

# Bachelor of Agriculture

## First-year subjects

### 202-101 Chemistry for Land and Food Resources

**Note:** Students intending to subsequently undertake Chemistry 610-142 must achieve at a high level in the examination component of this subject. They will also be required to complete additional computer-aided learning tasks during the winter break.

**Availability:** Dookie and Parkville campuses. This subject is offered at Parkville in Semester 1 and Dookie in Semester 2.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr John Pilkington

**Contact:** Thirty-six hours of lectures and 36 hours of practicals/tutorials (*Semester 1, repeat 2*).

**Description:** The subject will cover areas including:

- nature of matter: elements, atoms, ions and molecules;
- electronic structure of atoms and ions;
- bond formation including covalent, ionic, metallic, hydrogen bonding, van der Waal's;
- solubility and the solution state; ions and hydration;
- the behaviour of gases;
- the mole concept, concentrations and stoichiometry;
- acids, bases, neutralisation reactions and salt formation;
- acid/base strength and the pH scale;
- energy and chemical systems;
- rates of reaction and reaction order;
- catalysis and enzymes;
- chemical equilibrium: the equilibrium constant,  $K_a$ ,  $K_b$ , stability constants and solubility products;
- redox reactions and redox potentials;
- organic molecules: structure, nomenclature and functional groups;
- hydrophobicity and hydrophilicity;
- and biologically significant macromolecules.

**Assessment:** Three-hour final examination (65%). Three tests during semester (15%). Practical work (20%). Pass in practical component required.

**Recommended texts:** S Zumdahl, *Chemistry, 5th edition*, Houghton Mifflin.

### 202-103 Biology for Land and Food Resources

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Cas McLean

**Contact:** Thirty-six hours lectures, 36 hours of practicals/tutorials (*Semester 1*).

**Description:** The subject introduces students to biological concepts and skills which will form the foundation of other 'biology-based subjects'.

The subject covers areas including:

- cell biology and metabolism: molecules of life - water, organic compounds, ions, polymers (proteins, nucleic acids, polysaccharides), supramolecular structures; organelles, membranes and walls; unicellular and multicellular organisms, cell division, mitosis; cell differentiation and specialisation; diversity and unity of cell structure, prokaryotes and eukaryotes; tissues and organs; major metabolic pathways, primary and secondary metabolism; enzymes; photosynthesis and photorespiration, chloroplasts, respiration, glycolysis, fermentation;
- inheritance: protein synthesis and gene expression; brief description of DNA, RNA, the double helix, recombination and mutation; Mendelian genetics;
- plant structure and function: roots, stems, leaves, meristems, flowers and seeds; plant cells and tissues, anatomical diversity; transpiration and translocation; nutrient uptake; primary and secondary growth;
- animal structure and function: tissues, organs and organ systems; comparative anatomy; homeostasis; nutrient uptake, circulation, gas and fluid exchange; structure of selected invertebrate groups, especially insects; mammalian structures; differences between animal and plant anatomy;
- reproduction and nutrition: heterotrophy and autotrophy; nutrients and nutrient cycling; productivity; gametogenesis - process and structures in plants and animals; fertilisation, seed development, germination, emergence; gestation, embryo development, parturition, hatching; life cycles; animal growth (briefly);

- introduction to biodiversity and evolution: populations, communities and ecosystems; adaptation; phylogeny and evolution (brief introduction only);
- practicals: will emphasise the handling and identification of biological material and the use of microscopes and other instruments.

**Assessment:** Mid-semester examination (10%), final examination (70%), practicals (20%). Pass in practical component required.

**Recommended texts:** R B Knox, P Y Ladiges B K Evans and R Saint, *Biology*, McGraw Hill, 2001.

### 202-104 Information Technology and Communication

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Nick Bailey

**Contact:** Thirty-six hours lectures, 36 hours practicals/tutorials (*Semester 1*).

**Description:** This subject will engage students in a high level of interactive learning, often using group collaborative learning tasks.

On completion of this subject, students should:

- have a working knowledge of, and basic competence in the use of, tools for communication and for accessing and managing information, particularly electronic and web-based technologies;
- understand the principles of effective communication at different levels (one-on-one, small group, large group etc.) and to audiences from different backgrounds and with different interests;
- have experience in written and oral communication to a range of audiences and be competent in both forms of communication, and also have experience in inter- and intra-team communication using electronic and web-based communication tools;
- have developed problem-solving and critical thinking skills to a level that will serve as a platform for further development of these capabilities throughout the course;
- understand group dynamics, and the factors that lead to effective team work.

**Assessment:** Referenced abstract (20%), oral presentation (20%), three software projects (15% each), assessed team processes (15%)

**Prescribed texts:** J Dwyer, *The Business Communication Handbook*, Prentice Hall, 2000. • G Courter and A Marquis, *Mastering Microsoft Office 2000 Professional Edition*, Sybex, 1999.

### 202-106 Land Resources

**Availability:** Burnley and Dookie campuses. This subject is offered at Dookie in Semester 1 and Burnley in Semester 2.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Robert Edis

**Contact:** Thirty-six hours lectures, 36 hours practicals (*Semester 1, repeat 2*).

**Description:** This subject will focus on the nature of land resources and the processes of landscape evolution. Topics will include introductions to Australian geology, soils, climate and weather, ecosystems, water resources, catchment management and human impacts on the environment. It will demonstrate how science can be applied to evaluating and managing ecosystems, and to maintaining and improving the productivity of land resource-based industries

On completion of this subject, students should be able to apply the principles developed in relation to major land systems in Australia and globally. They should also understand the application of various important practices in the management of land resources at different scales, and the adverse impacts of mismanagement of such systems.

**Assessment:** 3-hour examination (50% of final marks), one major assignment (small groups with individual responsibilities for members) of 3000 words (25% of final marks) and four minor assignments (25% of final marks) based upon field, laboratory and problem based learning exercises.

### 202-107 Mathematics for Land and Food Resources

**Note:** Students with a score of 25 or above in VCE Mathematics Methods or equivalent will not normally be permitted to enrol in this subject for credit.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr John Pilkington & Ms Karen Baker

**Prerequisites:** Mathematics as a final-year subject at school or 202-250 Quantitative Skills for Land and Food Resources or equivalent.

**Contact:** Thirty-six hours of lectures, 36 hours of tutorials/workshops (*Semester 1*).

**Description:** Students should develop:

- mathematical knowledge and skills which are applicable to and provide a foundation for other Land and Food Resources subjects, including chemistry, biology, statistics and economics;

- the ability to apply mathematical knowledge and skills to analyse, investigate, model and solve problems in a variety of situations, ranging from well-defined and familiar situations to unfamiliar and open-ended situations.
- Course content will be set within the context of relevant examples. Technology will be used as an effective support for mathematical activity.

Topic areas include:

- Algebra: polynomials of up to and including degree 3, linear factors, factor theorem, remainder theorem, quadratic and cubic equations, transposition of formulae;
- Functions: trigonometric, exponential and logarithmic functions and graphs, including transformations; composite and inverse functions; solution of equations involving transcendental functions;
- Calculus: derivatives, product, quotient and chain rules for differentiation; integration of simple functions; applications of differentiation and integration including rates of change, related rates and simple differential equations;
- Sequences and series and applications;
- Probability and statistics: elementary probability; random variables, mean and variance; binomial and normal distributions; introductory statistical modelling, inference for population means, linear regression.

**Assessment:** One 3-hour examination, up to 24 pages of written assignments throughout semester and up to 1.5 hours of tests throughout semester.

**Prescribed texts:** S.Tan, *College Mathematics, 5th ed*, Brooks/Cole 2002.

### 207-101 Economics of Resource Use

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Ms Ros Gall

**Contact:** Thirty-six hours lectures, 36 hours tutorials (*Semester 2, repeat Summer*).

**Description:** Students of agriculture, forestry, viticulture and horticulture require an understanding of the fundamental economic forces that effect markets for both the inputs and outputs in the system in which they operate. In particular, students need to be made aware that the management of the land and water resources has economic consequences. This is evident when such issues as salinity (an externality) and land degradation arise. Further, the links between the wider economic forces and the success of ventures in resource industries are indisputable. Recently commodity markets have been examined as part of the regularly occurring rounds of international trading agreements. The changes that have occurred in response to these agreements made under the World Trade Organisation, for both the domestic and international economies, have been far reaching for all participants in the markets. The information provided in this subject would ensure that students understand and can apply the economic concepts of supply and demand to issues of policy and trade analysis and of resource use.

**Assessment:** A 3-hour examination (60%), an assignment equivalent to 2000 words (20%) and two class tests (each worth 10%).

**Prescribed texts:** D McTaggart et al, *Economics*, Addison-Wesley, 1996. • W D Seitz, G C Nelson and H G Halcrow, *Agriculture and Food, Economics of Resources*, 2nd edition, McGraw-Hill, 1994.

### 208-109 Australian Agricultural Production Sys

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** A/Prof B Malcolm and Dr S Hamilton

**Contact:** Thirty-six hours of lectures and 36 hours of demonstration and practical work, including full-day tours (*Semester 1*).

**Description:** The aim of this subject is to provide students with a range of knowledge, practical experiences and observations of the main agricultural industries land users of south-eastern Australia. It is expected that on the completion of this subject students should have gained a practical understanding of the management operations and options of the production cycle and be conversant with the limitations, constraints and impacts which influence them. Importantly, an insight into the landholder perspective of these industries will be gained. The place of agriculture in rural communities and factors affecting sustainability will be explored.

Topics covered include:

- the history and development of Australian agriculture;
- the annual cycle of production of the major agricultural industries in south-eastern Australia;
- the sustainability of these industries from economic, social, environmental and system-wide perspectives.

**Assessment:** A 3-hour written examination (60%), a 3000-word assignment (20%), and a 2000-word assignment (20%).

## Second-year subjects

### 202-201 Plant Function

**Availability:** Creswick, Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Marc Nicolas

**Prerequisites:** 202-101 Chemistry for Land and Food Resources, 202-103 Biology for Land and Food Resources.

**Corequisites:** 202-202 Experimental Design/Statistical Methods

**Contact:** Twenty-four hours lectures, 36 hours practicals/tutorials (*Semester 1*).

**Description:** Plant Function is a functional approach to the question 'How do plants work?' and is delivered with an integrative, production-oriented approach. It is organised around three themes:

- biomass acquisition
- biomass allocation
- environmental physiology: limitations to productivity.

Common content will include:

- radiation, energy budgets and transfer, photosynthesis, photorespiration;
- water use, uptake and transpiration, xylem flow, stomatal control;
- biomass assimilation, translocation and storage, respiration, phloem;
- root growth and function, nutrients and nutrient uptake, nitrogen fixation;
- plant vegetative development, production of flowers and fruit, seed dormancy and germination;
- abiotic factors affecting growth and productivity (deficiency or excess): light, temperature, nutrients, water, biotic factors affecting growth and productivity, secondary metabolism.

and will be augmented by stream-specific content, including:

- crops (leaf area development, canopy light interception, dry matter partitioning);
- horticulture (plant selection, environmental modification, plant hormones);
- forestry (lignin, water relations of trees, nutrient deficiencies in pines and eucalypts);
- animals (inherent qualities of plants as food and feed, changes from manipulation).

Practicals will cover topics in plant physiology, give skills in basic plant handling, field and greenhouse experimentation, and measurement and statistical analysis of populations of plants.

**Assessment:** A three-hour exam (50%) and two assignments equivalent to 3000 words (each worth 25%).

### 202-202 Experimental Design/Statistical Methods

**Availability:** Burnley, Creswick, Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Graham Hepworth

**Prerequisites:** 620-081 Preliminary Mathematics A or 202-107 Mathematics for Land and Food Resources or VCE Mathematics Methods or equivalent.

**Contact:** Twenty-four hours lectures; 36 hours practicals (*Semester 1, repeat Summer*).

**Description:** Upon completion of the subject, students should be able to:

- recognise, understand and apply the basic concepts of study design, such as observational studies versus designed experiments, confounding, replication, randomisation, and blocking, and discuss the effect of the design concepts on the interpretation of results;
- recognise and apply basic study designs like completely randomised one and two factor and randomised block designs;
- make and interpret appropriate graphs and tables for data from one and two factor designs;
- display an understanding of the basics of statistical models such as predictions, residuals, parameters, estimation, and the normal distribution;
- formulate models for simple one and two factor designs, including interaction, and interpret them in terms of the data;
- state the assumptions of simple models and use the data and residuals to check these assumptions;
- and display an understanding of the purpose and limitation of inference, and be able to use the main tools of inference to learn about data.

Topics include:

- one- and two-way ANOVA, simple linear and multiple regression, t-tests, confidence intervals and multiple comparisons;
- use of the statistics package Minitab to carry out the analyses described above; and

- the interpretation of output in terms of the agricultural context.

**Assessment:** A three-hour examination (60%), a mid-semester open-book test of one hour (20%) and three assignments totalling 30 pages (20%).

### 202-203 Soil and Water Resources

**Availability:** Burnley, Dookie and Creswick campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Robert White

**Prerequisites:** 202-101 Chemistry for Land and Food Resources, 202-106 Land Resources.

**Contact:** Twenty-four hours lectures, 36 hours practicals (*Semester 2*).

**Description:** This subject will identify the importance of soil and water in the landscape and as key components of ecosystems, both natural ecosystems and production systems. A basic knowledge of soil properties and behaviour will be applied to understanding the cycling of water and nutrients, the appropriate use of fertilisers, irrigation and drainage, and soil management practices designed to maintain soil and water resources in good condition. The origin of soil variation in the landscape and codification of soil information through classification will be introduced.

The subject will cover areas including:

- the origins of soil variability and how this variability is expressed through the properties and behaviour of soils in the field (builds on the 100-level subject Land Resources);
- soil profile description; an introduction to soil classification (the Australian Soil Classification);
- the physical and chemical nature of soil minerals and organic matter; the main soil organisms and their function; reactions in the soil solution and between the solution and surfaces;
- soil structure, aeration, water retention and movement, availability of water to plants and effects of waterlogging;
- introduction to nutrient cycling and its importance in natural ecosystems and production systems (agriculture, horticulture and forestry); emphasis on N, P, K and S; use of fertilisers and other soil amendments to correct nutritional problems;
- the hydrological cycle, with emphasis on the major processes - precipitation, evaporation, runoff and drainage; catchment processes and water management at the farm scale, including irrigation. Examples of water balances at large (basin) and small (farm) scales;
- land degradation processes and their management - accelerated soil acidification, sodicity, salinity and erosion; understanding the processes and the extent of the problems; remedial measures;
- and the impact of soil management on water quality, especially with respect to nutrients and salts.

**Assessment:** Three-hour examination (50%) and two assignments equivalent to 3000 words (each worth 25%).

**Recommended texts:** R E White, *Principles and Practice of Soil Science*, 3rd edn, Blackwell Science, 1997.

### 208-210 Financial Management for Resource Ind I

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Assoc Prof Bill Malcolm

**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

**Contact:** Twenty-four hours lectures, 36 hours practicals (*Semester 2*).

**Description:** The aim of this subject is for students of agricultural science and agricultural economics to understand the principles of management economics applied to the operation of agricultural business, be able to analyse investment and profitability of resource use in agricultural businesses, and evaluate business marketing strategies.

The content of the subject is as follows:

- management;
- financial management;
- profit, cash flows and business structure;
- activity analysis;
- budgeting;
- investment analysis;
- risk management; and
- futures markets.

A number of case studies will be completed.

**Assessment:** A three-hour end-of-semester written examination and case study assignments.

**Recommended texts:** L R Malcolm and J P Makeham, *The Farming Game Now*, CUP, 1992.

## Third-year subjects

### 202-001 Industry Placement#

**Note:** This subject is a hurdle requirement for completion of the Bachelor of Agriculture, Bachelor of Applied Science (Food Technology), Bachelor of Animal Science and Management, Bachelor of Food Science, Bachelor of Forestry, Bachelor of Horticulture, Bachelor of Resource Management, and the combined degrees.

**Availability:** Burnley, Creswick, Dookie and Parkville campuses.

**HECS-band:** 2

**Coordinator:** Assoc Prof Bill Malcolm

**Contact:** At least 12 weeks practical experience in an industry workplace (16 weeks for BFor students), arranged by the student in consultation with the campus coordinator. This must include two placements of at least four weeks duration, unless a variation is negotiated. Students may also be required to complete formal training in workplace occupational health and safety, risk assessment, and practical skills acquisition, delivered in block courses (*Year long*).

**Description:** Work experience is a feature of all ILFR degree and advanced diploma courses. On completion of Industry Placement, students should have:

- direct experience of employment and of employer-employee relationships in a range of workplaces in the relevant land and food industries;
- improved inter-personal and vocational skills;
- broader understanding of the diversity of workplaces and professional roles in the relevant land and food industries;
- greater appreciation of the practical application of the content taught during their course;
- and improved practical skills relevant to the management and operation of businesses in the land and food industries.

Industry placements may be undertaken in a range of businesses in the relevant land and food industries. These include commercial farm, horticulture or forest operations, service industries including financial institutions, government departments and agencies, research and development organisations, processing and marketing companies. Students are responsible for organising their own placement, but will be assisted if requested and will be assigned a supervisor for the subject. Formal training in workplace occupational health and safety, risk assessment, and practical skills may be provided in block courses to give students an appreciation of safe working practices.

**Assessment:** A written report (1000 words) is submitted on one period of industry placement and is marked as pass/fail only. A journal must be kept for all placements and be made available for review by the campus coordinator. Host employers will complete evaluation forms assessing the standards of performance and participation achieved by students while on placement.

### 202-301 Industry Project

**Availability:** Burnley, Dookie and Parkville campuses.

**Credit points:** 25

**HECS-band:** 2

**Coordinator:** Dr Steve Read

**Prerequisites:** Completion of 1st and 2nd year of degree, or equivalent.

**Contact:** Twelve hours of lectures, plus weekly class contact and seminars as arranged (*Year long*).

**Description:** This subject involves definition and development of an industry-related project, and develops skills in project management, problem solving and planning and reporting investigations. The topic involves or draws on a planned period of time spent in the workplace or in industry placement, and may be developed in relation to previously or concurrently selected elective subjects, applying the knowledge gained in these subjects to a real resource-based industry investigative problem. The project may address an applied scientific, economic or sociological or managerial topic, and the work will involve close collaboration between student, academic and industry advisers.

Students work interactively with subject coordinators and the class to define their particular project. Each student prepares a short oral presentation on the project proposal, followed by a 5-8 page written proposal that also covers the relevant background. Project execution involves establishing base knowledge in the relevant area; quantification of aspects of the problem; development of suitable investigative strategies and methodologies; and analysis of results or outcomes in a practical context. Students meet weekly as a group (or electronically for those in the workplace) for guided, interactive discussion on their projects. A longer oral presentation is presented at completion, to an audience including institute and industry staff.

Students are also required to attend a series of seminars delivered across the institute on project design, management and communication strategies, including case studies.

**Assessment:** Oral presentation of project proposal (10%), written project proposal (20%), individual written thesis of 5000-10 000 words (50%), final oral presentation (20%).

**202-302 Human Resource Management****Availability:** Dookie and Parkville campuses.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Ms Ros Gall**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.**Contact:** Twenty-four hours lectures and 36 hours practicals (*Semester 1*).**Description:** At the end of this subject the student should be able to demonstrate that they understand:

- the functions of leadership and management including the human resource management role of managers;
- the sources of power and authority in organisations;
- the social responsibilities of organisations;
- key management theories and their application to the management of organisations;
- the organisation of the workplace in terms of organisational structures and job design;
- and perform human resource management functions including human resource planning, job analysis, recruitment and selection, staff remuneration, performance appraisal;
- the industrial relations framework;
- and apply models that improve organisational effectiveness with specific reference to change management; groups and teams; motivation and job satisfaction and conflict management.

The subject covers areas of:

- functions of management and leadership;
- management theories and philosophies;
- power and authority in organisations;
- social responsibility of organisations;
- organising the workplace (organisational structures and job design);
- the strategic and operational role of human resource management - human resource planning - job analysis and design - recruitment and selection - staff remuneration - performance appraisal, development and training;
- improving organisational effectiveness;
- change management;
- groups and teams;
- motivation and job satisfaction;
- conflict management; and
- overview of the Australian Industrial Relations framework.

**Assessment:** One three-hour exam (60%) and two assignments equivalent to 3000 words (each worth 20%).**Prescribed texts:** Robbins, Bergman and Stagg, *Management*, Prentice Hall, Sydney, 1997.**202-303 Industry Project****Availability:** Burnley, Dookie and Parkville campuses.**Credit points:** 25**HECS-band:** 2**Coordinator:** Dr Steve Read**Prerequisites:** Completion of 1st and 2nd year of degree, or equivalent.**Contact:** Twelve hours of lectures, plus weekly class contact and seminars as arranged (*Semester 1, repeat 2*).

**Description:** This subject involves definition and development of an industry-related project, and develops skills in project management, problem-solving and planning and reporting investigations. The topic involves or draws on a planned period of time spent in the workplace or in industry placement, and may be developed in relation to previously or concurrently selected elective subjects, applying the knowledge gained in these subjects to a real resource-based industry investigative problem. The project may address an applied scientific, economic or sociological or managerial topic, and the work will involve close collaboration between student, academic and industry advisers. Students work interactively with subject coordinators and the class to define their particular project. Each student prepares a short oral presentation on the project proposal, followed by a 5-8 page written proposal that also covers the relevant background. Project execution involves establishing base knowledge in the relevant area; quantification of aspects of the problem; development of suitable investigative strategies and methodologies; and analysis of results or outcomes in a practical context. Students meet weekly as a group (or electronically for those in the workplace) for guided, interactive discussion on their projects. A longer oral presentation is presented at completion, to an audience including institute and industry staff.

Students are also required to attend a series of seminars delivered across the institute on project design, management and communication strategies, including case studies.

**Assessment:** Oral presentation of project proposal (10%), written project proposal (20%), individual written thesis of 5000-10 000 words (50%), final oral presentation (20%).

**Fourth year subjects****202-401 Industry/Research Project****Availability:** Burnley, Creswick, Dookie and Parkville campuses.**Credit points:** 50**HECS-band:** 2**Coordinator:** Professor R Richardson**Prerequisites:** Eligibility for honours degree.**Contact:** Twelve hours of lectures, plus supervisor contact and seminars as arranged (*Year long*).

**Description:** This industry-based research honours project develops a student's ability to design and undertake a substantial body of work, to find solutions to a particular industry or discipline issue, and to report on this in written and verbal form. The project topic is developed in close collaboration between student, academic and industry advisers. Project definition is completed two weeks after commencement of the semester of enrolment in the subject, and requires approval from the subject coordinator based on input from academic and industry advisers, taking into account the student's preparation through previous selection of elective or stream subjects.

Students registered in the subject will attend a series of lectures delivered throughout the institute on research methodology, statistics and data analysis. Logistic assistance for projects is coordinated on a case-by-case basis.

Each student prepares a short oral presentation on their project proposal, which is peer-reviewed, as well as a written proposal (5-8 pages) to be assessed by academic and industry advisers. A more detailed oral presentation is presented on the final results of the project to an audience of Institute and industry staff.

**Assessment:** Written project proposal (10%), thesis of 10 000-15 000 words (75%), final oral presentation (15%).

**202-402 Industry/Research Project****Credit points:** 50**HECS-band:** 2**Coordinator:** Professor R Richardson**Prerequisites:** Eligibility for honours degree.**Contact:** Twelve hours of lectures, plus supervisor contact and seminars as arranged (*Semester 1, repeat 2*).

**Description:** This industry-based research honours project develops a student's ability to design and undertake a substantial body of work, to find solutions to a particular industry or discipline issue, and to report on this in written and verbal form. The project topic is developed in close collaboration between student, academic and industry advisers. Project definition is completed two weeks after commencement of the semester of enrolment in the subject, and requires approval from the subject coordinator based on input from academic and industry advisers, taking into account the student's preparation through previous selection of elective or stream subjects.

Students registered in the subject will attend a series of lectures delivered throughout the institute on research methodology, statistics and data analysis. Logistic assistance for projects is coordinated on a case-by-case basis.

Each student prepares a short oral presentation on their project proposal, which is peer-reviewed, as well as a written proposal (5-8 pages) to be assessed by academic and industry advisers. A more detailed oral presentation is presented on the final results of the project to an audience of Institute and industry staff.

**Assessment:** Written project proposal (10%), thesis of 10 000-15 000 words (75%), final oral presentation (15%).

**Elective subjects**

Note: Insufficient enrolments may lead to a subject being suspended.

**208-101 Farm Animal Biology****Availability:** Dookie and Parkville campuses.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Mr Chris Laird and Dr Brian Leury**Prerequisites:** 202-103 Biology for Land and Food Resources.**Contact:** Thirty-six hours lectures, 36 hours of practicals (*Semester 2*).**Description:** On completion of this subject students should:

- understand the basic anatomy of the major domestic and agricultural animal species and the principal functions of the major organs and tissues;
- understand how and what products are harvested from farm animals and how manipulating animal form and function can alter animal production;

- understand animal behaviour, factors modifying its expression and the influence of behaviour on animal production as well as the implications for animal welfare;
- be able to analyse how the environment and genetics influence animal performance and the quality of products harvested;
- and appreciate the importance of animal health in animal production systems and that disease usually has animal management as a component of its occurrence, prevention and treatment.

**Assessment:** A three-hour written examination at the end of semester (70%), practical work (20%) and tutorial work (10%).

**Recommended texts:** W Bruce Currie, *Structure and Function of Domestic Animals*, CRC Press Inc., 1995.

### 208-102 Field Engineering

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Roger Wrigley

**Contact:** Four hours lectures and two hours tutorials (per week) (*Semester 2*).

**Description:** The objectives of this subject are to help students apply basic engineering principles to the investigation, design and management of:

- irrigation systems;
- hydraulic networks;
- agricultural and horticultural machinery and implements;
- farm structures and buildings;
- landscape modifications;
- farmstead planning and farm layout;
- and rural enterprise establishment and development.

The content includes:

- units and measurement;
- environmental measurement;
- surveying;
- hydraulics, fluid mechanics and hydrology;
- principles of traction;
- agricultural and horticultural machinery;
- strength of materials and structures;
- buildings and environmental control;
- occupational health and safety;
- project management and project planning; and
- CAD/CAM.

**Assessment:** A three-hour examination (60%), and four practical/tutorial reports (40%).

### 208-105 Field Skills

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Semester:** Semester 2

**Description:** This subject includes familiarising/extending knowledge of farm enterprise cycles, farm routines, farm safety, farm equipment and correct use, daily activity planning, livestock handling, farm recording; and an introduction to additional field soil, crop and livestock measurements, sampling, recording and data analysis.

By completion of the subject, student should have:

- a basic understanding of cropping and livestock farm enterprises;
- key basic skills relating to technical management practices;
- awareness of personal and co-worker health and safety matters related to enterprise practices;
- awareness of major environmental and animal welfare issues related to respective enterprises;
- and basic skills in some objective measurement and sampling methods, recording and analysing data and reporting.

**Assessment:** This is a hands-on subject with ongoing assessment of student performance. Progressive assessment will be conducted at each practical session. Marks will be allocated with equal weighting for participation, skills aptitude, and safety appreciation. In addition, students will be required to successfully complete a tractor safety and driving test, and first aid, OH&S, and farm chemicals user courses.

### 208-107 Vineyard & Winery Ops for Quality WP I

**Note:** Prior to the residential school, students receive a printed subject guide, subject notes (taking the place of face-to-face lectures) and a practical book. In the subject guide, students receive a planner outlining the work that must be completed on a weekly basis throughout the semester. Two assignments

are completed at different times during semester, one related to viticulture and one to oenology.

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Geoff Bath

**Contact:** Flexible delivery with a one-week residential school at Dookie Campus in the week prior to the commencement of Semester 2 that includes practical sessions in the campus vineyard, winery, laboratory and tasting rooms (*Semester 2*).

**Description:** The subject Vineyard and Winery Operations for Quality Wine Production I is the first of two units that provide students with the basic knowledge of management strategies to maximise the quality and yield of grapevines along with a basic knowledge of the principles and practices of wine production.

On completion of the viticulture component of the subject students should be able to:

- explain the commercial influences on vineyard establishment and operation;
- describe major weather differences;
- evaluate the suitability of different cultivars for different purposes and locations; and
- demonstrate the skills and knowledge associated with a number of winter and spring vineyard operations.

Oenology components of the subject are:

- the characteristics of white and red wine cultivars;
- principles and practices involved in production of various wine styles;
- post-fermentation treatments associated with wine production; and
- evaluation of wine styles and flavour characteristics using basic sensory processes.

**Assessment:** Examination (3-hour 40%), two assignments (each 2000 words and 20%), practical reports (20%).

### 600-142 Genetics & The Evolution of Life

See full subject details on page 1.

### 610-142 Chemistry

See full subject details on page 2.

### 207-201 Resource Industry Economics

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Brian Davidson

**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

**Contact:** Twenty-four hours of lectures and 24 hours of tutorials/practicals (*Semester 2*).

**Description:** At the end of the course students should be able to:

- understand basic economic concepts applied to problems of resource use and conservation;
- understand the issues associated with public versus private ownership of resources;
- apply economic tools (eg. benefit-cost analysis) to the analysis of decisions about resource use and conservation.

The material will be applied in the context of resource issues of concern across agriculture, forestry and horticulture such as:

- alternate land uses;
- harvesting timber;
- water allocation pricing and policy;
- soil and flora conservation; and
- pollution and environmental degradation;

Students will learn to apply the following concepts and methods to issues of resource use:

- introductory benefit/cost analysis;
- social welfare - consumer surplus, producer surplus, social welfare;
- willingness to pay - measuring in actual situations;
- market failure - definition, dynamic, renewable and non-renewable resources;
- externalities - measurement of the magnitude and inclusion in empirical analysis; and
- implications of property rights/public goods for decision making.

Stream specific tutorial work is to be used.

**Assessment:** A three-hour exam (60%), a written assignment of 3000 words (20%) and two class tests (10% each).

**Prescribed texts:** J Sinden, and D Thamapapillai, *Introduction to Benefit Cost Analysis*, 1995. • J R Kahn, *The Economic Approach to Environmental and Natural Resources*, Dryden Press, 1998.

### 208-201 Comparative Nutrition

**Note:** This subject involves the use of animals in experiments. Students should be aware that these experiments are an essential part of the course and exemption from this component is not possible.

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Adrian Egan

**Prerequisites:** 202-101 Chemistry for Land and Food Resources, 202-103 Biology for Land and Food Resources.

**Contact:** Twenty-four hours lectures, 12 hours tutorials and 36 hours of practical work, with computer-aided learning enhancement (*Semester 1*).

**Description:** At the end of the subject the students should be able to;

- understand the physiological and metabolic basis of nutritional requirements;
- understand the nutritional qualities of particular classes of feedstuffs;
- understand the principles of feed evaluation and ration formulation;
- be familiar with principles and practices in diagnosis of nutritional inadequacies and nutrition-related diseases;
- be familiar with commonly used computer-based nutritional models;
- have used simulation models in solving nutritional problems;
- be able to formulate rations for particular classes of animal; and
- be able to formulate supplements for animals under specified nutritional circumstances.

An understanding of basic nutrition is a prerequisite for subsequent courses in the animal sciences stream and enables the student to appreciate (a) the significance to animal production of many other subjects in the course and (b) the nutritional quality criteria in production and processing of human foods and animal feeds.

Content includes:

- nutrition and energy metabolism basic nutritional and bioenergetic concepts;
- the nutrients, their chemical and physical properties, digestion, metabolism, and metabolic roles and interactions; their supply and availability in feedstuffs;
- nutritional requirements of animals;
- the central role in animal production of efficiency of conversion of feeds to desired products;
- food resources: identification and utilisation in meeting nutritional needs of domestic animals and humans; and
- basic ration formulation and problem solving in nutrition.

**Assessment:** Three-hour examination (40%) and three practical assignments equivalent to 2500 words (each worth 20%).

**Prescribed texts:** McDonald, Edwards, Greenhalgh and Morgan, *Animal Nutrition*, 5th edition, Longman Scientific, Harlow.

### 208-202 Animal Physiology

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Brian Leury

**Prerequisites:** 208-101 Farm Animal Biology.

**Contact:** Twenty-four hours lectures, 36 hours practicals (*Semester 1*).

**Description:** On completion of the program should have;

- the working knowledge of structure and normal physiological function of domestic animals;
- the terminology and basic principles of structure and function in animals;
- functions of different cell types and their interactions in organs and tissues;
- mechanisms by which organ systems are controlled and functions coordinated;
- the physiology of the nervous system, of digestion, circulation, respiration, and excretion;
- the processes of growth, reproduction and lactation; and
- differences in animal performance relating to physiological factors.

The content of the subject includes;

- cell physiology, molecules and membranes;
- nervous system and information transfer;

- muscle function;
- lymphocytes and the immune system;
- physiology of cardiovascular, gastro-intestinal, renal, respiratory and reproductive systems;
- endocrine system; and
- lactation; growth and development.

**Assessment:** Three-hour examination (50%) and two assignments equivalent to 3000 words (each worth 25%).

**Prescribed texts:** R D Frandson, *Anatomy and Physiology of Farm Animals*, 5th edn, 1992. • L Sherwood, *Human Physiology from Cells to Systems*, 2nd edn, 1993. • J G Cunningham, *Textbook of Veterinary Physiology*, 1992. • W Bruce Currie, *Structure and Function of Domestic Animals*, Butterworths, 1998.

### 208-203 Ecology & Management of Grazing Systems

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof David Chapman

**Corequisites:** 202-201 Plant Function.

**Contact:** Twenty-four hours lectures, 36 hours practicals/tutorial sessions (*Semester 1*).

**Description:** On completion of this subject, students should;

- understand the basic ecology and agronomy of pasture communities and the factors that influence yield of a grazed pasture;
- know the principles underlying efficient pasture and grazing management, and the practices required for sustainable production from grazing systems;
- appreciate the importance of seasonality in pasture production, and its consequences for the management of grazing systems;
- have experience in using the practical tools and skills required for the efficient management of grazing systems; and
- be able to solve problems in the management of grazing systems.

The subject will include;

- analysis of Australia's pasture and grassland resources;
- pasture plant form and function, including basic plant growth processes;
- the population biology of pasture plants, including the growth cycles of annual and perennial plants, and pathways of plant survival;
- the major pasture plant species and pasture types, their agronomic and adaptive characteristics and management requirements;
- interactions between plants and their environment, and between plants and animals and their effects on the productivity and botanical composition of pastures;
- the feeding and nutritive value of pastures and factors affecting animal intake;
- pasture improvement principles and practices;
- matching feed supply and demand for efficient animal production including the use of feed planning tools;
- the principles and practices of grazing management; and
- optimising pasture production and utilization in seasonal production systems.

**Assessment:** Three-hour exam (60%) and practical assignments to be completed using interactive multimedia (totalling 40%).

### 208-205 Australia in the Wine World

**Note:** Prior to the 1-week block, students receive a printed subject guide, subject notes, a reader and a practical book. The examination is held on the last afternoon of the 1-week block, and the assignment is due three weeks after the 1-week block.

**Availability:** Dookie and Parkville campuses

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Snow Barlow

**Contact:** One-week block in February. Students are required to undertake some reading prior to attending the block and complete a major assignment following the block (*Summer semester*).

**Description:** The objective of this subject is to introduce students to the Australian wine industry and its role in world wine production.

The content includes:

- evolution of the grapevine;
- history of viticulture and winemaking;
- main grape varieties of the world and their distribution;
- chemistry of winemaking;
- wine tasting;
- appellation and the culture of wine;

- world wine regions including France and Germany, Spain Portugal and Italy, North America, South America, South Africa, New Zealand and Australia;
- Australian wine regions and production;
- the global wine trade and Australia's export markets; and
- wine, food, health and culture.

**Assessment:** Examination (3-hour, 40%), assignment (4000 words, 40%), practical reports (20%).

### 208-206 Vineyard & Winery Ops for Quality WP II

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Geoff Bath

**Contact:** Subject is offered by flexible delivery. Prior to the residential school, students receive a printed subject guide, subject notes (these take the place of face-to-face lectures) and a practical book. Students attend a one-week residential school at Dookie Campus in the week prior to the commencement of Semester 1. Practical sessions in the campus vineyard, winery, laboratory and tasting rooms are undertaken during the residential school. In the subject guide, students receive a planner outlining the work that must be completed on a weekly basis throughout the semester (*Semester 1*).

**Description:** The subject Vineyard and Winery Operations for Quality Wine Production II is the second of two units that provides students with the basic knowledge and skills to prepare management strategies to maximise the quality and yield of grapevines along with a basic knowledge of the principles and practices of wine production.

The subject introduces students to grape handling and fermentation. Evaluation of wine, styles and flavour characteristics are refined using basic sensory processes.

On completion of the subject students should be able to:

- demonstrate the skills and knowledge associated with a number of summer and autumn vineyard operations; and
- propose management options for improving grape quality.

**Assessment:** Examination (3-hour, 40%), assignments (2 x 2000 words, 40%), practicals (20%). Two assignments are to be completed during the semester, one on viticulture, one on oenology, due at different times in the semester and returned to students prior to the final examination.

### 208-207 Animal Management and Production I

**Note:** This subject involves the use of animals. Students should be aware that this is an essential part of the subject and exemption from this component is not possible.

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Professor Adrian Egan

**Semester:** Semester 2

**Description:** On completion of this subject, students should be:

- aware of all the major inputs into an animal production system;
- aware of the products of animal production systems and product quality;
- able to understand the effects of changes in inputs and/or outputs on the efficiency of the production system;
- capable of the basic analysis of a production system;
- aware of alternative production systems; and
- capable of surveying an animal industry.

The course provides a review of the major animal production industries of Australia and includes a basic introduction to the following key issues in live-stock production systems:

- the size, distribution and value of each animal industry;
- breed selection and genetic improvement;
- practical feeding of breeding and growing animals;
- optimisation of reproductive output;
- environmental effects and use of buildings;
- management regimes to maintain animal health;
- maximisation of product quality;
- production system analysis and consideration of alternatives;
- and marketing and markets.

**Assessment:** One three-hour exam (50%) and two assignments equivalent to 3000 words (each worth 25%).

### 208-208 Crop Production

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Marc Nicolas

**Semester:** Semester 2

**Description:** This subject includes:

- an appraisal of the cropping enterprises in southern Australia - the location, scale and nature of cropping enterprises and their contribution to the national economy;
- growth, development and yield in crop production - definitions and relations between growth and development attributes, yield and yield components, measurement of crop yields, biological and economical yield and harvest index (complemented by field exercises);
- environmental constraints limiting productivity - climate and growing season, water and nutrient availability;
- agronomic management to optimise production and product quality, including water and nutrient management, soil management and rotations;
- nutrient cycling; and
- problems and prospects of both dryland and irrigated crop production within farm systems, comparative cost-return analysis, marketing strategies.

**Assessment:** Three-hour examination (50%), a practical test (10%) and two assignments equivalent to 2500 words (each worth 20%).

### 208-212 Agribusiness Marketing

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Ms Ros Gall

**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

**Contact:** Block mode over one week in the mid-semester break, with subsequent in-semester reading and assessment (*Semester 2, repeat Summer*).

**Description:** This subject approaches agribusiness marketing by ensuring students are familiar with the relationship of the Australian agribusiness sector with the global environment, and the importance of these relationships and international trade to the sector and the economy. Students thus develop an understanding of the complex system required to supply food products to the final consumer. Building on economic concepts, this subject introduces students to the economic importance of marketing activities.

The subject includes:

- the evolution of marketing and its impact on the marketing of agricultural products (from commodity marketing to branded product);
- basic marketing concepts of price, promotion, place and product, with marketing developed as the physical distribution and economic link between producers and consumers;
- the potential of marketing to add value by providing form, place, time and possession utility;
- environmental analysis of the factors, both internal and external, that impact on the success of the agribusiness firm;
- marketing channels, including the factors contributing to marketing efficiency, an awareness of the alternative channels for marketing food and fibre products, and the impact of power relationships in the agribusiness channel;
- the importance of quality and grading/classification to agricultural marketing;
- analysis of consumer needs as well as consumer and industrial buyer behaviour in food marketing; and
- contemporary issues in marketing of Australia's major food and fibre products, including food safety, genetically modified foods, and ethically and socially responsible production and marketing.

**Assessment:** A three-hour examination (60%), and two assignments equivalent to 3000 words (each worth 20%).

**Prescribed texts:** D J Schaffner, W R Schroder, and M D Earle, *Food Marketing: An International Perspective*, McGraw-Hill, 1998.

### 202-304 Resource Mgt & Agric Systems Analysis

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof David Chapman

**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

**Contact:** Thirty-six hours of lectures/tutorials, and up to 36 hours practical work (*Semester 2*).

**Description:** On completion of this subject, students should have gained:

- a basic understanding of systems theory and practice;
- experience in practical situation analysis and skills in problem solving, in 'real world' settings;

- recognition of the importance of adult learning and decision-making processes in the management of agricultural businesses and natural resources;
- an understanding of the way technology is adopted in the management of agricultural businesses and natural resources
- experience in the use of systems analysis tools;
- the opportunity to apply knowledge gained earlier in their course to the solution of practical problems; and
- a broader range of communication skills.

Students will carry out up to six case study analyses during the semester. Each case study addresses an aspect of systems analysis and management, and is based on a commercial farm or resource management business. Case study analysis will require students to clearly identify the problem to be solved and the context for problem solving (including business and personal goals of the owners and their approach to management and decision making), analyse options for solving the problems and meeting goals, and communicate their findings to the 'client'. Case study visits are supplemented by lectures and tutorials that develop the theory and practice of systems analysis and thinking. The subject integrates traditional biophysical science disciplines, economics, and human systems elements. It is designed to enable students to work effectively with the owners and managers of resource management and agricultural businesses in bringing about change in their business.

**Assessment:** Up to six case study reports, two-thirds of which may be prepared in groups with reports of approximately 1000 words (collectively 40% of final marks), and one-third prepared individually with reports of 2000 words (collectively 50% of final marks). A further 10% of final marks may be allocated based on contribution to group work.

### 207-301 Global Env'ment & Sustain Prod Systems

**Availability:** Parkville campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Tony Weatherley

**Contact:** Thirty-six hours of seminars and tutorials (average of three hours per week) and up to 36 hours of self-directed learning. This subject begins in early February and finishes one month before the end of Semester 1 (*Semester 1*).

**Description:** The subject challenges the student to take on the perspective of different stakeholders in issues relating to the environment and sustainable production systems in both a regional and a global context. The student will become part of a global classroom as a member of a group formed from students from several international universities and facilitated by local classroom discussions, postings to discussion forums and chat rooms on the internet. Compressed video technology is used to present the global seminar, held every two to three weeks, in which students from all universities play an active role. Subject content is presented via case studies developed by the participating universities (currently Cornell, Uppsala, Wageningen, Zamorano and EARTH) in topical areas of environment and sustainable production systems.

Content will vary depending on the institution involved but will cover issues such as:

- global warming
- biodiversity
- population demographics
- water quality
- waste management
- food security.

**Assessment:** The assessment tasks are a project report of 3000 words (25%), a seminar on the project report (15%) and a 1000-word reflection paper on each case study (40%). The remaining marks will be allocated for tutorial attendance and active participation in each of the live broadcasts (5%) and postings to discussion forums (15%).

### 207-328 Working with Community Groups

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Ms Cathy Botta

**Contact:** Thirty-five-hour workshop conducted over five consecutive days (*Semester 1*).

**Description:** The objective of this subject is to introduce the students to the roles, understanding and skills of extension workers, through practice, observation and reflection.

The content includes:

- exploration of the roles of extension workers in a range of occupations, including some background on the philosophy and practice of extension;
- methods extension workers use to engage rural people in individual and cooperative learning projects;
- practice in group skills and other skills used by extension workers; and

- an insight into the workings of rural communities. Introduction to the literature of extension and rural sociology.

**Assessment:** Participation, students are assessed on an individual basis (20%), reflective statement (10%), literature review (40%) and presentation of case study (30%).

### 208-301 Crop and Pasture Physiology

**Availability:** Parkville campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Marc Nicolas

**Prerequisites:** 202-201 Plant Function

**Contact:** Twenty-four hours of lectures and 36 hours of practicals (*Semester 1*).

**Description:** Students should develop an understanding of the productive processes that determine growth and yield in crop and pasture communities. They should also develop skills in critically analysing literature and in designing and conducting experiments.

On completion of this subject, students should be able to understand the interactions between plant canopies and the environment that determine yield and product quality; synthesise information from a range of disciplines including plant anatomy and physiology, biochemistry and engineering (environmental physics); critically analyse literature on physiological and agronomic topics; set up and conduct experiments to test hypotheses; and interpret experimental results and report their findings in seminars and written reports.

The main sections are phenological development; light interception, carbon economy; water use; responses to environmental stresses, including drought and salinity; nutrient economy; and pasture management.

**Assessment:** A 3-hour end-of-semester written examination and two written assignments of no more than 4000 words each.

### 208-302 Molecular Biology, Breeding & Biotechnology

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr P Bhalla & Dr P Salisbury

**Prerequisites:** 202-103 Biology for Land and Food Resources and 202-101 Chemistry for Land and Food Resources. 600-142 Genetics and the Evolution of Life is desirable but not essential.

**Contact:** Thirty hours of lectures, 30 hours of other activities (assignments, computer searches of gene and patent data bases, breeding case histories) (*Semester 1*).

**Description:** On completion of this subject students should:

- understand the principles and methodology of crop and animal breeding, and the contribution of genes to development of quantitative traits; and
- have basic understanding of molecular biology, genetic engineering and its impact on agriculture (plant and animal), horticulture, forestry and the food industry.

Topics include nature of genes and regulation of gene expression at the molecular level; introduction to gene manipulation and recombinant technology for production of improved food and forest plants, crops and food animals; management of transgenic plants, crops and animals in agricultural systems; risks and concerns regarding environmental release of transgenic organisms, and safety criteria for transgenic food; principles and methodology of crop and animal breeding, basic population genetics and genetic development of quantitative traits; evolutionary processes and genetic variability of plant populations; world-wide distribution and conservation of plant genetic resources; methods of breeding self- and cross-pollinating plants, development of hybrids, chromosome manipulation and polyploidy; methods for breeding disease and insect resistance in agricultural plants; molecular markers for DNA fingerprinting, genetic diversity, marker-assisted selection; and special techniques in plant breeding, somatic hybridisation and tissue culture.

**Assessment:** Two-hour end-of-semester examination (50%), 1-hour mid-semester test (25%), written project report (4000 words, 25%)

### 208-303 Animal Management and Production II

**Availability:** Dookie and Parkville campuses.

**Credit points:** 12.5

**HECS-band:** 2

**Prerequisites:** 208-207 Animal Management and Production I.

**Corequisites:** 208-203 Ecology and Management of Grazing Systems.

**Semester:** Semester 1

**Description:** On completion of this subject students should be able to:

- understand the structure and content of selected Australian beef, sheep meat, wool, dairy, pig and poultry industries in their global economic environment, and the influence of this environment on individual livestock businesses;

- understand and critically evaluate the physiological and management concepts behind the range of alternatives available for efficient production of meat, eggs and/or fibre to market requirements; and
- analyse and evaluate the biological, technological, industry, product and marketing factors affecting management decisions and trends in the industries.

The focus of this subject is on efficient and responsive management systems for the beef, sheep meat, wool, dairy, pig and poultry industries, covering in depth genetics and breeding, nutrition, grazing systems, reproduction, health and environmental aspects and their interactions in managing production systems. Integral in the subject will be topical issues and research findings relating to new technologies, management options, and industry development. The subject will offer students a choice of six modules (each comprising 50 per cent of subject content), covering beef, sheep meat, wool, dairy, pig and poultry management systems, with each student choosing two of these modules. Students will undertake self-paced learning, problem-solving, and practical work relevant to the industry of their choice, this being supported by a short, lecture-based component and relevant tutorials.

**Assessment:** Three-hour examination (50%) and two assignments equivalent to 3500 words (25% each).

### 208-304 Advanced Topics in Animal Science

**Note:** This subject involves the use of animals. Students should be aware this is an essential part of the subject and exemption from this component is not possible.

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Brian Leury

**Prerequisites:** 208-202 Animal Physiology.

**Semester:** Semester 2

**Description:** At completion of this subject students should:

- be aware of the motivation for, and implications of, current animal research areas and the use of new technologies to improve or modify animal performance;
- have an advanced understanding of the molecular, physiological, metabolic and endocrine factors involved; and
- be aware of any social, economic or ethical considerations associated with the application of new technologies to improving or modifying animal performance.

This subject presents to students a range of topics covering new and innovative research related to the improvement in or modification of animal performance and product yield, composition and quality. Emphasis will be placed on keeping students abreast of new and emerging areas of animal science and biotechnology related to growth and development, red and white meat production, fibre production, lactation and milk production and reproduction. Lecture material will be supplemented with independent, self-paced learning through projects and assignments in specific areas of animal science chosen by the students.

**Assessment:** Three-hour examination (50%), one assignment equivalent to 3500 words (25%), one assignment equivalent to 2000 words (15%) and a seminar (10%).

### 208-306 Agricultural Marketing

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Assoc Prof Bill Malcolm

**Prerequisites:** 207-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

**Contact:** Thirty-six hours of lectures and 36 hours of tutorials (*Semester 2*).

**Description:** This subject is about marketing of agricultural products. The content deals with:

- marketing as a business activity;
- schools of marketing thought;
- perfect and imperfect competition in business activity;
- agricultural supply and supply chains;
- agricultural demand;
- price formation;
- analysis of effects of interventions in agricultural markets;
- determination and distribution of marketing margins;
- product differentiation;
- product grading;
- promotion;
- risk in marketing;
- strategic alliances;

- transactions costs;
- contract marketing;
- cooperative marketing;
- international trade in agricultural products; and
- issues in marketing the major agricultural products.

**Assessment:** A three-hour examination (60%), and two assignments equivalent to 3000 words (each worth 20%).

**Prescribed texts:** W G Tomek, and K L Robinson, *Agricultural Product Prices*, Cornell University Press, 1990.

### 208-307 Plant Pathology and Pest Management

**Availability:** Dookie and Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Paul Taylor

**Contact:** Twenty-four hours of lectures and 36 hours of practical work (*Semester 2*).

**Description:** Topics covered include:

- taxonomy, identification and biology of the main groups of plant pathogens and abiotic causes of plant diseases;
- host-pathogen relationships, and the nature of resistance and pathogenesis;
- the processes leading to plant disease epidemics and their evaluation;
- the types and uses of chemical fungicides, the bases of biological control of plant diseases, insects and weeds; and
- the management and integrated control of plant diseases in general.

Practical work includes the identification and diagnosis of common diseases; and the development of skills in research techniques and methodology in plant pathology.

On completion of this subject, students should:

- be familiar with the biology and taxonomy of the major biotic causes of disease;
- be aware of the factors leading to disease epidemics;
- be capable of diagnosing common diseases of agricultural and horticultural crops;
- have a basic understanding of the use of molecular biology techniques in plant pathology;
- be able to formulate a practicable approach to integrated control in commercial species.

**Assessment:** Three-hour examination (60% of final marks), practical examination (10% of final marks), and an assignment comprising a collection of plant diseases (30% of final marks).

**Prescribed texts:** J F Brown and H J Ogle, *Plant Pathogens and Plant Diseases*, Rockvale Publications, 1997. • G N Agrios, *Plant Pathology*, 4th edn, Academic Press, Harcourt/Academic Press.

### 208-308 Irrigation and Water Management

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Roger Wrigley

**Semester:** Semester 1

**Description:** At completion of this subject students should be able to:

- describe the scale and distribution of the major irrigation systems in south-eastern Australia;
- evaluate plant water requirements in terms of water quality and frequency of supply;
- apply basic principles of hydraulics to the selection of irrigation systems appurtenances and structures;
- assess irrigation systems in terms of efficiency, economy, energy-use and environment impact;
- recognise the advantages and disadvantages of common irrigation systems; and
- recognise the need for efficient irrigation drainage as well as water supply.

The content includes:

- water supply potential for the development of irrigation systems, management planning and operation of water allocations, water law, cost benefit analysis, environmental and energy-use implications of resource utilisation and development, efficiency of irrigation systems and long-term viability;
- climatic factors in irrigation development, rainfall, evaporation, evapotranspiration and hydrology;
- plant physiology and plant water use, transpiration crop water requirements in terms of water quality and quantity;

- soils and water, soil moisture retention and movement, plant root zones and development, infiltration and leaching;
- irrigation scheduling, soil moisture measurement; and
- types of irrigation systems, selection of irrigation systems, irrigation drainage, seepage, surface and subsurface drainage systems, salinity, conveyance and disposal of drained effluent, re-use systems, management of irrigation systems, operations and maintenance requirements.

**Assessment:** Three-hour examination (50%), a practical test (10%) and two assignments equivalent to 2500 words (each worth 20%).

### 208-316 Oenology

**Availability:** Dookie campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr David Hodgson

**Contact:** Three hours lectures and two hours practical per week (*Semester 2*).

**Description:** This subject gives detailed coverage of wine production and processing.

The subject content includes:

- history of viticulture and winemaking in Australia;
- production of wine in cool climate;
- characteristics, composition and technological importance of grape juice;
- chemistry and microbiology of wine production;
- fundamentals of winemaking;
- wine quality and defects and factors affecting;
- analytical and quality control techniques;
- evaluation of wine types and styles; and
- waste management and by-product utilisation.

**Assessment:** Two assignments of 2000 words (25%), three practical reports (25%) and 3-hour final exam (50%).

### 208-320 Fertiliser Management

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Ken Young

**Prerequisites:** 202-201 Plant Function, 202-203 Soil and Water Resources

**Contact:** Thirty-six hours of lectures and tutorials plus one three-to-four-day workshop (*Semester 2*).

**Description:** The objectives of this subject are to provide specialist knowledge on the fertiliser and soil ameliorant industries in Australia, and on systems of recommending and applying fertilisers to crops (grain, horticultural and vegetable) and pastures. This unit is designed specifically for students considering a career as an extension and/or research agronomist.

Subject content includes:

- factors affecting availability of macro- and micro-nutrients from soil and fertiliser; major nutrient and carbon cycles; role of major nutrients in plant and farm animal growth, with specific reference to grain, horticulture and vegetable crops and pasture based livestock production;
- overview of the Australian fertiliser and soil ameliorant industries; chemical fertiliser production and distribution; alternative fertilisers - biosolids, green manures, mineral fertilisers, other organic fertilisers; types and forms of fertilisers; physical and chemical characteristics and standards of fertilisers and soil ameliorants;
- interpretation of plant nutrient status including visual assessment and soil and foliar analysis; prediction of fertiliser responses using a range of systems including response curves, yield targets, nutrient mass balance and other predictive models; economics of fertiliser use;
- factors affecting availability of macro- and micro-nutrients from soil and fertiliser; major nutrient and carbon cycles; role of major nutrients in plant and farm animal growth, with specific reference to grain, horticulture and vegetable crops and pasture based livestock production;
- fertiliser application technologies for different forms and types of fertilisers; fertiliser mixtures and compatibilities; site specific application; time of application; risks and problems in fertiliser use and application systems; and
- environmental issues in fertiliser use; high or low input systems; nutrient transfer and off-site effects; interactions between plant nutrition and production, sustainability issues associated with fertiliser use including soil acidification, structural decline, organic matter decline.

**Assessment:** Participation (10%), assignments and exercises (30%), oral examination (20%) and examination (40%).

### 208-329 Viticulture

**Availability:** Dookie campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Geoff Bath

**Semester:** Semester 1

**Description:** The objectives of this subject are to enable students to:

- prepare management strategies to maximise the quality and yield of grapevines taking into account environmental and management influences;
- explain the commercial influences on vineyard establishment and operation;
- describe major weather differences and evaluate the suitability of cultivations for different purposes and locations; and
- actively evaluate trends and developments in viticulture, with particular reference to technology, management and marketing aspects, and then to develop proposals from their evaluations.

The content includes:

- the distribution and structure of viticultural production throughout the world, the pattern and trend of Australia's viticulture industry, and its association with other areas of primary production;
- grape grower and affiliated organisations;
- vineyard site selection with regard to the nature of grape production, soil type, climatic and weather patterns, pest and disease problems;
- vineyard establishment and design; selection of cultivars and rootstocks for wine, table and dried fruit; strategies for spacing, planting and training, and their interaction with trellis construction and design;
- crop management through pruning, irrigation, frost control, soil management, and canopy management;
- techniques for improving grape quality through canopy configuration and its influence on development and maturation; and
- the assessment of fruit maturity and yield estimation.

Comparative management strategies as seen through annual work programs for table grape, wine and dried fruit production.

**Assessment:** Three-hour examination (50%), a practical test (10%) and two assignments equivalent to 2500 words (each worth 20%).

### 791-013 Special Studies

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr Chris Laird

**Prerequisites:** This subject is only available to students who have completed all first- and second-year level core subjects in their course.

**Contact:** Equivalent to three hours per week. Students will be required to complete a substantial portion of the subject's work by independent study and activities (*Summer semester*).

**Description:** The subject encourages independent, critical thought and self-directed enquiry. Students should develop their ability to plan work and use available time effectively. This is an individualised subject which enables students to pursue studies in areas of agriculture and related fields, not otherwise covered in the normal subjects offered within the degree structure.

The student must provide a rationale for the study in terms of the objectives of the course and their own objectives. A proposed study program must be devised with a specific lecturer and approved by the coordinator. The program must demonstrate availability of expertise within the institute or from industry to provide guidance to the student, feasibility of the study within the constraints of resources and time, necessity of the study to the student's overall academic objectives, limits of the study in topics and depth of study, industry input necessary to complete the study, the level of academic rigor is appropriate to 300-level of study, methods of assessment.

The students must be able to nominate an ILFR academic staff member as a supervisor, who has the necessary expertise to supervise the study, or who is able to supervise the study in conjunction with a cooperating, outside expert. The student, with the supervisor must prepare a written contract which includes the objectives of the study, a timeline for completion and a clear statement of the assessment requirements and calculation of the final grade. The contract must be approved by the subject coordinator.

**Assessment:** To be advised.

### 791-056 Whole Farm Planning

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Mr G Sadler

**Prerequisites:** This subject is only available to students who have completed all first- and second-year level core subjects in their course.

**Contact:** Offered as a five-day block to be completed during the mid-semester break (*Semester 1, repeat 2, Summer*).

**Description:** The content includes examination of whole farm planning philosophy and theory and the application of whole farm planning. The subject aims to develop an understanding of the principles involved in the holistic approach to whole farm planning. Students are required to apply the basic

principles of whole farm planning to a reference farm and prepare a whole farm plan. Students should also develop the rudimentary skills involved in the collaborative processes in leadership, particularly those related to problem-solving techniques in whole farm planning.

**Assessment:** One 2.5-hour examination (50% of final marks) and the preparation and presentation of a whole farm plan in both written and oral format (50% of final marks). The written component will consist of a 2000-word report and an overlay poster of the Whole Farm Plan.

### 207-401 Soil Management and Conservation

**Note:** Students who have completed 212-306 Processes in the Soil Environment will not be able to enrol in this subject without the approval of subject co-ordinator.

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Tony Weatherley

**Prerequisites:** 202-203 Soil and Water Resources.

**Semester:** Semester 1

**Description:** This subject will examine the major current issues in the management of soils under various land uses in Australia. The dynamic nature of the soils will be explored through study of the chemical, physical and biological processes in the soil environment, particularly those which impact directly on plant growth. The subject will develop an understanding of how soils can be managed to optimise plant growth and minimise adverse effects on the environment and present practical solutions to soil management.

Content includes:

- reactions of nutrients and contaminants with soil surfaces;
- processes controlling nutrient availability with particular reference to nitrogen and phosphorus;
- assessment of nutrient availability including quantity/intensity relationships;
- processes leading to sodic, salinised and acidified soils;
- soil structure classification and management to minimise erosion;
- water and solute movement; and
- model descriptions of solute transport.

**Assessment:** A three-hour examination (60%), a major assignment of 3000 words (30%) and a class talk (10%).

### 207-404 Agricultural Policy & International Trade

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Assoc Prof Donald MacLaren

**Prerequisites:** 207-101 Economics of Resource Use, or 316-102 Introductory Microeconomics, 208-301 Agricultural Marketing.

**Contact:** Thirty-six hours lectures and 24 hours tutorials/seminars (*Semester 2*).

**Description:** At completion of this subject students should be able to:

- understand the reasons for government intervention in the agricultural sectors of several countries, including Australia, and have knowledge of the policy objectives being pursued, together with the policy instruments employed;
- analyse the effects of agricultural protectionism on international trade and be knowledgeable about the outcome of the Uruguay Round in the GATT;
- analyse environmental issues as they relate to trade issues in food and fibre; and
- understand the issue of world food security.

The subject covers the following topics:

- the reasons for government intervention in the agricultural sector;
- the principal agricultural policy issues in Australia, the European Union, the United States and Japan;
- the effects of these policies on international trade in agricultural products;
- agriculture on the GATT and the WTO;
- environmental issues as they relate to trade in food and fibre products; and
- aspects of the world food problem.

**Assessment:** A three-hour end-of-semester written examination (60%) and two assignments of up to 3000 words worth 20% each.

### 207-413 Community Mgt Of Land & Natural Resource

See full subject details on page 5.

### 207-414 Social Research Methods

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Kathryn Williams & Dr Ruth Beilin

**Contact:** Six days over two blocks, including lectures and exercises (*Semester 1*).

**Description:** Understanding of social process and action is critical to effective land management and social research skills are therefore valued by resource management agencies.

The subject aims to equip students with knowledge and skills to design social research which can be used to improve management of natural resources, agricultural and food systems.

The subject presents a framework for understanding diverse approaches to social research; the relationship between theory and method is given particular emphasis.

The research process is considered step by step including scoping research issues, the evolution of research questions, and selection of appropriate methods.

A number of research strategies are considered in more detail including survey research, case studies and action research. Social research ethics, quality in social research and advances in social research methods are examined.

**Assessment:** A research proposal of 4000 words worth 40% of final marks, an essay of 3500 words worth 35% of final marks and a seminar presentation worth 25% of final marks.

**Prescribed texts:** A Bryma, *Social Research Methods*, Oxford University Press, 2001.

### 208-401 Advanced Topics in Plant Pathology

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Paul Taylor

**Prerequisites:** 208-307 Plant Pathology & Pest Management or equivalent

**Semester:** Semester 1

**Description:** On completion of this subject, students should have an in depth understanding of aspects of host-pathogen relationships, including the mechanisms of disease resistance, the molecular basis of infection and resistance, and the use of molecular biology techniques in plant pathology.

Topics include disease progress curves and the measurement of disease, and the application of molecular marker technology in pathogen identification, disease resistance and pathogen biodiversity.

**Assessment:** Three-hour examination (50% of final marks) and two assignments equivalent to 2500 words each (each worth 25% of final marks).

### 208-402 Advanced Plant Breeding & Biotechnology

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr M Singh & Dr P Salisbury

**Prerequisites:** 212-314 Genetics and Breeding and 212-315 Molecular Biology & Biotechnology or 208-302 Molecular Biology, Breeding and Biotechnology or other subjects as approved by course coordinators.

**Contact:** Twenty-four hours lectures and 36 hours practical work (*Semester 1*).

**Description:** This subject builds on the knowledge gained from 208-302 Molecular Biology, Breeding and Biotechnology. Case studies are used to illustrate the steps involved in taking knowledge from research laboratory or breeding trials and producing and releasing novel crop varieties. This subject will include a research project in an area chosen by each student.

On completion of this subject students should:

- comprehend many of the issues, concepts and difficulties involved in developing new crop varieties through breeding and biotechnological processes;
- have developed experience in the planning and execution of experiments and have extended their abilities in both oral and written scientific communication; and
- have a good preparation for higher-degree study in plant breeding and biotechnology.

Topics to be covered include:

- application of genetics to plant improvement;
- methods, concepts and case studies in breeding for yield, quality and pest-resistance in agricultural plants, including genetic modification of reproductive systems in plant breeding, molecular methods for hybrid seed production, and application of molecular markers to breeding;
- case histories of cloning of agriculturally important genes by phenotype;
- biotechnological approaches to manipulation of commercially important traits in agricultural plants, including genetic stability, expression in different field and environmental conditions, and the application of special techniques such as induced mutation and in-vitro selection; and
- research techniques in plant breeding and biotechnology.

**Assessment:** Three-hour end-of-semester examination (60%), written project report (4000 words, 25%), oral research presentation (15%).

### 208-409 Animal Welfare

**Note:** This subject involves the use of animals. Students should be aware that this is an essential part of the subject and exemption from this component is not possible.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Paul Hemsworth

**Semester:** Semester 1

**Description:** On completion of the course, students should have sound and broad understanding of the systems regulating body function and the behavioural and physiological responses utilised by animals in responding to environmental change. From this theoretical base, students should develop an appreciation of the scientific approaches available to assess animal welfare. Furthermore, students should understand the concepts of animal welfare and be aware of the main welfare issues confronting animals in modern livestock production systems.

Specific topics covered include:

- the current debate about animal usage and animal welfare;
- systems regulating the body (homeostasis, motivation and control systems, and development of regulatory systems);
- limits to adaptation (stimulation, tolerance and coping, variation in adaptation);
- stress and welfare (Selye's concept of stress and refinements to the concept, coping and fitness, definition of welfare and its assessment);
- assessing welfare using short- and long-term biological responses;
- assessing welfare using preference testing;
- assessing welfare by studying cognitive skills;
- ethical problems concerning welfare;
- welfare issues in agriculture and the general community; and
- codes of practice for the welfare of livestock; welfare solutions.

**Assessment:** Three-hour examination (50%), a practical test (10%), and two assignments equivalent to 2500 words (each worth 20%).

**Prescribed texts:** D M Broom and K G Johnson, *Stress & Animal Welfare*, Chapman & Hill, 1993. • A F Fraser D M and Broom, *Farm Animal Behaviour & Welfare*, CABI, 1990.

### 208-412 Advanced Topics in Genetics and Breeding

**Availability:** Parkville campus.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Peter Ades & Prof. Mike Goddard

**Prerequisites:** 207-323 Plantation Silviculture or other subjects as approved by the course coordinators.

**Contact:** Thirty hours lectures and 36 hours practical classes (*Semester 1*).

**Description:** On completion of this subject students should:

- understand genetics as it is applied to practical animal and forest tree breeding;
- have a sound knowledge of operational genetic improvement programs; and
- be able to apply this knowledge in design and management of these programs.

The topics to be covered include:

- defining breeding objectives in economic terms;
- the meaning of genetic parameters such as heritability;
- estimating breeding values;
- the effects of inbreeding and how to minimise them;
- the structure of natural and domesticated populations;
- use of genetic resources, cross and hybrid breeding;
- the design of genetic improvement programs;
- the use of reproductive biology and molecular technology in genetic improvement;
- disease-resistance breeding;
- genetic conservation; and
- genetics of economically important traits appropriate to the target species.

**Assessment:** One 3-hour written examination (50%) and a series of written practical reports and assignments including at least one of up to 5000 words.