

Bachelor of Agriculture

First year subjects

202-101 Chemistry for Land and Food Resources

Note: Students intending to subsequently undertake Chemistry 610-142 in order to meet prerequisites for later year Biochemistry subjects 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 recess break.

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr John Pilkington

Contact: 36 hours of lectures and 36 hours of practicals/tutorials (*Semester 1*).

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: Zumdahl, S, *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: Mr Chris Laird

Contact: 36 hrs lectures, 36 hrs 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; fertilization, 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 emphasize 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, 1994.

202-104 Information Technology and Communication

Availability: Burnley, Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof David Chapman

Contact: 36 hrs lectures, 36 hrs practicals/tutorials (*Semester 1, repeat 2*).

Description: This subject should 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;
- have formally interacted with students completing this subject at other campuses, and developed an understanding of the learning environment of their peers at those campuses;
- understand group dynamics, and the factors that lead to effective team work.

Assessment: 3-hour exam (50%) presentation of an on-line seminar (25%) and two assignments equivalent to 3000 words (each worth 25%).

Prescribed texts: T S Kuhn, *The Structure of Scientific Revolutions*, The University of Chicago Press, 1970. • H Mackay, *Why Don't People Listen? Solving the Communication Problem*, Pan, 1994.

202-106 Land Resources

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Peter May

Contact: 36 hrs lectures, 36 hrs practicals (*Semester 1*).

Description: This subject will focus on the fundamental processes in landscape evolution and ecosystem development. It will demonstrate how science can be applied to managing natural ecosystems, and to maintaining and improving the productivity of land resource based-industries through the development of environmentally sustainable practices. On completion of this subject, students will be able to apply the principles developed in relation to major land uses in Victoria and other regions of Australia. They will also understand the application of various important practices in the management of ecosystems at different scales, and the adverse impacts of mismanagement of such systems.

Assessment: 3-hour examination (50%) and two assignments equivalent to 3000 words (each worth 25%).

209-101 Economics of Resource Use

Availability: Burnley and Dookie campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Ros Gall

Contact: 36 hrs lecture, 36 hours tutorials (*Semester 2*).

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*, Second Edition, McGraw-Hill, 1994.

Second year subjects

Complete description of second year and later subjects will be available in the 2002 Handbook, or from the course coordinator.

202-201 Plant Function

Availability: Creswick, Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Steve Read

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

Contact: 36 hrs lectures, 36 hrs 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 organized around three themes:

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

Common content would include:

- radiation, energy budgets and transfer, photosynthesis, photorespiration;
- water use, uptake and transpiration, xylem flow, stomata;
- 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 would be augmented by stream-specific content, such as:

- for 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);
- and 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: Graham Hepworth

Prerequisites: First year core subjects.

Contact: 36 hrs lectures; 12 hrs tutorials and 24 hrs practicals (*Semester 1*).

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

- recognize, understand and apply the basic concepts of study design, such as observational studies versus designed experiments, confounding, replication, randomization, and blocking, and discuss the effect of the design concepts on the interpretation of results;
- recognize and apply basic study designs like completely randomized one and two factor and randomized 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 interference, 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%) and two assignments equivalent to 3000 words (worth 20% each).

202-203 Soil and Water Resources

Availability: Burnley and Dookie 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: 36 hrs lectures, 36 hrs 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 fertilizers, 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 fertilizers 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;
- 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: White, R.E., *Principles and Practice of Soil Science*, 3rd Ed, 1997, Blackwell Science.

209-202 Financial Management for Resource Ind I

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr Gavin Drew

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 36 hrs lectures, 36 hrs tutorials (*Semester 2*).

Description: The student will be able to:

- understand the role of financial management in business management;
- understand the principles of control mechanisms that exist in business financial systems;
- understand accounting concepts and be able to apply them in financial management information systems;
- establish and apply criteria for assessing and planning the business management;
- understand the various business structures and implications for management;
- understand the essence of the operation of the Australian Tax system;
- analyze decisions;
- understand the roles, constraints and risks of debt and equity capital;
- and communicate financial information in a professional manner.

The content includes:

- Business and financial management (principles and responsibilities);
- financial recording/ reporting of information systems and audit principles;
- financial performance criteria;
- analysis and interpretation of accounting/ financial information;
- business structure and risk;
- financial statements - profit - cashflow - balance sheets;
- budgets and planning;
- principle of increasing risk;
- costing methods;
- computer business applications;
- business taxation decision analysis;
- case studies will be carried out.

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

Recommended texts: Makeham and Malcolm (1993), *The Farming Game Now*, Cambridge Press.

Third year subjects

202-001 Work Experience

Note: This subject is a hurdle requirement for completion of the Bachelor of Agriculture, Bachelor of Forestry, Bachelor of Horticulture, Bachelor of Resource Management, and the combined degrees.

Availability: Burnley, Creswick, Dookie, Glenormiston, Longerenong, McMillan and Parkville campuses.

HECS-band: 2

Coordinator: Prof Ellen Goddard

Contact: Can be completed during the year or during vacation breaks (*Year long*).

Description: Required work experience is a feature of all ILFR degree and advanced diploma streams. The Institute is developing a comprehensive strategy for assessing work experience and ensuring that work experience contributes, in a meaningful way, to student education.

Assessment: Students must be required to document their activities across their studies (enrichment report, for example) as well as have a complete set of workplace supervisor reports.

202-301 Industry/Research Project

Availability: Burnley, Creswick, Dookie and Parkville campuses.

Credit points: 50

HECS-band: 2

Coordinator: Mr Chris Laird

Prerequisites: 12 hours of required classes on research methodology and supervision sessions and seminars, as arranged.

Corequisites: 50 credit points of 300 level subjects.

Contact: Can be completed in one semester during the year (*Year long*).

Description: Upon completion students should have

- the ability to apply the knowledge gained in other subjects to a real resource based industry investigative problem;
- the ability to undertake an independent research project including - developing a research proposal - undertaking a literature review - defining and applying an appropriate research methodology in conducting the investigation - writing up the results - undertaking empirical analysis appropriate to the specified project (eg. experimentation, survey, secondary data analysis.);
- and the ability to communicate effectively orally and in writing to both scientific and non-scientific audiences.

The industry-based review project must be developed in close collaboration between student, academic and industry advisers. The project definition must be developed in the semester(s) preceding registration in this subject. Industry and academic advisers must be satisfied with the student's preparation for undertaking the project through previous selection of elective or stream subjects. Each student must prepare a peer reviewed site-based short oral presentation on project proposal as well as a written proposal (5-8 pages), to be assessed by academic and industry advisers. A more detailed oral presentation must be presented on the final results of the project to an audience of Institute and industry staff. The project must be written up in the form of a minor thesis of 10,000 to 15,000 words. A two-page abstract in non-technical language must also be prepared for public distribution.

Assessment: Project proposal (oral and written) 10%, abstract of research results (10%) and minor thesis (of between 10,000 and 15,000 words, 70%) and presentation (10%).

202-302 Human Resource Management

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr Peter McSweeney

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 36 hrs lectures and 36 hrs tutorials (*Semester 1*).

Description: At the end of this subject the student should be able to demonstrate they:

- understand the functions of leadership and management including the human resource management role of managers;
- understand the sources of power and authority in organizations;
- understand the social responsibilities of organizations;
- understand key management theories and their application to the management of organizations;
- understand the organization of the workplace in terms of organisational structures and job design;
- understand and perform human resource management functions including human resource planning, job analysis, recruitment and selection, staff remuneration, performance appraisal;
- understand the industrial relations framework;
- and understand 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 organizations;
- social responsibility of organizations;
- organizing 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, 1997, *Management*, Prentice Hall, Sydney.

Fourth year subjects

202-401 Industry/Research Project

Availability: Burnley, Creswick, Dookie and Parkville campuses.

Credit points: 50

HECS-band: 2

Coordinator: Mr Chris Laird

Prerequisites: 12 hours of required classes on research methodology and supervision sessions and seminars, as arranged.

Corequisites: 50 credit points of 300 level subjects.

Semester: Year long

Description: Upon completion students should have:

- the ability to apply the knowledge gained in other subjects to a real resource based industry investigative problem;
- the ability to undertake an independent research project including - developing a research proposal - undertaking a literature review - defining and applying an appropriate research methodology in conducting the investigation - writing up the results - undertaking empirical analysis appropriate to the specified project (eg. experimentation, survey, secondary data analysis.);
- and the ability to communicate effectively orally and in writing to both scientific and non-scientific audiences.

The industry-based review project must be developed in close collaboration between student, academic and industry advisers. The project definition must be developed in the semester(s) preceding registration in this subject. Industry and academic advisers must be satisfied with the student's preparation for undertaking the project through previous selection of elective or stream subjects. Each student must prepare a peer reviewed site-based short oral presentation on project proposal as well as a written proposal (5-8 pages), to be assessed by academic and industry advisers. A more detailed oral presentation must be presented on the final results of the project to an audience of Institute and industry staff. The project must be written up in the form of a minor thesis of 10,000 to 15,000 words. A two-page abstract in non-technical language must also be prepared for public distribution.

tation on project proposal as well as a written proposal (5-8 pages), to be assessed by academic and industry advisers. A more detailed oral presentation must be presented on the final results of the project to an audience of Institute and industry staff. The project must be written up in the form of a minor thesis of 10,000 to 15,000 words. A two-page abstract in non-technical language must also be prepared for public distribution.

Assessment: Students must be required to document their activities across their studies (enrichment report, for example) as well as have a complete set of workplace supervisor reports.

Elective subjects

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

202-105 Field Skills

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr Howard Hanna

Semester: Semester 2

Description: This subject includes familiarizing/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.

204-101 Farm Animal Biology

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Brian Leury

Prerequisites: 202-103 Biology for Land and Food Resources.

Contact: 24 hrs lectures, 36 hrs of practicals/tutorials (*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: 3-hour examination (50%) and two assignments equivalent to 3000 words (each worth 25%).

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

205-102 Field Engineering

Availability: Dookie and Longerenong campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr Roger Wrigley

Contact: 4 hrs lectures, 2 hrs tutorials (per week) (*Semester 1, repeat 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;
- 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;
- and occupational health and safety; project management and project planning; and CAD/CAM.

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

206-106 Australia in the Wine World

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof Snow Barlow

Contact: 3 hrs lectures (or equivalent), 3 hrs practicals (per week) (*Semester 2*).

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:

- the evolution of the grapevine;
- the history of viticulture and winemaking;
- the main grape varieties of the world and their distribution;
- the 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 (40%), assignments (2x20%), wine practical (20%).

206-107 Vineyard & Winery Ops for Quality WP I

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof Snow Barlow

Contact: 3 hrs lectures or equivalent; plus 3 hrs practicals (per week) (*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.

The main oenology components of this subject are the characteristics of white and red wine cultivars and the principles and practices involved in the production of various wine styles. The subject introduces students to post-fermentation treatments associated with wine production. Evaluation of wine, styles and flavour characteristics are also introduced using basic sensory processes.

Assessment: Examination (30%), assignments (2x20%), wine practical (15%), vineyard practical (15%).

206-108 Vineyard & Winery Ops for Quality WP II

Availability: Dookie campus.

Credit points: 12.5**HECS-band:** 2**Coordinator:** Mr Geoff Bath**Contact:** 3 hrs lectures (or equivalent), 2 hours practicals (per week) (*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 viticulture component of the subject students should be able to:

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

Assessment: Examination (30%), assignments (2x20%), wine practical (10%), vineyard practical (10%), tour report (10%).

209-102 Food Science

See full subject details on page 619.

209-106 Introduction to Food Microbiology

See full subject details on page 619.

209-109 Food Chemistry

See full subject details on page 620.

600-142 Genetics & The Evolution of Life

See full subject details on page 792.

610-142 Chemistry

See full subject details on page 800.

204-201 Comparative Nutrition

Note: This course 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: 24 hrs lectures, 12 hrs tutorials and 36 hrs of practical work, with computer aided learning enhancement (*Semester 1*).

Description: At the end of the subject the students will;

- 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 utilization. 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.

204-202 Animal Physiology

Availability: Parkville campus.

Credit points: 12.5**HECS-band:** 2**Coordinator:** Assoc Prof Paul Hughes

Prerequisites: 204-101 Farm Animal Biology.

Semester: Semester 1

Description: On completion of the program will 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, gastrointestinal, 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: Frandson, R.D., *Anatomy and Physiology of Farm Animals, 5th ed.*, 1992. • Sherwood, L., *Human Physiology from Cells to Systems, 2nd ed.*, 1993. • Cunningham, J.G., *Textbook of Veterinary Physiology*, 1992. • Currie, W. Bruce, *Structure and Function of Domestic Animals*, Butterworths 1998.

204-203 Ecology & Management of Grazing Systems

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:** Prof David Chapman

Prerequisites: 202-201 Plant Function.

Contact: 36 hrs lectures, 24 hrs practicals/tutorial sessions (*Semester 1*).

Description: On completion of this subject, students should;

- understand the basic ecology and physiology of pasture communities and the factors that influence yield of a grazed pasture;
- know the principles underlying pasture and grazing management, and the optimization of yield from grazing systems;
- appreciate the importance of spatial and temporal differences in pastures, and their 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;

- pasture plant form and function, including basic physiology, phenology and growth processes;
- the population biology of pasture plants, including the pathways of plant recruitment and survival, and the growth cycles of annual and perennial plants;
- the major pasture plant species and pasture types, their agronomic and adaptive characteristics and management requirements;
- plant x environment interactions, focusing on resource capture, plant strategies and adaptation, and potential productivity;

- community ecology, particularly inter- and intra- specific competition and plant x animal interactions as they influence the botanical composition of pastures;
- components of pasture growth, including canopy development and light interception, tissue turnover and mass flux processes, and the principles of optimizing pasture yield and consumption;
- the feeding and nutritive value of pastures; pasture improvement principles and practices;
- matching feed supply and demand for efficient animal production by manipulating seasonal pasture growth and the use of feed profiling, feed budgeting and grazing planning tools;
- the principles and practices of grazing management;
- and optimizing pasture production and utilization in seasonal production systems.

Assessment: Three-hour exam (60%) and practical assignments to be completed using interactive multi-media (totaling 40%).

204-204 Animal Mangement 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: Mr Howard Hanna & Prof 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;
- optimization of reproductive output;
- environmental effects and use of buildings;
- management regimes to maintain animal health;
- maximization 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%).

204-205 Equine Stud Mangement

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

Prerequisites: 204-101 Farm Animal Biology.

Contact: 24 lectures and 24 hrs practical classes, tutorials and tours (*Semester 1*).

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

- describe the processes used and structures of the equine breeding industry;
- apply innovative reproductive technology to stud management procedures;
- discuss the implications of recent research on breeding practice;
- and demonstrate common breeding procedures.

This subject includes:

- an introduction to the horse industry and the structures and major organizations;
- an examination of the production systems (stud management);
- equine reproductive physiology;
- nutritional systems in studs;
- health practices and strategies;
- genetic strategies for breeds and individual studs;

- and facility requirements of studs; practical breeding practices.

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

204-206 Equine Training Management

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

Prerequisites: 204-101 Farm Animal Biology.

Contact: 24 hrs lectures, 24 hrs practical classes, tutorials and tours (*Semester 1*).

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

- describe the processes used and structures of the equine training industry;
- analyze fitness and training programs;
- discuss the implications of recent research on training practice;
- and demonstrate common training procedures.

The content includes:

- an examination of training systems (stable management) and service industries (bloodstock services, feed and drug companies);
- exercise physiology;
- stable practices and management, equine sports medicine;
- nutrition for performance;
- and practical training practices for thoroughbred racing, harness racing and equestrian sports.

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

205-206 Crop Production

Availability: Burnley and Dookie campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof David Connor

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%).

206-203 Techniques of Resource Assessment

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Tony Weatherley

Prerequisites: 202-106 Land Resources.

Contact: 24 h lecture and 30 h tutorials/practicals (*Semester 2*).

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

- knowledge of the major methods utilized in the evaluation of land and biological resources and the implementation of these techniques in field situations so as to derive the necessary information required;
- and an ability to interpret the results emanating from the use of such techniques, and an understanding of how to apply them in a natural resource management context.

Content includes:

- basic land survey instruments and their use;
- map reading and interpretation and the use of remotely sensed data;
- an introduction into the use of Global Positioning Systems and other forms of electronic data gathering, and the use of such information in Geographic Information Systems;

- field sampling in aquatic and terrestrial ecosystems. Methods of analysis of biological materials, and interpretation of data;
- and survey methodologies for biological assessment.

Assessment: A three-hour examination (50 %), and two 3000 word assignments (each 25%).

206-211 Wine Evaluation and Appraisal

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr David Hodgson

Contact: 3 hrs per week (*Semester 2*).

Description: This subject provides students with an advanced understanding of the processes associated with the production of different wine styles and the effects that regional, viticultural, and quality control techniques have on the quality of the wine.

The content includes:

- tasting procedure and techniques;
- wine type and style;
- palate calibration (basic tastes and thresholds, aroma assessment and wine faults);
- winemaking;
- viticultural and regional techniques and their effects on wine quality;
- wine production (white and red table wine, sparkling, fortified and dessert wine production);
- and wine social issues and the law.

Assessment: Examination (40%), assignments (20%), wine practicals (40%).

209-201 Resource Industry Economics I

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof Ellen Goddard

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 36 hrs of lectures and 12 hrs of tutorials/practicals (*Semester 1*).

Description: At the end of the course students would be expected to:

- understand basic economic concepts applied to problems of resource use and conservation;
- understand the issues associated with public versus private ownership of resources;
- and 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: Sinden, J. and Thamapapillai, D., *Introduction to Benefit Cost Analysis*, 1995. • Longman Godden, D., *Agricultural and Resource Policy*, 1997, Oxford University Press Melbourne. • Kahn, J.R., *The Economic Approach to Environmental and Natural Resources*, 1998, Dryden Press. • Tietenberg, T., *Environmental and Natural Resource Economics*, 1996, Harper Collins, Fourth Edition.

209-203 Agribusiness Marketing

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Ros Gall

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 24 hrs of lectures and 36 hrs of tutorials (*Semester 2*).

Description: The student should be able to:

- characterize marketing decisions for an individual firm;
- develop marketing plans for specific agribusiness firms;
- develop strategic plans for a specific agribusiness firm;
- apply market research techniques;
- and apply effective communication tools in agribusiness problem solving.

The subject covers areas of:

- market planning;
- strategic marketing;
- marketing research;
- marketing project;
- total quality marketing;
- forecasting;
- competitive Forces;
- and Market Logistics.

The context of all analysis is in the unique areas of food, fibre, ornamental and other raw products. No other products are as affected by legislation, spoilage and security issues. This makes agribusiness marketing unique as compared to more traditional marketing subjects.

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

209-204 International Agribusiness

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Ros Gall

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 24 hrs of lectures and 36 hrs of tutorials (*Semester 2*).

Description: Upon completion of the subject the student should be able to:

- understand the operation of international markets with reference to Australia;
- understand developments in the international economy, international bodies affecting trade;
- assess and evaluate the costs and benefits of conducting international business;
- gain an appreciation of the cultural, political, legal and geographical factors which have an impact on international trade - documentation;
- and understand financing of international trade.

The subject covers areas of:

- the use of marketing data -primary and secondary data in projecting and assessing international market potential;
- marketing entry strategies;
- legal influences and strategies;
- financing international trade;
- risks in international trade;
- and export promotion.

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

Prescribed texts: Czinkota, M.R., Ronkainen, I.A. and Moffatt, M.H., *International Business, 3rd Edition*, 1996, The Dryden Press, Fort Worth Texas. • Schaffner, D.J., Schroder, W.R., and Earle, M.D., *Food Marketing: An International Perspective*, 1998, McGraw-Hill.

209-205 Food Microbiology

See full subject details on page 620.

521-211 Biochemistry & Molecular Biology Part A

See full subject details on page 786.

521-212 Biochemistry & Molecular Biology Part B

See full subject details on page 786.

526-201 Principles of Microbiology & Immunology

See full subject details on page 849.

202-304 Resource Mgt & Agric Systems Analysis

Availability: Dookie and Parkville campuses.

Credit points: 12.5**HECS-band:** 2**Coordinator:** Prof David Chapman**Prerequisites:** 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.**Contact:** 20 hrs of lectures, 52 hrs practical work (*Semester 1*).**Description:** On completion of this subject, students should;

- be able to integrate and apply information from subjects in the soil, plant, animal and agricultural economics disciplines to the solution of practical problems in the management of natural resources used in agriculture and of agricultural systems;
- have a better formal understanding of systems analysis concepts and techniques;
- be skilled in problem identification and solving;
- and be better able to communicate effectively with farmers and resource management specialists in a practical context.

Students will complete at least two 'mini-consultancy' case study projects. The case studies will be identified in advance, and will involve solving problems in the management of dairying, cropping, or sheep production systems, or the management of soil, water or vegetation resources associated with agriculture. Students will be required to identify the key biological or biophysical issue or problem, analyze the issue/problem by drawing on material learned from previous subjects and adding information gathered from other sources, and recommend solutions or strategies. Projects will be augmented by lectures and seminars that deal with systems concepts, systems analysis tools and methods, and issues associated with the sustainable management of agricultural land in Australia.

Assessment: Two-hour examination (40%), two written project reports equivalent to 2500 words (each worth 20%), and one oral project report (20%).

204-303 Animal Management and Production II

Availability: Dookie and Parkville campuses.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Assoc Prof Paul Hughes**Prerequisites:** 204-204 Animal Management and Production I.**Corequisites:** 204-203 Ecology & Management of Grazing Systems.**Semester:** Semester 1**Description:** The objective of this subject is to enable students 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 analyze 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% 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).

204-304 Advanced Topics in Farm Animal Science

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: Parkville campus.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr Brian Leury**Prerequisites:** 204-202 Animal Physiology.**Semester:** Semester 2**Description:** The objective of this subject is to enable students to:

- 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%).

204-306 Dairy Production

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 campus.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Mr Richard Dickins & Prof David Chapman**Prerequisites:** 204-203 Ecology and Management of Grazing Systems.**Contact:** Up to 36 hrs lectures and up to 24 hrs practical sessions, tutorials and field work (*Semester 2*).**Description:** The objective of this subject is to enable students to:

- understand the structure and nature of the Australian dairy industry in its global context and the influence of the global environment for the marketing of Australia's milk products on producers;
- understand, and have working experience with, the physiological and management concepts underpinning the efficient production of milk of high quality in pasture-based production systems;
- and analyze and evaluate biological, technological, economic and industry factors affecting management decisions at the farm level.

The subject will focus on efficient and profitable management systems for pasture-based milk production, and will include:

- the scale and structure of the Australian dairy industry; the major dairy-producing regions of Australia, and their distinctive features;
- the basis of the Australian dairy industry's international competitiveness, and its strengths, weaknesses, opportunities and threats; genetics and breeding including analysis and interpretation of Australian Breeding Values in the dairy industry, and the economic value of improved animal genotypes;
- nutrition of the dairy cow, including principles and practice of supplementation and ration formulation for pasture-based systems, and pasture x supplement interactions;
- pasture and grazing management for efficient milk production;
- factors influencing the intake of the dairy cow; whole-farm feed management;
- reproductive technologies and breeding management in the dairy industry, including the principles and practice of achieving desired conception and calving patterns in pasture-based systems;
- animal health;
- basic lactation physiology;
- milk harvesting;
- and aspects of sustainable resource management in the dairy industry, in particular the efficient use of water.

The analysis of topical industry development, technology, and national and international socio-political issues, and the appropriate industry response to change in these areas, will be an integral part of the subject

Assessment: One Three-hour exam (60%); two assignments equivalent to 3000 words (20% each).

204-407 Advanced Animal Breeding

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: Parkville campus.**Credit points:** 12.5**HECS-band:** 2

Coordinator: Prof Mike Goddard

Prerequisites: 205-303 Molecular Biology, Genetics and Breeding.

Contact: 36 hrs of lectures and 36 hrs practical work (*Semester 2*).

Description: On completion of the subject students should:

- understand genetics as it is applied to animal breeding;
- and have a sound knowledge of genetic improvement programs operating in the livestock industries; and be able to apply this knowledge in the design and management of animal breeding programs.

The topics to be covered include:

- defining breeding objectives in economic terms;
- the meaning of genetic parameters such as heritability;
- calculating and using estimated breeding values;
- prediction of selection response;
- the use of breed resources and cross breeding;
- the effects of inbreeding and its minimization;
- the structure of livestock populations;
- genetic improvement programs in dairy and beef cattle, sheep and pigs; use of reproductive and molecular technology in livestock improvement;
- and genetic conservation in domestic animals, genetics of growth, lactation, reproduction, wool growth and quality, carcass composition meat quality, and disease resistance.

One assignment will involve the development of a complete breeding program for a production system of choice. The practical work will be partly based on computer analysis of alternative breeding programs and solution of practical problems and partly on the assessment of live animals.

Assessment: Three-hour examination (50%), two assignments equivalent to 2500 words (each worth 25%), and a 15 minute seminar. (50%).

205-301 Crop and Pasture Physiology

Availability: Parkville campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Marc Nicolas

Semester: Semester 1

Description: This subject deals with the productive processes that determine growth and yield in crop and pasture communities. The emphasis is on the behaviour of the plant canopy, rather than the individual plant (as in Plant Function) in response to the environment and management practices.

The content includes:

- light interception;
- carbon economy;
- water use;
- responses to environmental stresses, including drought and salinity;
- nutrient economy;
- and pasture management.

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

205-307 Integrated Plant Protection

Availability: Parkville campus.

Credit points: 12.5

HECS-band: 2

Semester: Semester 2

205-308 Irrigation and Water Management

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Semester: Semester 1

Description: The objective of this subject is to enable the students 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;
- recognize the advantages and disadvantages of common irrigation systems;
- and recognize 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 utilization 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%).

206-301 Global Environment and Food Systems

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr Tony Weatherley

Contact: 36 h of seminars/tutorials, 36 h of self-directed learning (*Semester 1*).

Description: The subject challenges the student to take on the perspective of different stakeholders in issues relating to the environment and sustainable food 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 postings to discussion forums and construction of web sites on the internet. Compressed video and other technologies are used to present case study material and the global seminar in which students play an active role. Case studies will be presented in topical areas of environment and sustainable food systems by the participating universities.

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

- population demographics;
- eco-tourism;
- waste management;
- biodiversity;
- biotechnology;
- and dry-land agriculture.

Assessment: The major assessment task is a project of not more than 7,000 words. Marks may be allocated for attendance and active participation in each of the live broadcasts and postings to discussion forums.

206-302 Molecular Biology, Genetics & Breeding

Availability: Parkville campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof Phillip Salisbury

Prerequisites: 202-103 Biology for Land and Food Resources, 202-101 Chemistry for Land and Food Resources, 600-142 Genetics and the Evolution of Life, or 521-211 Biochemistry and Molecular Biology.

Contact: 36 hrs of lectures, 36 hrs of practical work (*Semester 1*).

Description: It is expected that on the completion of this subject, students should gain an understanding of the principles and methodology of crop and animal breeding and a knowledge of genes at the levels of populations and their contribution to development of quantitative traits. Basic understanding of genetic engineering (molecular biology) and its impact on agriculture (plant and animal), horticulture, forestry and the food industry.

The topics include:

- structure of DNA, Nature of genes, Regulation of gene expression at the molecular level;
- introduction to gene manipulation for production of transgenic plants and animals;
- use of recombinant technology in breeding improved food and forest plants, crops and food animals;
- management of transgenic plants, crops and animals in agriculture systems;
- risks and concerns regarding environmental release of transgenic organisms;
- safety assessment criteria for transgenic food etc;
- principles and methodology of crop and animal breeding and a knowledge of genes at the levels of populations and their contribution to 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;
- breeding methods for disease and insect resistance in agricultural plants;
- molecular markers for DNA fingerprinting, genetic diversity, marker-assisted selection;
- special techniques used in plant breeding- induced mutations, polyploidy, double haploids, somatic hybridization and tissue culture;
- and quantitative genetics in plant breeding.

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

206-307 GIS and Remote Sensing

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Mr Graham Brodie

Contact: 36 hrs Lectures, 36 hrs Practical and Field Excursions (*Semester 1*).

Description: The objectives of the subject is to extend the students' ability to:

- use Geographic Information Systems;
- interpret map data;
- manage databases;
- evaluate and use GIS methods appropriate to resource management;
- apply active and passive remote sensing techniques;
- utilize aerial photography, satellite imagery in an integrated approach to the use of information to manage land based resources;
- map natural resources;
- and use techniques to interpret spatial variation of vegetation, water and land resources for planning and resource management.

The topics to be studied in the subject are:

- introduction to Geographic Information Systems;
- map data interpretation; database management;
- GIS methods appropriate to resource management;
- active and passive remote sensing techniques;
- aerial photography applications;
- satellite imagery;
- integrated approaches to the use of information to manage land based resources;
- mapping of natural resources;
- and techniques to interpret spatial variation of vegetation, water and land resources for planning and resource management.

Assessment: A three-hour examination (50%), two assignments equivalent to 2500 words (20% each), and a practical assignment (10%).

206-320 Processes in the Soil Environment

See full subject details on page 613.

206-327 Resource Industry Communication

Credit points: 12.5

HECS-band: 2

Coordinator: Prof David Chapman

Prerequisites: 202-104 Information Technology and Communication.

Semester: Semester 1

Description: This subject provides an understanding of the principles of effective communication, the practical skills to communicate effectively, and the development of skills in critical analysis of communication problems.

Topics include the communication of agricultural and environmental technology as processes of information exchange; the communication skills of speaking, nonverbal communication, establishing rapport, questioning and listening; omnium consultation and mass media techniques including oral and radio, newspapers and advertising copy; working with groups, leadership, conflict management, managing difficult people, and assertiveness; marketing as a communication process, determining clients needs; adult learning models and influencing human behavior; interpretation of natural resources, including forest, to the general public; project management, evaluating the effects of communication projects; public and private extension and communication; and case studies.

The industry project provides an opportunity to study communication and marketing problems in resource management industries, to apply the issues studied in lectures to industry, and to make recommendations for enhancing communication processes. Students will be expected to visit and observe or work with a business, examine a communication problem using a range of research strategies and report findings and recommendations. In certain cases

the industry project may relate to an extension program run by government or with rural communities.

Assessment: Industry/extension report 3000 words (30%), case study 3000 words (30%), examination 2 hours (40%)

Prescribed texts: Mackay, *Why Don't People Listen?*, Pan, 1994. • Ban, Ward, Hawkins, *Agricultural Extension*, Longman, 1998.

206-328 Working with Community Groups

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Cathy Botta

Contact: 35-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: Assessment A three-hour examination (50%) and two assignments equivalent to 3000 words (each worth 25%).

206-329 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 maximize 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 organizations;
- 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%).

206-330 Resource Management Policy and Action

Availability: Parkville campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof Snow Barlow

Prerequisites: 202-106 Land Resources.

Contact: 4 hours per week (*Semester 2*).

Description: This subject will provide a general introduction to the development, implementation and review of environmental policy, and its relationship with the legal system. A variety of both Australian and international case studies will be examined, with a range of guest speakers to further explore these themes.

At the completion of the subject, students should have developed an appreciation for the role of the legal and policy development process in the management of public and private land resources.

The content includes:

- the Australian legal system and the formation of law;
- the role of environmental law on a national and international scale;
- the major state and national legislation associated with land use, conservation and/or environment;
- the scope, objectives and practices of the major government agencies involved in public and private land policy development and implementation in Australia;
- assessment/regulatory procedures for potential environmental impacts of proposed developments;
- environmental policy at the international, national, state and local level, including the roles and powers of major stakeholders;
- environmental activism in Australia, and the role of populist opinion in policy development;
- the concept of ecological, economic and social sustainable development as a framework for environmental policy;
- policy analysis techniques and policy instruments, including regulatory and economic instruments;
- and future perspective on environmental policy in Australia.

Assessment: Examination of 3 hours duration 40 %, two assignments of 3000 words each 25% each, seminar presentation 10%.

206-331 Whole Farm Planning

Availability: Dookie campus.

Credit points: 12.5

HECS-band: 2

Semester: Semester 1

Description: The aims of the subject are to:

- develop an understanding of the principles involved in the holistic approach to whole farm planning;
- develop skills in applying objective indicators of farm and catchment health in a whole farm planning context;
- develop an awareness of the application of geographical positioning systems (GPS) and geographical information systems (GIS) to whole farm planning;
- apply the basic principles of whole farm planning and monitoring to a reference farm;
- prepare a Whole farm Plan for a reference farm;
- and develop the rudimentary skills involved in the collaborative processes in leadership, particularly those related to problem-solving techniques in whole farm planning.

The subject includes:

- lecture and project work in map work and interpretation, indicators of catchment health, financial performance/ quality trends;
- use of GPS and GIS in farmland planning;
- land degradation;
- trees and the Whole Farm Plan;
- pastures and the Whole Farm Plan;
- cropping and The Whole Farm Plan;
- water quality and quantity;
- farm subdivision, land classification;
- fire prevention;
- community and Regional Networking;
- and budgeting and setting priorities in the implementation of a whole farm plan.

Assessment: Whole Farm Plans and written reports, equivalent to about 3000 words and each worth a minimum of 20% of the final mark.

209-301 Agricultural Marketing

Availability: Dookie and Parkville campuses.

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Ros Gall

Prerequisites: 209-101 Economics of Resource Use or 316-102 Introductory Microeconomics.

Contact: 36 hrs of lectures and 36 hrs of tutorials (*Semester 2*).

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

- understand the application of economic theory to marketing decisions for agricultural, forest and horticultural products;
- analyze implications of changes in macroeconomics, domestic and international policy for primary producers of all products;

- analyze implications of different market structures for producer, processor, retailer and consumer behaviour;
- develop marketing behavioural rules such as optimal (eg advertising and research) investment rules for industry individuals under a variety of market structures;
- and use basic algebraic, regression and simulation techniques to examine marketing issues empirically.

The subject covers areas of:

- food fibre and forest product supply and demand relationships - perennial and annual crops and livestock sector modeling - dynamic relationships - habit formation - price formation under different market structures;
- spatial and temporal implication for market equilibrium of price and quantity - storage;
- trade policies - impact and response - tariffs - export subsidies - phytosanitary regulations;
- marketing organizations and group decision making for primary producers - collective vs. individual;
- domestic policy on grading, standards, food, safety and security;
- market information and insurance;
- advertising/ research (primary)/ research (processing) investment implications and strategy;
- and market structure- (monopoly, oligopoly, competitive) implications for marketing strategies for producers, processors and retailers.

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

Prescribed texts: Godden, D., *Agricultural and Resource Policy*, 1997, Oxford University Press, Melbourne. • Helmburger, P.G., and Chavas, J., *The Economics of Agricultural Prices*, 1996, Prentice Hall, New Jersey. • Tomek, W.G., and Robinson, K.L., *Agricultural Product Prices*, 1990, Cornell University Press.

209-303 Rural Women

Availability: Glenormiston campus.

Credit points: 12.5

HECS-band: 2

Coordinator: Ms Jennifer Jackson

Contact: 45 equivalent contact hours, incorporating study by distance education and a teleconference (*Semester 1*).

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

- understand the nature and extent of Australian farm women's involvement in agricultural production;
- analyze the economic value of the work done by women on farms;
- devise strategies appropriate for agribusinesses and service providers to successfully target 52% of the market - Australian women;
- recognise the role of rural women in sustaining rural communities, often in the absence of government services;
- and examine the issues of leadership and representation.

Through the ten topics and extensive collection of reader articles this subject covers many of the major issues concerning rural women and the nature and economic value of their contribution to agricultural production. Topics include:

- the definition and visibility of rural women's work;
- paid and unpaid work on farms;
- off farm and in the community;
- the economic viability of family farms;
- higher levels of formal qualifications and the link to farm profitability;
- barriers to education;
- women farmers in the media;
- and leadership issues.

The important implications of these issues for agribusinesses and rural service providers are emphasized.

Assessment: Three assignments - one case study 1,000 words (20%); one minor essay 1,500 words (30%); one major essay 3,000 words (50%).

209-312 Oenology

See full subject details on page 625.

209-314 Fruit and Vegetable Technology

See full subject details on page 625.

204-409 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 utilized 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 will 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: Broom, D.M., and Johnson, K.G., *Stress & Animal Welfare*, Chapman & Hill, 1993. • Fraser, A.F., and Broom, D.M., *Farm Animal Behaviour & Welfare*, CAB, 1990.

205-401 Plant Pathology

Availability: Parkville campus.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr Peter Taylor

Prerequisites: 202-103 Biology for Land and Food Resources, 205-206 Crop Protection or 211-326 Forest Entomology and Pathology.

Semester: Semester 1

Description: On completion of this subject, students should:

- be familiar with the biology and taxonomy of the major biotic causes of disease;
- understand the processes of infection and pathogenesis;
- be aware of the factors leading to epidemic diseases;
- be capable of diagnosing common diseases of agricultural and horticultural crops;
- and be able to formulate a practicable approach to disease control in commercial species.

The content includes:

- taxonomy, identification and biology of the main groups of plant pathogens and abiotic causes of plant diseases;
- host parasite relationships, the nature of resistance to and tolerance of pathogenesis; means of transferring, including and modifying resistance in plants;
- mycotoxicoses in feed and fodder crops;
- aspects of aerobiology, ecology and variation of plant pathogens;
- and the processes leading to plant disease epidemics and their evaluation; the types and uses of fungicides, the bases of biological control of plant disease, insects and weeds and the management and control of plant diseases in general.

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

Prescribed texts: Agrios, G.N., *Plant Pathology*, 3rd ed. 1988, Academic Press. • Alexopoulos, C.J., and Mims, C.W., *Introductory Mycology*, 1979, Wiley.

205-402 Management of Plant and Animal Invasions

Availability: Parkville campus.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Prof Roger Cousens

Contact: 24 hrs lectures, field trips (*Semester 1*).

Description: This course deals with the biology, ecology and control of invasions. Case studies of particular species will be explored in some depth. Will

include a short field trip, an assignment and a plant collection (if the latter is no longer part of another subject).

Topics covered will include:

- the theoretical basis of colonization and population spread; genetics of invasions;
- ecology of feral animals;
- ecology of weeds;
- effects on biodiversity;
- chemical control (biochemistry, classification of chemicals, regulations);
- biological control;
- quarantine;
- and policy issues and legislation.

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

206-401 Advanced Plant Breeding & Biotechnology

Availability: Parkville campus.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Assoc Prof Mohan Singh

Prerequisites: 206-302 Molecular Biology, Genetics and Breeding.

Contact: 36 hrs lectures and 36 hrs practical work (*Semester 1*).

Description: It is expected that on completion of this subject students should understand genetics as it relates to plant breeding and be confident in applying genetics to improvement programs in plants. The students should also understand application of biotechnological techniques in relation to plant improvement and have a good preparation for higher degree study in plant breeding and biotechnology.

The topics to be covered include:

- application of genetics to plant improvement;
- methods, concepts and case studies in breeding for yield, quality and pest in agricultural plants;
- genetic modification of reproductive systems in plant breeding;
- molecular methods for hybrid seed production;
- application of molecular markers to breeding;
- case histories of cloning of agriculturally important genes by phenotype e.g. transposon tagging, T-DNA tagging;
- biotechnological approaches to manipulation of commercially important traits in agricultural plants;
- genetic stability, expression in field conditions, expression under different environmental conditions;
- the application of special techniques such as induced mutation, in-vitro selection.
- and practical work - exercises, excursions and discussion to illustrate particular aspects of the lectures and to familiarize students with research techniques in plant breeding and biotechnology.
- Excursions to plant breeding institutes and biotechnology laboratories may also be arranged.

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

206-402 Soil Management and Conservation

Availability: Dookie and Parkville campuses.**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr Tony Weatherley

Prerequisites: 206-201 Soil and Water Resources (recommended), 206-320 Processes in the Soil Environment.

Semester: Semester 1

Description: An understanding of the major current issues in the management of soils under various land uses in Australia, and the ability to apply practical solutions to problems of soil management.

The content includes:

- principles and application of methods of soil survey and land capability assessment, as appropriate to case studies;
- principles and practical significance of major soil management issues, including soil structure and its maintenance, maintenance of soil fertility, soil testing and the use of fertilizers, salinity and sodicity, soil acidification and erosion; application of case studies;
- and soil contamination and remediation.

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

209-403 Resource Industry Economics II

Availability: Parkville campus.

Credit points: 12.5**HECS-band: 2****Coordinator:** Prof Ellen Goddard**Prerequisites:** 209-101 Economics of Resource Use, or 316-102 Introductory Microeconomics, 209-201 Resource Industry Economics I.**Contact:** 24 hrs lectures and 24 hrs tutorials/pracs (*Semester 1*).**Description:** At the end of the course students should be able to apply economic reasoning and analytical techniques to resource use and conservation problems. This subject is about analysing the economics of environmental and ecological problems, all from the viewpoint of public choice.

The subject will cover areas of:

- natural resource scarcity and sustainability
- resource management choices and decision making;
- public choice theory and practice;
- economic and ecological criteria for decisions;
- valuation of resources including economic rent, land and water pricing, non-market valuation, discounting and sustainability;
- economics of renewable resources, optimal harvest rotation, preservation of old-growth forests, regulation, multiple use;
- and public goods and international environmental problems and tradeable permits.

Assessment: A three-hour examination (60%), and two written assignment equivalent to 3000 words (20% each).**Prescribed texts:** Hartwick, J.M. and N.D. Olewiler, *The Economics of Natural Resource Use*, 1998, Second Edition, Addison, Wesley, Longman.**209-404 Agricultural Policy & International Trade****Availability:** Parkville campus.**Credit points: 12.5****HECS-band: 2****Coordinator:** Assoc Prof Donald MacLaren**Prerequisites:** 209-101 Economics of Resource Use, or 316-102 Introductory Microeconomics, 209-301 Agricultural Marketing.**Contact:** 36 hrs lectures and 24 hrs tutorials/seminars (*Semester 2*).**Description:** The objective of the subject is for students to 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;
- analyze the effects of agricultural protectionism on international trade and be knowledgeable about the outcome of the Uruguay Round in the GATT;
- analyze 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;
- and environmental issues as they relate to trade in food and fibre products. 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.**211-412 Advanced Topics in Genetics & Breeding**

See full subject details on page 608.

