Bachelor of Agricultural Science

Fourth-year subjects

Compulsory subjects

212-413 Vacation Work (Practical Experience) 2

Note: This subject is a hurdle requirement for the completion of the BAgSc degree. Degrees are not conferred until the practical work experience requirement is satisfied.

Availability: Parkville campus

Credit points: 4 **HECS-band:** 2

Coordinator: Assoc Prof Bill Malcolm

Semester: Year long

Assessment: Reports on at least two periods of work experience which are marked pass or fail only. They must be submitted during Semester 2.

Elective subjects

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

207-301 Global Env'ment & Sustain Prod Systems

See full subject details on page 8.

521-301 Protein Structure, Design & Engineering

See full subject details on page 2.

521-302 Functional Genomics

See full subject details on page 2.

521-303 Molecular Aspects of Cell Biology

See full subject details on page 3.

521-304 Hormone & Neurotransmitter Biochemistry

See full subject details on page 3.

521-305 Biochemistry of Metabolism & Nutrition

See full subject details on page 3.

521-306 Plant Biochemistry & Biotechnology

See full subject details on page 3.

521-321 Gene Technology & Protein Expression

See full subject details on page 4.

207-410 Agroforestry

See full subject details on page 4.

208-412 Advanced Topics in Genetics and Breeding

See full subject details on page 12.

212-404 Animal Welfare

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Prof Paul Hemsworth

Contact: Twenty-four hours of lectures and 36 hours of project work *(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 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; codes of practice for the welfare of livestock; and welfare solutions.

Assessment: An exam (50%) and one written project report (50%).

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

212-406 Crop & Pasture Physiology

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Dr Marc Nicolas

Prerequisites: 212-205 Environmental Infomatics and 212-304 Plant Production.

Contact: Thirty-six hours of lectures and 36 hours of practical work *(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.

212-407 Applied Plant Breeding & Biotechnology

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: A/Prof Mohan Singh & Dr Philip Salisbury

Prerequisites: 212-314 Genetics and Breeding, and 212-315 Molecular Biology and Biotechnology. If prerequisites are not met, please see subject coordinator for possible exemption.

Contact: Twenty-four hours of lectures and 48 hours of practical work/excursions *(Semester 2).*

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; case histories of cloning of agriculturally important genes by phenotype eg. 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; gametophytic selection, cytogenetics, interspecific hybridisation to the improvement of agricultural plants. Practical work includes exercises, excursions and some formal practical classes and discussion to illustrate particular aspects of the lectures and to familiarise students with research techniques in plant breeding and biotechnology. Excursions to plant breeding institutes and biotechnology laboratories may also be arranged.

Assessment: A 3-hour end-of-semester written examination; practical work (up to one seminar discussion, one project report and one practical examination).

212-408 Advanced Topics in Farm Animal Science

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

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Dr Brian Leury

Prerequisites: 212-358 Animal Physiology

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

Description: The aim of this subject is to present 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.

On 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.

Subject content will include topics drawn from current research areas in growth and development, meat production, lactation, and reproduction. Emphasis will be placed on factors controlling growth and differentiation, growth promoting agents, hormones involved in the repartitioning of nutrients towards meat, milk and fibre production, transgenesis and reproduction.

Assessment: A 3-hour end-of-semester written examination (50%), two assignments of up to 3500 words each, (40%) and a seminar (10%).

212-409 Plant Pathology

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Dr Peter Taylor

Contact: Thirty-six hours of lectures and 36 hours of practical work *(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.

Topics include 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. Practical work includes the identification and diagnosis of disease and the development of skills in research techniques and methodology in plant pathology. Excursions and assignments will be included when appropriate.

Assessment: A 3-hour end-of-semester written examination. Marks are given for a practical examination, and for an assignment comprising a collection of plant diseases.

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

212-411 Animal Management and Production

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Prof Adrian Egan

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

Description: The course includes analysis of the following key issues in livestock production systems: the size, distribution and value of each animal industry, breed selection and genetic improvement, practical feeding of breeding and growing animals, optimisation and reproductive output, environmental effects and use of buildings, management regimes to maintain animal health, maximisation of product quality, production system analysis and considering of alternatives, and marketing and markets. On completion of this subject, students should be aware of all the major inputs into a management 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 analysing a production system; aware of alternative production systems; and capable of surveying an animal industry.

Assessment: A 3-hour written end-of-semester examination; two written assignments (up to 2500 words each) related to the practical work

212-416 Resource Economics & Management

Note: For BForSc students, 12.5 points only.

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Dr Brian Davidson

Semester: Semester 2

212-423 Agricultural Policy & Internat.Trade

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Assoc Prof Donald Maclaren

Semester: Semester 2

212-424 Project In Agricultural Science

Note: To be eligible to undertake this subject students will generally need to have at least an H3 average in the previous year of study.

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Professor R Richardson

Contact: A supervised project equivalent in weight to a fourth-year elective in agricultural science (ie. 36 hours of lectures and 36 of hours practical work) *(Semester 1, repeat 2).*

Description: The aim of this subject is to provide undergraduate students with experience in research in the following ways: nomination of a research problem; reviewing relevant published literature on the research topic and developing a rationale for the proposed research; devising feasible sound experimental approaches to conducting research on the proposed topic; and the reporting of research findings, both by way of a written report (in the form of a research paper) and a seminar with emphasis on critical and sound scientific judgement. The project is designed and conducted under direct supervision of an academic staff member and comprises a review of the literature, a research task and the preparation of a report on the task.

Assessment: A written report of up to 5000 words, including a literature review and a report on the conduct and findings of the research; a seminar presentation.

212-433 Resource Mgt & Agric Systems Analysis

Availability: Parkville campus

Credit points: 16 **HECS-band:** 2

Coordinator: Professor David Chapman

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

Description: On completion of this subject, students will 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.