Bachelor of Agricultural Science

Second year subjects

212-201 Soil Resources

Availability: Parkville campus

Credit points: 12 **HECS-band:** 2

Coordinator: Professor Bob White

Prerequisites: Familiarity with chemistry and mathematics is recommended.

Contact: 33 hours of lectures; 33 hours of laboratory practical classes; two 1-day field excursions *(Semester 1).*

Description: This subject identifies the importance of soils in the landscape and as part of ecosystems, both natural and managed ecosystems. It explains the origins of soil variability and how this variability is expressed through the properties and behaviour of soils in the field. Topics covered include the physical and chemical nature of soil minerals and organic matter; the main soil organisms and their function, soil structure, aeration, water retention and movement, reactions in the soil solution and between the solution and surfaces, and processes in soil profile development and horizon differentiation. This information will be applied to understanding the cycling of water and nutrients in natural and managed ecosystems, the behaviour of wet soils, and the impact of disturbance through clearing of vegetation and the establishment of agriculture on the quality of the resource. The concept of soil information systems and codification through classification will also be introduced.

Assessment: One 3-hour written examination. Practical tests will be given throughout the semester and marks will also be given for practical records, excursion reports and an assignment.

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

212-202 Agricultural Economics

Credit points: 10 **HECS-band:** 2

Coordinator: Dr Brian Davidson

Contact: 36 hours of lectures and 12 hours of tutorials *(Semester 2).*

Description: The aim of the subject is to provide students with an understanding of basic principles of economics, with an emphasis on the agricultural sector. After completing this subject students will be able to apply economic ways of thinking and techniques of analysis to questions about uses of resources. The subject covers the following topics: introductory principles of micro and macro economics; scarcity; demand; supply; markets; competition and resource allocation; demand, price, elasticity and total revenue; supply, production and cost relationships; marginal analysis and profit; market failure; capital markets; investment; economic growth; role of government; economic cycles; comparative advantage and trade; and agriculture in the economy.

Assessment: A 3-hour written examination at the end of semester worth 70%. Three assessment tasks during semester, each worth 10%.

Prescribed texts: D McTaggertet al, *Economics*, Addison-Wesley, 1996.

212-205 Environmental Infomatics

Availability: Parkville campus

Credit points: 10 **HECS-band:** 2

Coordinator: Dr Glyn Rimmington

Contact: 48 hours of presentations, tutorials and practicals *(Semester 2).*

Description: On successful completion, students will be able to identify, use and, if necessary, develop appropriate software applications for analysis, problem-solving, communication and knowledge integration in environmental studies. In addition, they will gain an appreciation of the impact of information technology on rural industries concerned with land management and the importance of tailoring computer systems to the needs of users. They will understand the basis of choosing appropriate IT solutions to solve environmental management problems, the mathematical methods underlying software applications, the process of IT acquisition and the principles of meeting users' requirements in applications development. Students will develop skills in spreadsheet modelling, simulation, geographic information systems and applications development. They will appreciate the importance of the human-computer interface, the application of automated data acquisition and remote sensing, image processing, neural networks, video conferencing, disaster recovery planning, virtual reality, computer-aided learning and the necessity for ongoing study of IT developments to increase the effectiveness and efficiency of environmental studies and management.

Assessment: A 2-hour end-of-semester examination and practical assignments.

Prescribed texts: N Stephenson, *Snow Crash*, Penguin, 1992. • N Negroponte, *Being Digital*, Knopf, 1995.

212-207 Field Experimentation

Availability: Parkville campus

Credit points: 10 **HECS-band:** 2

Coordinator: Dr Marc Nicolas and Prof Adrian Egan

Contact: 14 hours of lectures, 27 hours of practical work and 12 hours of tutorials. For the practical work, the class will be divided into two groups that attend on alternate weeks *(Year long).*

Description: On completion of this subject, students should be familiar with a range of routine crop and livestock management practices, their purposes and the skills involved; be aware of factors affecting the level and variability of crop and livestock performance encountered in practice; have experience in investigation of crop and livestock performance in the field by observation and measurement; have a working knowledge of appropriate experimental design and sampling procedures; and be able to interpret results and present a written report using a scientific format.

The practical work will involve the measurement of growth and development of crops, pastures and livestock in relation to environmental constraints and management practices. Aspects of experimental design, sampling procedures, measurement methods and interpretation of results will be emphasised.

Assessment: A 3-hour end-of-year written examination, and two written assignments throughout the year (each up to 2000 words). Practical work and participation in tutorials will be assessed.

212-220 Animal Science 1

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

Availability: Parkville campus

Credit points: 11 **HECS-band:** 2

Coordinator: Prof Adrian Egan

Contact: 36 hours lectures and 24 hours of practical work *(Semester 2).*

Description: Animal Behaviour: topics include behaviour and adaptation; imprinting, habituation and conditioning; social behaviour, with emphasis on domestic and agricultural species. The student will have an understanding of animal behaviour, factors modifying its expression and the influence of behaviour on animal production systems. This will lead to better handling and management of livestock. Animal Health: topics include the concept of 'Production Disease'; management for control of nutritional, reproductive, parasitic and neonatal diseases. The student will 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. Nutrition and Energy Metabolism: Topics include basic nutritional and energetic concepts; the central role in animal production of efficiency of conversion of feeds to desired products; feed resources: identification and utilisation; interactions between plant and animal production in meeting nutritional needs of domestic animals and humans. Students will understand the central role of nutrition in animal production systems, be familiar with the nature of the nutrients, their digestion, metabolism, interactions and their supply and availability in feedstuffs. An understanding of basic nutrition is a prerequisite for subsequent courses in the animal sciences stream and enables the student to appreciate the significance to animal production of many other subjects in the course.

Assessment: Up to three hours of written examinations; practical work.

521-024 Biochemistry and Molecular Biology

Availability: Parkville campus

Credit points: 22 **HECS-band:** 2

Coordinator: Ms B Bencina and Dr K R Gayler

Prerequisites: Chemistry - 25 points at 100 level. Biology 600-141/142 is not a prerequisite but is recommended.

Contact: 72 hours of lectures, 12 hours of tutorials and 12 hours of computer-based tutorials, 36 hours of practical work, including computer-assisted learning exercises *(Year long).*

Description: By the end of the subject, students should have acquired knowledge of the fundamental areas of biochemistry and molecular biology relating to structure and function of biological molecules, metabolism, gene function, replication and regulation and develop an appreciation of the relevance of these areas to agriculture and related disciplines. For a complete description of the lecture content of the course, please refer to the entries under Principles of Biochemistry and Molecular Biology Part A (521-211) and Principles of Biochemistry and Molecular Biology Part B (521-212), which are listed under the Science Faculty entries of this Handbook. The laboratory section of this course deals with biochemical analysis with an emphasis on metabolism,

enzymes and regulation. The practical work for this subject is carried out within the Biochemistry and Molecular Biology Department.

Assessment: Theory: computer-based tests on knowledge gained from computer tutorials (5%), progressive assessment during tutorial sessions (15%) and two 3-hour written examinations at the end of Semester 1 and Semester 2 (30% each). Practical work will be assessed by continuous assessment (15%) and written tests during practical session times (5%).

Prescribed texts: C Mathews and K van Holde, *Biochemistry*, 3rd ed. Benjamin/Cummins, 1999.

606-023 Agricultural Botany

Availability: Parkville campus

Credit points: 15 **HECS-band:** 2

Coordinator: Dr Ian Woodrow

Prerequisites: 600-141 Biology of Cells and Organisms *(p.791)* and 600-142 Genetics & The Evolution of Life *(p.792)*

Contact: 24 lectures and 60 hours of practical work *(Semester 1)*.

Description: Topics studied include:

- plant anatomy: structure of plant cells, tissues and organs (6 lectures, 15 hours practical).
- plant physiology: photosynthesis, growth and development; plant-animal interactions; plant nutrition; secondary metabolism; flowering. (18 lectures, 21 hours practical).
- plant taxonomy: morphology and identification, taxonomy of angiosperms (24 hours practical).

Upon completion of the subject, students should gain:

- a knowledge of plant structure and physiological function in relation to the environment;
- practical skills in studying and identifying plants;
- skills in experimental design and methods.

Assessment: A 3-hour combined theory examination; practical book and slide preparation (anatomy); log book and up to three practical reports (physiology); practical test, practical book and plant collection (taxonomy).

Prescribed texts: F H Salisbury and C Ross, *Plant Physiology*, 4th ed.,Wadsworth, 1991. • S L Duigan, *The Families and Genera of Victorian Plants*, School of Botany, University of Melbourne. • S L Duigan, *The Grasses, Particularly Those of Victoria, Australia*, School of Botany, University of Melbourne.

620-031 Statistics & Data Analysis

Availability: Parkville campus

Credit points: 10 **HECS-band:** 2

Coordinator: Dr K Borovkov

Contact: 24 lectures (two hours a week); 12 hours of tutorials and 12 hours practical work (two hours a week) *(Semester 1)*.

Description: Upon completion of the subject, students should be able to recognise, understand, and apply the basic concepts of study design, such as observational studies versus designed experiments, confounding, replication, randomisation, and blocking, and discuss the effect of the design concepts on the interpretation of results; recognise and apply basic study designs like completely randomised one and two factor and randomised block designs; make and interpret appropriate graphs and tables for data from one and two factor designs; display an understanding of the basics of statistical models, such as predictions, residuals, parameters, estimation, and the normal distribution; formulate models for simple one and two factor designs, including interaction, and interpret them in terms of the data; state the assumptions of simple models and use the data and residuals to check these assumptions; and display an understanding of the purpose and limitations of inference, and be able to use the main tools of inference to learn about data. Topics include one- and two-way ANOVA, simple linear 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: *Theory*: a 2-hour end-of-semester examination (75%). *Practical*: up to 50 pages of assignments (25%).

Third year subjects

212-304 Plant Production

Availability: Parkville campus

Credit points: 18 **HECS-band:** 2

Coordinator: Prof David Connor

Prerequisites: 606-023 Agricultural Botany *(p.628)*, 521-024 Biochemistry and Molecular Biology *(p.627)*, 212-201 Soil Resources *(p.627)*.

Contact: 48 hours of lectures and 36 hours of practical work *(Semester 2)*.

Description: Topics include potential and actual production; factors limiting productivity; efficiency of production; intra- and inter-specific competition; effect of weeds; modes of action, methods of application and role of herbicides; availability of water and nutrients; water flow through crops and pastures, relationship to growth and yield; productivity and management of rainfed agriculture; principles of irrigation; components of yield in crops and pastures; growth and development; legumes as components of communities and rotations; final and seasonal production; nutrient cycling; dynamics of re-establishment of annual pastures; infectious agents and their effect on growth, yield and quality; diagnosis and treatment; crop protection and integrated pest management; practical work: Practical classes in plant protection will be held and a research project will be conducted in residence at the Longerenong Campus.

On completion of this subject students should: be aware of the potential productivity of crops and pastures in temperate Australian agriculture; appreciate many of the physical, biological and environmental constraints which limit productivity; and be aware of important agronomic and disease control practices used in the management of crops and pastures.

Assessment: A 3-hour written examination (60%); a practical examination (10%), a literature review (10%) and a report on the Longerenong excursion (20%). Students are also required to submit an accurately named collection of 80 plants of agricultural significance, including at least 20 grasses. A pass in the subject requires individual passes in the written examination plus the literature review and in the remaining practical components taken as group.

Prescribed texts: G N Agrios, *Plant Pathology*, 3rd ed., Academic Press, 1988. • C J Pearson and R L Ison (eds), *Agronomy of Grassland Systems*, CUP, 1987. • R S Loomis and D J Connor, *Crop Ecology: Productivity and Management in Agricultural Systems*, CUP, 1992.

212-305 Communicating Ag & Environ Technology

Note: This subject may be offered in block teaching mode. This will include full days off campus within industry and relevant working environments and some weekend work.

Availability: Parkville campus

Credit points: 10 **HECS-band:** 2

Coordinator: Dr Kath Williams

Contact: 36 hours of lectures plus an industry placement *(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.

This subject examines the communication of agricultural and environmental technology as processes of information exchange which assist information users make better decisions. Topics include the communication skills of writing, speaking, body language, establishing rapport, questioning and listening; community consultation and mass media techniques; 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 behaviour; interpretation of natural resources, including forest, to the general public; business decision making, project management, evaluating the effects of communication projects; public and private extension, Australian and overseas extension models; the ethics of social influence applied to extension and communication; and case studies.

Students must undertake an industry project. This provides an opportunity to study communication and marketing techniques used by an agricultural or forestry business or government department and to apply the issues studied in lectures to industry. Students will be expected to visit and observe or work with a business for two days and during that time undertake a project related to communication or marketing.

Assessment: A 2-hour end-of-semester written examination; one written assignment (up to 2000 words); a report on industry placement.

Prescribed texts: H Mackay, *Why Don't People Listen?*, Pan, 1994. • A W van den Ban and H S Hawkins, *Agricultural Extension*, Longmans, 1988.

212-306 Processes in the Soil Environment

Availability: Parkville campus

Credit points: 15 **HECS-band:** 2

Coordinator: Dr Tony Weatherley

Prerequisites: 212-201 Soil Resources *(p.627)*

Contact: 72 hours of lectures, field demonstrations and laboratory-based classes *(Semester 2)*.

Description: By the completion of the subject, students should have developed an appreciation of the dynamic nature of the soil resource; have acquired detailed knowledge of chemical, physical and biological processes in the soil environment, particularly those which impact directly on plant growth; and have gained an understanding of how soils can be managed to optimise plant growth and minimise adverse effects on the environment.

Topics to be covered include:

Soil-plant relationships: Concepts in plant nutrition, mechanisms of nutrient uptake by roots, nutrient interactions; the rhizosphere, diffusion and mass flow, redox, carbon and nutrient dynamics; soil as a medium for plant growth, processes controlling nutrient availability with particular reference to nitrogen, phosphorus, potassium, sulphur and the micro-nutrients; assessment of nutrient availability including quantity/intensity relationships; processes of soil acidification and amelioration of soil acidity.

Soil contamination: Contaminants in urban and agricultural systems, reactions and mobility in soil, soil remediation.

Soil biotechnology: Symbionts and their role in plant nutrition, microbially-derived plant growth regulators, inoculation, soil enzymes and biological inhibitors.

Soil physical processes: Soil structure classification and effects on water and solute movement, leaching and model descriptions of solute transport.

Assessment: Up to three hours of written examination. Tests on the practical component of the subject may be given during the semester. Marks will also be allotted for assignments and practical reports. The weighting of each component will be published at the beginning of the semester.

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

212-313 Vacation Work(Practical Experience) 1

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

Availability: Parkville campus

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

Coordinator: Dr Peter Taylor

Contact: At least 6 weeks practical experience on two or more farms; each period of farm work should last for at least 2 weeks. (Reports to be submitted by end of first week of second semester) *(Year long).*

Description: On completion of vacation work students should have some experience of life and work on farms, farming operations and planning, rural society, its structure and organisation, as well as the structure and operation of rural industries. A major objective is to provide practical experience which assists students to relate to subjects taught in the course.

Practical experience should normally be gained on private farms, but other work connected with agriculture (on institutional farms, research stations and other enterprises as the Dean may approve on behalf of the Faculty) may also be accepted. Some credit may be granted for work done on family farms and with certain commercial organisations on written application to the Dean.

Assessment: Reports, which are marked to pass or fail only, must be submitted as soon as possible after the work is performed and in any event by the first day of the second semester of third year.

212-314 Genetics and Breeding

Availability: Parkville campus

Credit points: 5 **HECS-band:** 2

Coordinator: Dr Philip Salisbury

Contact: 24 hours of lectures *(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. The topic includes 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; marker-assisted selection; special techniques used in plant breeding: induced mutations, poly ploidy, double haploids, somatic hybridization and tissue culture; commercialisation and intellectual property issues; quantitative genetics in plant and animal breeding; and breeding programs for the economic improvement of livestock.

Assessment: A 2-hour end-of-semester examination and one written assignment (up to 3000 words).

212-315 Molecular Biology & Biotechnology

Availability: Parkville campus

Credit points: 5 **HECS-band:** 2

Coordinator: Assoc Prof Mohan Singh

Contact: 24 hours of lectures *(Semester 1).*

Description: It is expected that on the completion of the subject students should gain an understanding of the genes at the molecular level and a knowledge of genetic engineering techniques for manipulation of important traits. The topics to be covered include; the structure and arrangement of the genome in eukaryotes contrasted with the prokaryote genome; the mechanism and regulation of gene expression in higher organisms, both plants and animals, both at the RNA and DNA level; the molecular basis of tissue and organelle specific gene expression; modern methods of genetic engineering including details of vector systems currently being applied to plants and animals of agricultural importance; biotechnological approaches for manipulation of commercially important traits in crop plants such as improved nutritional quality, seed oil composition, disease resistance and tolerance to abiotic stresses; biotechnological approaches to improved post harvest characteristics of horticultural produce; the use of reproductive technology, genetic markers and transgenics for genetic improvement of animals; transgenic animals as bioreactors; application of biotechnology for improvement of pastures; risks and concerns regarding environmental release of transgenic organisms; and intellectual property issues in biotechnology.

Assessment: A 2-hour end-of-semester written examination; and one written assignment (up to 3000 words).

212-316 Resource Economics & Management

Availability: Parkville campus

Credit points: 15 **HECS-band:** 2

Coordinator: Dr Brian Davidson

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

Description: On completion of this course students will understand social cost-benefit analyses, have an understanding of welfare economics and the questions of efficiency and distribution, be able to make resource management decisions on an economic basis, be familiar with the methods for the economic evaluation of non-market goods, and be familiar with the issues of resource conservation and degradation in Australia. The content will cover financial and economic analysis: inflation, discounting, taxes and subsidies, criteria; principles of welfare economics; benefit-cost analysis: criteria, opportunity costs, market prices vs shadow prices, transfer payments, non-market goods and services; recreation economics: willingness to pay, travel cost method, introduction to contingent valuation; conservation economics: public consumption goods, hedonic prices, contingent valuation; theory of common property resource use; non-renewable resources; environmental constraints to Australian agriculture; and economic and policy analysis of land and water use and of resource degradation issues such as soil acidity, salinity, erosion, vegetation decline.

Assessment: One 3-hour examination at the end of the semester worth 60% and assessment tasks worth 40%.

Prescribed texts: J A Sinden and D J Thampapillai, *Introduction to Benefit-Cost Analysis*, Longman, 1995.

212-323 Agricultural Policy & Internat.Trade

Availability: Parkville campus

Credit points: 15 **HECS-band:** 2

Coordinator: Assoc Prof Donald Maclaren

Contact: 36 hours of lectures and 24 hours of 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 a knowledge of the policy objectives being pursued, together with the policy instruments employed; analyse the effects of agricultural protectionism on international trade and be knowledgeable about the outcome of the Uruguay Round in the GATT; and analyse environmental issues as they relate to trade issues in food and fibre; 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 in the GATT and the WTO. Environmental issues as they relate to trade in food and fibre products; and aspects of the world food problem.

Assessment: A 3-hour end-of-semester written examination (80%); a written assignment of up to 3000 words (20%). A pass requires not only an overall mark of 50% but also a minimum mark of 45% in the final written examination.

212-358 Animal Physiology

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: Parkville campus

Credit points: 15 **HECS-band:** 2

Coordinator: Dr Brian Leury

Prerequisites: 212-220 Animal Science 1 *(p.627)*

Contact: 36 hours of lectures and up to 36 hours of practical classes, demonstrations, tutorials and/or discussion periods *(Semester 1)*.

Description: The aim of this subject is to establish a knowledge of normal physiological function of domestic animals. The lecture course is supplemented by practical classes that illustrate the lecture series and which are designed to assist students to develop certain manipulative skills, to handle experimental animals, to sample tissues and body fluids, and to analyse these using a variety of physiological techniques.

On completion of the program, students should know and understand: the terminology of physiology; the principles and essential information regarding the functions of different cell types, their interactions in organs and tissues; the mechanisms by which the organ systems are controlled and coordinated in the normal animal body; nutritional, reproductive, lactation and growth physiology; differences in animal productivity related to nutritional, endocrine and physiological factors; and how to analyse data from class experiments and to validate the data against published information.

Subject content includes introduction to cell physiology, molecules of the cell membranes, and movement of molecules across cell membranes; nervous system and information transfer, and contraction of muscle; lymphocytes and the immune system; physiology of the cardiovascular, renal, respiratory and reproductive systems; endocrinology; lactation; and pre- and post-natal growth and development.

Assessment: A 3-hour written examination. Practical work and participation in tutorials and discussion groups will be assessed. The timetable and weighting for each component will be published at the start of the course.

Prescribed texts: R D Frandson, *Anatomy and Physiology of Farm Animals*, 5th ed., 1992. • L Sherwood, *Human Physiology from Cells to Systems*, 2nd ed., 1993. • J G Cunningham, *Textbook of Veterinary Physiology*, 1992. • W Bruce Currie, *Structure and Function of Domestic Animals*, Butterworths, 1988.

212-410 Agricultural Business Mgt & Marketing

Availability: Parkville campus

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

Coordinator: Assoc Prof Bill Malcolm

Contact: 36 hours of lectures and 36 hours of tutorials/seminars *(Semester 2)*.

Description: The aim of this subject is for students of agricultural science and agricultural economics to understand the principles of management economics applied to the operation agricultural businesses, be able to analyse investment and profitability of resource use in agricultural businesses, and evaluate business marketing strategies The content of the subject is as follows: management; financial management; profit, cash flows and business structure; activity analysis; budgeting; investment analysis; risk management; agricultural marketing concepts; futures markets; and a number of farm visits will be made and case studies completed.

Assessment: A 3-hour end-of-semester written examination; case study assignments.

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

620-032 Design & Analysis of Experiments

Availability: Parkville campus

Credit points: 10 **HECS-band:** 2

Coordinator: Dr K Sharpe

Prerequisites: 620-031 Statistics and Data Analysis

Contact: 24 lectures (two hours a week); 12 hours of tutorials and 12 hours of practical work (two hours a week) *(Semester 2)*.

Description: On completion of the subject, students should be able to demonstrate a working knowledge in practical situations of material from a variety of special topic areas in statistics. Material will be chosen from among the topics: multiple regression, diagnostics, model selection etc.; three-way factorial designs; designs with discrete response; sample surveys; time series; unbalanced two-way designs, incomplete blocks; split-plot, repeated measures and nested designs; non-linear regression; and non-parametric methods.

Assessment: Theory: a 2-hour end-of-semester examination (75%). Practical: up to 50 pages of assignments during the course (25%).

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: Dr Peter Taylor

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 second semester.

Additional details as for 212-313 Vacation Work(Practical Experience) 1 *(p.629)*.

Elective subjects

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

211-412 Advanced Topics in Genetics & Breeding

See full subject details on page 608.

212-404 Animal Welfare

Availability: Parkville campus

Credit points: 16 **HECS-band:** 3

Coordinator: Prof Paul Hemsworth

Contact: 24 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 *(p.627)* and 212-304 Plant Production *(p.628)*.

Contact: 36 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: 24 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 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; gametophytic selection, cytogenetics, interspecific hybridization 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 *(p.629)*

Contact: 36 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: 36 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 ed., 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: 24 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

212-412 Social Research Methods

Availability: Parkville campus

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

Coordinator: Dr Kath Williams & Dr Ruth Beilin

Contact: 36 hours of lectures and 24 hours of practical work, including a field project *(Semester 2).*

Description: Understanding of human social processes is critical to effective land management and social research skills are therefore valued by resource management agencies. This subject aims to equip students with knowledge and skills to collect and evaluate social data which can be used to improve resource management. The subject covers both quantitative and qualitative methods in social research including selection of appropriate research techniques; and issues of sampling, reliability and validity in social research. Methods of social research including construction of surveys and sampling procedures; interview techniques for individual and group settings; participant and non-participant observation; documentary and comparative research; and social research ethics are examined.

The field project covers the three phases of social research: design, field application and writing-up.

Assessment: A 3-hour end-of-semester written examination, an assignment, a field project, class exercises and seminar. Written and practical tests may be given throughout the subject.

Prescribed texts: D A de Vaus, *Surveys in Social Research,* 4th ed., Allen and Unwin, 1995. • T May, *Social Research: Issues, Methods and Process,* 2nd ed., Open University Press, 1997. • C Robson, *Real World Research,* Blackwell, 1993.

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 1

Additional details as for 212-316 Resource Economics & Management *(p.629).*

212-417 Global Environment and Food Systems

Availability: Parkville campus

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

Coordinator: Dr Tony Weatherley

Prerequisites: None

Contact: 36 hours of seminars and tutorials (average of 3 hours per week) and up to 36 hours of self-directed learning (average of 3 hours per week) *(Semester 1).*

Description: On completion of this subject students should be able to recognise that the response of a stakeholder to environment and sustainable food systems may be influenced by regional and global issues; and be able to

appreciate the perspectives of different stakeholders and their role in the solution to problems associated with environment and sustainable food systems.

Case studies will be presented in topical areas of environment and sustainable food systems by the participating institutions. Content will vary depending on the institution involved but will cover issues such as population demographics, ecotourism, waste management, biodiversity, biotechnology and dryland agriculture. The student will become part of a global classroom as a member of a group formed from students at each university and facilitated by postings to discussion forums and construction of websites on the Internet. Each group will take, in turn, a particular perspective to be addressed during the seminars: social/cultural, political, technical, environmental, ethical/philosophical. Thus after six seminars each group will have tackled a topic from one of the above perspectives. Compressed video and other technologies are used to present case study material and the global seminar.

Assessment: The major assessment tasks are a report of not more than 7000 words and a seminar on the group project relating to an aspect of the seminar series. Marks will be allocated for attendance and active participation in each of the live broadcasts and postings to discussion forums.

212-423 Agricultural Policy & Internat.Trade

Availability: Parkville campus

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

Coordinator: Assoc Prof Donald Maclaren

Semester: Semester 2

Additional details as for 212-323 Agricultural Policy & Internat.Trade *(p.629)*.

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 David Chapman

Contact: A supervised project equivalent in weight to a fourth year elective in agricultural science (i.e. 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: Up to 20 hours lectures and seminars, plus 52 hours project work including field site visits, background research, preparation of written reports, and oral reporting back sessions to an audience *(Semester 2)*.

Description: On completion of this course, 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 in a practical context.

Students will complete two 'mini-consultancy' case study projects, the first in small groups and the second as individuals. 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, analyse 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: A 2-hour end-of-semester examination worth not more than 40% of final mark; continuous assessment of written and oral reports on project work.

211-441 Advanced Agroforestry

Note: For BAgSc students, points will be 16.

Availability: Parkville campus

Credit points: 12.5 **HECS-band:** 2

Coordinator: Mr Rowan Reid

Contact: 24 hours of lectures and 36 hours of practical work *(Semester 1)*.

Description: This lecture-based course covers in detail the technical aspects of farm revegetation planning. Students will be expected to participate in field-based learning exercises and information gathering, and to contribute to discussion and debate.

By the end of the subject students should have a working knowledge of agroforestry diagnosis and design as an approach to the development of farm tree management opportunities on farms in Australia and overseas; appreciate the importance of assessing landowners' needs, aspirations and performance criteria when designing agroforestry projects and development strategies; be able to develop technical design criteria for effective revegetation for resource conservation, agricultural production and direct commercial purposes; and be familiar with approaches to tree monitoring and evaluation.

Assessment: Agroforestry design project (25%), farm forestry strategy project (25%) and 2-hour examination (50%).

421-470 Land Degradation & Management

See full subject details on page 510.

521-301 Protein Structure, Design & Engineering

See full subject details on page 787.

521-302 Functional Genomics

See full subject details on page 787.

521-303 Molecular Aspects of Cell Biology

See full subject details on page 787.

521-304 Hormone & Neurotransmitter Biochemistry

See full subject details on page 788.

521-305 Biochemistry of Metabolism & Nutrition

See full subject details on page 788.

521-306 Plant Biochemistry & Biotechnology

See full subject details on page 788.

521-321 Gene Technology & Protein Expression

See full subject details on page 789.