physical geography with emphasis on processes in geomorphology and interactions of climate with weathering, soils and vegetation.

Second semester: Introduction to Human Geography

An introduction to the principles of human geography illustrated by an analysis of development problems in the south-west Pacific and a study of the location and distribution of economic activities including resource use.

Geography 2 16 units

The course extends over two semesters with three lectures and the equivalent of five hours' assignment work (which may comprise tutorials and/or individual course work including fieldwork) weekly. The following courses are offered:

     Principles of Geomorphology
     Environment and Resources
     Human Geography

In addition there is an integrated field methods course which will examine skills associated with the acquisition, manipulation and presentation of data used in geographical analysis of a region. The region will be studied in the field during a compulsory one week excursion. Skills developed within courses studied in the first semester will be applied to the collection and analysis of data obtained during the excursion.

Principles of Geomorphology

Lecturers Dr Short, Dr Thoms, Dr Cowell
Classes Yr: (3 lec & 1 tut)/wk
Assessment (one 3hr exam, two 1000w essays, tut papers, 5 days fieldwork)/sem

A two-semester course designed to introduce students to the principles of geomorphology. It involves an examination of the major earth surface landforms and the theories which have been developed to explain landform genesis. Earth surface processes are examined; there is an emphasis on systems theory to provide an understanding of the processes over a wide range of spatial and temporal scales.

First semester: Global and Regional Landforms

An examination of the major earth surface landforms and the theories which have been developed to explain landform genesis.

Second semester: Fluvial and Coastal Geomorphology

This course provides:
(1)   an introduction to hydrogeomorphology and is concerned with processes and morphologies associated with rivers; and
(2)   an introduction to the principles of coastal geomorphology assessing the role of endogenic (lithosphere) and exogenic (atmosphere and ocean) forces in shaping coasts.

Environmental Geography and Resource Management

Lecturers Dr Dragovich, Dr Chapman, Dr Davey
Classes Yr: (3 lec & 1 tut)/wk
Assessment (one 3hr exam, two 2000w essays, tut papers, 5 days fieldwork)/sem

A two-semester course designed to evaluate the interaction of the physical environment and human use of the earth's surface. The first part of the course examines the role of the physical environment in influencing human activities. The second studies resources from social, political and economic perspectives.

    Particular attention is given to two aspects of

physical systems: soil erosion and natural hazards. Resource management problems are investigated at a range of scales with some emphasis being given to the changing relationship between people and environment in tropical areas.

Principles of Human Geography
Lecturers Dr Gough, Dr Greenberg
Classes Yr: (3 lec & 1 tut)/wk
Assessment (one 3hr exam, two 2000w essays, tut papers)/ sem

The course introduces concepts concerned with explaining the peopling of the earth by examining processes at various scales and the dynamics of systems over time.

Levels of human activity, from the global through to the urban, are considered through an examination of basic economic and social processes.

Geography 3   24 units
This course extends over two semesters with three lectures and the equivalent of nine hours' assignment work (which may be comprised of tutorials and/or individual coursework including fieldwork) weekly. All students are required to attend a five-day field excursion. The traditional excursion may be replaced with fieldwork (up five days in each semester) conducted locally in association with courses being offered in 3P and 3M.

Three 12-unit courses are offered: Geography 3P (Physical), Geography 3M (Environmental) and Geography 3E (Human). Students may elect to do one or two of these three courses. It would be assumed that those doing Geography 3P would have undertaken Principles of Geomorphology in second year; those doing Geography 3M would have undertaken Environment and Resources in second year; and those doing Geography 3E would have undertaken the Human Geography course in second year.

To complete Geography 3 a student must select four options, two per semester. Each option is equivalent to 3 units. A student's choice of options within the 3P, 3M or 3E courses is to be from themes or sequences which are related to the systematic development of research skills in the Department. These sequences are only a guide for the selection of courses. Any variation of these sequences must have the approval of the Head of Department. Students should consult with the course coordinator before selecting options. Not all options are offered in any given year.

Geography 3P: Advanced Geomorphology
The course examines the evolution of the landscape involving the history of landforms and vegetation in association with tectonic forces, climatic change and biological factors. Physical, chemical and biological weathering processes are studied and there is an emphasis on pedogeomorphology.

Coastal Systems
The course deals with the relationships between coastal morphologies and the processes responsible for them.

The focus is on the general principles of morphodynamic adjustment, particularly as applied to the coastal boundary layer operating on the inner shelf, shoreface and in estuaries. Form and process relationships that generate the world's major coastal depositional environments are studied.

Fluvial Systems
The focus is on short-term development and changes in fluvial systems; channel stability and instability, adjustments or channel metamorphosis, and the role of fluvial thresholds are considered.

Geography 3M: Advanced Environmental Geography
The course focuses on: coastal zone environmental management and environmental geomorphology. Critical physical systems and natural hazards in the coastal zone are examined and the ways in which decisions are made about resource management are studied. The practical uses of geomorphological concepts to solve problems are discussed.

Environmental Geomorphology and Information Systems
Geomorphological concepts are applied to solve problems where landforms are transferred and where there is some use of or change to superficial processes. The techniques of geographic information systems analysis are illustrated and applied.

Geography 3E: Advanced Social and Economic Geography
The course examines the contemporary economic geography of the richer capitalist countries. It examines the social and economic dynamics of industrial change in a regional context.

Dynamics of the Asia-Pacific Region
The general structure and growth patterns of the region are considered. Special topics include agricultural processes, population, migration and urbanisation.

Urban and Regional Geographic Systems
Development theories and their relationship to rural development and natural resources development, the role of aid and the structure and role of international capital flows are examined. Social structures and their relationship to resolving conflicts over development aims and environmental management are studied.

Government I   12 units
Government I is organised into two semester courses. They are both introductory courses, and are essential prerequisites for later year courses in the Department. Both must be passed before a student may proceed to Government II. They will not necessarily be offered in the order set out below.

Introduction to Australian Politics
This course aims to introduce students to debates about the nature and limits of Australian democracy, the major institutions of Australian politics, and the distribution of power in Australian society. Major institutions and forces such as parliament, executive

government, the federal system, political parties and the media will be examined as arenas of power, conflict and consensus. Who rules? How? Which groups are excluded?

Introduction to International and Comparative Politics

This course aims to introduce students to the major concepts and approaches in international and comparative politics. It will examine the role of the state and of non-state actors in interactions — military, economic and political — between states. It will also introduce the variety of non-Western political systems and the uses and problems of comparative methods. The course will examine the interactions between the internal and external influences on state behaviour, and how these can interact to produce radical change in both spheres. There will be a strong emphasis on theoretical and normative issues in international and comparative politics.

Government II   16 units
Prereq Government I

Students in Government II must take two semester courses (one in each half of the year) from the list of semester courses given in the *Faculty of Economics Handbook*.

Government III   16 units
Prereq Government II

Students in Government III must take two semester courses (one in each half of the year) from the list in the *Faculty of Economics Handbook*. Students cannot repeat courses completed previously.

Horticultural Science   6 units
This course is the same as Horticultural Science 3. (See alphabetically under First, Second and Third Year courses for the BScAgr degree.)

Management Accounting A   8 units
Prereq Accounting I
Coreq Econometrics I
Classes Sem 1: (2 lec, 1 tut & 1 prac)/wk
Assessment one 3hr exam, weekly assignments

This course provides students with an introduction to the basics of management/cost accounting. Areas specifically covered include: cost terms and purposes, cost behaviour, cost-volume-profit analysis, cost estimation via regression analysis and other means, basic and alternative product costing methods, detailed study of the budgeting process (master budgets, flexible budgets, standard costing and variance analysis) and cost allocation.

Management Accounting Concepts   6 units
Classes Sem 2: (2 lec, 1 tut & 1 workshop)/wk
Assessment one 3hr exam, mid-sem test

Follows on from Financial Accounting Concepts. The aim is to explain how management accounting information is used by managers. Topics include:

estimating cost functions, relevant costing, cost allocation and discounted cash flow analysis.

Marketing

Introduction
Any semester course in Marketing. Refer to *Faculty of Economics Handbook* for other than those listed below.

Marketing 201: Marketing Principles
8 units

Prereq Economics 1, Econometrics 1
Classes Sem 1: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Introduction to the terminology and functions of marketing in modern business practice. Market forces and opportunities, with reference to the role of social, economic, political and global influences and trends. Macro (societal) and micro (individual and firm) implications of the market process and marketing decision-making.

Marketing 202: Consumer Behaviour
8 units

Coreq Marketing 201: Marketing Principles
Classes Sem 2: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Introduction to and overview of economic, psychological and sociological bases of consumer behaviour as they relate to the purchase and consumption of goods and services. Marketing implications of consumer behaviour and the interaction of consumers and the marketing process of organisations.

Marketing 203: Marketing Research I
8 units

Coreq Marketing 201: Marketing Principles
Classes Sem 2: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Introduction to marketing research and the marketing research industry. Basics of problem recognition, formulation, research design and reporting. Qualitative research methods. Survey design and data collection. Data entry and coding. Introduction to basic quantitative analysis. Research practicum.

Marketing 301: Marketing Research II
8 units

Prereq Marketing 201: Marketing Principles, Marketing 203: Marketing Research I, Economics II
Classes Sem 1: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Quantitative marketing research methods, including multivariate research methods and models. Analysis and interpretation of data, report preparation and presentation. Applications to market segmentation, targeting, positioning and demand forecasting. Advanced research methods and overview of current state-of-the-art. Research practicum continued from Marketing 203: Marketing Research I.

Marketing 302: Marketing Communications
8 units

Prereq Marketing 201: Marketing Principles, Marketing 203: Marketing Research I, Economics II
Coreq Marketing 301: Marketing Research II
Classes Sem: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Introduction to and overview of current theory and practice in advertising, sales promotion and personal selling. Course includes case study and research practicum.

Marketing 303: Retail and Services Marketing
8 units

Prereq Marketing 201: Marketing Principles, Marketing 203: Marketing Research I, Economics II
Coreq Marketing 301: Marketing Research II
Classes Sem (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

The role of marketing and the marketing function within retail and service organisations. Special marketing issues involved in these organisations. Course includes case study and research practicum.

Marketing 304: New Products Marketing
8 units

Prereq Marketing 201: Marketing Principles, Marketing 203: Marketing Research I, Economics II
Coreq Marketing 301: Marketing Research II
Classes Sem: (1 lec & 1 tut)/wk
Assessment two 2hr exams, assignments

Development and marketing of new consumer and industrial products and the role of the marketing function in that process. Identification of potentially profitable target markets and demand estimation. Dynamics of new product introductions. Course includes case study and research practicum.

Mathematics I (Life Sciences)
12 units

AKn HSC 2-unit Mathematics
Classes Yr: (4 lec & tut)/wk
Assessment (two 2hr exams & 4 assignments)/sem, computer project

Content
This is a one-year course in mathematics intended to give a rounded view of mathematics and particularly designed for students intending to major in the life and social sciences. Topics covered include differential and integral calculus, linear algebra and statistics.

There are comprehensive details of the Mathematics 1 (Life Sciences) course in the *Mathematics First Year Handbook*, distributed at the time of enrolment.

Assumed knowledge
Knowledge equivalent to the 2-unit HSC course is assumed. Students who do not have this knowledge are strongly advised to attend a bridging course conducted by the School in February.

Natural Resource Economics
8 units

Prereq Production Economics, Commodity Price Analysis
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

A course in natural resource economics of relevance to agriculture and the resource industries. Issues discussed are: the environment as a source of environmental services; socially efficient resource allocation and Pareto welfare economics; market failure and characteristics of environmental services; benefit cost analysis of public projects, including the modification of environmental services; non-depletable resources and pollution; depletable resources; irreversibility; sustainability. Applications include land degradation, fisheries, forestry, land-use planning and greenhouse effect.

Textbooks
A. Randall *Resource Economics: An Economic Approach to Natural Resource and Environment Policy* (Wiley, 1987)

Operations Research A
8 units

Prereq Econometrics IIA
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

The theory and application of linear programming models to economic problems is the main concern of this course. Topics include: formulation skills, algorithms, duality, sensitivity analysis, parametric programming, goal programming, integer programming with heuristics, network models and dynamic programming. The theoretical material is illustrated with several substantial case studies and a discussion of available computer software.

Operations Research B
8 units

Coreq Operations Research A
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

The work of Operations Research A is extended in two important directions with the consideration of non-linear and stochastic models. Topics include: quadratic programming, gradient methods, separable methods, chance constrained programming, stochastic programming, inventory control theory, queuing theory, simulation, decision theory, and stochastic processes. The theoretical material is illustrated with several substantial case studies and a discussion of available computer software.

Principles of Taxation Law
8 units

Prereq Corporations Law 1 or Commercial Law I (which includes Corporations Law I)
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, weekly assignments, class work

This course is the first part of a subject which is primarily concerned with taxation law. It commences with an overview of the Australian tax system, discusses contemporary tax issues and then deals with specific topics, viz. basis of liability to Australian income tax, concepts of residence and source of income, meaning of income, tax accounting, statutory concepts of income, taxation of termination and long service leave payments, taxation of fringe benefits, basis of liability to capital gains tax and allowable deductions.

Production Economics　　　　　8 units
Prereq Agricultural Economics I
Classes Sem 2: (3 lec and 1 tut)/wk
Assessment one 3hr exam, assignments

Production economics is concerned with production decisions on resource allocation at the firm, industry and economy levels. The topics include: the nature of agricultural and resource industry production; production functions; factor substitution; principles of enterprise combination and multi-product production; firm objectives; constrained and unconstrained maximisation; cost functions and other duality relationships; economies of scale and size in farming; input demands and dual relationships; production over time; productivity and technical change; production under risk and the illustration of the principles involved through the use of practical applications and exercises involving both the agricultural and resource industries. In addition, basic decision analysis will be introduced including basic concepts of probability; concepts of utility; utility functions and elicitation of preferences.

Textbooks
D.L. Debertin *Agricultural Production Economics* (Macmillan, 1986)
J.P. Doll and F. Orazem *Production Economics: Theory with Applications* (Wiley, 1984)

Reference book
J.R. Anderson *et al. Agricultural Decision Analysis* (Iowa State U.P., 1977)

Quantitative Business Management and Finance　　　　　8 units
Prereq Production Economics and Applied Commodity Modelling
Classes Sem 1: (3 lec & 1 tut/lab session)/wk
Assessment one 3hr exam, assignments

The application of applied optimising methods to decision-making in the agricultural and resource sectors is the focus of this course. Topics covered include: an overview of the applications of optimising models; the mathematical basis for constrained optimisation; basic linear, quadratic and nonlinear programming; farm modelling; agricultural sector models; transport and location models; spatial equilibrium systems; introduction to general equilibrium models; and model validation and verification. Issues of financial analysis and control, financial relationships, investment, capital budgeting, risk management and risk in investment decision making will also be covered.

Textbooks
P.J. Barry *et al. Financial Management in Agriculture* (Interstate, 1992)
S.M. Lee *et al. Management Science* (Wm C. Brown, 1990)
H. Levy and M. Sarnat *Capital Investment and Financial Decisions* (Prentice Hall, 1994)

Reference books
P.B.R. Hazell and R.D. Norton *Mathematical Programming for Economic Analysis in Agriculture* (Macmillan, 1986)

Research Methods　　　　　4 units
Classes Sem 2: (2 lec & 1 tut/workshop)wk
Assessment one 2hr exam, assignments

Topics covered will include: report preparation; journalistic techniques and methods of reporting; seminar and workshop presentation methods; visual methods including overhead slides, projected slides and video; time management techniques; research as an orderly process of enquiry; hypothesis formulation and testing; preparation of research proposals; the role of the economist; sources and collection of agricultural data; primary versus secondary data; agricultural surveys; questionnaire construction and interviewing techniques; and methods of analysis of survey data.

Textbook
K. Howard and J.A. Sharp *The Management of a Student Research Project* (Gower Publishing, 1970)

Reference book
G.L. Johnson *Research Methodology for Economists: Philosophy and Practice* (Macmillan, 1986)

Sample Design and Analysis　　　　　8 units
Coreq Econometrics IIA
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments, tests

The twin problems of cost and efficiency in sampling lead to the development of different methods of sampling (stratified, cluster, multistage, replicated samples, probability proportional to size) and to different estimators (for example, ratio). Non-response in a survey may lead to biased estimation, and procedures must be developed to overcome this potential bias. The analysis of survey data leads to a consideration of the estimation of the sampling variance from the complex samples. The use of survey data in regression analysis and Chi-square tests raises several problems that are addressed. Special topics may include: panels, sampling rare populations, optimal experimental design and telephone interviewing.

The Australian Economy　　　　　12 units
Classes Yr: (3 lec & 1 tut)/wk

This terminating course provides a comprehensive treatment of the workings of the Australian economy. The emphasis in this course is on applied themes with theory introduced only where necessary to sustain the analysis. The aim is to show the interdependencies between the main sectors of the Australian economy and the rest of the world. The course offers a broad appraisal of how the Australian economy operates and the main policy issues bearing upon it. The main sections of the course are as follows:
1. Australia in an international economic setting
2. National economic structure:
   (a) national income and expenditure
   (b) financial flows
3. Foreign sector and the balance of payments
4. Financial activity: institutions and markets
5. Business sector: incorporated and unincorporated business enterprises and their markets
6. Government sector: federal and state functions on revenue and expenditure, and the provision of services

7. Households: composition and distribution of income and expenditure
8. Labour markets and wage determination
9. Policies for development:
    (a) agriculture
    (b) resources
    (c) industry: manufacturing and services
10. Economic policy:
    (a) goals and instruments
    (b) policy issues and controversies
11. Prospects for development.

Reference books

Australian Bureau of Statistics *Australian Year Book* (A.B.S. current edn)

F.H. Gruen (ed.) *Surveys of Australian Economics* (Allen & Unwin, current edn)

State of Play: The Australian Economy Today (Allen & Unwin) An Indecs Economics Special Report

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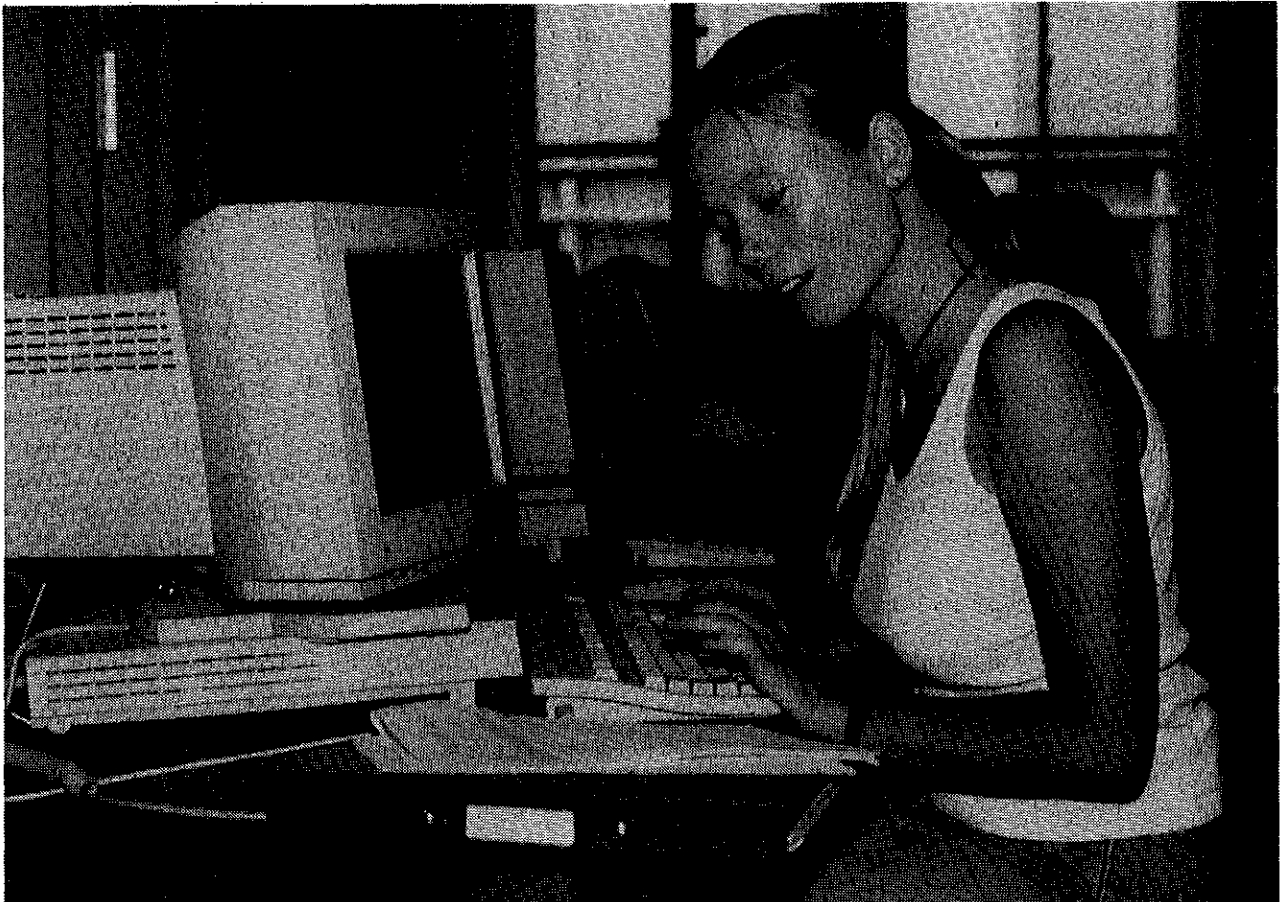
At work on the computer.

This chapter of the handbook contains information specific to the Faculty of Agriculture and some general information. For further details about discontinuation and examinations, as well as general information about the organisation of the University, assistance for students with disabilities, child care facilities, accommodation, health, counselling, financial assistance, careers advice and a range of other matters, see the *University of Sydney Diary*, available free from the Student Centre and student Union outlets.

Enrolment

New students and re-enrolling students who do not satisfy the pre-enrolment conditions collect their enrolment forms from the Faculty Office in the McMillan Building where they choose courses and lodge a registration form.

Confirmation of enrolment

All the information provided when you enrol is added to the University's computerised student record system. This includes your degree, academic year and the subjects you are taking. It is important that this information be recorded correctly at the beginning of the year, and amended should a change occur in any of the details during the year. Any subject enrolment has a financial implication under the Higher Education Contribution Scheme (HECS).

To enable you to see what enrolment data has been recorded, you will be sent a 'confirmation of enrolment' notice shortly after completion of enrolment. You should check this carefully. If the information is correct you should keep the notice as a record of your current enrolment. Should the notice be incorrect in any detail, you should apply at the Faculty Office immediately to have your record amended. A new confirmation will then be prepared and sent to you. You will also receive, about two months after the beginning of each semester, a statement showing your HECS assessment for that semester. If there appears to be an error in this assessment, you should follow the directions for correction of the assessment which are included on the statement.

If you wish to:
change a subject in which you are enrolled;
discontinue a subject; or
discontinue enrolment totally
you should apply at the Student Centre or Faculty Office for the appropriate form and then at the Faculty Office to obtain approval. Your record at the University will not be correct unless you do this. *It is not sufficient for instance to tell the lecturer, associate lecturer or even the departmental office that you discontinued a subject.* Unless an enrolment change is approved formally at the Faculty Office it will not be accepted by the University and in some cases will incur a financial liability under HECS.

Regulations
Discontinuation of enrolment and re-enrolment after discontinuation—undergraduate
All Faculties and Boards of Studies[1]

1. A candidate for a degree of Bachelor who ceases attendance at classes must apply to the Faculty or Board of Studies concerned and will be presumed to have discontinued enrolment from the date of application, unless evidence is produced (i) that the discontinuation occurred at an earlier date and (ii) that there was good reason why the application could not be made at the earlier time.

2. A candidate for a degree of Bachelor who at any time during the first year of attendance discontinues enrolment in all courses shall not be entitled to re-enrol for that degree unless the Faculty or Board of Studies concerned has granted prior permission to re-enrol or the person is re-selected for admission to candidature for that degree.

3. Subject to subsections (i) and (ii) of section 1, no candidate for a degree of Bachelor may discontinue enrolment in a course or year after the end of lectures in that course or year.

4. The Dean, Pro-Dean or an Associate Dean of a Faculty or the Chairperson of a Board of Studies, may act on behalf of that Faculty or Board of Studies in the administration of these resolutions unless the Faculty or Board of Studies concerned decides otherwise.

WITHDRAWAL FROM FULL-YEAR AND FIRST SEMESTER COURSES
5. A candidate for a degree of Bachelor who discontinues enrolment in a full-year or First Semester course on or before 31 March in that year shall be recorded as having withdrawn from that course.

WITHDRAWAL FROM SECOND SEMESTER COURSES
6. A candidate for a degree of Bachelor who discontinues enrolment in a Second Semester course on or before 31 August in that year shall be recorded as having withdrawn from that course.

All Faculties and Boards of Studies except the Faculty of Engineering
DISCONTINUATION
7. (1) A discontinuation of enrolment in a course shall be recorded as 'Discontinued with Permission' when the discontinuation occurs after the relevant withdrawal, period and
(a) on or before the Friday of the first week of Second Semester for a full-year course, or
(b) up to the last day of the seventh week of teaching in a one semester course.
(2) A discontinuation of enrolment in a course shall be recorded as 'Discontinued' when the discontinuation occurs

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Note that 'Faculty' includes for these purposes a 'College Board'.

(a) after the Friday of the first week of Second Semester for a full-year course, or

(b) after the last day of the seventh week of teaching in a one semester course.

(3) Notwithstanding paragraph (2) the Dean, Pro-Dean or an Associate Dean of the Faculty or Chairperson of the Board of Studies concerned may determine that a discontinuation of enrolment should be recorded as 'Discontinued with Permission' on the grounds of serious ill-health or misadventure.

Examinations

Periods
There are three formal examination periods each year.

Period	when held	approximate duration
First semester	June	2 weeks
Second semester	November	3 weeks
Supplementary	January	1 week

In addition individual faculties and departments may examine at other times and by various methods of assessment, such as essays, assignments, *viva voce*, practical work, etc. Some departments do not examine during the first semester.

The following information applies to both the Bachelor of Science in Agriculture and the Bachelor of Agricultural Economics degrees.

Completion of course
Except by permission of the Dean, no student shall be allowed to sit for any examination unless the requirements specified by the Faculty have been completed. The Dean may call upon any student who has been absent from more than 10 per cent of classes in any semester to show cause for such absence. Students who fail to show sufficient cause are excluded from admission to examinations. No excuse for absence from lectures, demonstration or practical work shall be received unless tendered in writing to the Faculty Office within one week after attendance is resumed.

Notification of examination results
The results of annual examinations are displayed on noticeboards in the Main Quadrangle and posted directly to you at the end of the year.

Disclosure of examination marks
Final marks will appear on your annual result notice. Marks may also be obtained from your department for the major components of assessment which make up the final marks. You are entitled to information about any details of the assessment procedures used to determine the final result.

Your examination scripts and any other assessment material may be retrieved within a reasonable time after the completion of assessment in each course. This does not apply to examination papers which involve the repeated use of the same material in successive examinations.

Examination grades
Each subject taken will be allotted one of the following grades at the annual examinations:

Grade	per cent
High Distinction	85-100
Distinction	75-84
Credit	65-74
*Pass	50-64
Fail	below 50

*See section on concessional passes.

Award of honours at graduation
Extract from resolutions of the Faculty

1. Honours are awarded in Agriculture and not in an individual subject.

2. Details of the Fourth Year work and determination of marks for Fourth Year are the responsibility of heads of departments and sections concerned.

3. All candidates are formally eligible to be considered for honours. Except with the special permission of the Faculty, honours shall not be awarded to any candidate for the degree of Bachelor of Science in Agriculture or Bachelor of Agricultural Economics unless the candidate has completed the course in the minimum time. Notwithstanding the previous condition, students who complete the first three years of the course in four years, and who by virtue of their weighted average marks would otherwise qualify for the award of honours, will be so considered. Such candidates may however be disadvantaged in terms of honours grading and ranking.

4A. For the BAgrEc degree. For the assessment of an aggregate mark for the award of honours at the end of the Fourth Year—

(a) Each of the courses provided for in the resolutions in Second and Third Years shall be weighted according to unit value and a weighted mean obtained. The combined examination results of the Second and Third Years shall be given a weighting of 50 per cent.

(b) The Fourth Year mark shall be given a weighting of 50 per cent.

4B. For the BScAgr degree. For the determination of the overall honours mark for the award of honours at the end of the Fourth Year—

(a) Each of the courses provided for in the resolutions in Second and Third Years shall be weighted according to unit value and a weighted average mark (WAM) obtained.

(b) The overall honours mark shall be the average of the Second and Third Year WAM and the Fourth Year mark.

5. In computing the aggregate marks of students, the mark achieved on the occasion of the first attempt at a course shall be the mark used. A supplementary examination mark is not considered a first attempt at a course.

6A. For the BAgrEc degree. For the award of a particular level of honours a candidate, except in special circumstances, must obtain the relevant minimum aggregate mark and the minimum WAM in Second and Third Year courses set out in the following table:

Level of honours	Minimum aggregate mark	Minimum weighted average mark in Second and Third Year courses
Class I	75	70
Class II Division 1	70	65
Class II Division 2	65	62

In the event of a recommendation for the award of honours that departs from these standards, it shall be incumbent upon the head of department and section concerned to make out a substantial case for such a departure. Admissible grounds for departure would include medical disability or misadventure early in the course, and the existence of consistently lower standards of grading in courses undertaken outside the Faculty of Agriculture.

6B. For the BScAgr degree. For the award of a particular level of honours, a candidate, except in special circumstances, must obtain the relevant minimum marks as set out in the following table:

Level of honours	Minimum overall honours mark	Minimum Fourth Year mark	Minimum WAM in Second and Third Years
Class I	75	75	70
Class II Division 1	66	70	63
Class II Division 2	61	65	58

In the event of a recommendation for honours that departs from these standards, it shall be incumbent upon the head of department and section concerned to make a substantial case for such a departure.

7. The Board of Examiners shall be responsible for the award of the university medal and the award of honours. Achievement of the minimum standards referred to elsewhere in these resolutions is not in itself sufficient justification for these awards.

8A. For the BAgrEc degree. A university medal may be awarded, on the recommendation of the Head of the Department of Agricultural Economics, to a student who has a mark of at least 85 in the Fourth Year course, an aggregate mark of at least 80 and a Second/Third Year WAM of at least 75.

8B. For the BScAgr degree. A university medal may be awarded, on the recommendation of the Head of Department concerned, to a student who has a mark of at least 85 in the Fourth Year course, an overall honours mark of at least 80 and a Second/Third Year WAM of at least 75.

Supplementary examinations

Supplementary examinations may be granted to students who have:

(a) been prevented by duly certified illness or misadventure from sitting or completing examination; or

(b) failed in any examination, but whose work is deemed to be of sufficient merit to warrant a further test.

Senate resolution

Students should note the following resolution of the Senate:

(a) Supplementary examinations should be regarded by both teacher and taught as distinct privileges granted to worthy students and not as rights.

(b) Boards of Examiners shall determine which students shall be allowed to take supplementary examinations. Due notice should be taken of certified illness or misadventure.

Award of supplementary examinations for the BScAgr degree

Where a candidate fails to secure 50% in one or more courses the Faculty shall reserve the right to award supplementary examinations.

(a) Normally such awards shall be subject to the following restrictions:

   (i) No candidate shall be awarded a supplementary examination in any course in which less than 40% was secured;

   (ii) Supplementary examinations shall only be awarded to a candidate who has passed 50% or more of the units attempted at the annual examinations;

   (iii) A candidate attempting a course for the second time at the annual examinations, who fails to pass in that course, shall not normally be eligible for the award of supplementary examinations.[1]

(b) In cases of misadventure or duly certified illness the Board of Examiners shall determine each case individually on its merits.

A candidate awarded supplementary examinations under this rule will normally be permitted to count the supplementary examinations as annual examinations and they will be entered as annual examinations on the academic record.

Supplementary examinations and further tests for the BAgrEc degree

1. Supplementary examinations are normally not awarded to candidates for the BAgrEc degree.

2. Further tests may be awarded by the examining department where the candidate has been prevented by sufficient and duly certified illness or misadventure from completing the assessment for a course. Such further tests are privileges and not rights.

3. Further tests may also be awarded in a course where the examiner requires further evidence to reach a final assessment of a candidate who has failed a course and whose performance is borderline.

4. Where possible and practicable, all further tests will be administered and results finalised before the Board of Examiners' Meeting.

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[1] For students coming within this rule who have achieved a weighted average mark (WAM) greater than 50 or who failed in only one course, each case would be considered on its merits.

5. Incomplete results at the time of the Board of Examiners are recorded by the symbol 'V' (result to come). Any incomplete result not finalised by the commencement of First Semester in the next academic year will be altered to 'Fail', on the approval of the Associate Dean (Agricultural Economics) in consultation with the Head of Department offering the subject.

6. The Head of Department is responsible for the awarding, timetabling and conduct of further tests, which may take such form as the Head of Department directs. Students in a course must be given notice of the proposed date for conducting further tests no later than the date of publication of the final University Examinations Timetable.

7. Individual students granted a further test should wherever possible be given at least three days' prior notice. A candidate who is absent from a further test without sufficient reason will be deemed to have failed the test.

8. In respect to the notification of students referred to in sections 6 and 7, students will be deemed to have been notified by the Department as a result of the posting of information by the due date on official noticeboards as advised by the Department concerned.

9. It is the responsibility of the student to provide written evidence of illness or misadventure to the appropriate Head of Department as soon as possible and practicable and in any case before the close of the relevant examination period. Where such evidence is not presented in time for the student to be offered a further test on the advertised date, it will only be considered by the Head of Department where there is sufficient reason why it has not been presented by that date.

10. The highest grade of award following a further test is Pass, except where the further test is granted on the grounds of illness or misadventure.

Concessional passes

The Faculty reserves the right to award a concessional pass to candidates at the December examinations. A candidate awarded a concessional pass at the December Board of Examiners' Meeting may attempt to upgrade the result to a pass at the supplementary examinations, but a concessional pass is deemed to fulfil any requirements for the student to continue in the degree course unhindered.

Award of concessional passes

The concessional pass is not available for candidates in the BAgrEc degree.

The following conditions shall normally guide the Board of Examiners in the award of a concessional pass to candidates in the BScAgr degree:

(a) A candidate's performance in all other courses attempted shall be considered by the Board of Examiners.

(b) To be eligible for a concessional pass a candidate shall have—
    (i) obtained a weighted average mark of at least 52% at the first attempt at First Year courses, and in subsequent examinations a weighted average mark of at least 55%;

    (ii) been examined in at least 36 units of coursework;

    (iii) only one course which has a contributing mark between 49% and 45% (inclusive);

    (iv) no course with a mark of less than 45%.

(c) Students taking the Fourth Year examinations shall not be eligible for the award of a concessional pass.

(d) A candidate will not be awarded both the right to sit a supplementary examination in one course and a concessional pass in another course concurrently.

(e) A candidate who is attempting a course for the second time at the annual examination shall not be eligible for the award of a concessional pass in that course.

Having awarded a concessional pass to a candidate, the Faculty shall not alter the mark awarded to the candidate by a department. This mark shall be entered in the candidate's record and recorded as a concessional pass on the academic record.

Illness or misadventure

You may apply to the Faculty in writing for special consideration of your examination performance on grounds of illness or misadventure. In the case of *illness* a medical certificate should be provided. The minimum requirements of a medical certificate are that it:

(a) be submitted and signed by your own medical practitioner and indicate the dates on which you sought attention;

(b) certify unambiguously a specified illness or medical disability for a definite period;

(c) indicate the degree of your incapacity, and express a professional opinion as to the effect of your illness on your ability to take an examination.

Certificates in connection with annual or supplementary examinations should be submitted prior to the examinations, unless the illness or misadventure takes place during the examinations, in which case the evidence must be forwarded as soon as practicable, and in any case before the close of the examination period. There is a special form available at the Student Centre and at the University Health Service for submission with medical certificates.

For consideration on the grounds of *misadventure*, your application must include a full statement of circumstances and any available supporting evidence.

The need to seek early advice

Many students in need of advice fail to make full use of the assistance available to them. If you believe that your performance during a course, or your preparation for your examinations, has been adversely affected by medical, psychological or family circumstances, you should seek advice as early as possible. Members of the teaching staff, of the University Counselling Service, and of the University Health Service, are all available for consultation and can give advice on appropriate action to take.

Exclusion
Restriction upon re-enrolment
There are certain circumstances in which you could be asked to show good cause why you should be permitted to repeat any previously attempted study. Liability for exclusion from re-enrolment is determined by academic attainment during the immediate past one or two academic years (depending upon the faculty or board of studies concerned). The resolutions of the Senate restricting re-enrolment may be found in *Statutes and regulations*, indexed under 'Re-enrolment'. You should acquaint yourself with the studies in which you are enrolled. If you are in any doubt about your liability for exclusion following academic failure or discontinuation of courses you should ask advice of the Exclusions Officer in the Records Services Unit.

It is not possible to define in advance all the reasons that constitute 'good cause' but serious ill health, or misadventure properly attested, will be considered. In addition your general record, for example in other courses, would be taken into account. In particular if you were transferring from another faculty your record in your previous faculty would be considered. Not usually acceptable as good cause are such matters as demands of employers, pressure of employment, time devoted to non-university activities and so on, except as they may be relevant to any serious ill health or misadventure.

Extract from resolutions of the Senate relating to the Faculty of Agriculture
10. (1) The Senate authorises the Faculty of Agriculture to require a student to show good cause why he/she should be allowed to re-enrol in the Faculty of Agriculture if, in opinion of the Faculty, he/she has not made satisfactory progress towards fulfilling the requirements of the degree.

(2) Satisfactory progress cannot be defined in all cases in advance but a student who has –

(i) twice failed, or discontinued enrolment to count as a failure, any course as defined in sections 1 2, 3 and 4 relating to the degrees of Bachelor of Science in Agriculture and Bachelor of Agricultural Economics, or

(ii) at the annual examinations in the second or any subsequent year of enrolment, failed more than sixty per cent of the units for which enrolled and has also obtained a weighted average mark of less than fifty per cent in the total number of units for which enrolled in the two most recent years of enrolment,

shall be deemed not to have made satisfactory progress.

(3) In cases where the Faculty permits the re-enrolment of a student whose progress has been deemed unsatisfactory, the Faculty may require the completion of specified courses in a specified time, and if the student does not comply with these conditions the student may again be called upon to show good cause why he/she should be allowed to re-enrol in the Faculty of Agriculture.

Professional experience
The Faculty of Agriculture regards the professional experience which, under Senate resolutions, it requires its students to undertake in University vacations, as an integral and essential part of their overall training. The Faculty resolutions relating to this professional experience are listed below.

Faculty resolutions (BScAgr and BAgrEc)
1. Candidates must complete 18 weeks of professional experience. Each component of the experience must be approved by the Dean before it is undertaken.
2. A total of two weeks may be gained (one week per excursion) by:

    (i) attendance at the First Year Faculty excursion and submission of an acceptable report on an aspect of the region visited;

    (ii) attendance at the Second Year or Third Year Faculty excursion, one of which is compulsory, and submission of an acceptable report on an aspect of the region visited;

    (iii) attendance at the Faculty Senior Years excursion and submission of an acceptable report.

3. At least 6 weeks' experience must be gained on commercial farms, not owned by the student's parents. This must include experience in at least 2 regions, in at least 2 rural industries, with a maximum of 6 weeks on any one farm. An appropriate detailed report will be required from Second, Third or Fourth Year students for one period of professional experience.
4. Additional experience to a total of 18 weeks must be completed on other commercial farms or in professional activities appropriate to the candidate's particular academic interests. The maximum period permissible on any one farm or in any other professional activity is 6 weeks and up to 4 weeks may be approved on an enterprise owned by the candidate's parents.
5. Approved professional experience will not be credited until satisfactory reports have been submitted. A report will be required for every visit.
6. Students *normally should complete six* weeks of professional experience by the beginning of Second Year, twelve by the beginning of Third Year and eighteen by the beginning of Fourth Year.
7. Students wishing to graduate at the principal agriculture graduation ceremony must complete all professional experience requirements by 31 January after their final year.

Excursions
The Faculty, and some departments within the Faculty, conduct excursions to farms and to a variety of other facilities related to agriculture. The Faculty conducts three excursions, each having a duration of one week. The first excursion is for First Year students who attend on a voluntary basis. It is compulsory to attend one of the other two excursions for Second or Third Year students.

The credit granted is set out under 'Professional experience'.

Scholarships and prizes

See also the section on financial assistance in the *University of Sydney Diary*.

Cadetships

Students interested in applying for government cadetships should enquire at the nearest branch of the Commonwealth Employment Service.

Matriculation scholarships and prizes

In addition to assistance granted by the Australian Government there are a number of matriculation scholarships and prizes. Details of matriculation scholarships available by application may be obtained from the Scholarships Office (closing date: 31 March each year).

Martin McIlrath Scholarships are tenable in the First Year in the Faculty of Agriculture. James Murphy Bursaries, which are tenable by sons of Catholic parents, cover collegiate fees at St John's College.

Others include the Services Canteen Trust Fund scholarships, the Soldiers' Children Education Scheme scholarships and the Gowrie scholarship. Some are tenable by students of any faculty, some are restricted to the Faculty of Agriculture.

University bursaries

Bursaries are awarded on the combined grounds of financial need and academic merit and application may be made at any time to the Financial Assistance Office (open Monday to Thursday from 9.30 am to 2.30 pm). In addition interest-free loans are available to students who are able to demonstrate financial need.

University scholarships and prizes

Details may be obtained from the Scholarships Office. Some scholarships and prizes may be awarded to students of any faculty; others to students in specified faculties.

Other scholarships and prizes

A summary of the details of scholarships and prizes available to students in the Faculty of Agriculture is given below. Note that scholarships marked * require the applicant to submit an application. For further information, contact the Scholarships Office.

Prize compositions

Details of these may be obtained from the Scholarships Office with whom applications generally close in the first week of Second Semester.

Faculty resolutions

A candidate who presents for re-examination in any subject shall not normally be eligible for any prize or scholarship awarded in connection with such examination.

Prize or scholarship	Value $	Qualification
Australian Farm Management Society Prize	Trophy	Proficiency in field of farm management in Fourth Year
Belmore Scholarships	300	Proficiency in First Year
	300	Proficiency in Chemistry I
	300	Proficiency in Second Year
	300	Proficiency in Soil Science 2 and Agricultural Chemistry 2
Brian G. Davey Memorial Scholarships in Soil Science	350	Proficiency in Soil Science 2 and 3
John Arthur Cran	75	Proficiency in HSC
Dairy Research Foundation	400	Proficiency in Fourth Year Animal Production
John Neil Downing Memorial	500	Proficiency in professional experience
John and Beatrice Froggatt	950	Proficiency in (a) Anatomy and Taxonomy of Insects and (b) Physiology and Toxicology taken either as part of Agricultural Entomology 4 or Biology 3
W.W. Froggatt Memorial	110	Proficiency in Agricultural Entomology 4 project
Golden Jubilee Scholarship in Agricultural Science	450	Proficiency in Third Year
Clifford Dawson Holliday	150	Proficiency in Third Year Examinations
D.L. Jackson	150	Proficiency in Crop Science I
F.C. McCleery Memorial Award	150	Fellowship and Leadership in the Faculty (Third Year students)
*Martin McIlrath Scholarships	490	Proficiency in HSC and First, Second and Third Years (men only) Preference to sons of ex-servicemen
Theresa G. Makinson	85	Proficiency in Horticulture 4
National Farmers' Federation	150	Proficiency in Fourth Year in degree of Bachelor of Science in Agriculture or Bachelor of Agricultural Economics
Sibella Macarthur Onslow	150	Proficiency in Agronomy 4
*F.L. Partridge	400	For students in Third and Fourth Years in need of financial assistance
Poultry Research Foundation	400	Proficiency in Fourth Year Animal Production
Joyce Winifred Rouse	40	Proficiency in Agricultural Chemistry 4
SUAGA Prize	100	President, AGSOC
Sydney Chinese Association	30	Proficiency in Microbiology 3 (Science) or Agricultural Microbiology 3A and/or 3B

Prize or scholarship	Value $	Qualification
Universities Credit Union	100	Proficiency in Agricultural Economics I
G.W. Walker Memorial Essay	80	Most proficient essay in the course Applied Marketing
Professor W.L. Waterhouse	70	Proficiency in Plant Pathology 3 and Agricultural Genetics 3
Sir Robert Watt Memorial	70	Proficiency in Crop Science 2
Weed Society of N.S.W.	50	Proficiency in Weed Science
A.R. Woodhill Prize in Entomology	150	Proficiency in Agricultural Entomology and Mycology 3 and Agricultural Entomology 4
Arthur Yates and Co. Pty Ltd (2 prizes)	50	Proficiency in Agricultural Genetics 4
	50	Proficiency in Horticultural Science 4

Badham Library

See also the section on libraries in the *University of Sydney Diary*.

Badham Library holds most of the current material needed by Agriculture staff and students, especially in the later years of their courses.

The Library covers the fields of agriculture, plant industry and agricultural economics, biological science, botany, zoology, genetics, veterinary science and food technology.

Other libraries containing material of use to the students of Agriculture are the Fisher Library (First Year students), the Geography Library and Wolstenholme (Economics) Library.

Books, but not periodicals, may be borrowed from these libraries. Use of reserve material is for limited periods only.

Mathematics Learning Centre

Lecturer-in-charge Jacqueline M. Nicholas, MSc *Hull*

The Mathematics Learning Centre offers help to students who enter the University with insufficient preparation in mathematics to enable them to cope with the mathematical requirements of their chosen course.

In the Faculty of Agriculture, courses in Agricultural Economics, Biometry, Economics and Econometrics all assume a certain level of knowledge of mathematics. Generally, students entering the Faculty are assumed to have taken HSC 2-unit mathematics or its equivalent. If you know that you lack this assumed knowledge, or if you are doubtful whether you are well enough prepared, you should contact the Mathematics Learning Centre.

Staff at the Centre can help you decide which topics you need to do extra work on. Resources are provided for individual study, with guidance from tutors, and small tutorials are arranged for students who are having difficulties. Introductory and bridging courses are organised during the summer and throughout the year.

Location

The Centre is on the fourth floor of the Carslaw Building (go to the fourth floor via the stairs opposite Stephen Roberts Theatre). Any student seeking assistance should call at the Centre, or phone 351 4061.

Faculty societies

The Sydney University Agricultural Society

The Agricultural Society is an association of the undergraduates of the Faculty of Agriculture which controls the social and sporting functions associated with the Faculty. The function and organisation of the Society will be explained in detail at the official welcome to new students held in the orientation period.

Membership

There is an annual subscription for society membership. This fee entitles you to the privilege of voting and holding office, enables you to take part in the many social and sporting activities organised by the Society and entitles you to the annual publication *Triticum*.

A membership card is presented to each new member.

Benefits of membership

The Society receives an annual grant from the Students' Representative Council, the size of which depends on the number of members. Membership of many faculty societies is compulsory. This is not the case in Agriculture, yet last year there was over 90% membership. This is an indication of the 'esprit de corps' for which the small and close Faculty of Agriculture is noted.

The main benefits from membership of the Society are derived from participation in the various functions held throughout the year.

Special activities include the ball and dinner, which tend to be formal functions, together with barbecues, wine-tastings, car rallies, harbour cruises and other informal occasions.

The Society fields teams in as many of the interfaculty sports as possible. Both men's and women's sports are catered for.

Triticum, the Society's annual publication, which is generally available at the end of Semester 2, is distributed to all members. The Society also publishes a newsletter, *Aggerophobia*, which carries all the latest news and information relating to agricultural students.

Sydney University Agricultural Graduates' Association

The Sydney University Agricultural Graduates' Association (SUAGA) is a graduate society. All graduates of the Faculty of Agriculture are eligible for membership. Some of the more important aims of the Association are to maintain and foster the relationship between agriculture graduates and the University, to promote social and cultural relationships among the graduates and to take an interest in any matters that may be of benefit to the Faculty of Agriculture.

POSTGRADUATE DEGREE AND DIPLOMA REQUIREMENTS

Degrees

The higher degrees in the Faculty of Agriculture are:

DAgrEc   Doctor of Agricultural Economics
DScAgr   Doctor of Science in Agriculture
PhD   Doctor of Philosophy
MAgrEc   Master of Agricultural Economics
MScAgr   Master of Science in Agriculture
MAgr   Master of Agriculture.

The regulations governing the award of these degrees are printed in *Statutes and regulations*. Prospective candidates should consult with the head of the department most closely concerned before submitting an application for admission to candidature.

All candidates would normally begin in First Semester (near the end of February). In some cases candidates may be able to commence in Second Semester (about the end of July).

The following statements summarise part only of the regulations governing the award of these degrees.

Doctor of Agricultural Economics and Doctor of Science in Agriculture

The degrees of Doctor of Agricultural Economics and Doctor of Science in Agriculture shall not be conferred until the candidate is a graduate of eight years' standing from the degree which qualified him or her for candidature. The degree may be awarded for published work which, in the opinion of the examiners, has been generally recognised by scholars in the field concerned as a distinguished contribution to knowledge.

Doctor of Philosophy

The degree of Doctor of Philosophy is a research degree awarded for a thesis considered to be a substantially original contribution to the subject concerned. Some coursework may be required (mainly in the form of seminars) but in no case is it a major component.

Applicants should normally hold a master's degree or a bachelor's degree with first or second class honours of the University of Sydney, or an equivalent qualification from another university or institution.

The degree may be taken on either a full-time or part-time basis.

In the case of full-time candidates, the minimum period of candidature is two years for candidates holding a master's degree or equivalent, or three years in the case of candidates holding a bachelor's degree with first class or second class honours; the maximum period of candidature is normally five years. The first 12 months of candidature is normally on probation.

Part-time candidature may be approved for applicants who can demonstrate that they are engaged in an occupation or other activity which leaves them substantially free to pursue their candidature for the degree. They should be able to devote at least 20 hours per week to candidature including at least one day per week during each year of candidature or an equivalent annual period made up in blocks. Normally the minimum period of candidature will be determined on the recommendation of the Faculty but in any case will not be less than three years; the maximum period of candidature is normally seven years.

Degrees of Master of Agricultural Economics (MAgrEc), Master of Science in Agriculture (MScAgr) and Master of Agriculture (MAgr)

Graduates of the University of Sydney who have completed courses acceptable to the Faculty of Agriculture or persons who, in the opinion of the Faculty, have qualifications equivalent to those required of a graduate of the University of Sydney, may apply for admission as candidates for the degree of master.

Master of Agricultural Economics and Master of Science in Agriculture

Candidates engage in research culminating in a thesis for two to three years full-time or pro rata part-time. Some honours graduates (or equivalent) may be eligible for a minimum candidature of one year full-time. A candidate may be required to serve a period of probation for not more than one year and to complete such work during the period as may be prescribed.

Master of Agriculture

Candidates engage in courses of advanced study in some branch of agriculture for one year full-time or pro rata part-time. Candidates proceed by coursework including a research project comprising between 15% and 40% of the year's work. The areas of study are agricultural chemistry, agricultural economics, agricultural entomology, agricultural genetics, agronomy, animal science, biometry, cereal chemistry, horticultural science, microbiology, plant breeding, plant pathology, plant protection, soil conservation, soil contamination, soil science and turf management. The first semester of candidature is normally on probation.

Diplomas

The following postgraduate diplomas are awarded by the Faculty of Agriculture:

GradDipAgrEc – Graduate Diploma in Agricultural Economics
GradDipAgrSc – Graduate Diploma in Agricultural Science.

The Graduate Diploma in Agricultural Science shall be awarded in the following subject areas and the testamur for the diploma shall specify the subject area: agricultural chemistry; agricultural entomology;

agricultural genetics; agronomy; animal science; biometry; horticultural science; microbiology; plant pathology; plant protection, soil science and turf management.

Graduates of the University of Sydney who have completed courses acceptable to the Faculty of Agriculture or persons who, in the opinion of the Faculty, have qualifications equivalent to those required of a graduate of the University of Sydney, may apply for admission as candidates for a diploma.

Candidates engage in courses of advanced study in some branch of agriculture, for one year full-time or pro rata part-time. Candidates proceed by coursework including a research project comprising between 15% and 50% of the year's work. The first semester of candidature is normally on probation.

Faculty resolutions
Eligibility for admission
1. An applicant for admission to candidature for a research degree shall:
    (a) be a Bachelor of Agricultural Economics or Bachelor of Science in Agriculture with First or Second Class Honours or equivalent of the University of Sydney; or
    (b) for the Master of Agricultural Economics or Master of Science in Agriculture, be a Bachelor of Agricultural Economics or Bachelor of Science in Agriculture with a Credit or above in the Fourth Year course in the field in which the candidate is proceeding; or
    (c) have completed courses in another faculty or institution, these courses being deemed by the faculty to be equivalent.
2. Demonstrated research ability will be considered when determining eligibility; applicants proposing to proceed primarily by research and thesis should provide evidence such as publications in scientific journals.
3. A research topic, which is satisfactory in terms of research interests, resources and availability of supervision within the department, must be agreed upon between the applicant and the relevant department.
4. An applicant for admission to candidature for the degree of Master of Agriculture by coursework or the Graduate Diploma in Agricultural Economics or the Graduate Diploma in Agricultural Science, both by coursework, shall have a bachelor's degree of the University of Sydney, or equivalent, and have demonstrated an adequate ability for the subject area to be studied.
5. Applicants may be required to provide evidence of adequate financial resources for personal support and compulsory fees during candidature. They may be required to demonstrate to the satisfaction of the Faculty a proficiency in the English language adequate to undertake the proposed candidature.

Availability
6. The number of students admitted may be limited and will be determined by:
    (a) availability of resources, including space, library, equipment and computing facilities, and
    (b) availability of adequate and appropriate supervision, including both the supervision of research candidatures and, where appropriate, the coordination of coursework programs.
7. In considering an application for admission to candidature the Faculty will take account of resource limitations and will select in preference applicants who are most meritorious in terms of sections 1-4 above.

Control of candidature
8.   (i) Each candidate for the MAgrEc or MScAgr degree shall pursue his or her course of advanced study and research wholly under the control of the Faculty.
    (ii) Where a candidate is employed by an institution other than the University, the Faculty may require a statement by that employer acknowledging that the candidature will be under the control of the Faculty.

Part-time candidature by research
9.   (i) The Faculty may permit candidates to enrol in part-time candidature provided they supply a satisfactorily detailed plan of their proposed program and attend at the University for such consultation with the supervisor and participate in such departmental and faculty or college activities as are required by the Head of the Department.
    (ii) The Faculty may permit part-time candidates for the MAgrEc or the MScAgr degree admitted under the provisions of Chapter 10 of the by-laws to complete the investigation elsewhere, after two years have been spent in this or equivalent candidature within the University of Sydney.
    (iii) Candidates admitted to part time candidature are expected to devote a minimum of 20 hours per week (or equivalent) to their candidature.
    (iv) Research assistants or associate lecturers in the University shall enrol part-time unless they can demonstrate to the satisfaction of the Faculty that they have sufficient time to pursue full-time candidature.

Coursework to be completed
10. A candidate proceeding by coursework shall satisfactorily complete such coursework as the Faculty on the advice of the Head of the Department may prescribe. Coursework, including a research project, will be chosen from the tables of courses attached to these resolutions.
    (a) For the MAgr degree, 56 units of coursework must be completed including 8 to 24 units of a research project.
    (b) For the DipAgrEc, 52 units of coursework must be completed including 8 or 16 units of a research project.
    (c) For the DipAgrSc, 48 units of coursework must be completed including 8 to 24 units of a research project.

Credit for previous studies

11. The Board of Postgraduate Studies (Board) may grant credit:

(a) towards MAgr candidature for coursework completed in graduate diploma candidature in this Faculty;

(b) for up to 12 units of unspecified coursework towards MAgr candidature for courses completed in another faculty of this University or of other tertiary institutions;

(c) for up to 8 units of unspecified coursework towards graduate diploma candidature for courses completed in another faculty of this University or of other tertiary institutions; provided that—

(a) no course for which credit is granted has been a basis for the award of any other degree or diploma;

(b) the course or courses were passed at a level of competence or with such additional assessment or other requirements as may be determined by the Board in each case;

(c) the course or courses were completed within six years immediately preceding the commencement of candidature for the MAgr degree or the graduate diploma.

Form of a thesis

12. (i) A thesis may be bound for submission in either a temporary or a permanent form.

(ii) Temporary binding must be strong enough to withstand ordinary handling and postage. The preferred form of binding is the 'Perfect Binding' system; ring-back or spiral binding is not permitted.

(iii) The cover of a temporarily bound thesis must have a label with the candidate's name, name of the degree, the title of the thesis and the year of submission.

(iv) The requirements for permanent binding are set out in *Statutes and regulations* in the Academic Board's resolutions for binding of PhD theses.

(v) Following examination, and emendation if necessary, at least one copy of a thesis (the Rare Book Library copy) must be bound in permanent form on acid-free paper.

(vi) If emendations are required, all copies of a thesis which are to remain available within the University must be emended.

Result of candidature

13. (1) The Board awards, or for the PhD degree recommends the award of, the degree or diploma whenever:

(a) the examiners have recommended without reservation that the degree be awarded and the Head of the Department concurs; or

(b) all of the examiners have recommended that the degree be awarded or awarded subject to emendations to all copies of the thesis which are to remain available within the University and the Head of the Department concurs; or

(c) the Board accepts a recommendation from the Head of the Department to award or award subject to emendations despite reservations expressed by one or more of the examiners; or

(d) the coursework results are satisfactory and the Head of the Department recommends the award of the degree or diploma.

(2) The Board may permit an unsuccessful candidate to prepare for re-examination if, in its opinion, the candidate's work is of sufficient merit to warrant this concession and the Head of the Department has so recommended.

(In order to ensure that the copies of the thesis which are retained in the University are as free of error as possible, the Board may award the degree subject to emendations even if the Head of the Department has not recommended the correction of minor errors which examiners have listed. To avoid any confusion as to what is required, the Board will draw to the attention of the Head of the Department the emendations it requires.)

Satisfactory progress

14. (i) A candidate proceeding by research and thesis shall lodge a progress report annually with the Registrar.

(ii) The Board may require a candidate proceeding by coursework to show good cause why he/she should be allowed to re-enrol in a course which has been twice failed, or discontinued to count as failure.

Preliminary requirements

15. When an applicant is not qualified for admission to a master's degree by research, the Faculty may require satisfactory completion of a preliminary examination before admission to candidature can be granted. In such a case a candidate may be enrolled in a master's preliminary program which shall consist of such coursework or other requirements as the Faculty may determine.

Delegation

16. In these resolutions—

(i) 'Faculty' delegates its responsibility to the Board;

(ii) the Board delegates the following responsibilities to the Dean who in turn delegates them to the Associate Dean (Postgraduate Studies):

Approval of—

(a) award of the Master of Agriculture degree and the Graduate Diplomas in Agricultural Science and Agricultural Economics

(b) award of the Master of Science in Agriculture and Master of Agricultural Economics degrees when there is no apparent reason for debate at the Board

(c) appointment of examiners

(d) admission to candidature

(e) supervisory arrangements

(f)   variation of candidature
(g)   extension of candidature
(h)   completion of candidature away from the University
(i)   suspension of candidature
(j)   approval of continuance following receipt of annual progress reports.

Table of courses of advanced study MAgr (Agricultural Science subject areas) and GradDipAgrSc

Course	Unit value	Comment
Courses with the same name but different unit values are mutually exclusive.		

Agricultural Chemistry

Course	Unit value	Comment
Research Methods in Agricultural and Biological Chemistry	8	Compulsory
Research Project	24	Compulsory ⎫
Research Project A	16	Compulsory ⎬
Chemistry and Biochemistry of Biological Macromolecules	16	
Chemistry and Biochemistry of Biological Macromolecules A	8	
Cereal Chemistry	16	
Cereal Chemistry A	8	
Methods of Analysis of Agricultural and Food Products and the Environment	16	
Methods of Analysis of Agricultural and Food Products and the Environment A	8	
Other courses approved by the Head of Department up to 8 units		

Cereal Chemistry

Course	Unit value	Comment
		MAgr only
As for Agricultural Chemistry except Cereal Chemistry	16	Compulsory

Animal Science

Course	Unit value	Comment
Research Project	24	Compulsory
Animal Health (Advanced)	8	
Animal Reproduction (Advanced)	8	
Non-Ruminant Nutrition (Advanced)	8	
Animal Genetics (Advanced)	8	
Pig Production (Advanced)	8	
Poultry Production (Advanced)	8	
Ruminant Nutrition (Advanced)	8	
Ruminant Production (Advanced)	8	
Other courses approved by the Head of Department up to 8 units		

Agricultural Genetics

Course	Unit value	Comment
Research Project	16	Compulsory ⎫
Research Project A	8	Compulsory ⎬
Research Project B	24	Compulsory ⎭
Biotechnology	4	
Advanced Biotechnology	4	
Cytology and Cytogenetics	4	
Advanced Cytogenetics	4	
Data Management (Advanced)	4	
Introductory Plant Breeding	4	
Advanced Plant Breeding	4	
Livestock Genetics	4	
Population Genetics	8	
Prokaryote and Eukaryote Molecular Genetics	12	
Other courses approved by the Head of Department up to 24 units		

Agronomy

Course	Unit value	Comment
Research Project	24	Compulsory ⎫
Research Project A	8 or 16	Compulsory ⎬
Agronomic Experimentation	8	
Advanced Crop Agronomy	8	

Course	Unit value	Comment
Courses with the same name but different unit values are mutually exclusive.		
Advanced Pasture Agronomy	8	
Crop Physiology (Advanced)	6	Compulsory
Plant Nutrition	4	
Weed Ecology	4	
Other courses approved by the Head of Department up to 24 units		

Biometry

Research Project	24	Compulsory
Advanced Biometry	8	
Applied Multivariate Analysis	8	
Computing Skills in Biometry	8	
Designing Experiments in Agriculture	8	
Statistical Modelling in Agriculture	8	
Other courses approved by the Head of Department up to 24 units		

Horticultural Science

Research Project	26	Compulsory (MAgr only)
Research Project A	18	Compulsory
Ornamental Horticulture (Advanced)	6	Compulsory
Methods in Horticultural Research (Advanced)	6	Compulsory
Other courses approved by the Head of Department up to 18 units		

Plant Breeding

Research Project	24	Compulsory
Plant Breeding A	8	Compulsory
Plant Breeding B	4	
Biotechnology	4	
Breeding for the Environment	4	
Cytogenetics and Genetic Manipulation	4	
Germplasm Management	4	
Quantitative Genetics	4	
Other courses approved by the Head of Department up to 20 units		

Soil Conservation

Research Project	8	Compulsory
Formation, Evaluation and Management of the Soil Resource	8	Compulsory
Natural Resource Economics (Advanced)	8	Compulsory
Soil Properties and Processes	8	Compulsory for students without previous training in soil science
Strategies for Soil Conservation	10	Compulsory
Advanced Methods of Studying and Analysing Soil	6	
Chemistry of the Soil Environment	6	
Data Management (Advanced)	4	
Physical Modelling of the Soil Environment	6	
Soil Mineralogy, Pedogenesis and Taxonomy	6	
Other courses approved by the Head of Department up to 16 units		

Soil Contamination

Research Project	16	Compulsory
Advanced Methods of Studying and Analysing Soil	6	Compulsory
Chemistry of the Soil Environment	6	Compulsory
Physical Modelling of the Soil Environment	6	Compulsory
Soil Contamination	10	Compulsory
Soil Properties and Processes	8	Compulsory for students without previous training in soil science
Advanced Biometry	8	
Data Management (Advanced)	4	
Formation, Evaluation and Management of the Soil Resource	8	
Other courses approved by the Head of Department up to 12 units		

Course	Unit value	Comment
Courses with the same name but different unit values are mutually exclusive.		

Soil Science

Course	Unit value	Comment
Research Project	16	Compulsory
Research Project A	8	Compulsory }
Advanced Methods of Studying and Analysing Soil	6	
Chemistry of the Soil Environment	6	
Data Management (Advanced)	4	
Formation, Evaluation and Management of the Soil Resource	8	
Physical Modelling of the Soil Environment	6	
Soil Mineralogy, Pedogenesis and Taxonomy	6	
Soil Properties and Processes	8	
Other courses approved by the Head of Department up to 24 units		

Microbiology

Course	Unit value	Comment
Microbiology (Advanced)	24	Compulsory
Research Project	24	Compulsory
Special Aspects of Microbiology	8	Compulsory for MAgr

Agricultural Entomology

Course	Unit value	Comment
Insect Anatomy	8	Compulsory
Insect Taxonomy and Collection	8	Compulsory
Research Methods in Entomology	16	Compulsory for MAgr
Research Methods in Entomology A	8	Compulsory for GradDipAgrSc
Insect Ecology (Advanced)	8	
Special Topics in Entomology	8	
Other courses approved by the Head of Department up to 16 units		

Plant Pathology

Course	Unit value	Comment
Research Methods in Plant Pathology	20	Compulsory for MAgr
Research Methods in Plant Pathology A	16	Compulsory for GradDipAgrSc
Biology and Control of Viral and Bacterial Diseases	6	
Crop Protection	4	
Ecology and Control of Soilborne Fungal Pathogens	6	
Mycology (Taxonomy and Physiology)	6	
Defence Mechanisms of Plants	6	
Special Topics in Plant Pathology	8	
Other courses approved by the Head of Department up to 16 units		

Plant Protection

Course	Unit value	Comment
Insect Taxonomy and Collection	8	Compulsory
Principles of Crop Protection	8	Compulsory
Plant Protection Research Methods	16	Compulsory for MAgr
Plant Protection Research Methods A	8	Compulsory for GradDipAgrSc
Biology and Control of Viral and Bacterial Diseases	6	
Ecology and Control of Soilborne Fungal Pathogens	6	
Insect Anatomy	8	
Insect Ecology (Advanced)	8	
Mycology (Taxonomy and Physiology)	6	
Defence Mechanisms of Plants	6	
Special Topics in Entomology	8	
Topics in Plant Pathology	6	
Other courses approved by the Head of Department up to 16 units		

Turf Management

Course	Unit value	Comment
Research Project	16	Compulsory
Diagnostic Methods in Turf Management	2	Compulsory
Advanced Turf Management	8	Compulsory
Plant Nutrition	4	Compulsory
Turf Management	8	Compulsory
Turf Species and Varieties	4	Compulsory
Special Topics in Business Management	4	Compulsory Alternate years from 1993
Applied Plant Ecology	6*	
Computing Applications in Management	6*	
Ecology and Control of Soilborne Fungal Pathogens	6*	

*Available subject to background knowledge and availability of facilities.

Course	Unit Value	Comment
Courses with the same name but different unit values are mutually exclusive.		
Ecology and Control of Soilborne Fungal Pathogens	6*	
Irrigation Science	4*	
Soil Properties and Processes	8*	
Mycology (Taxonomy and Physiology)	6*	
Other courses approved by the Head of Department up to 8 units		

*Available subject to background knowledge and availability of facilities.

Note: MAgr 56 units total
GradDipAgrSc 48 units total

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Table of courses of advanced study MAgr (Agricultural Economics) and GradDipAgrEc

Course	Unit Value	Comment
Courses with the same name but different unit values are mutually exclusive.		
Research Project	16	Compulsory ⎫
Research Project A	8	Compulsory ⎭
Agricultural and Resource Policy (Advanced)	8	
Applied Commodity Modelling (Advanced)	8	
Applied Commodity Trade (Advanced)	8	
Applied Marketing (Advanced)	8	
Commodity Price Analysis (Advanced)	8	
Contemporary Issues in Agricultural Economics	4	
Natural Resource Economics (Advanced)	8	
Production Economics (Advanced)	8	
Quantitative Business Management and Finance (Advanced)	8	
Research Methods (Advanced)	4	
Applied Econometrics	8	MAgr only
Decision Theory	8	MAgr only
Econometric Applications A	8	
Econometric Theory A	8	
Econometrics B	8	MAgr only
Economics III (Supplementary)	8	MAgr only
Forecasting for Economics and Business	8	MAgr only
Macroeconomics A	8	
Macroeconomics B	8	
Microeconomics A	8	
Microeconomics B	8	
Other courses approved by the Head of Department up to 16 units		

Note: MAgr 56 units total
GradDipAgrEc 52 units total

COURSE DESCRIPTIONS FOR AGRICULTURAL SCIENCE SUBJECT AREAS

Agricultural Chemistry and Cereal Chemistry

Chemistry and Biochemistry of Biological Macromolecules   16 units

Chemistry and Biochemistry of Biological Macromolecules A   8 units
Classes Yr

A course of lectures and laboratory classes on physical behaviour of natural macromolecules and the structure and function of polysaccharides, proteins and nucleic acids. The 8-unit course will include additional material on the mechanism of enzyme action, the chemistry and biochemistry of nucleic acids and gene expression, and the regulation of metabolism.

Cereal Chemistry   16 units

Cereal Chemistry A   8 units
Classes Yr

A course of lectures and practical classes on the uses of various cereal, legume and oil-containing seeds. It includes descriptions of the chemical structures, location, properties, isolation and analysis of commercially significant components such as proteins, polysaccharides and lipids as well as harmful substances, such as enzyme inhibitors, alkaloids, mycotoxins.

Methods of Analysis of Agricultural and Food Products and the Environment 16 units

Methods of Analysis of Agricultural and Food Products and the Environment A 8 units
Classes Yr

This course teaches the theory and practice of advanced analytical techniques for measuring the quality of agricultural products and the environment. It consists of laboratory analyses of the compounds in food that are important in nutrition, as well as procedures for assessing the quality of food, soil and water with respect to residues of agricultural chemicals. Exercises using computer simulation will be included to model processes of environmental chemistry and the factors affecting the persistence of some compounds.

Research Methods In Agricultural and Biological Chemistry 8 units
Classes Sem 1

This course deals with recent developments in experimental techniques and analytical methods in agricultural and biological chemistry. Candidates prepare discussion papers and short essays (of approximately 1000 words) on topics of their choice, selected from a reading list which covers a wide range of basic and applied areas of biological chemistry.

Research Project 24 units

Research Project A 16 units
Classes Yr

Candidates either undertake a program of extended laboratory experiments in biological chemistry and analyses of food and agricultural products or they elect to carry out a short research project in close association with a member of the academic staff. Projects are usually available in one of the following areas of research interest within the Department of Agricultural Chemistry and Soil Science: carbohydrate and nitrogen metabolism in a variety of crop plants; symbiotic nitrogen fixation; biochemistry of herbicides and pesticides; nutritional aspects of seed proteins; organic and inorganic residues in agricultural products.

Animal Science
Coordinator Dr Lean

Research Project 24 units
Candidates will conduct and report on a well-defined investigation into an aspect of animal production.

Animal Health 8 units
Lecturer Dr Miller
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam

Biology and immunology of host responses to infectious and parasitic diseases; definition of general disease states; examination of several livestock diseases of major economic significance; the development of livestock management programs which minimise the occurrence of or eradicate the above diseases; the use of commercial biological and chemical products to control animal health.

Animal Reproduction (Advanced) 8 units
Lecturer Dr Miller
Classes Yr: (3 lec & 1 tut)/wk
Assessment one 3hr exam

Reproductive biology, with a strong emphasis on reproductive processes in domestic animals; assessment of reproductive performance and the identification of causes of reproductive failure; the principles and practice of controlled breeding programs, the production, manipulation and storage of gametes and embryos; artificial insemination and multiple ovulation and embryo transfer.

Non-ruminant Nutrition (Advanced) 8 unit
Lecturer Assoc. Prof. Bryden
Classes Yr: (3 lec & 1 tut)/wk
Assessment one 3hr exam

Nutritional requirements of pigs and poultry, with emphasis on commercial production, and the special needs of breeding stock. Least cost formulation of rations. The use of computer-based models to predict production responses to nutrients, and to maximise profitability. Nutrition: genotype interactions and the influence of antinutritive factors and the application of biotechnology to the feed industry.

Animal Genetics (Advanced) 8 units
Lecturers Assoc. Prof. Nicholas, Assoc. Prof. Moran
Classes Yr: (2 lec & 2 prac)/wk
Assessment one 3hr exam, assignments

A course of lectures and practical classes providing a firm basis in population and quantitative genetics, leading to more advanced applications in animal breeding. Single locus population genetics theory, including the theory of selection and random drift, precedes the exposition of quantitative theory, including partitioning of phenotypic and genetic variances and parameter estimation. Selection indexes (both single trait and multi-trait) are dealt with extensively and BLUP (Best Linear Unbiased Prediction) is discussed. Practical classes are based on computer simulation or analysis of illustrative data. Excursions illustrate the applications of genetics in commercial and research settings.

Pig Production (Advanced) 8 units
Coordinator Assoc. Prof. Bryden
Classes Yr: (2 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

A course of lectures and practical classes with emphasis on the efficiency of pig meat production. All aspects of the production cycle are covered including management of the breeding sow and growing pig. Environmental requirements, housing, feeding practices and disease control are considered. Application of computer-based models to commercial piggeries.

Poultry Production (Advanced)　　8 units
Lecturer Assoc. Prof. Balnave
Classes Yr: (3 lec & 1 tut)/wk
Assessment one 3hr exam

Avian biology, with emphasis on the unique features of the digestion, absorption and utilisation of nutrients, and on the physiology of egg formation. Commercial production of broilers and table eggs, with consideration of environmental requirements, housing and disease control.

Ruminant Nutrition (Advanced)　　8 units
Lecturer Assoc. Prof. Kellaway
Classes Yr: (3 lec & 1 tut)/wk
Assessment one 3hr exam

Ruminant physiology and metabolism, with particular reference to the unique features of digestion in the ruminant. Nutrient requirements of sheep for meat and wool production, and of cattle for meat and milk production. The use of computer-based models to maximise the profitability of production. Nutrition: genotype interactions.

Ruminant Production (Advanced)　　8 units
Lecturer Assoc. Prof. Gooden
Classes Yr: 4 lec/wk
Assessment one 3hr exam

Sheep production, including wool production, meat production, pasture and sheep management systems, reproduction and property management. Intensive and extensive systems of beef production, including pasture and cattle management systems and reproduction. Milk production, including milking systems, pasture and dairy cow management and reproduction. Use of computer-based models in animal production.

Agricultural Genetics

Research Project　　16 units

Research Project A　　8 units

Research Project B　　24 units
Candidates will conduct and report on a well-defined investigation into an area of interest in agricultural genetics.

Biotechnology　　4 units
Lecturer Dr Sharp
Classes Sem 1 or Sem 2

A course of lectures and practical periods covering: techniques and potential uses of plant transformation in manipulating plant quality and agronomic characteristics; the use of molecular techniques in the diagnosis of plant diseases in plant breeding; the construction and use of genetic maps for selection in plant breeding programs.

Advanced Biotechnology　　4 units
An advanced course.

Cytology and Cytogenetics　　4 units
Lecturer Dr Darvey
Classes Sem 1 or Sem 2
Assessment one 2hr exam

Lectures in cytology and cytogenetics, with special emphasis on cereals and the application of chromosome engineering to plant breeding. The laboratory course includes routine cytological procedures and tissue culture technology.

Advanced Cytogenetics　　4 units
An advanced course in cytogenetics with a strong practical component.

Data Management (Advanced)　　4 units
Lecturer Assoc. Prof. O'Neill
Classes Sem 2
Assessment one 2hr exam, assignments

This course explores experimental design and analysis, using balanced and unbalanced data sets. Examples are taken from current experiments conducted in the Department or the Faculty. This course is half of Advanced Biometry.

Introductory Plant Breeding　　4 units
Approximately 30 lectures and 30 hours of laboratory work devoted to the theory of plant breeding, conservation of genetic variability, breeding for resistance to disease and measurements and analysis of data.

Advanced Plant Breeding　　4 units
An advanced course in plant breeding, with emphasis on design and implementation of a breeding program.

Livestock Genetics　　4 units
Lecturer Assoc. Prof. Nicholas
Classes Sem 2

A course of lectures in livestock genetics with special emphasis on the genetic basis of animal disease.

Population Genetics　　8 units
Lecturers Assoc. Prof. Nicholas, Assoc. Prof. Moran
Classes Yr: (2 lec & 2 prac)/wk
Assessment one 3hr exam, assignments

A course of lectures and practical periods, dealing with population genetics, quantitative inheritance and animal breeding given by the Department of Animal Science.

Prokaryote and Eukaryote Molecular Genetics
　　12 units
This course is offered by staff in the School of Biological Sciences, Faculty of Science.

Agronomy

Research Project　　24 units

Research Project A　　8 or 16 units
Candidates will conduct and report on a well-defined investigation into an area of interest in agronomy.

Advanced Crop Agronomy　　8 units
Classes Sem 1
Assessment one 3hr exam, review paper

A field-based course on crop management with particular reference to grain legume and fibre crops. Analyses will be in the context of (i) their ecology, underlying physiology and nutrition; (ii) their farming system, including technical and economic analysis of their management and their roles and restrictions within existing and imaginable farming systems; and (iii) their end uses, and how to better meet the technical needs of markets. Remote sensing and geographic information systems technology are used to monitor crop area and production, computer-based decision support systems to assist crop management, and professional diagnosis of hypothetical problems in crop production to develop analytical skills.

The course involves two field trips. The first, of five days, begins in the first week of Semester 1. This allows study of two crops. A second field trip is organised to research broader issues of management of traditional and alternative field-crop ecosystems identified by students during the course.

Advanced Grassland Agronomy   8 units
Classes Yr
Assessment one 2hr exam, assignments

Identification of management problems relating to pastures within farming systems; grassland measurement; improvement of farm performance; plant adaptation and management of plant competition. Principles of grassland ecology; taxonomy and identification of important grasses and legumes.

Weed Ecology   4 units
Classes Sem 1
Assessment one 2hr exam, assignments

Principles of weed ecology and weed management. Population dynamics, control strategies, effects of weeds on crops. Herbicide residues and herbicide resistance. Future developments.

Plant Nutrition   4 units
See under Turf Management.

Biometry

Research Project   24 units
Candidates will conduct and report on a well-defined investigation into an area of interest in biometry.

Advanced Biometry   8 units
Lecturer Assoc. Prof. O'Neill
Classes Yr
Assessment one 3hr exam, assignments

This course explores experimental design and analysis, using balanced and unbalanced data sets. Examples are taken from current experiments conducted in the Department or the Faculty. It also extends statistical theory to more difficult design problems. Topics here include bivariate distributions, maximum likelihood estimation, likelihood ratio tests.

Applied Multivariate Analysis   8 units
Lecturer Dr Thomson
Classes Sem 2

This course develops methods for analysing several agronomic variables simultaneously, in designed experiments.

Computing Skills in Biometry   8 units
Lecturers Assoc. Prof. O'Neill, Dr Thomson
Classes Sem 1
Assessment assignments

This course takes many of the latest computing packages such as Word, Excel, Genstat, SAS and S, and applies them to problems in design and analysis of experiments. A programming language such as Basic, Fortran or Pascal is also studied, as it relates to biometrical problems.

Designing Experiments in Agriculture   8 units
Lecturers Assoc. Prof. O'Neill, Dr Thomson
Classes Sem 1
Assessment one 2hr exam, assignments

This course looks at the principles and techniques underlying the modern statistical approach to designing experiments in agricultural research. Emphasis is placed on students learning how to advise experimenters on design problems, in consultation with Faculty members.

Statistical Modelling in Agriculture   8 units
Lecturers Assoc. Prof. O'Neill, Dr Thomson
Classes Sem 2
Assessment one 2hr exam, assignments

This course looks in depth at how statistical models can be of use in agricultural research. Topics covered include linear and non-linear models, time series methods, and spatial analyses of field experiments.

Horticultural Science

Research Project   26 units

Research Project A   18 units

Candidates will conduct and report on a well-defined investigation into an area of interest in horticulture.

Ornamental Horticulture (Advanced)   6 units
Coordinator: Dr Goodwin
Classes: Sem 1: (2 lec & 1hr workshop)/wk & three 6hr workshops; Sem 2: 1hr workshop/wk & four 3hr workshops
Assessment: class work, assignments, one 2hr exam

A lecture and practical course on the production and postharvest handling of ornamental crops, and the identification and properties of ornamental plants. The practical component emphasises the design and conduct of experiments on ornamental plants.

Methods in Horticultural Research (Advanced)
                                    6 units
Lecturer Dr Goodwin
Classes: Sem 1: 14 lec & seven 6hr prac, 4-day residential short course (mid-sem break)
Assessment: two 1hr exams (50%), assignments

Lectures and practicals on methods used in rsearch on ornamental and fruit crops. The course covers the use of controlled environment rooms, DNA manipulation and advanced tissue culture methods, including *Agrobacterium*-mediated genetic transformation. The fruit crop segment of the course (2 units) will be given as a one-week residential at Yanco in the MIA.

Plant Breeding

Research Project   24 units
An attempt is made to tailor the project to the student's requirements, thus discussion of project requirements is welcome prior to course enrolment. Projects may be carried out at any of the Plant Breeding Institute locations (Campus, Cobbitty, Narrabri); however Australian students with access to approved research facilities (other universities, public or private breeding centres or laboratories, CSIRO, etc.) will be exempted from this requirement, subject to adequate supervision.

Plant Breeding A   8 units
Classes mid-year break (end of Sem 1)
Assessment open book exam, seminar assignments

Lectures and laboratory work on the theory and philosophy of plant breeding. Special emphasis is placed on present and future technologies with respect to anther culture, mutation breeding, breeding for disease resistance, somaclonal variation, apomixis, interspecific hybridisation, the wheat x maize system for haploid production, hybrid producing systems and microspore culture for the production of transgenic plants. The course aims to develop perspective in relation to research priorities and realistic research objectives. It also considers various aspects of program design and efficiency, including the cost of establishing and maintaining programs, returns to growers, and sources of income (PVR, patents, hybrid seed, etc.).

Plant Breeding B   4 units
Classes Sem 2
Assessment literature review, assignments

A review of various plant breeding programs, obtained from field trips to public and private breeding centres in eastern Australia, including the Phytotron in Canberra. The course includes practical hands-on field experience. It also includes various aspects of plot design and automated data analysis, which are mainly presented during the visit to the Plant Breeding Institute at Narrabri.

Biotechnology   4 units
A course of lectures and practical periods covering: techniques and potential uses of plant transformation in manipulating plant quality and agronomic characteristics; the use of molecular techniques in the diagnosis of plant diseases in plant breeding; the construction and use of genetic maps for selection in plant breeding programs.

Breeding for the Environment   4 units
Lectures and practical periods dealing with management of pests, diseases (fungi, bacteria and viruses) and environmental pollutants. Deals briefly with soil degradation and weed control. The plant breeding options will be discussed, including the selection, identification and transfer of genes for resistance to diseases, mineral toxicities, etc. The details of the National Rust Program and its philosophy for the genetic control of the rusts will be elaborated at both a theoretical and practical level. The greenhouse effect and the management options for rapidly altering breeding strategies in response to a changing environment will also be discussed.

Cytogenetics and Genetic Manipulation   4 units
Lectures and lab work in cytogenetics emphasising cereals and genetic means for manipulation and alien incorporation. Cytogenetics component includes chromosome identification; aneuploidy; polyploidy; genome origins; genetic control of chromosome pairing; gene mapping; and cytogenetics of crop species. Genetic manipulation component includes: alien genetic transfer; induced mutation; alternative methods for the production of haploids; genetic and cytoplasmic male sterility; alternative systems for hybrid production; wide-species crosses; and identification of useful genes (apomixis, meiotic, restitution, endosperm and embryo quality from wide species crosses, parthogenesis, semigamy, etc.). Practical component includes: techniques for chromosome identification (Feulgen staining, C-banding, N-banding, autoradiography); various tissue culture techniques including somaclone production and anther culture; and various other laboratory and greenhouse techniques including mutation breeding, chromosome doubling, etc.

Visits are made to key research centres including the CSIRO Division of Plant Industry in Canberra in conjunction with the biotechnology course.

Germplasm Management   4 units
Classes Sem 2
Assessment literature review, assignments

Lectures on strategies and methods for germplasm collection, storage, evaluation, and utilisation; and on germplasm databases. A review of major international germplasm centres is also included.

Quantitative Genetics   4 units
(for part-time students)

A course of lectures and practical periods, dealing with population genetics and quantitative inheritance.

Note
In an attempt to assist Australian students wishing to complete this degree while simultaneously working in industry, it is intended to run each of the above four-unit courses as an intensive two-week program at least once every two years, so that part-time students can complete the course on a pro rata basis. These intensive courses would be conducted during the University vacation periods, when college facilities should be readily available.

The eight- and four-unit courses in plant breeding will also be presented on a similar basis; however field

trips will need to be adjusted to seasonal limitations, with part-time students having a choice as to the year of participation in each field trip.

Soil Conservation

Research Project   **8 units**

Candidates will conduct and report on a well-defined investigation into an area of interest in soil conservation.

Formation, Evaluation and Management of the Soil Resource   **8 units**

See Soil Science.

Natural Resource Economics (Advanced) 8 units

See Agricultural Economics.

Soil Properties and Processes   **8 units**

See Soil Science.

Strategies for Soil Conservation   **10 units**

Classes Yr: 10 days in the field (semester breaks)
Assessment assignment, seminar

In this course candidates will investigate and integrate biological, chemical, physical, economic and sociopolitical constraints on soil conservation in the context of a particular enterprise, farming system or geographic region. This will involve the design and execution of a field-sample survey. The concepts of land care and sustainable development will be investigated thoroughly in the course of this study.

Advanced Methods of Studying and Analysing Soil   **6 units**

Chemistry of the Soil Environment   **6 units**

Data Management (Advanced)   **4 units**

Physical Modelling of the Soil Environment   **6 units**

Soil Mineralogy, Pedogenesis and Taxonomy   **6 units**

See Soil Science.

Soil Contamination

Research Project   **16 units**

Candidates will conduct and report on a well-defined investigation into an area of interest in soil contamination.

Advanced Methods of Studying and Analysing Soil   **6 units**

Chemistry of the Soil Environment   **6 units**

Physical Modelling of the Soil Environment   **6 units**

See Soil Science.

Soil Contamination   **10 units**

Lecturer Prof. McBratney
Classes Sem 2: (4 lec & 1 prac)/wk; 5 days of fieldwork
Assessment one 3hr exam, essay, field and lab work

The course explores topical environmental issues concerned with soil contamination and considers causes of soil contamination; sampling of contaminated soil, analysis and interpretation; hazards posed to biological systems; and soil and waste management strategies in pollution prevention and land reinstatement. Amongst the topics considered are sewage sludge (heavy metals and organics), agrochemicals (pesticides and nitrogenous fertilisers), acid rain (aluminium toxicity), industrially-contaminated land (petrochemicals, cyanides, phenols, asbestos, catalysts, PAHs, PFA, strong acids/bases), domestic waste (methane, plastics, metalliferous materials), mines and mine wastes (coal, oil shale, metal ore mining) and reinstatement of spoiled soils (soil storage/emplacement, slope stability, vegetation establishment, use of ameliorants, end-use sensitivity).

Laboratory classes will involve the study and determination of soil contaminants and investigations into their retention, movement and phytotoxicity. Site visits will provide an opportunity to view problems and practical solutions in the field.

Soil Properties and Processes   **8 units**

See Soil Science.

Advanced Biometry   **8 units**

Lecturer Assoc. Prof. O'Neill
Classes Yr
Assessment one 3hr exam, assignments

This course explores experimental design and analysis, using balanced and unbalanced data sets. Examples are taken from current experiments conducted in the Department or the Faculty. It also extends statistical theory to more difficult design problems. Topics here include bivariate distributions, maximum likelihood estimation, likelihood ratio tests.

Data Management (Advanced)   **4 units**

Formation, Evaluation and Management of the Soil Resource   **8 units**

See Soil Science.

Soil Science

Research Project   **16 units**

Research Project A   **8 units**

Candidates will conduct and report on a well-defined investigation into an area of interest in soil science.

Advanced Methods of Studying and Analysing Soil   **6 units**

Lecturer Mr Geering
Classes Sem 2: (3 lec, 1 tut & 8hr prac)/7wks (second half)
Assessment one 2hr exam, field and prac reports, problem sets, essay

Approaches to scientific investigation and methods of literature survey followed by tutorial on computer search techniques.

Physical. Particle Size Analysis (PSA) of clay fraction and fractionation by centrifugation techniques, specific surface area measurements by BET Thermocouple methods for field measurements of moisture. Thermal conductivity methods for soil moisture content, Gamma and neutron probe methods for field measurements of moisture content and bulk density and time-domain reflectometry.

Physico-chemical. Measurement of oxidation-reduction status, O_2 diffusion rate and O_2, CO_2 concentrations in soil, selective ion-electrodes for measurements of ion activities in soil solution.

Geotechnical. Mechanical measurements of soil properties including Atterberg limits, unconfined compression, penetrometer, Proctor and compaction, torsion shear box, dynamometer, rupture-test and drop shatter test, sampling and testing procedures for determining physical properties of swelling soils.

Soil structural. Soil structure and stability tests in relation to aggregate size and soil micro-aggregates. Fractionation of soil organic matter and determination of principal functional groups involved in CEC and complexation of heavy metals.

Chemistry of the Soil Environment   6 units
Classes Sem 1: (3 lec, 1 tut & 8hr prac)/7wks (first half)
Assessment one 2hr exam, prac report, problem sets, essay

Topics include cation exchange capacity and pH dependent charge, soil charge characteristics, soil chemical analyses and their interpretation, formation of acid soil – Al and Mn toxicities, chemistry and adsorption/desorption of K, P and S in soil, soil solution and speciation of ionic components, soil salinity and sodicity, oxidation/ reduction reactions in soil and chemistry of soil organic matter and nitrogen.

Physical Modelling of the Soil Environment
                                          6 units
Lecturer Prof. McBratney
Classes Sem 1: (2 lec, 1 tut & 5hr prac)/7wks, 5 days in the field (first half)
Assessment one 2hr exam, field and prac reports, problem sets, essay

The emphasis is to examine the quantitative aspects of soil physics particularly in relation to the transfer of energy, gas, water, solids and solutes in soil.

Lecture and laboratory topics include heat flow, gas movement, soil water energetics, saturated and unsaturated flow of soil water, infiltration, solute movement, water and wind erosion as well as the fundamentals of numerical computer modelling of soil physical processes.

Field work involves field measurement of soil physical properties such as hydraulic conductivity and infiltration rates and moisture content.

Data Management (Advanced)   4 units
Lecturer Assoc. Prof. O'Neill
Classes Sem 2
Assessment one 2hr exam, assignments

This course explores experimental design and analysis, using balanced and unbalanced data sets. Examples are taken from current experiments conducted in the Department or Faculty. This course is half of Advanced Biometry.

Formation, Evaluation and Management of the Soil Resource   8 units
Lecturers Assoc. Prof. Koppi, Mr Geering, Prof. McBratney
Classes Sem 2: (4 lec & 3hr prac)/wk, 5 days in the field
Assessment one 3hr exam, report, field and lab work

Lectures on classification of soil, soil survey, pedological processes, geomorphology and soil stratigraphy, aerial photography, geostatistics and their application to land evaluation for rural purposes, the forms of land degradation occurring in Australia, and management conducive to sustainable soil husbandry.

Field work involves landscape description and the description, mapping and sampling of soil profiles for the purpose of assessing land use capability and field variability of soil properties.

Laboratory work involves routine physical and chemical tests of samples taken in the field relevant to assessment of the land-use potential and the quantification of the soil variability at the survey site.

Soil Mineralogy, Pedogenesis and Taxonomy
                                          6 units
Lecturer Assoc. Prof. Koppi
Classes Sem 2: (3 lec, 1 tut & 8hr prac)/7wks
Assessment one 2hr exam, prac reports

This course centres on a weathering study which traces the changes from a rock parent material up through the soil profile. The methods of study include particle-size analysis and extraction of a fine-sand fraction for optical identification and quantification of the mineral species present. Thin sections of the rock and profile are prepared, examined and the main features identified and quantified. The data from the sand analysis, micromorphological investigations and clay mineral assessments are used to provide an understanding of the pedogenesis of the particular soil.

A detailed study, including exercises, is made of the USDA soil classification system, Soil Taxonomy.

Soil Properties and Processes   8 units
Lecturers Assoc. Prof. Koppi, Prof. McBratney, Mr Geering, Dr New
Classes Sem 1: (4 lec & 4hr prac)/wk, 1 day in the field
Assessment one 3hr exam, class work, prac book

This course includes the fundamental properties of soil, the factors of soil formation, and the processes that operate in the soil system. Components comprising pedology, soil physics, soil chemistry and soil biology are synthesised by reference to common soil horizons and profiles from N.S.W. Field studies start with description and assessment of essential characteristics. The physics of water and gas movement, temperature, density, swelling and strength are considered. The chemistry of soil solids, surfaces and solutions are discussed as well as macronutrients and micro-nutrients and problems such as salinity, acidity and

waterlogging. There is also some discussion of soil microorganisms and microbiological transformations in the soil.

Microbiology

Microbiology (Advanced) 24 units
Classes 108 lec, 189hr of prac work and 32hr of other course-related activities organised into four themes

Theme 1: Molecular Microbiology – bacterial structure and function, microbial differentiation, prokaryote evolution and taxonomy, bacterial and bacteriophage genetics and bacterial physiology.
Theme 2: Medical Microbiology – medical bacteriology, virology and serology.
Theme 3: Applied Microbiology and Biotechnology – recombinant DNA, microbial growth, industrial microbiology, food microbiology, pollution microbiology.
Theme 4: Environmental Microbiology – microbial ecology, plant microbiology. In second semester there are several specialist lecture courses, based on research interests of the academic staff.

The practical course complements the lecture course and includes project work and excursions to industrial, medical and research institutions.

Research Project 24 units
Classes Yr

Candidates are required to undertake a project and submit a report in some advanced aspect of agricultural microbiology related to the area of interest.

Special Aspects of Microbiology 8 units
These may include tutorials, seminars, essays and directed reading on selected topics.

Agricultural Entomology

Insect Anatomy 8 units
Lecturer Assoc. Prof. McDonald
Classes Sem 1: (2 lec & 6 prac)/wk
Assessment one 3hr theory exam & one 3hr prac exam

The internal and external anatomy of all orders of insects will be studied in detail. Practical classes will enable students to dissect a number of insect types and examine examples of the major order of insects.

Insect Ecology (Advanced) 8 units
Lecturer Dr Meats
Classes Sem 2: (2 lec & 6 prac)/wk
Assessment one 3hr exam, assignment

Ecological principles will be dealt with as they apply to conservation, sustained-yield harvesting and pest management (classical and managed biological control, sterile male techniques, behavioural and integrated systems). The remainder of the course will emphasise behavioural mechanisms of importance to ecological systems. Further topics to be covered range from foraging theory and predator-prey interactions to interference mechanisms and opportunistic responses.

Insect Taxonomy and Collection 8 units
Lecturer Assoc. Prof. McDonald
Classes Yr: (2 lec & 6 prac)/wk
Assessment one 3hr exam & two 3hr prac exams, assignment

The classification, life cycle and general biology of all orders of insects will be considered. Candidates will be given an introduction into the philosophy of taxonomy. Lectures will deal with insect zoogeography and phylogeny. Practical classes will give students good working knowledge of all insect orders. The collection will supplement the practical classes.

Research Methods in Entomology 16 units

Research Methods in Entomology A 8 units
Classes Yr

This will involve analytical laboratory work, management of experimental data and writing up of data for critical review.

Special Topics in Entomology 8 units
Classes Yr
Assessment assignment

The course deals with specialised areas of particular interest to each candidate. Candidates will be given a selected reading list and will prepare discussion papers and essays on these topics.

Plant Pathology

Biology and Control of Viral and Bacterial Diseases 6 units
Coordinator Prof. Deverall
Lecturer Dr Bowyer
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the characteristics of viruses and bacteria and their interactions with plants, and the principles of disease control.

Crop Protection 4 units
Coordinator Dr Rose
Lecturers Dr Rose, Prof. Burgess, Prof. Deverall, Dr Bowyer
Classes Sem 2: 4 lec/wk
Assessment one 3hr exam, essay

The course covers weeds, diseases and insect pests of crops. The topics covered in this introductory course on the principles of crop protection are population dynamics; loss assessment; strategies, including thresholds; biocontrol; legislation, including quarantine; pesticide use; resistance to pesticides; future directions. There will be contributions from invited speakers.

Ecology and Control of Soilborne Fungal Pathogens 6 units
Lecturer Prof. Burgess
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and practical classes on the nature of diseases caused by soilborne fungi and the ecology and control of these pathogens.

Mycology (Taxonomy and Physiology)　6 units
Lecturers Prof. Deverall, Prof. Burgess
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the principles of fungal taxonomy and fungal physiology. The taxonomy of the Fungi Imperfecti is considered in detail.

Defence Mechanisms of Plants　6 units
Lecturer Prof. Deverall
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the genetic and physiological aspects of the interactions between plants and pathogens underlying disease resistance.

Research Methods in Plant Pathology　20 units

Research Methods in Plant Pathology A
16 units
Classes Sem 2

This course involves analytical laboratory work and the management of experimental data, together with essay assignments on a range of topics in experimental plant pathology. A written report is required on the experimental work.

Special Topics in Plant Pathology　8 units
This course deals with specialised areas of particular interest to each candidate. Candidates will be given a reading list on which essays and/or seminars will be presented.

Plant Protection
Biology and Control of Viral and Bacterial Diseases　6 units
Coordinator Dr Rose
Lecturer Dr Bowyer
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the characteristics of viruses and bacteria and their interactions with plants, and the principles of disease control.

Ecology and Control of Soilborne Fungal Pathogens　6 units
Lecturer Prof. Burgess
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and practical classes on the nature of diseases caused by soilborne fungi and the ecology and control of these pathogens.

Insect Anatomy　8 units
Lecturer Assoc. Prof. McDonald
Classes Sem 1: (2 lec & 6 prac)/wk
Assessment one 3hr exam & one 3hr prac exam

The internal and external anatomy of all orders of insects will be studied in detail. Practical classes will

enable students to dissect a number of insect types and examine examples of the major order of insects.

Insect Ecology (Advanced)　8 units
Lecturer Dr Meats
Classes Sem 2: (2 lec & 6 prac)/wk
Assessment one 3hr exam, assignment

Ecological principles will be dealt with as they apply to conservation, sustained-yield harvesting and pest management (classical and managed biological control, sterile male techniques, behavioural and integrated systems). The remainder of the course will emphasise behavioural mechanisms of importance to ecological systems. Further topics to be covered range from foraging theory and predator-prey interactions to interference mechanisms and opportunistic responses.

Insect Taxonomy and Collection　8 units
Lecturer Assoc. Prof. McDonald
Classes Yr: (2 lec & 6 prac)/wk
Assessment one 3hr exam & two 3hr prac exams, assignment

The classification, life cycle and general biology of all orders of insects will be considered. Candidates will be given an introduction into the philosophy of taxonomy. Lectures will deal with insect zoogeography and phylogeny. Practical classes will give students good working knowledge of all insect orders. The collection will supplement the practical classes.

Mycology (Taxonomy and Physiology)　6 units
Lecturers Prof. Deverall, Prof. Burgess
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the principles of fungal taxonomy and fungal physiology. The taxonomy of the Fungi Imperfecti is considered in detail.

Defence Mechanisms of Plants　6 units
Lecturer Prof. Deverall
Classes Sem 1: (3 lec & 12 prac for 7wks)/wk
Assessment one 3hr exam

A course of lectures and laboratory classes on the genetic and physiological aspects of the interactions between plants and pathogens underlying disease resistance.

Plant Protection Research Methods　16 units

Plant Protection Research Methods A　8 units
Classes Sem 2
Assessment assignment

This will involve analytical laboratory work, and management of experimental data on a topic in plant protection.

Principles of Crop Protection　8 units
Coordinator Dr Rose
Lecturers Dr Rose, Prof. Burgess, Prof. Deverall, Dr Bowyer
Classes Sem 2: 4 lec/wk
Assessment one 3hr exam, assignment

The course covers weeds, diseases and insect pests of crops. The topics covered in this introductory course on the principles of crop protection are population

dynamics; loss assessment; strategies, including thresholds; biocontrol; legislation, including quarantine; pesticide use; resistance to pesticides; future directions. There will be contributions from invited speakers. An assignment on a topical aspect of crop protection is required.

Special Topics in Entomology 8 units
Classes Yr
Assessment assignment

The course deals with specialised areas of particular interest to each candidate. Candidates will be given a selected reading list and will prepare discussion papers and essays on these topics.

Topics in Plant Pathology 6 units
Classes Yr
Assessment assignment

This course deals with areas of particular interest to each candidate. Candidates will be given a reading list on which essays and/or seminars will be presented.

Turf Management

Research Project 16 units
Candidates will conduct and report on a well-defined investigation into an area of interest in turf management.

Applied Plant Ecology 6 units
Lecturers Dr Smith, Prof. Martin
Classes Sem 2
Assessment one 3hr exam, assignments and an individual seminar

Aspects of plant protection and its effects on the environment. Interaction between weeds, pests and diseases; contamination of groundwater; herbicide and pesticide safety and other topical issues. In addition to written assignments, each student will be required to choose a topic in consultation with the lecturer and subsequently present a seminar for the class on that topic. For example, a golf course manager might address the ecological management of pest susceptible, regularly cut turf grasses growing on soils of low cation exchange capacity outside the usual thermal limits of the grasses.

Diagnostic Methods in Turf Management
2 units
Coordinator Prof. Martin
AKn extensive knowledge of turf management, basic knowledge of inorganic chemistry
Prereq Turf Management, Plant Nutrition
Classes Sem 1: 7 lec & seven 3hr prac
Assessment quizzes, an assignment and a prac exam

Following an overview of the main chemical, physical and biological diagnostic tests used in the formulation of advice by turf consultants and in decision-making by turf managers, the course will provide an introduction to the theoretical basis and practical application (including interpretation guidelines) of selected chemical methods used for diagnostic purposes in the turf industry for soils, irrigation waters and plant tissues.

Reference book
G.E. Rayment and F.R. Higginson *Australian Laboratory Handbook of Soil and Water Chemical Methods* (Iskanta Press, 1992)

Irrigation Science 4 units
Coordinator Dr Sutton
Classes Sem 1: (1 lec & 3 prac/workshop)/wk
Assessment one 2000w report, one 1500w essay

The course covers the scientific basis of irrigation practice. Modification of productivity potential through irrigation. Objectives of irrigation. Biological, physical and technical aspects of irrigation science, including furrow, flood, sprinkler and drip systems. Efficiency of water use and the proper use of instrumentation for irrigation management.

Reference book
M. E. Jensen *Design and Operation of Farm Irrigation Systems* (American Society of Agricultural Engineers, 1980)

Plant Nutrition 4 units
Lecturer Dr Campbell
Classes Yr
Assessment assignments

This course examines how plants acquire nutrients and distribute nutrients between organs during growth. Temperature, water and cutting (defoliation) effects on nutrient uptake. Nutrient function, nutrient genotype interactions and diagnosis of nutrient deficiencies/toxicities are interrelated concepts. Other topics include: prediction of macronutrients and micronutrient requirements; legume nutrition; heavy metals; can nutrients affect plant resistance to pathogens?; environmental considerations, e.g. leaching of nitrate. A substantial reading list and written assignment are directed to an industry of the graduate student's choice.

Turf Management 8 units
Lecturer Prof. Martin
Classes Sem 1
Assessment one 3 hr exam, assignments and prac exercises

Lectures, workshops and field visits centred on the theme of 'turf: a self-contained system'. Students will address the scientific issues underlying the design, construction, grassing and maintenance of turf facilities: construction of desired soil profiles; structure, nutrition and drainage of soils under turf management; the micro- and macroenvironment of turf; water management; physiology of growth under turf conditions; environmental legislation and emerging issues for turf management.

Advanced Turf Management 8 units
Coordinator Prof. Martin
Prereq Turf Management
Classes Sem 2
Assessment one 3hr exam, reports

Lectures, discussions and practical experiments to gain advanced expertise in laboratory and field aspects of the plant sciences underlying turf management. Topics include germination, stress physiology,

irrigation and water use, root growth, growth analysis, canopy photosynthesis and fertilizer management.

Turf Species and Varieties   4 units
Lecturers Mr King, Prof. Martin
Classes Sem 2
Assessment one 2hr theory exam, prac exam, plant collection

This course, which is given as intensive workshops, has three aims: to provide an overview of plant taxonomy (how plants are named and how the families of plants are arranged); to teach skills in plant identification (use of botanical terminology and use of conventional and vegetative taxonomic keys); and to recognise commercially-important turf species and varieties and weeds. Information is also provided on biochemical methods of identifying grasses; development of new cultivars by breeding and/or selection; comparative trialing of grasses: plant variety rights and cultivar registration.

Special Topics in Business Management 4 units
Lecturer Assoc. Prof. Drynan
Classes Sem 2
Assessment exam, class work, term paper

This course involves a minimum of 25 hours of formal lectures and practical classes with additional directed reading of relevance to particular student groups. The course will focus on the management economics of organisations providing market-priced and non-priced services such as recreation. Topics may include market assessment and marketing strategies, pricing strategies, financial planning and control, and resource management.

Computing Applications in Management 6 units
Lecturer Dr Sutton
Classes Sem 1
Assessment assignment

This course considers elements of computer programming using a standard language such as Pascal, Fortran or Quick Basic; the application of programming to simulation modelling; the application of programming to the automation of intensive agricultural, horticultural and turf grass industries; the use of spreadsheets in record keeping and performance analyses.

Soil Properties and Processes   8 units
Lecturers Assoc. Prof. Koppi, Prof. McBratney, Mr Geering, Dr New
Classes Sem 1: (4 lec & 4hr prac)/wk, 1 day in the field
Assessment one 3hr exam, class work, prac book

This course includes the fundamental properties of soil, the factors of soil formation, and the processes that operate in the soil system. Components comprising pedology, soil physics, soil chemistry, and soil biology are synthesised by reference to common soil horizons and profiles from N.S.W. Field studies start with description and assessment of essential characteristics. The physics of water and gas movement, temperature, density, swelling and strength are considered. The chemistry of soil solids, surfaces and solutions are discussed as well as macronutrients and

micronutrients and problems such as salinity, acidity and waterlogging. There is also some discussion of soil microorganisms and microbiological transformations in the soil.

Mycology (Taxonomy and Physiology)   6 units
Lecturers Prof. Deverall, Prof. Burgess
Classes Sem 1: (3 lec & 12 prac)/wk for 7wks
Assessment one 3hr exam

A course of lectures and laboratory classes on the principles of fungal taxonomy and fungal physiology. The taxonomy of the Fungi Imperfecti is considered in detail.

COURSE DESCRIPTIONS FOR AGRICULTURAL ECONOMICS

Agricultural and Resource Policy (Advanced)   8 units
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

The topics discussed include: the basic theoretical frameworks for the economic evaluation of policy formation (including Pareto welfare economics and public choice theory), market and government failure; the institutional structure of agricultural and resource policy formulation in Australia; microeconomic issues in agricultural and resource policy arising from linkages between agriculture and the resource industries and with the rest of the economy. Students will be expected to read widely for this course.

Applied Commodity Modelling (Advanced)   8 units
Classes Sem 1: (3 lec & 1 tut/lab session)/wk
Assessment one 3hr exam, assignments

The application of applied econometric methods to the agricultural and resource sectors is the focus of this course. Topics covered will include: estimation of production relationships; demand; supply; expectations models and simple simultaneous representations of commodity sectors using multiple regression techniques; time series forecasting applied to commodity and futures markets; and a suitable selection from an introduction to dynamic multipliers, dynamic elasticities, and econometric simulation. Use will be made of a variety of data analysis and econometric computer packages. Emphasis will also be placed on electronic and graphical approaches to data analysis along with consideration of the limitations and problems of the particular techniques.

Applied Commodity Trade (Advanced)   8 units
Classes Sem 1: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

In this course the basic economic principles underlying international trade in agricultural and resource commodities and the policies involved will be

presented. Issues related to trade and development will also be considered. The main topics covered will include: trends in agricultural and resources trade; trade policies of importing and exporting nations, including issues such as food aid and surplus disposal programs; economic integration and impacts on international commodity trade; international trade policy-making, including GATT; trade policies of the centrally-planned economies and developing countries; the impact of exchange rates and other macroeconomic variables on international trade in commodities.

Applied Marketing (Advanced)   8 units
Classes Sem 2: (3 lec & 1 tut/excursion)/wk
Assessment one 3hr exam, assignments

Applied Marketing relates to the basic economic concepts involved in the marketing of products into the food and fibre system. Topics covered will include: the marketing function including transportation, storage, processing, market development, advertising, market information, standardisation and grading; marketing management and planning; market efficiency; futures markets and other risk-sharing devices; types of market and industry organisation; marketing boards and corporations and their role in administered pricing; private trading corporations and their roles in agriculture and the resources sector.

Commodity Price Analysis (Advanced)
                                         8 units
Classes Sem 1: (3 lec & 1 tut/excursion)/wk
Assessment one 3hr exam, assignments

The topics covered will include: the nature of agricultural and resource commodity markets, market supply relationships, market demand relationships, price determination, marketing margin relationships, spatially related markets, market dynamics, derived demand for inputs, price expectations, non-competitive market forms and contestable markets. Applied examples from agriculture and the resource industries will be used throughout the course as illustrations of the principles involved.

Textbooks
W.G. Tomek and K.L. Robinson *Agricultural Product Prices* (Cornell U.P., 1990)
R.S. Pindyck and D.L. Rubinfeld *Microeconomics* (Macmillan, 1992)

Contemporary Issues in Agricultural Economics   4 units
Classes Yr: 54hr seminars

Topics include: recent developments in agricultural economic theory; current economic issues in the Australian and world agricultural and resource industries; appraisal of current Australian agricultural and resource policy.

Natural Resource Economics (Advanced)
                                         8 units
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

A course in natural resource economics of relevance to agriculture and the resource industries. Issues discussed are: the environment as a source of environmental services; socially efficient resource allocation and Pareto welfare economics; market failure and characteristics of environmental services; benefit cost analysis of public projects, including the modification of environmental services; non-depletable resources and pollution; depletable resources; irreversibility; sustainability. Applications include land degradation, fisheries, forestry, land-use planning, greenhouse effect.

Production Economics (Advanced)   8 units
Classes Sem 2: (3 lec & 1 tut)/wk
Assessment one 3hr exam, assignments

Production economics is concerned with production decisions on resource allocation at the firm, industry and economy levels. The topics include: the nature of agricultural and resource industry production; production functions; factor substitution; principles of enterprise combination and multi-product production; firm objectives; constrained and unconstrained maximisation; cost functions and other duality relationships; economies of scale and size in farming; input demands and dual relationships; production over time; productivity and technical change; production under risk and the illustration of the principles involved through the use of practical applications and exercises involving both the agricultural and resource industries.

Quantitative Business Management and Finance (Advanced)   8 units
Classes Sem 1: (3 lec & 1 tut/lab session)/wk
Assessment one 3hr exam, assignments

The application of applied optimising methods to decision-making in the agricultural and resource sectors is the focus of this course. Topics covered include: an overview of the applications of optimising models; the mathematical basis for constrained optimisation; basic linear, quadratic and nonlinear programming; farm modelling; agricultural sector models; transport and location models; spatial equilibrium systems; introduction to general equilibrium models; and model validation and verification. Issues of risk management will also be covered, including basic concepts of probability; concepts of utility; utility functions; elicitation of preferences; production under risk; farm planning under risk; and risk allocation mechanisms.

Research Methods (Advanced)   4 units
Classes Sem 2: (2 lec & 1 tut/workshop)/wk
Assessment one 2hr exam, assignments

Topics covered will include: report preparation; journalistic techniques and methods of reporting; seminar and workshop presentation methods; visual methods including overhead slides, projected slides and video; and time management techniques; research as an orderly process of enquiry; hypothesis formulation and testing; preparation of research proposals; the role of the economist; sources and collection of agricultural data; primary versus

secondary data; agricultural surveys; questionnaire construction and interviewing techniques; and methods of analysis of survey data.

ENROLMENT REGULATIONS

Discontinuation of enrolment and readmission after discontinuation — postgraduate

All Faculties, Boards of Studies and Graduate Schools — all candidates

1. A candidate will be presumed to have discontinued enrolment in a course, degree or diploma from the date of application to the Faculty, Board of Studies or Graduate School concerned, unless evidence is produced (i) that the discontinuation occurred at an earlier date and (ii) that there was good reason why the application could not be made at the earlier time.

2. A candidate who at any time discontinues enrolment from a degree or diploma shall not be entitled to re-enrol in that degree or diploma unless the candidate is readmitted to candidature for that degree or diploma.

3. Subject to subsections (i) and (ii) of section 1, candidates may not discontinue enrolment in a course after the end of classes in that course, unless the degree or diploma regulations permit otherwise.

4. The Dean, Pro-Dean or an Associate Dean of a Faculty, or a Chairperson of a Board of Studies or a Chairperson of a Graduate School may act on behalf of that Faculty, Board of Studies or Graduate School in the administration of these resolutions.

Candidates proceeding mainly by coursework
Withdrawal from full-year and First Semester courses
5. A candidate for a degree or diploma who discontinues enrolment in a full-year or First Semester course on or before 31 March in that year, shall be recorded as withdrawn from that course.

Withdrawal from Second Semester courses
6. A candidate for a degree or diploma who discontinues enrolment in a Second Semester course on or before 31 August in that year, shall be recorded as withdrawn from that course.

Discontinuation
7. A candidate for a degree or diploma who discontinues enrolment in a course after the withdrawal period but before the end of classes in that course, shall be recorded as 'Discontinued with Permission' in that course, unless the degree or diploma resolutions permit otherwise.

Candidates proceeding mainly by thesis
Withdrawal
8. A candidate who discontinues enrolment in a course or degree before the end of the fifth week of enrolment, shall be recorded as having withdrawn from that course or degree.

Discontinuation
9. A candidate who discontinues enrolment in a course or degree after the end of the fifth week of enrolment shall be recorded as 'Discontinued with Permission'.

Note that 'Faculty' includes for these purposes a 'College Board'.

POSTGRADUATE RESEARCH INSTITUTES

Plant Breeding Institute
The Plant Breeding Institute associated with the Faculty promotes the science of plant breeding, and the improvement of crop plants available for cultivation in New South Wales. The Institute is governed by a council composed of the Vice-Chancellor, members of the N.S.W. Wheat Research Foundation, members of the Faculty of Agriculture, and a representative of the N.S.W. Minister for Agriculture and Rural Affairs. The Professor of Plant Breeding in the Department of Crop Sciences is the Director of the Institute.

Institute of Advanced Studies
The Institute of Advanced Studies was established within the Faculty of Agriculture in 1974 to advise the Senate regarding several bequests. The Institute will use the funds to further the development of postgraduate studies and research in the Faculty. It is intended that the Institute shall promote the attraction of additional income.

The directors of the Institute are elected from and by members of the Faculty of Agriculture who are full-time permanent members of the departments. The Dean and Associate Dean (Postgraduate Studies) are *ex officio* directors.

SCHOLARSHIPS AND PRIZES: POSTGRADUATE
The following is a summary only; for full details concerning the conditions governing the awards of these prizes and scholarships contact the Scholarships Office.

Scholarship	Value $	Closing date for applications	Other information
Tenable at the University of Sydney			
Australian Postgraduate Awards	14 619	15 October	Graduates with Hons I. For research in any field
Henry Bertie and Florence Mabel Gritton Postgrad. Research Scholarships —			For research in chemistry in relation to industry and agriculture
Senior	41 574- 43 143	as advertised	
Junior	14 619	as advertised	
Linnean Macleay Fellowships	800- 3200		Graduates in science or agriculture who are members of the Linnean Society of N.S.W.
Richard Claude Mankin Scholarship —			For research into water conservation
Postdoctoral	34 091- 35 442	as advertised	
Postgraduate	16 000	as advertised	
James Vincent Scholarship in Microbiology		31 March	APA or similar scholarship holders working in applied microbiology
Awards restricted to candidates in Agriculture			
McCaughey Memorial Institute Scholarship	as for APA	as advertised	Graduates to conduct research in agricultural sciences with particular relevance to rice
Norman Scott Noble Scholarship	up to 1000	31 May	Travel grant or grant-in-aid to candidates in the discipline of agricultural entomology
Irvine Armstrong Watson Scholarship	up to 300	31 May	Travel grant or grant-in-aid to candidates in the disciplines of agricultural genetics, biometry, plant breeding or plant pathology

Faculty scholarships
The following five are identical (except that the F.H. Loxton is restricted to males) and are awarded annually depending on the availability of funds.

Scholarship	Value $	Closing date for applications	Other information
Thomas Lawrence Pawlett Postgraduate Scholarship	as for APA	31 October	Graduates for full-time research within the faculty (Preference to Hons I or Hons II Div. 1 or equivalent)
Christian Rowe Thornett Scholarship	as above	31 October	as above
Alexander Hugh Thurburn Scholarship	as above	31 October	as above
W.C. Turland Postgraduate Scholarship	as above	31 October	as above
F.H. Loxton Postgraduate Scholarship	as above	31 October	as above Restricted to males

Awards not restricted to graduates in Agriculture

Travelling scholarships
Baillieu Research Scholarship
H.S. Carslaw Memorial Scholarship
William and Catherine McIlrath Scholarship
The Rhodes Scholarship
The Linnean Macleay Fellowships
The Nuffield Foundation Dominion Travelling
    Fellowships
Science Research Scholarships of the Royal
    Commission for the Exhibition of 1851
The Gowrie Postgraduate Research Scholarships
The J.B. Watt Travelling Scholarship
The James King of Irrawang Travelling Scholarship
The G.H.S. and I.R. Lightoller Scholarship
The University of Sydney Postgraduate Research
    Travelling Scholarships
The Charles Gilbert Heydon Travelling Fellowship in
    the Biological Sciences
The Eleanor Sophia Wood Travelling Fellowships
The Herbert Johnson Travel Grants
The Rotary Foundation Fellowships
The Commonwealth Scholarships tenable in other
    British Commonwealth countries under the
    Commonwealth Scholarship and Fellowship Plan
CSIRO postdoctoral studentships.

Other scholarships are available. Enquiries about scholarships should be made at the Scholarships section of the Administrative Support Services Division. Enquiries about scholarships offered by other universities should be addressed to the registrar of the university concerned.

Appendix: Explanation of symbols for courses of study

Symbols may have been used in the courses of study chapter in the handbook as a succinct way of presenting teaching and assessment information. Because of the varied nature of the work described and occasional difficulties in interpretation and typesetting, such details are not construed as a firm undertaking. Students are advised to check details with the departments concerned. The significance of symbols used is as follows:

Hypothetical examples of symbols used

Title of course	**Double Dutch 1**
Actual lecturers	Assoc. Prof. Holland
	Dr Nederlands
Allied studies	*AKn* HSC German
Class contact & course duration	*Classes* Yr: (3 lec & 1 tut)/wk
Exams, essays, etc.	*Assessment* one 3hr exam, two 2000w essays/sem, 4 tut papers/sem

Title of course	**8766 Star Wars 5**
Actual lecturers	Dr Lazer Ms Gunn
Allied studies	*Prereq* 7653 *Coreq* Intro. Media Manipulation
Class contact & course duration	*Classes* Sem 1: (2 lec & 3 tut/ prac)/wk; Sem 2: (2 lec & 2 tut/prac)/wk
Exams, essays, etc.	*Assessment* one 3hr exam/sem, classwork

Allied studies

AKn	assumed knowledge
Prereq	prerequisite (you must have passed the indicated prerequisite before you start the course)
Coreq	corequisite (you must enrol in this course at the same time unless you have already passed it)

Type of class contact/assessment

class	class contact of any form
lab	laboratory
lec	lecture
prac	practical
tut	tutorial
exam	examination
tut paper	tutorial paper

Duration

hr	hour
Sem 1	Semester 1
Sem 2	Semester 2
Yr	throughout the year

Frequency

/wk	per week
/fn	per fortnight
/sem	per semester
/yr	per year

Examples

Classes

Sem 1: 1 class/wk	one class work session each week during Semester 1
Yr: (2 lec & 3 tut/ prac)/wk	two lectures and three tutorials or practicals weekly, throughout the year
Sem 2: 3 lec/wk & 1 tut/fn	three lectures per week and one tutorial per fortnight, during Semester 2

Assessment

one 3hr exam	one 3-hour exam
two 3hr exams/sem	two 3-hour exams per semester
one 2000w essay	one 2000-word essay
one 3000w essay, two 2000w essays/sem, 4 tut papers the course	one 3000-word essay for the course, two 2000-word essays per semester and four tutorial papers for
(one 3000w & two 2000w essays)/sem	one 3000- and two 2000-word essays per semester

Buildings, departments and operations (main campus)

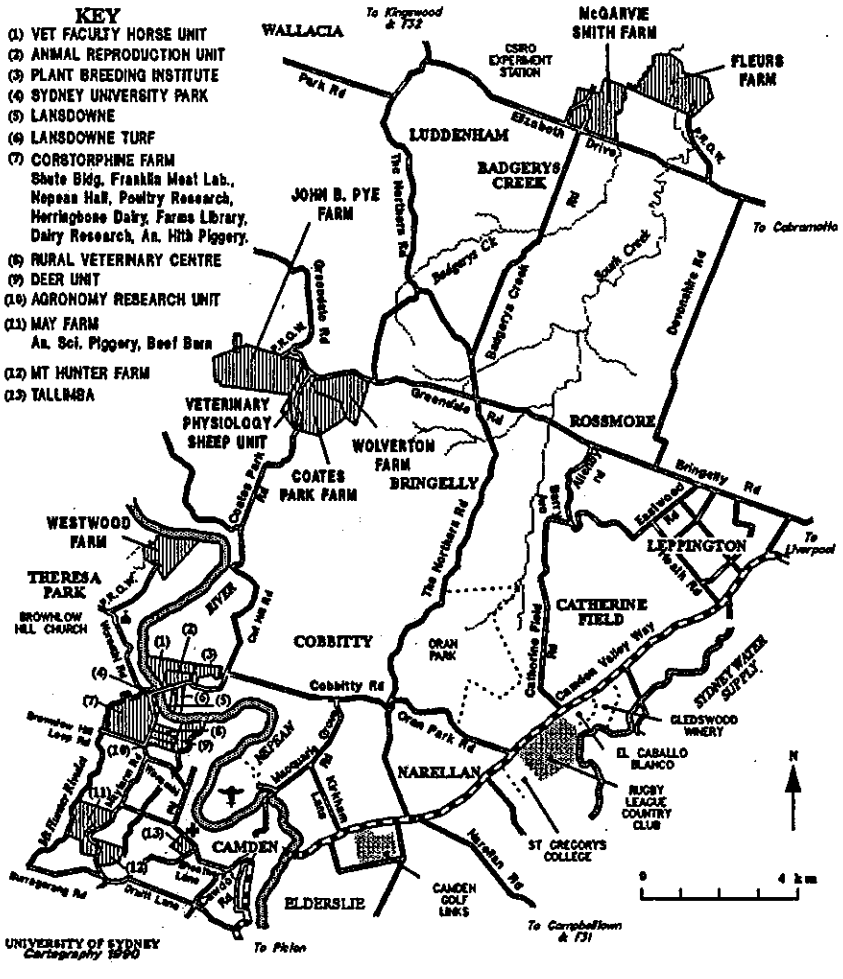| Code	Building/Department
13G	Accommodation Service A35
16S	Accounting H51
16E	Admin. Policy & Strategic Planning Division A14
17D	Admin. Support Services Division A14
17D	Admissions A14
26N	Aeronautical Engineering J07
11C	Agricultural Annexe A07
10C	Agricultural Chemistry & Soil Science A03
11C	Agricultural Economics A04
11C	Agricultural Glasshouses A06
11C	Agriculture Faculty Office A05
23N	Alma Street Glasshouse G07
17O	Alumni Relations F18
17H	Anderson Stuart Building F13
17H	Anatomy & Histology F13
7E	Animal Science BI9
16F	Anthropology A14
16S	ANZAAS H44
16F	Archaeology, Classics & Ancient History A14
22M	Architectural & Design Science G04
22M	Architecture, Dept & Faculty Office G04
20G	Archives F04
20N	Art Workshop G03
16E	Arts Faculty Office A14
14F	Asian Studies A18
17O	Attendant's Lodge F18
14D	Badham Building & Library A16
	Banks
19N	Advance G01
13C	Commonwealth A09
19N	Commonwealth G01
15D	National Australia A15
19N	National Australia G01
22D	Baxter's Lodge F02
8L	Behav. Sciences in Medicine D06
20P	Biochemistry G08
12C	Biological Sciences, Zoology A08
16C	Biological Science, Botany A12
8L	Blackburn Building D06
16K	Bookshop F12
8L	Bookshop, Medical D06
19N	Bookshop SRC Secondhand G01
8M	Bosch Building D05
9M	Bosch Lecture Theatres D04
16C	Botany A12
14F	Brennan, C., Building A18
17H	Burkitt Library F13
17E	Business Liaison Office A14
12A	Careers & Appts Service K01
6C	Caretaker's Cottage (Vet. area) B03
19L	Carslaw Building F07
16D	Cashier A14
15E	Celtic Studies A17
21S	Central Stores G12
19L	Centre for Teach & Learning F07
17D	Chancellor's Committee Shop A14
10G	Chaplains, University D11
23Q	Chemical Engineering J01
21S	Chemical Store G11
17K	Chemistry F11
	Child Care
17U	Boundary Lane
9R	Carillon Avenue
14A	Laurel Tree House (Glebe) K05
21S	Union (Darlington) G10
24R	Civil Engineering J05
17T	Clark Building H12
17E	Clock Tower A14
17L	Computer Science, Basser Dept F09
12A	Continuing Education K01
9K	Coppleson Postgrad. Med. Inst. D02
13G	Counselling Service, University A35
14C	Credit Union A09
12E	Crop Sciences A20
11C	Agricultural Entomology A04
11C	Agricultural Genetics & Plant Breeding A04
12E	Agronomy A20
10C	Biometry A03
12E	Horticulture A20
11C	Plant Pathology A04
7C	CSIRO McMaster Laboratory B02
7E	—, Annexe B14
22B	Dental H. Educ. & Res. Fndn K03
16K	Dentistry Faculty Office A27
18Q	Econometrics H04
18Q	Economic History H04
18P	Economics H04
18P	Economics Faculty Office H04
19J	Edgeworth David Building F05
13G	Education A35
15K	Edward Ford Building A27
24P	Electrical Engineering J03
17L	Electron Microscope Unit F09
23Q	Engineering Faculty Office J02
24S	Engineering Workshop J06
12E	English A20
16S	Equal Employment Opportunity H47
6D	Evelyn Williams Building B10
8L	Experimental Medicine D06
17D	External Relations Division A14
17D	Financial Services Division A14
16H	Fine Arts A26
20F	Fisher Library F03
14C	Footbridge Theatre A09
14E	Found Property A19
14F	French Studies A18
21T	Garage, University G13
17Q	Geography H03
19J	Geology & Geophysics F05
14F	Germanic Studies A18
18Q	Govt & Public Admin H04
8K	Grandstand No. 1 Oval D01
18D	Great Hall A14
17E	Greek—Ancient A14
13F	Greek—Modern A19
13F	Griffith Taylor Building A19
7E	Gunn, R.M.C., Building B19
	Health Service, University
13C	Holme Building A09
19N	Wentworth Building G01
15F	History A17
17K	History & Philosophy of Science F11
13C	Holme Building A09
5D	Horse Stables B09
20P	Human Nutrition Unit G08
17Q	Industrial Relations H03
8L	Infectious Diseases D06
19U	Information Services H08
17Q	Institute Building H03
17Q	Internal Auditor H03
13D	International Education Office K07
23L	International House G06
4D	Isolation Block—large animal bull pen B05
16H	Italian Studies A26
18T	Joinery G12
12F	Koori Centre A22
13F	Language Centre A19
17E	Latin A14
13G	Learning Assistance Centre A35
16K	Linguistics F12
25O	Link Building J13
12A	Mackie Building K01
16F	MacLaurin Hall A14
16C	Macleay Building A12
16C	Macleay Museum A12
7C	McMaster Laboratory CSIRO B02
11C	McMillan, J.R.A., Building A05
17L	Madsen Building F09
15C	Mail Room (Internal) A11
17E	Main Building A14
14G	Manning House A23
13A	Margaret Telfer Building K07
16K	Mathematics Learning Centre F12
19L	Mathematics & Statistics F07
26N	Mechan. & Aero. Eng Bdg J07
25O	Mechanical Engineering J07
15K	Medicine Faculty Office A27
8L	Med., Paraclinical & Clinical D06
17H	Medicine, Preclinical F13
18P	Merewether Building H04
20P	Microbiology G08
16H	Mills, R.C., Building A26
14Q	Moore Theological College 1
15F	Mungo MacCallum Building A17
17S	Museum Studies H36
24M	Music J09
16F	Nicholson Museum A14
10K	Obstetrics & Gynaecology D02
17S	Ocean Sciences Institute H34
15C	Old Geology Building A11
22O	Old School Building G15
12F	Old Teachers' College Building A22
8L	Pathology & Path Museum D06
12E	Performance Studies A20
13A	Personnel Services K07
8L	Pharmacology D06
15D	Pharmacy A15
17F	Philosophy A14
16K	Phonetics Laboratory F12
21T	Photography G12
13K	Physics A28
17H	Physiology F13
10K	Postgraduate C'ttee in Medicine D02
15D	Post Office A15
16R	Press Building H02
21T	Printing Service G12
16E	Professorial Board Room A14
13A	Properties Office K07
6H	Psychiatry D06
15F	Psychology A17
11D	Publications A20
15K	Public Health A27
17E	Quadrangle A14
10K	Queen Elizabeth II Res. Inst. D02
16D	Records A14
15R	Regiment, University H01
13F	Religion, School of Studies in A19
17S	Research Institute for Asia & the Pacific H40
18S	Risk Management H31
25P	Rose Street Building J04
10C	Ross Street Building A03
7D	Round House B11
23P	Russell, Peter Nicol, Building J02
16K	SAUT F12
5P	St Andrew's College 2
3H	St John's College 3
21M	St Michael's College
12N	St Paul's College 4
1F	Sancta Sophia College 5
4C	Sand roll shed B04
19L	Science Faculty Office F07
14E	Security A19
12A	Selle House K02
18E	Semitic Studies A14
18E	Senate Room A14
21T	Services Building G12
25M	Seymour Theatre Centre J09
5D	Sheep Building & Pens B07
17H	Shellshear Museum F13
21S	Shepherd Centre G10
27M	Shepherd St Parking Station J10
16H	Social Work A26
	Sports
20R	Noel Martin Recreation Centre, Darlington G09
12H	Sports Centre Western Ave A30
7F	Sports Union D08
7F	Ward, H.K., Gymnasium D08
20J	Stephen Roberts Theatre F06
8D	Stewart, J.D., Building B01
17L	Student Centre F09
19N	SRC G01
21T	Supply Department G12
718S	SUPRA H28
8L	Surgery D06
20R	Swimming Pool G09
20D	Tennis pav. & women's courts F01
14E	Traffic Office A19
16K	Transient Building F12
19N	Union, University of Sydney G01
15F	University of Sydney Club A17
22M	Urban & Regional Planning G04
8D	Vet. Anatomy B01
6D	Vet. Clinic, hospital, surgery B10
6D	Vet. Clinical Sciences B10
7D	Vet. Operating theatre & animal house B13
7D	Vet. Pathology B12
7E	Vet. Physiology B19
8D	Vet. Science, Faculty Office B01
16E	Vice-Chancellor A14
11D	Wallace Theatre A21
17D	War Memorial Gallery A14
25O	Warren Centre for Adv. Engin. J07
11C	Watt, R.D., Building A04
17L	Welfare Association F09
19N	Wentworth Building G01
11L	Wesley College 6
8N	Western Avenue Underground Parking Station D07
16E	Western Tower A14
22M	Wilkinson Building G04
17H	Wilson (Anatomy) Museum F13
11O	Women's College 7
12H	Women's Sports Association
16S	Women's Studies Centre H53
12E	Woolley Building A20
17D	Yeoman Bedell A14
12C	Zoology A08

UNIVERSITY OF SYDNEY
Main Campus

SIDERE·MENS·EADEM·MUTATO

0   100   200 metres
an approximate scale

THE UNIVERSITY OF SYDNEY FARMS, CAMDEN

KEY

(1) VET FACULTY HORSE UNIT
(2) ANIMAL REPRODUCTION UNIT
(3) PLANT BREEDING INSTITUTE
(4) SYDNEY UNIVERSITY PARK
(5) LANSDOWNE
(6) LANSDOWNE TURF
(7) CORSTORPHINE FARM
    Shute Bldg, Franklin Meat Lab.,
    Nepean Hall, Poultry Research,
    Herringbone Dairy, Farms Library,
    Dairy Research, An. Hlth Piggery.
(8) RURAL VETERINARY CENTRE
(9) DEER UNIT
(10) AGRONOMY RESEARCH UNIT
(11) MAY FARM
    An. Sci. Piggery, Beef Barn
(12) MT HUNTER FARM
(13) TALLIMBA