

367-345A,B	(1)	Horticulture - Solanaceous Crops
367-346A	(1)	Horticulture - Temperate Tree Fruits
367-347A	(1)	Horticulture - Small Fruits
367-348A,B	(1)	Horticulture - the Brassicas
367-421A	(3)	Landscape Plant Materials
367-460A	(3)	Plant Ecology
367-535B	(3)	Plant Breeding

MINOR IN AGRICULTURAL PRODUCTION

Academic Adviser: Professor K. A. Stewart

This Minor program is designed to allow students in non-agricultural production Majors to receive credit for courses in agricultural production and to stimulate "cross over" studies. The Minor can be associated with existing Major programs in the Faculty, but in some instances it may require more than 90 credits to meet the requirements of both the Major and the Minor.

Students are advised to consult their Major Program adviser and the Academic Adviser of the Minor in their first year. At the time of registration for their penultimate year, students must declare their intent to obtain a Minor in Agricultural Production. With the agreement of their Major Program adviser they must submit their program of courses already taken, and to be taken in their final year, to the Academic Adviser of the Agricultural Production Minor. The Academic Adviser of the Agricultural Production Minor will then certify which courses the student will apply toward the Minor and that the student's program conforms with the requirements of the Minor.

General Regulations

To obtain a Minor in Agricultural Production, students must:

- ensure that their academic record at the University includes a C grade or higher in the courses as specified in the course requirements given below.
- offer a minimum total of 24 credits from the courses as given below, of which not more than 6 credits may be counted for both the Major and the Minor programs. This restriction does not apply to elective courses in the Major program.

Required Courses: 12 credits

Complementary Courses: 12 credits.

		CREDITS
Required Courses:		12
342-250A	Principles of Animal Science	3
367-211A	Principles of Plant Science	3
367-300B	Cropping Systems	3
372-210A	Principles of Soil Science	3

Complementary Courses: 12

12 credits chosen from the following list in consultation with the Academic Adviser for the Minor:

342-450A	(3)	Dairy Cattle Production
342-452B	(3)	Beef and Sheep Production
342-454B	(3)	Swine Production
342-456A	(3)	Poultry Production
367-331A	(3)	Field Crops
367-341A,B	(1)	Horticulture - the Alliums
367-342A,B	(1)	Horticulture - Perennial Vegetable Crops
367-343A,B	(1)	Horticulture - Root Crops
367-344A,B	(1)	Horticulture - Salad Crops
367-345A,B	(1)	Horticulture - Solanaceous Crops
367-346A,B	(1)	Horticulture - Temperate Tree Fruits
367-347A,B	(1)	Horticulture - Small Fruits
367-348A,B	(1)	Horticulture - the Brassicas

Notes:

- Most courses listed at the 300 level and higher have prerequisites. Although instructors may waive prerequisite(s) in some cases, students are urged to prepare their program of study well before their final year.
- Not all courses are available in any given year. Consult departmental listings for full course descriptions and offerings.

7 Course Descriptions

Courses are listed numerically by prefix. For courses in the following areas, consult listings with the appropriate prefix:

Agricultural and Biosystems Engineering - 336	(page 449)
Animal Science - 342	(page 452)
Biology - 344	(page 452)
Biotechnology - 394	(page 460)
Economics - 334	(page 448)
English - 348	(page 453)
Entomology - 350	(page 453) and 373
Ethics - 260	(page 447)
Extension - 352	(page 453)
Food Science and Agricultural Chemistry - 333	(page 447)
Forest Resources - 374	(page 457)
General Agriculture - 330	(page 447)
Genetics - 356	(page 453)
Mathematics - 360	(page 454)
McGill School of Environment - 170	(page 446)
Microbiology - 362 and 373	(page 454)
Natural Resource Sciences - 373	(page 456)
Nutrition and Dietetics - 382	(page 458)
Parasitology - 391	(page 460)
Physics - 338	(page 451)
Plant Science - 367	(page 456)
Renewable Resources - 375	(page 457)
Soil Science - 372 and 373	(page 456)
Zoology - 349	(page 453)

All pre- and co-requisites in a course sequence leading to a more advanced course must be successfully completed before registration will be permitted in the advanced course.

The course credit weight appears in parentheses (#) after the name.

- Denotes courses not offered in 2000-01.
- ★ Denotes courses offered only in alternate years.
- Denotes limited enrolment.

7.1 Environment

170-200A THE GLOBAL ENVIRONMENT. (3) A systems approach to study the different components of the environment involved in global climate change: the atmosphere, biosphere, hydrosphere, and lithosphere. The interactions among these components. Their role in global climate change. The human dimension to global change.

Section 01 - Downtown Campus

Section 51 - Macdonald Campus

170-201A,B SOCIETY AND ENVIRONMENT. (3) An introduction to human societies and their relations with the biophysical environment, focusing on how economy, technology, and institutions interact to give rise to environmental problems. Analytical treatment of key concepts from distinct disciplinary perspectives in the social and life sciences, including "carrying capacity", "renewable resources", "environmental equity", and "sustainability".

Section 01 - Downtown Campus

Section 51 - Macdonald Campus

170-202B THE EVOLVING EARTH. (3) Formation of the earth and the evolution of life. How geological and biological change are the consequence of history, chance, and necessity acting over different scales of space and time. General principles governing the formation of modern landscapes and biotas. Effects of human activities on natural systems.

Section 01 - Downtown Campus

Section 51 - Macdonald Campus

170-203A,B KNOWLEDGE, ETHICS AND ENVIRONMENT. (3) Introduction to cultural perspectives on the environment: the influence of culture and cognition on perceptions of the natural world; conflicts in orders of knowledge (models, taxonomies, paradigms, the-



ories, cosmologies), ethics (moral values, frameworks, dilemmas), and law (formal and customary, rights and obligations) regarding political dimensions of critical environments, resource use, and technologies.

Section 01 - Downtown Campus, B Term

Section 51 - Macdonald Campus, A Term

170-400B ENVIRONMENTAL THOUGHT. (3) (Students work in interdisciplinary seminar groups on challenging philosophical, ethical, scientific, and practical issues. They will explore cutting-edge ideas and grapple with the reconciliation of environmental imperatives and social, political and economic pragmatics. Activities include meeting practitioners, attending guest lectures, following directed readings, and organizing, leading and participating in seminars.

Downtown Campus only.

170-401A ENVIRONMENTAL RESEARCH. (3) ((Restricted to students in the B.A., B.Sc. and Diploma in Environment programs. Corequisite: 170-400) Students work in an interdisciplinary team on a real-world research project involving problem definition, methodology development, social, ethical and environmental impact assessment, execution of the study, and dissemination of results to the research community and to the people affected. Teams begin defining their projects during the preceding year.

Downtown Campus only.

□ **170-451B RESEARCH IN PANAMA** (6) (Restricted to students in the Panama Field Semester program.) Research projects will be developed by instructors in consultation with Panamanian Universities, Government Agencies and non-Governmental Organizations. Project groups will consist of four to six students working with a Panamanian Institution. Topics will be relevant to Panama: e.g. protection of the Canal watershed, economical alternatives to deforestation, etc. See McGill School of Environment, [page 476](#). Offered in Panama only.

7.2 Ethics

260-270A ETHICS AND THE ENVIRONMENT. (3) Survey of issues and debates in environmental ethics. The challenge posed to human and religious values by the present ecological crisis and some ethical and religious responses to this challenge, Native American spirituality, Eastern and African religions, ecofeminism and liberation theology will be discussed, as will recent environmental debates concerning technology and large scale development projects. Lectures supplemented by guest speakers and audiovisual presentations. **Staff, Faculty of Religious Studies**

7.3 Agriculture

330-210B AGRO-ECOLOGICAL HISTORY. (3) (3 lectures) Introduction to the environmental consequences of agriculture through time, relating the cultural diversity of agronomic practices to regionally varied ecological processes. **Professor Duncan**

330-250B PRINCIPLES OF ECOLOGICAL AGRICULTURE. (3) (3 lectures and one 2-seminar.) Historical overview; ecological basis; environmental, nutritional, socio-cultural, economic and international implications; practical examples of soil management, pest and disease control; integrated crop and livestock production and marketing systems; appropriate technology; agronomic, economic, institutional and political opportunities for change. **Staff**

330-305B TROPICAL FOOD SYSTEMS FIELD COURSE. (3) An examination of agricultural enterprises and their effect on the environment and society in the tropics. The course which is taught in conjunction with the University of the West Indies, includes a twelve day session at the Bellair's Research Institute in the Barbados. The course combines conferences, field trips, and small-group case studies. The timing of the field trip in this course does not conflict with students' other courses/exams, or at the most, a maximum of one (1) day of other classes will be missed. **Staff**

330-411B INTERNATIONAL AGRICULTURE. (3) (3 lectures and 1 conference) A study of the climate, soils and major economic plant and animal species in tropical and sub-tropical regions; cropping

and agro-forestry systems; pest and disease problems; soil and water management; environmental, health and nutrition, and economic issues in rural development; energy and technology for developing countries; the role of international aid and development agencies; case studies on various aspects of food and agricultural systems in developing countries will be presented.

Professor Buckland

330-430A ECOLOGICAL AGRICULTURE SYSTEMS. (3) (2 lectures and 1 conference) (Prerequisite: 330-250B) A detailed examination of a representative range of ecological vegetable, fruit, cash crop and livestock operations using a systems approach. The transition process, and optimal design and management of the operation will be emphasized. The course will include a number of weekend visits.

Staff

330-435A,B SOIL AND WATER QUALITY MANAGEMENT. (3) (3 lectures and one 3-hour lab.) Management of soil and water systems for sustainability. Cause of soil degradation, surface and ground-water contamination by agricultural chemicals and toxic pollutants. Human health and safety concerns. Water-table management. Soil and water conservation techniques will be examined with an emphasis on methods of prediction and best management practices. **Professors Madramootoo, Mehuis and Prasher**

● **330-440B TECHNOLOGY FOR LOW INPUT AGRICULTURE.** (3) (2 lectures and one 2-hour seminar) (Prerequisite: 330-430A.) (Restricted enrolment. Preference given to students in the Ecological Agriculture Minor.)

330-491G CO-OP EXPERIENCE. (3) A co-op experience program of at least 12 weeks duration. Students will be exposed to the main areas of operation of their employer. The cooperating employer and the Instructor (or designate) will develop an individualized co-op experience for each student. Students will be supervised by staff of their employer who will be in contact with the instructor (or designate). A site visit by the Instructor (or designate), a report by the student's employer and a final written and oral report by the student will form the basis for evaluation. **Professor Buckland**

330-495D,N SEMINAR AND ASSIGNMENT. (2) (1 lecture) Preparation, presentation and discussion of reports upon approved agricultural subjects chosen in consultation with staff members involved in the subject concerned. **Professor Stewart**

7.4 Food Science and Agricultural Chemistry

Students should check with their Academic Adviser as to which of the ★ (alternate year) courses will be given in 2000-01.

333-110A INORGANIC CHEMISTRY. (4) (3 lectures and 1-3 hour lab) The course will be a study of the fundamental principles of atomic structure, valence theory and the periodic table.

Professor Ismail

333-200A INTRODUCTION TO FOOD SCIENCE. (3) (3 lectures) This course enables one to gain an appreciation of the scope of food science as a discipline. Topics include introductions to chemistry, processing, packaging, analysis, microbiology, product development, sensory evaluation and quality control as they relate to food science. **Professor van de Voort**

333-211A BIOCHEMISTRY I. (3) (3 lectures) (Corequisite: 333-230A) Biochemistry of carbohydrates, lipids, proteins, nucleic acids; enzymes and coenzymes. Introduction to intermediary metabolism. (AUA Prereq change to coreq) **Professor Ribeiro**

333-212A BIOCHEMISTRY LABORATORY. (2) (1 lecture, 1 lab) (Corequisite: 333-211A) The laboratory use of ionic strength and pH; the chemical properties of carbohydrates, lipids, proteins and enzymes; the instruction of laboratory techniques such as titration, chromatography, the use of the analytical balance and the pH meter. (Awaiting University Approval) **Professor Kermasha/ Professor Simpson**

333-213A ANALYTICAL CHEMISTRY I. (3) (3 lectures and 1-3 hour lab) Theoretical aspects of wet chemical techniques including gravimetric and volumetric analyses, redoximetry, and separation techniques. **Professor Marshall**

333-230A,B ORGANIC CHEMISTRY. (4) (3 lectures and 1-3 hour lab) Overview of functional groups, modern concepts of bonding, mechanisms, conformational analysis, stereochemistry and reactions of aliphatic compounds. **Professor Yaylayan**

333-233B PHYSICAL CHEMISTRY. (3) (3 lectures) Introduction to kinetic theory, thermodynamics, properties of liquids and solids, chemical equilibrium and the law of mass action, phase rule, properties of solutions, chemical kinetics. **Professor Ismail**

333-251B FOOD CHEMISTRY I. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-211A) A study of the chemistry and functionality of the major components comprising food systems, such as water, proteins, carbohydrates and lipids. The relationship of these components to food stability will be studied in terms of degradative reactions and processing. **Professor van de Voort**

333-300A FOOD ANALYSIS I. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-251B) The theory and methodologies for the analysis of food products for moisture, fat, protein, ash and fibre (proximate analysis). The quantitative aspects of colour measurement and infrared spectroscopy are also developed in relation to the analysis of food systems. **Professor Alli**

333-305A FOOD CHEMISTRY II. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-251B) A study of the chemistry and functionality of the minor components comprising food systems, such as enzymes, anthocyanins, carotenoids, additives, vitamins and essential oils. The relationship of these components to food stability in terms of degradative reactions and processing. **Professor Simpson**

333-310A POSTHARVEST FRUIT & VEGETABLE TECHNOLOGY. (3) (3 lectures; 1-3 hour lab) The post harvest chemistry and physiology of horticultural crops as they affect quality and marketability, handling methods pre and post harvest, principles and practices in cooling, storage, transportation and packaging. **Professor Ramaswamy**

333-315B FOOD ANALYSIS II. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-300A) A more detailed treatment on the principal analytical techniques associated with the analysis of carbohydrates, lipids, proteins and vitamin constituents in food systems. **Professor Kermasha**

333-319B FOOD CHEMISTRY III. (3) (2 lectures; 1-3 hour lab) (Prerequisite: 333-305A) The relationship between the chemistry of food constituents present in common commodities, such as milk, meat, eggs, cereals, oilseeds etc. and the common processing methodologies associated with their transformation into stable food product. **Professor Smith**

333-330B FOOD PROCESSING. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-251B) The principles and practices of food processing with an emphasis on canning, freezing, and dehydration. A survey of the newer methods of food preservation such as irradiation, reverse osmosis etc. **Professor Ramaswamy**

333-334B ANALYTICAL CHEMISTRY II. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-213A or equivalent) Theoretical and practical aspects of potentiometric measurements (pH and other ion-selective electrodes), spectrophotometry, atomic absorption spectroscopy and automated chromatography. **Professor Marshall**

333-400A FOOD PACKAGING. (3) (3 lectures; 1-3 hour lab) (Prerequisite: 333-305A) An integrated approach to the materials used for the packaging of food products, considering the physical, chemical and functional characteristics of such materials and their utility, relative to the chemistry of the food system they are designed to enclose and preserve. **Professor Smith**

333-405A PRODUCT DEVELOPMENT. (3) (3 lectures 1-3 hour lab) (Pre/Co-requisite: 333-305A) The chemical, technological and procedural aspects of product development. An understanding of the role and functionality of food ingredients such as acidulants, phosphates, modified starches, gums, emulsifiers, food additives and other functional components in relation to the formulation of food products. **Staff**

333-410B FLAVOUR CHEMISTRY. (3) (3 lectures) (Prerequisite: 333-305A) The chemistry of the flavour constituents of foods, synthesis, modification, extraction and use. **Professor Yaylayan**

333-415A,B DIRECTED STUDIES IN FOOD SCIENCE. (3) (3 lectures) An individualized course of studies under the direction of a member of staff, usually consisting of written report on a selected food science topic based on current literature. **Staff**

333-425B PRINCIPLES OF QUALITY ASSURANCE. (3) (3 lectures) (Prerequisite: 360-310A,B) The principles and practices required for the development, maintenance and monitoring of systems for food quality and food safety. The concepts and practices of Hazard Analysis Critical Control Point; ISO 9000; Total Quality Management; Statistical Sampling Plans, Statistical Process Control; Tools of Quality; Government Regulations. **Professor Alli**

333-491D,N RESEARCH PROJECT. (4) A laboratory oriented research project carried out under the supervision of a faculty member in the Department of Food Science and Agricultural Chemistry. A clear ability for laboratory research is required. **Staff**

333-495D,N FOOD SCIENCE SEMINAR. (3) (2 lectures) Two 20-minute presentations (1 per term) on an assigned or selected topic. The purpose is to research a subject and present to a peer audience the essence of the subject investigated. Development of presentation and communication skills at a professional level is stressed and rapport with the industry will be established through guest speakers. **Professor Smith**

★ **333-500B FOOD ENZYMOLOGY.** (3) (3 lectures) (Prerequisite/ Corequisite: 333-305A) Enzymes as they pertain to the deteriorative processes, as processing aids and their use as analytical tools in food. **Professor Simpson**

★ **333-510B FOOD HYDROCOLLOID CHEMISTRY.** (3) (3 lectures) (Prerequisite: 333-319B. Corequisite: 333-305A) The concepts of colloid chemistry as it applies to food systems. Components such as proteins, gums, carbohydrates, and emulsions are studied in terms of their chemical and physical properties (i.e., rheology, optical characteristics, etc.) and how they can be used to advantage in food systems. **Professor Kermasha**

★ **333-519B ADVANCED FOOD PROCESSING.** (3) (3 lectures) (Prerequisite: 333-330B) Advanced technologies associated with food processing studied in more detail. Topics include food irradiation, reverse osmosis, super critical fluid extraction and extrusion. **Professor Ramaswamy**

★ **333-520A BIOPHYSICAL CHEMISTRY OF FOOD.** (3) (3 lectures) (Prerequisite: 333-233B) This courses will cover recent advances in the application of spectroscopic techniques, including infrared, Raman, near-infrared, circular dichroism, and fluorescence spectroscopy, to the study of biomolecules of relevance to food. Particular emphasis will be placed on the molecular basis of structure-function and structure-functionality relationships. **Professor Ismail**

★ **333-530A ADVANCED ANALYTICAL CHEMISTRY.** (3) (3 lectures) (Prerequisite: 333-223B) Selected instrumental methodologies including advances in automated chromatography, wide band NMR, chemical sensors, and the application of other spectroscopic techniques to the analysis of food constituents. **Professor Marshall**

333-535A FOOD BIOTECHNOLOGY. (3) (3 lectures) (Prerequisite: 362-230B) Developments in biotechnology as it relates to food production and processing concerning traditional food fermentations as well as novel food biotechnology enzymes, ingredients, genetic engineering, plant tissue culture and developments for microbiological and food analysis. **Professor Lee**

7.5 Economics

334-200A PRINCIPLES OF MICROECONOMICS. (3) (3 lectures) The field of economics as it relates to the activities of individual consumers, firms and organizations. Emphasis is on the application of economic principles and concepts to everyday decision making

and to the analysis of current economic issues.

Professor Gunjal

334-201B PRINCIPLES OF MACROECONOMICS. (3) (3 lectures) (Prerequisite: 334-200A or equivalent.) The overall economic system, how it works, and the instruments used to solve social problems. Emphasis will be on decision-making involving the entire economic system and segments of it. **Staff**

334-230B ECONOMICS OF MARKETING. (3) (3 lectures) (Prerequisite: 334-200A or equivalent.) Marketing principles and practices, their relationship to the agriculture-food system, and the economic impact on all segments of this system. Emphasis on the application of marketing principles in problem-solving and in developing marketing and communication skills of the individual. **Staff**

334-231B ECONOMIC SYSTEMS OF AGRICULTURE. (3) (3 lectures) (Prerequisite: 334-200A or equivalent.) The structure and organization of Canada's agriculture-food system, the operation, financing, linkages, and functions of its components. Focus to be on management of the various components and the entire system, types of problems confronted now and in the future. **Professor Baker**

334-242A MANAGEMENT THEORIES AND PRACTICES. (3) (3 lectures) An introduction to contemporary management theories and practices in organizations of the food sector. **Staff**

334-320B ECONOMICS OF AGRICULTURAL PRODUCTION. (3) (3 lectures) (Prerequisite: 334-200A or equivalent.) An intermediate theory course in agricultural economics, dealing with economic concepts as applied to agricultural production and cost functions. Includes theory and application of linear programming as related to production decisions. **Professor Henning**

334-331A FARM BUSINESS MANAGEMENT. (3) (3 lectures) (Prerequisite: 334-200A or equivalent.) Managing a farm business. Topics include: the decision making process, farm business centre and farm records, farm management and economic concepts, farm planning and budgeting, input management (land, capital, labour and time), tax management (farm organization, estate planning, etc.). **Professor Baker**

334-333A RESOURCE ECONOMICS. (3) (Prerequisites: 334-200A or equivalent.) The role of resources in the environment, use of resources, and management of economic resources within the firm or organization. Problem-solving, case studies involving private and public decision-making in organizations are utilized. **Professor Thomassin**

334-343B ACCOUNTING AND COST CONTROL. (3) (3 lectures) An introduction to the basic principles and concepts of responsibility accounting and cost control, analysis and utilization of financial statements and control system data for decision making. **Staff**

334-350B AGRICULTURAL FINANCE. (3) (3 lectures) (Prerequisite: 334-331A) The economic study of acquisition and use of capital in agriculture. Topics include: the analysis of financial statements; farm appraisal; investment analysis; risk in financial management; the cost of capital and the role of financial intermediaries serving agriculture; aggregate financing in agriculture. **Professor Baker**

334-425A AGRICULTURAL ECONOMETRICS. (3) (3 lectures) (Prerequisites: 360-310A,B, 334-200A and 334-201B or equivalents.) Concepts and procedures used in defining and estimating econometric models applied in agriculture. Emphasis on application and estimation of single equation models and solutions to problems such as auto-correlation, heteroscedasticity and multicollinearity. Use of dummy variable technique. **Professor Henning**

334-430B AGRICULTURE, FOOD AND RESOURCE POLICY. (3) (3 lectures) (Prerequisites: 334-201B or equivalent, and 334-320A.) Examination of Canadian, North American and international agriculture, food and resource policies, policy instruments, programs and their implications. Economic analysis applied to the underlying principles, procedures and objectives of various policy actions affecting agriculture. **Professor Brown**

334-440A ADVANCED AGRICULTURE AND FOOD MARKETING. (3) (3 lectures) (Prerequisites: 334-201B or equivalent, and 334-

320A.) The nature and the economic organization of agricultural and food marketing including the application of economic concepts to problems and procedures, and their impact on Canadian and North American agriculture. Pricing and marketing of principal agricultural products in Canada is examined. **Staff**

334-442B ECONOMICS OF INTERNATIONAL AGRICULTURAL DEVELOPMENT. (3) (3 lectures) (Prerequisites: 334-200A or 334-201B or equivalent.) The course deals with economic aspects of international development with emphasis on the role of food, agriculture and the resource sector in the economy of developing countries. Topics will include, world food analysis, development project analysis and policies for sustainable development. Development case studies will be used. **Professor Gunjal**

334-450B AGRI-BUSINESS MANAGEMENT. (3) (3 lectures) (Prerequisites: 334-230B and 360-310A,B) Management of operations in agribusiness firms. The use of computer models to make decisions on output mix, facility location, expansion, inventory management and production and strategy. **Staff**

334-452B STUDIES IN AGRIBUSINESS. (3) (Open only to U3 students in Agribusiness Management option in Agricultural Economics.) This course integrates subject matter from agricultural economics and management through the use of case studies. Topics include feasibility analyses for new ventures, market research, strategic management decisions, workforce management, and international dimensions of agribusiness. Students will prepare written and oral presentations of individual and group case studies. **Staff**

334-491A RESEARCH SEMINAR IN AGRICULTURAL ECONOMICS. (3) (3 lectures) (Prerequisites: 334-201B or equivalent, and 334-320A.) The nature, methods, and objectives of agricultural economics research concerned with the economic problems affecting the agriculture and food system. Emphasis is on problem identification, and the collection, analysis, and presentation of evidence. Students will present one or more seminars on a research project in agricultural economics. **Professor Thomassin**

334-492A,B SPECIAL TOPICS IN AGRICULTURAL ECONOMICS. (3) (Prerequisite: 334-201B or equivalent.) Students will pursue topics that are not otherwise available in formal courses. An individual course of study will be followed under the supervision of a member of the staff qualified in the appropriate discipline or area. **Staff**

334-493D,N SPECIAL TOPICS IN AGRICULTURAL ECONOMICS. (3) Presentation and discussion of current problems in agricultural economics by staff and/or special guests. This course is offered on an irregular basis under special circumstances. **Staff**

334-495D,N PROJECT. (3) Under the supervision of a staff member of the Department of Agricultural Economics. Project topic will concern the economics of agriculture, food, or resource development. An agreement between the students and involved staff members must be reached prior to registration. **Staff**

7.6 Agricultural and Biosystems Engineering

NOTE: Instructors may refuse registration in a course to any student who does not have, in their opinion, an adequate background in the area.

336-103A,B LINEAR ALGEBRA. (3) (3 lectures and 1 conference) Vectors: equality and inequality, geometric representation, polar form, addition and subtraction, unit vectors, dot product, cross product, triple scalar and vector products, use of vectors in 3-D geometry. Matrices: definition, equality and inequality, addition and subtraction, multiplication, null matrix, identity matrix, triangular and diagonal matrices, determinants, matrix inverse, matrix applications. **Professor Prasher**

336-200B ELEMENTS OF AGRICULTURAL ENGINEERING. (3) (3 lectures and one 2-hour lab) Principles of the engineering infrastructure supporting the symbiotic/parasitic agricultural ecosystem. Topics include the thermodynamic, equipment, systems and environmental considerations of land development, cultivation, drainage and irrigation; soil and water quality conservation; plant and animal production environments; food and feed harvesting,

storage and processing; automation, robotics and information systems.
Professor Norris and staff

336-210A MECHANICS I. (4) (3 lectures and 2 hours lab or problems) Non-concurrent force systems; analysis of simple trusses and multiframe frames; friction, shearing forces and bending moments in beams and frames; centres of gravity; solution of problems by energy methods.
Professor Bonnell

336-211B MECHANICS II. (4) (3 lectures and 2 hours labs or problems) (Prerequisite: 336-210A) Kinematics, dynamics, energy, momentum, relative motion, the moment of momentum of particles and rigid bodies; the inertia tensor; introduction to vibrations.
Professor Raghavan

336-212A GRAPHICS. (3) (1 lecture and two 2-hour labs) This is a computer based course taught using personal computer technology. The course content includes principles of engineering drawing, the use of drafting instruments, computer graphics, engineering design, and 2D and 3D drafting with AUTOCAD. **Professor Kok**

★ **336-214A SURVEYING.** (3) (2 lectures and one 3-hour lab) The engineer's level and the theodolite are used to perform benchmark circuits, profile levelling, topographic maps and straight line extensions. A total station, computer programs and use of GPS are introduced.
Professor Bonnell

336-216B MATERIALS SCIENCE. (3) (2 lectures and one 2-hour lab) Relation between structure and properties in ceramic and organic materials. Bonding, structures, imperfections. Phase diagrams. Shaping, joining and testing of materials. Heat treatment, work in hardening and annealing of metals, introduction to physical metallurgy and processes. Failure theories.
Staff

336-217B HYDROLOGY AND DRAINAGE. (3) (3 lectures, one 2 hour lab) Measurement and analysis of components of the water cycle, and their relation to drainage. Precipitation, mass curves, intensity-duration frequency relationships. Evaporation from lakes, soil and vegetal covers. Interception, infiltration, groundwater, runoff hydrograph components. Estimation of water quantities and water flow rates for design of water control projects. Design of drainage systems.
Professor Madramootoo

336-251A,B MICROCOMPUTER APPLICATIONS. (3) (3 lectures and one 2-hour lab) A user level computing course oriented toward the use of microcomputers rather than programming. Networks, windows, FTP, web searching, e-mail, word processing, web pages, spreadsheets, slide shows, and other uses.
Professor Kok

336-252A STRUCTURED COMPUTER PROGRAMMING. (3) (3 lectures and one 2-hour lab) A user level computer programming course in Fortran-90 language. The pros and cons of computerization, differences between mainframe and microcomputers, network basics, discussion of the use of Fortran-90 and C languages to solve engineering problems, electronic spreadsheet analysis and the use of other software packages will be studied from an engineering point of view.
Professor Prasher

336-301A BIO-THERMODYNAMICS. (3) (3 lectures and one 2-hour lab) Classical thermodynamic analysis of pure and simple compressible systems. The course covers the first and second laws of thermodynamics. It deals with basic concepts of thermodynamics and thermochemistry in biological systems
Professor Ngadi

336-305A FLUID MECHANICS. (4) (3 lectures and one 2-hour lab or problems.) (Prerequisites: 336-211B, 360-202A) Properties of fluids; fluid statics; principles of flow of incompressible and compressible fluids; dimensional analysis boundary layers; conduit and open channel systems; simple applications to turbo machinery.
Professor Raghavan

336-312B CIRCUIT ANALYSIS. (3) (3 lectures and one 2-hour lab or problems.) (Prerequisite: 360-205B) General circuit laws and d.c. circuits; electromagnetic circuits; inductance and capacitance, natural and forced response of circuits; analysis of single phase and three phase networks; transformers, AC and DC motors/generators.
Professor Sheppard

336-314B AGRICULTURAL STRUCTURES. (3) (3 lectures and 2-hour lab) Analysis and design of structures to house animals and plants

and to process and store animal and plant products. Introduction to environmental control systems and animal waste management.
Professor Barrington

336-315A DESIGN OF MACHINE ELEMENTS. (4) (3 lectures, 2 hours-problems) (Prerequisite: 336-341B) Design of shafting, bearings, gear, belt and chain drives, clutches, brakes, vibrations, fasteners, welded joints, frames. Principles and practices of Engineering Drawing will be adhered to in laboratory submissions.
Professor McKyes

336-319A APPLIED MATHEMATICS. (3) (1 lecture, two 2-hour labs) (Prerequisite: 336-252A) This is a computer-based course taught via personal computer technology. The objectives of the course are to familiarize students with a number of computer-based mathematical engineering tools and to teach them how to effectively do mathematics with these. Subjects covered are: data conversion; data modelling and curve fitting; 3D geometry; vector and matrix algebra; filtering and filter design. A number of commercial software products will be used; these will be updated as the technology evolves.
Professor Landry

336-322A AGRO-FOOD WASTE MANAGEMENT. (3) (2 lectures and one 2-hour lab) An introduction to engineering aspects of handling, storage and treatment of agricultural and food industry wastes. For all three of these components, design criteria will be elaborated and related to the characteristics of various wastes. Treatments reviewed will discuss physical, chemical and biological systems.
Professor Barrington

● **336-323A PHYSICAL PROPERTIES OF BIOLOGICAL MATERIALS.** (3) (2 lectures and one 2-hour lab) (Prerequisite: 336-341B)

336-324A ELEMENTS OF FOOD ENGINEERING. (3) (3 lectures) (Pre/co-requisite 333-330B.) (Not open to students in the B.Sc.(Agr.Eng.) program.) A course in basic food engineering for non-engineering students, covering heat transfer, mass and energy balances, food process unit operations, material transport/steam/refrigeration systems.
Professor Sheppard

336-325A FOOD ENGINEERING. (3) (3 lectures and one 3-hour lab) Heat and mass transfer, enthalpy and mass balances, sterilizing, freezing, fluid flow, pipes, steam, refrigeration, pumps and valves.
Professor Sheppard

336-330B GIS FOR BIOSYSTEMS MANAGEMENT. (3) (2 lectures and one 2-hour lab) Applications of PC-based Geographic Information Systems (GIS) to the presentation and analysis of natural resource information. Spatial data sources and capture, data structure and analysis and modelling will be reviewed with reference to natural resource management and environmental concerns.
Professors Bonnell and Prasher

336-341B STRENGTH OF MATERIALS. (4) (3 lectures and one 3-hour lab) (Prerequisite: 336-210A) Stress, strain, resilience, elastic and plastic properties of materials; bending moment and shear force diagrams; bending and shear stress; deflections; simple, fixed and continuous beams, torsion and helical springs, reinforced concrete beams; columns, bending and direct stress; general case of plane stress; Mohr's circle.
Professor McKyes

● **336-411A OFF-ROAD POWER MACHINERY.** (3) (2 lectures and one 3-hour lab) (Prerequisite: 336-211B)

336-412A AGRICULTURAL MACHINERY. (3) (3 lectures and one 3-hour lab) Study and analysis of machines for tillage, harvesting, crop processing and handling. Field tests, load studies, design requirements; design of machines and components for agricultural applications.
Professors McKyes and Norris

● **336-416A ENGINEERING FOR LAND DEVELOPMENT.** (3) (3 lectures and one 2-hour lab or design problems) (Prerequisite: 336-217B)

336-418B SOIL MECHANICS AND FOUNDATIONS. (3) (3 lectures and one 3-hour lab) (Prerequisite: 336-341B) The exploration of subsoils, strength theories, granular and cohesive soils, foundation design, settlement calculation, consolidation, slope stability, Atterberg limits, triaxial testing, direct shear testing, compaction, soil freezing, frost heaving.
Professor McKyes

336-419A STRUCTURAL DESIGN. (3) (3 lectures and one 3-hour lab or design problems) (Prerequisites: 336-341B, 303-213A) Structural Design in steel and timber; application of complete design procedures to working stress design; plastic design for ultimate loading. **Professor Barrington**

336-450B CONSERVING THE NEOTROPICS. (3) (Restricted Enrollment. Location in Panama. Student must be registered for a full semester of studies in Panama) (Prerequisites: 144-218A,B or equivalent; 189-203 or 360-310A or equivalent) Theory and practice in defining environmental Neotropic "problems" and solutions. Indigenous and technical means of meeting environmental challenges. Soil erosion, water scarcity, water over-abundance, and water quality. Explore biodiversity protection via tools such as GIS for decision support. Institutional context of conservation strategies, NGO links, and public participation. **Professor Bonnell**

336-490D,N PROJECT. (3) (1 lecture) Presentation of oral and written reports on approved Agricultural Engineering projects. **Professor Landry**

336-491D,N SEMINAR 1. (1) Attendance and participation in departmental seminars. **Professor Landry**

336-492D,N SEMINAR 2. (1) Attendance and participation in departmental seminars. **Professor Landry**

336-493D,N SEMINAR 3. (1) Attendance and participation in departmental seminars. **Professor Landry**

336-500B ARTIFICIAL INTELLIGENCE FOR BIOSYSTEMS. (3) (3 lectures and one 2-hour lab) (Prerequisite 335-251A, B or 336-252A) A computer-based course taught via personal computer technology. The course covers advances in computer use for bio-system design, construction, maintenance and operation including agricultural and environmental systems. Topics include multimedia, rule-based expert systems, neural networks and artificially-intelligent control systems. **Professor Kok**

336-504B INSTRUMENTATION AND CONTROL. (3) (3 lectures and one 2-hour lab) (Prerequisite: 336-312A or 304-281B) Principles and operation of instrument systems used for measurement and control in agricultural processes and research. **Professor Landry**

● **336-506A,B,C ADVANCES IN DRAINAGE AND WATER MANAGEMENT.** (3) (3 lectures)

336-509A,B HYDROLOGIC SYSTEMS AND MODELLING. (2) Use of deterministic and stochastic models to analyze components of the hydrologic cycle on agricultural and forested watersheds, floods frequency analysis, hydrograph analysis, infiltration, runoff, overland flow, flood routing, erosion and sediment transport. Effects of land-use changes and farm and recreational water management systems on the hydrologic regime. **Professor Madramootoo**

● ★ **336-512B SOIL CUTTING, TILLAGE AND TRENCHING.** (3) (2 lectures and one 2-hour lab) (Prerequisite: 336-341B)

● **336-514B DRAIN PIPE AND ENVELOPE MATERIALS.** (3) (3 lectures)

336-515B COMPUTER MODELS IN DRAINAGE ENGINEERING. (3) (3 lectures and one 3-hour lab) A review of computer simulation models for designing subsurface drainage systems. Use of CAD systems in design and drafting drainage plans. In depth discussion and applications of DRAINMOD, a microcomputer based model for designing and evaluating drainage water management systems for soils with high water tables. **Professor Prasher**

● **336-516A PREPARATION AND APPRAISAL OF DRAINAGE PROJECTS.** (3) (3 lectures)

● **336-517A DRAINAGE PROJECT CONTRACTS, INSTALLATION AND MANAGEMENT.** (3) (3 lectures)

★ **336-518A POLLUTION CONTROL FOR AGRICULTURE.** (3) (One 3 hour lecture) Special topics concerning control of pollution agents from the agricultural industry; odour control, agricultural waste treatment including biological digestion, flocculants, land disposal and sedimentation, pesticide transport. **Professor Barrington**

★ **336-525B VENTILATION OF AGRICULTURAL STRUCTURES.** (3) (3 lectures and one 3-hour lab) (Prerequisite 336-301A) The analyses of heat and water vapour transfer through the structure of buildings are used to design heating, ventilation and refrigeration systems. Heat conduction and convection as well as radiation are included in the analysis of heat transfer. Ventilation systems are designed for livestock shelters, produce storages and greenhouses. **Professor Barrington**

★ **336-530B ADVANCED FOOD & FERMENTATION ENGINEERING.** (3) (3 lectures and one 3-hour lab) (Prerequisite 336-325 or equivalent.) Advanced topics in food and fermentation engineering are covered, including brewing, bioreactor design and control and microbial kinetics. **Professor Sheppard**

GRADUATE COURSES AVAILABLE TO SENIOR UNDERGRADUATES WITH PERMISSION OF THE INSTRUCTOR.

336-605B FUNCTIONAL ANALYSIS OF MACHINES. (3) (3 lectures) (Prerequisites: 336-211B and 336-323A.) Theoretical analysis of unit operations to be performed by various tillage and harvesting machines, physical and biological properties of the materials affected by the machines. **Professor Norris**

● **336-607B ENGINEERING ASPECTS OF PLANT ENVIRONMENT.** (3) (3 lectures)

● **336-612A SIMULATION AND MODELLING IN AGRICULTURAL ENGINEERING.** (3) (3 lectures)

336-616A,B ADVANCED SOIL AND WATER ENGINEERING. (3) (3 lectures) Derivation of the governing partial differential equations for both steady and unsteady 3-D flow of groundwater through a variably saturated, heterogeneous, anisotropic and deformable medium, finite difference techniques, numerical method of lines (NMOL), computer programs, stochastic methods in soil and water engineering. **Professor Prasher**

The following courses to be taken with the Faculty of Engineering, McGill Downtown Campus. (See the Faculty of Engineering section for descriptions.)

305-346B HEAT TRANSFER. (3) (3 lectures and 1 hour problem)

305-362B MECHANICAL LABORATORY. (2) (3 hour lab)

306-310B ENGINEERING ECONOMY. (3) (3 lectures)

7.7 Physics

338-112A INTRODUCTORY PHYSICS I. (4) (3 lectures and one 2-hour lab) Accelerated motion. Newton's Laws. Force, work and energy, power; momentum. Conservation principles. Circular motion. Simple harmonic motion. Waves and sound. **Professor Barthakur**

338-114B INTRODUCTORY PHYSICS II. (4) (3 lectures and one 2-hour lab) Electric and magnetic properties of matter: electrostatics, electric currents, the link between electric and magnetic phenomena, geometrical optics, interference diffraction. **Professor Mehuis**

338-201A INTRODUCTORY METEOROLOGY. (3) (3 lectures) The atmosphere – its properties (structure and motion), and thermodynamics (stability, dry and moist). Clouds and precipitation. Air masses and fronts. Radiation and the global radiation budget. Interactions between the atmosphere and the biosphere. **Staff**

● **338-303A ADVANCES IN ATOMIC AND NUCLEAR SCIENCE.** (3) (3 lectures and 1 conference)

338-405B TRACER TECHNIQUES. (3) (3 lectures and one 3-hour lab) (Prerequisite: 338-303A or equivalent.) Operation and theory of various radiation detectors; ionization chambers, G-M counter, proportional counter, solid and liquid scintillation counters, and autoradiography, counting statistics, measurements of environmental radioactivity; practice of radiological safety. **Professor Barthakur**

● ★ **338-510B AGRICULTURAL MICROMETEOROLOGY.** (3) (3 lectures)

7.8 Animal Science

342-234B BIOCHEMISTRY II. (3) (3 lectures and one 3-hour lab) (Prerequisite: 333-211A) Metabolism in humans and domestic animals. The chemistry of alimentary digestion, absorption, transport, intermediary metabolism and excretion.

Professors Zadworny and Kuhnlein

342-250A PRINCIPLES OF ANIMAL SCIENCE. (3) (3 lectures and one 2-hour lab) Introduction to the scientific principles underlying the livestock and poultry industries. Emphasis will be placed on the breeding, physiology and nutrition of animals raised for the production of food and fibre.

Professors Wade and Buckland

342-251B COMPARATIVE ANATOMY. (3) (3 lectures and one 3-hour lab) Study of the macroscopic anatomy of mammals based on detailed dissection of the dog. Comparison with other domestic species will be emphasized.

Professor Downey

342-301B PRINCIPLES OF ANIMAL BREEDING. (3) (3 lectures and one 2-hour lab) (Prerequisite: 360-310A,B or equivalent) The qualitative and quantitative aspects of genetics as they apply to the economic improvement of domestic mammals and birds. Topics include: animal domestication, animal cytology, Mendelian traits of economic importance, principles of population genetics, statistical tools to describe populations, environmental effects, selection and mating systems.

Professor Monardes

342-312B ANIMAL PATHOLOGY. (3) (2 lectures and one 2-hour conference) Introductory animal pathology. Includes discussion of causative agents, the development of the disease process, degenerative changes, protective mechanisms, factors influencing spread of disease and the control of disease.

Professor Downey

342-323A MAMMALIAN PHYSIOLOGY. (4) (3 lectures and one 3-hour lab) (Prerequisite: 344-202B or equivalent.) A study of the organization, functions and regulation of various organ systems in mammals. The nervous, endocrine, muscular, cardiovascular, respiratory, urinary, digestive and reproductive systems are discussed.

Professor Zhao

342-324A ANIMAL REPRODUCTION. (3) (3 lectures and one 3-hour lab) (Prerequisites: 342-250A, 333-211A and 342-323A) Reproduction in domestic animals integrated with management techniques to improve reproductive efficiency. Laboratory training includes anatomy, semen collection and evaluation, oestrus detection and control, artificial insemination and embryo transfer.

Professor Zadworny

342-330A FUNDAMENTALS OF NUTRITION. (3) (3 lectures) (Prerequisites: 333-211A and 342-234B) A discussion of the nutrients; water, carbohydrates, lipids, proteins, minerals and vitamins, with particular emphasis on their functions in and essentially for the animal organism.

Professor Chavez

342-424B METABOLIC ENDOCRINOLOGY. (3) (3 lectures and one 3-hour lab) (Prerequisite: 342-323A) A detailed study of the endocrine system and its role in the maintenance of homeostasis in higher vertebrates, including the endocrine regulation of energy balance.

Professor Laguë

342-433B ANIMAL NUTRITION. (3) (3 lectures and one 1-hour lab) (Prerequisites: 342-250A and 342-330A) Critical discussion of nutrient utilization by farm animals, an assessment of nutritive value of feeds. Recent developments in nutritional manipulation are discussed.

Professor Phillip

342-450A DAIRY CATTLE PRODUCTION. (3) (3 lectures and one 2-hour lab) (Prerequisite: 342-250A) The application and integration of biological principles of genetics, physiology, nutrition and pathology and of economics and engineering for the maximum production efficiency of milk and meat by dairy cattle. Emphasis on recent developments. Trips to dairy farms and related enterprises included as laboratory work.

Staff

342-452B BEEF CATTLE AND SHEEP PRODUCTION. (3) (3 lectures and one 2-hour lab) (Prerequisite: 342-250A) The application and integration of biological principles of genetics, physiology, nutrition and pathology and of economics and engineering for the maxi-

mum production efficiency of beef and sheep. Trips to beef and sheep farms and related enterprises will comprise part of the laboratory work.

Professor Phillip

342-454B SWINE PRODUCTION. (3) (3 lectures and one 2-hour lab) (Prerequisite: 342-250A) The application and integration of biological principles of genetics, physiology, nutrition and pathology and of economics and engineering for the maximum production efficiency of swine. Trips to swine farms and related enterprises will comprise part of the laboratory work.

Professor Chavez

342-455A,B SPECIAL TOPICS IN ANIMAL SCIENCE. (3) Topics that are not otherwise available in formal courses. Investigation of a particular topic will be carried out under the supervision of a staff member who has expertise in the area of study chosen by the student.

Staff

342-456A POULTRY PRODUCTION. (3) (3 lectures and one 2-hour lab) (Prerequisite: 342-250A) The application and integration of biological principles of genetics, physiology, nutrition and pathology, and of economics and engineering for the maximum production efficiency of poultry meat and eggs. Trips to poultry farms and related enterprises will comprise part of the laboratory work.

Professor Laguë

342-460B BIOLOGY OF LACTATION. (3) (3 lectures) (Prerequisites: 344-202B or equivalent and 333-211A or equivalent.) An interdisciplinary approach to the study of mammary development, the onset of lactation and its cessation. The course will compare the differences in mammalian species in mammary development from embryological, pre- and post-pubertal and pre- and post-partum aspects. Lactation will be discussed at the cellular and biochemical levels.

Staff

342-490D,N PROJECT IN ANIMAL SCIENCE. (3) A project to be completed under the supervision of a staff member of the Department of Animal Science. An agreement between student and the involved staff member must be reached prior to registration.

Professor Zadworny

342-495D,N SEMINAR. (2) (1 lecture and 1 lab) Instruction on the preparation, presentation and discussion of critical reviews of topics important to animal agriculture to be followed by student presentation of above reviews.

Professor Zadworny

Graduate courses available to undergraduates

342-501B ADVANCED ANIMAL PRODUCTION SYSTEMS. (3)

● **342-504A POPULATION GENETICS IN ANIMALS.** (3)

342-551B CARBOHYDRATE & LIPID METABOLISM. (3)

342-552A PROTEIN METABOLISM AND NUTRITION. (3)

Certain other graduate courses are available to undergraduates by permission. Please consult the Graduate Studies Calendar.

7.9 Biology

344-120A GENERAL BIOLOGY. (3) (2 lectures and one 3-hour lab) (Not open to students who have passed Biology 301 at CEGEP.) An introduction to the structure, function and adaptation of plants and animals in the biosphere.

Professor Dunphy

344-200A BIOLOGY OF ORGANISMS. (3) (3 lectures and 1 lab) The major taxonomic divisions of living organisms; the Protozoa with special reference to parasitic forms; animal embryology; a survey of the structure and biology of the major phyla, with emphasis on animal parasites and entomology.

Professor Lewis

344-202B CELLULAR BIOLOGY. (3) (4 lectures) Organization and function of intercellular organelles in eukaryotic cells. Protein synthesis and control of protein transport within the cell. Cell division and DNA replication. Energy metabolism and electron transport. Signal transduction and transmembrane signalling. Differentiation of cells and cancer. Function and components of the immune system.

Professor Beech

344-205B PRINCIPLES OF ECOLOGY. (3) (2 lectures and 1 conference) The interactions of organisms and the physical environment.

Ecological principles will be discussed at the level of the individual, the population and the community. **Professor Berteaux**

● **344-306B BIOLOGICAL INSTRUMENTATION.** (3) (Two 3-hour labs)

344-495D,N ENVIRONMENTAL BIOLOGY SEMINAR. (2) (1 lecture)
Presentation of papers on, and discussion of, topics from the field of environmental biology. **Professor Lewis**

7.10 English

There are three types of English courses. Two of them, ESL and EAP courses, have restrictions.

ESL (English as a Second Language) restrictions:

All courses below marked ESL are open to full-time, non-anglophone students. Non-anglophone students who, for a period of more than four years, have attended secondary institutions (high school and CEGEP) where the primary language of instruction was English are not eligible for ESL courses. Students who have taken courses at other post-secondary institutions are not eligible for courses described below which are judged to be equivalent. Equivalent, McGill, ESL courses are mutually exclusive as follows: 348-300 and 128-300; 348-301 and 128-301. Students too weak in English for 348-300 might inquire about the 128-200 and 128-201 courses offered on the Downtown Campus (Faculty of Arts).

EAP (English for Academic Purposes) restrictions:

348-330 requires an entrance placement test (see below), a pass-word, and is limited enrolment (capped). This course is not a remedial writing course, and it is not an English as a Second Language course. For this reason there are entrance requirements. The course is designed to allow students who have strong English language skills, and who have mastered basic writing skills, to develop academic and scientific writing skills. Students who are not sufficiently strong in English for this course might consider the ESL courses described below.

Entrance-Placement tests for ESL and EAP courses are coordinated through the office of the Associate Dean (Student Affairs). Placement tests will take place during the first regularly scheduled meeting of the class. Passwords will then be issued. Telephone (514) 398-7718 for further information. Quebec ESL students must bring copies of CEGEP transcripts. Students who have taken ESL courses for credit at a college or university other than McGill must also bring copies of transcripts. All ESL and EAP students are required to attend class without fail during their first two weeks in order to retain their places. Places for EAP and ESL courses are assigned on a first come, first served basis.

348-300A,B ESL: HIGH INTERMEDIATE I. (3) (3 hours) (Prerequisite: placement test.) (Restrictions: see above.) Improves proficiency of general writing skills while developing reading, oral and aural skills. Focuses on the structure of the English language and the process required to produce coherent short papers. Emphasis on the English of food, agriculture, and the environment. **Staff**

348-301A,B ESL: HIGH INTERMEDIATE II. (3) (3 hours) (Prerequisite: 348-300 or placement test.) (Restrictions: see above.) A continuation of 300A,B. Further improves proficiency of general writing skills while developing reading, oral and aural skills. Focuses on the structure of the English language and the process required to produce coherent short papers. Emphasis on the English of food, agriculture, and the environment. **Staff**

348-330A,B EAP: FUNDAMENTALS OF ACADEMIC AND SCIENTIFIC WRITING. (3) (3 hours) (Prerequisite: entrance test.) (Restrictions: see above.) The object of the course is to enable students who have previously mastered the basic elements of written English to produce well-written, well-researched, and well-documented scientific papers for an academic audience. **Staff**

7.11 Zoology

349-307A NATURAL HISTORY OF THE VERTEBRATES. (3) (Lectures and modules.) Review of higher taxonomic groups of vertebrates

and prochordates, emphasizing diagnostic characters evolution and distribution. **Professor Berteaux**

● **★ 349-308B COMPARATIVE MORPHOLOGY OF THE VERTEBRATES.** (3) (2 lectures, one 3-hour lab and project.)

349-311B ETHOLOGY. (3) (2 lectures, one 3-hour lab) Invertebrate and vertebrate behaviour; innate behaviour, learning, motivation, agonistic behaviour, rhythms, social organization, mating systems and communication. **Professor Titman**

● **★ 349-312A ZOOLOGICAL SYSTEMATICS AND EVOLUTION.** (3) (3 lectures, and assignments.)

● **★ 349-313B ZOOGEOGRAPHY.** (3) (2 lectures, 1 conference and project) (Prerequisite: 349-312A)

● **★ 349-315A SCIENCE OF INLAND WATERS.** (3) (2 lectures and one 3-hour lab) (Prerequisite: Any basic Botany or Zoology course.)

349-424B PARASITOLOGY. (3) (2 lectures and one 3-hour lab) Systematics, morphology, biology and ecology of parasitic protozoa, flatworms, roundworms and arthropods with emphasis on economically and medically important species. **Professor Rau**

7.12 Entomology

★ 350-440B SYSTEMATIC ENTOMOLOGY. (3) (1 lecture, 1 lab and project) (Prerequisite: 373-330A) Classification of principal orders, suborders and superfamilies of insects; use of keys; collecting methods. **Professor Wheeler**

350-452B BIOCONTROL OF INSECT PESTS. (3) (3 lectures) Modern concepts of integrated control techniques and principles of insect pest management, with emphasis on biological control (use of predators, parasites and pathogens against pest insects), population monitoring, and manipulation of environmental, behavioral and physiological factors in the pest's way of life. Physical, cultural, and genetic controls and an introduction to the use of non-toxic biochemical controls (attractants, repellents, pheromones, anti-metabolites). **Professors Dunphy and Rau**

Graduate courses available to undergraduates with permission:

350-525B INSECT ECOLOGY. (3)

● **350-535B AQUATIC ENTOMOLOGY.** (3)

350-600A,B INSECT PATHOLOGY. (3)

350-610D ADVANCED TAXONOMY AND ZOOLOGY. (3)

7.13 Extension Methods

352-300B COMMUNICATIONS - EXTENSION METHODS. (3) (Weekly 3-hour workshops) An introduction to the various methods of communicating science to the layperson, including popular writing, teaching, exhibit and handout design, video and news production, and use of the Web. **Professor Bird**

7.14 Genetics

For course offering by term, refer to <http://www.agrenv.mcgill.ca/plant/undergrad.htm>.

356-204A GENETICS. (4) (3 lectures, one 3-hour lab, one 1-hour tutorial.) The course integrates classical, molecular and population genetics of animals, plants, bacteria and viruses. The aim is to understand the flow of genetic information within a cell, within families and in populations. Emphasis will be placed on problem solving based learning. The laboratory exercises will emphasize the interpretation of genetic experimental data. **Professor Fortin**

356-500A,B,E TECHNIQUES IN PLANT MOLECULAR GENETICS. (3) This two-week intensive course uses an experimental laboratory-based approach to provide basic training in the analysis of plant genes and gene products. Some of the techniques covered will include DNA purification, restriction analysis, cloning, hybridization and protein expression. **Professor Fortin**

356-501B PLANT MOLECULAR BIOLOGY AND GENETICS. (3) Photosynthesis, plant development, plant genome mutagenesis and analysis, and plant stress are discussed. Journal articles and reviews on all aspects of plant molecular biology and genetics.

Professor Fortin

7.15 Mathematics

360-101A CALCULUS I. (3) (3 lectures) (Prerequisite: a course in functions.) A review of functions and graphs. Limits, continuity, derivatives. Differentiation of elementary functions. Anti-differentiation. Applications.

Professor Kuhnlein

360-102B CALCULUS II. (3) (3 lectures) (Prerequisite: Calculus I or equivalent.) Integration, the indefinite and definite integral. Trapezoidal and Simpson's Rule approximations for the integral. Applications to areas between curves, distance, volume, length of a curve, work, area of a surface of revolution, average values, moments, etc. Improper integrals and infinite series.

Professor Hayes

360-202A CALCULUS. (3) (3 lectures and 1 conference) Partial differentiation; multiple integrals; vector calculus; infinite series; applications.

Professor Barthakur

360-205B DIFFERENTIAL EQUATIONS. (4) (4 lectures; 1 conference hour) (Prerequisite: 360-202A or equivalent.) Techniques for solution of ordinary 1st and 2nd order equations; power series solutions; systems of equations; introduction to partial differential equations; numerical techniques for solutions; applications to biological, chemical and engineering systems.

Staff

360-306A MATHEMATICAL METHODS IN ECOLOGY. (3) (3 hours) (Prerequisite: 344-205 or permission. Corequisite: 360-310 or permission.) An introduction to mathematical and graphical tools for use in ecology). Representation and interpretation of data and associated statistics in graphs and tables; theoretical modelling in plant and animal ecology, including difference and differential equation models. Introduction to stability analysis and probability theory. Emphasis is placed on graphical techniques.

Professor Scott

360-310A,B STATISTICAL METHODS I. (3) (3 lectures and one 2-hour lab) Measures of central tendency and dispersion; normal, student's t, chi square, and F distribution; estimation and testing hypotheses; analysis of variance for simple experimental designs; regression and correlations; binomial and Poisson distribution.

Professor Dutilleul

360-403C ENVIRONMETRICS STAGE. (3) (Limited enrollment: Registration by application – Deadline December 15; the first seven applications received will have priority.) (Prerequisite: Permission of the instructor based on satisfactory completion of the U2 year of the Environmetrics Domain in the McGill School of Environment) Summer stage of at least four weeks, including a report. Provides students with professional experience in statistical analyses of environmental data. Can be undertaken at federal or provincial research stations and university research laboratories.

Professor Dutilleul

● ★ **360-411B EXPERIMENTAL DESIGNS.** (3) (2 1.5-hour lectures) (Prerequisite: 360-310A,B or equivalent) (Offered in alternate years with 360-414B)

★ **360-414B TEMPORAL AND SPATIAL STATISTICS.** (3) (2 1.5-hour lectures) (Prerequisite: 360-310A,B or equivalent) (Offered in alternate years with 360-411B) Temporal statistics; analysis in the time domain, Box-Jenkins forecasting methodology, analysis in the frequency domain. Spatial statistics: mapping, autocorrelation analysis, geostatistics. Statistical inference with autocorrelated sample data.

Professor Dutilleul

Graduate courses available to undergraduates by permission:

360-610A STATISTICAL METHODS II. (3) (3 lectures and one 2-hour lab)

Professor Cue

● **360-611B EXPERIMENTAL DESIGNS.** (3) (3 lectures and 1 conference)

7.16 Microbiology

362-200A LABORATORY METHODS IN MICROBIOLOGY. (3) (Two 3-hour labs) A practical application of techniques relating to morphology and physiology, enrichment, isolation and identification of selected classes of microorganisms.

Professor Idziak

362-230B THE MICROBIAL WORLD. (3) (3 lectures and one 3-hour lab) The occurrence and importance of microorganisms (especially bacteria) in the biosphere. Principles governing growth, death and metabolic activities of microorganisms. An introduction to the microbiology of soil, water, plants, food, man and animals.

Professor Idziak and Staff

362-337D,N FRONTIERS IN MICROBIOLOGY. (1) (Irregular meetings) This course involves the preparation of a comprehensive term paper based on a search of the literature on a topic assigned to include an area of recent development new to the student.

Staff

● ★ **362-341A MECHANISMS OF PATHOGENICITY.** (3) (3 lectures, one 3-hour lab) (Prerequisite: 362-230B)

362-492D,N PROJECT. (5) (Equiv. three 3-hour labs) A project involving laboratory work assigned each Microbiology Major student in his or her final year.

Professor Driscoll

362-495D,N SEMINAR. (3) (Equivalent of 1 lecture)

Professor Niven

Graduate courses available to undergraduates with permission:

362-764A READING AND CONFERENCE. (3) (2 conferences) **Staff**

362-765B READING AND CONFERENCE. (3) (2 conferences) **Staff**

7.17 Plant Science

For course offerings by term, refer to
<http://www.agrenv.mcgill.ca/plant/undergrad.htm>.

367-201B COMPARATIVE PLANT BIOLOGY. (3) (3 lectures plus 1-hour conference) Comparative study of the ways in which photosynthetic organisms acquire resources, develop and grow, reproduce, and interact with various groups of fungi and herbivores. Comparisons will be made among the following major groups: cyanobacteria, algae, liverworts, mosses, seedless vascular plants, gymnosperms, and angiosperms.

Professors J-Hare and Donnelly

367-211A PRINCIPLES OF PLANT SCIENCE. (3) (3 lectures and one 2-hour lab) A study of major world crop species with emphasis on their adaptation and distribution in relation to the economic botany of the plants.

Professor Watson

367-215A ORIENTATION IN PLANT SCIENCES. (1) An orientation to selected themes and problems in the pure and applied plant sciences, including crop production, plant ecology and diversity and biotechnology using case-studies based on field and laboratory situations. Offered during the week prior to the start of regular classes and open to all students. Grading, pass/fail.

TBA

367-220A INTRODUCTION TO VASCULAR PLANTS. (1) (Four 4-hour field labs plus project, given during the first 4 weeks of semester) Field survey of different habitats to introduce major groups of vascular plants (ferns, horsetails, clubmosses, gymnosperms, and flowering plants) in natural environments and demonstrate their role in the ecosystem. Emphasis on differences among groups as reflected in their classification. (First 4 weeks of term only).

Professor Waterway

367-221A INTRODUCTION TO FUNGI. (1) (Four 4-hour field labs, given during the second 4 weeks of semester) Field and laboratory survey of local representatives of the major groups of fungi, including edible and poisonous mushrooms. The role of each group in terrestrial and aquatic ecological niches will be studied with respect to saprophytism, parasitism and symbiosis. Economic im-

portant of fungi in medicine and biotechnology will be introduced. (Second 4 weeks of term only.) **Professor J.-Hare**

367-300B CROPPING SYSTEMS. (3) (3 lectures and 1 3-hour lab) (Prerequisite: 367-211A) Application of plant science and soil science to production of agronomic and horticultural crops. Use and sustainability of fertilization, weed control, crop rotation, tillage, drainage and irrigation practices. **Professor Smith**

367-304B BIOLOGY OF FUNGI. (3) (3 lectures and 1 3-hour lab) This course describes the various groups of fungi and explores in depth their biology and physiology, their ecological niches and the role in various ecosystems and their benefits and uses in industry and biotechnology. **Professor J.-Hare**

367-305A PLANT PATHOLOGY. (3) (3 lectures and one 3-hour lab) The theory and concepts of plant pathology, including the disease cycle, infection, symptoms, resistance, epidemiology and control. The biology and taxonomy of pathogens will be studied, including fungi, bacteria, viruses and nematodes. Techniques of inoculation, isolation of pathogens from diseased plants, disease diagnosis and pathogen identification will be demonstrated. **Professor Kushalappa**

367-310A PLANT PROPAGATION. (3) (3 lectures and one 3-hour lab) Principles and practical aspects of plant propagation are examined. The course consists of two parts. The first third deals with sexual propagation; the production, processing storage certification and analysis of seeds. The remaining two-thirds deals with vegetative propagation; cutting, budding, grafting, layering, and tissue culture. **Professor Donnelly**

367-322B GREENHOUSE MANAGEMENT. (3) (3 lectures and one 3-hour lab) Greenhouse design and operation, including environmental regulation, fertilization and pest management. Focus will be on the production of major floricultural and vegetable crops. **Professor Stewart and Mr. Wees**

367-331A FIELD CROPS. (3) (3 lectures and one 3-hour lab period.) (Prerequisite: 367-211A or 367-201B) (Not open to students who have taken 367-333A and/or 367-332B) A study of economically important field crops (cereals, forages, oilseeds and crops grown for fibre and other industrial products), historical development, botany, distribution and adaptation, cultural practices and factors that affect the utilization of crop products. Laboratories emphasize morphological study of major field crop species. **Professor Smith**

367-341A,B HORTICULTURE - THE ALLIUMS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of the Alliums. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-342A,B HORTICULTURE - PERENNIAL VEGETABLE CROPS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of perennial vegetable crops. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-343A,B HORTICULTURE - ROOT CROPS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of root crops. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-344,B HORTICULTURE - SALAD CROPS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory

section on crop establishment and a section dealing with the botany, physiology and management of salad crops. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments.

Professors Buszard and K. Stewart

367-345A,B HORTICULTURE - SOLANACEOUS CROPS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of the solanaceous crops. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-346A,B HORTICULTURE - TEMPERATE TREE FRUITS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of temperate zone tree fruits. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-347A,B HORTICULTURE - SMALL FRUITS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor.) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of small fruit crops. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professors Buszard and K. Stewart**

367-348A,B HORTICULTURE - THE BRASSICAS. (1) (Prerequisite: 367-211A or 367-201B or permission of instructor) An independent study course in CD-ROM format. Modules contain an introductory section on crop establishment and a section dealing with the botany, physiology and management of Brassicas. Students make use of the Internet. Electronic discussion groups are used for tutorials. Grading is through the submission of written assignments. **Professor K. Stewart**

367-353B PLANT STRUCTURE AND FUNCTION. (4) (3 lectures and one 3-hour lab) (Prerequisite: 367-211A or 367-201B.) (Not open to students who have taken 367-252B.) The general anatomy and physiology of vascular plants with emphasis on the cells, tissues, organs and chemical components of plants and the physiological processes associated with their function. **Professors Donnelly and Sparace**

367-358A FLOWERING PLANT DIVERSITY. (3) (2 lectures, one 3-hour lab, plus a 4-day field week held the week preceding the start of classes) (Prerequisites: 367-211A or 367-201B or permission of instructor) Principles of classification and identification of flowering plants and ferns, with emphasis on 35 major families of flowering plants and the habitats in which they grow. **Professor Waterway**

367-361B PEST MANAGEMENT AND THE ENVIRONMENT. (3) (3 lectures) Pests, pest impacts on the global food system and strategies for pest management. Pest management methods, models and programs, and how to reduce pest management impacts on the environment. **Professor Kushalappa**

367-421A LANDSCAPE PLANT MATERIALS. (3) (2 lectures and one 3-hour lab) (Prerequisites: 367-211A or 367-201B) A study of the major types of woody and herbaceous ornamental plants used in landscaping and how the landscaping industry uses plants to improve the environment. Laboratory includes a specimen collection of landscape plants widely used in Québec. **Staff**

367-434B WEED BIOLOGY AND CONTROL. (3) (3 lectures and one 3-hour lab) (Prerequisite: 367-211A or 367-201B) A study of the biology of undesirable vegetation as related to the principles of prevention and physical, biological, managerial and chemical control. Emphasis on the environmental impact of the different methods of weed control. **TBA**

367-445A HORTICULTURE INDUSTRY SYSTEMS SEMINAR. (2) Field trips to selected horticultural industry enterprises on alternate weeks. Each enterprise will be evaluated from production and management points of view. Students will be required to prepare written and oral presentations in seminar sessions between field trips. **Professors Buszard and K. Stewart**

367-450A,B SPECIAL TOPICS IN PLANT SCIENCE I. (2) A course of independent study by the student with the guidance of a professor of recognized competence in the area of the chosen topic. **Staff**

367-451A,B SPECIAL TOPICS IN PLANT SCIENCE II. (3) A course of independent study by the student with the guidance of a professor of recognized competence in the area of the chosen topic. **Staff**

367-458B FLOWERING PLANT SYSTEMATICS. (3) (1 lecture plus one 3-hour lab plus required summer plant collection) (Prerequisite: 367-358A or 177-358A or permission of instructor) Principles and methods of phylogenetic analysis of flowering plants with emphasis on new classification systems resulting from analysis of DNA sequence data. Laboratory sessions will focus on 40 temperate and tropical families not covered in 367-358A as well as on identification techniques for difficult plant families.

Professor Waterway

367-460A PLANT ECOLOGY. (3) (3 lectures and one 3-hour lab) A study of the major vegetation units; the influence of environmental factors on the evolution, distribution, and succession of plant communities; and on the distribution, form and function of plant species. Methods of ecological analyses. **Dr. Nantel**

367-490D,N PROJECT. (3) (1 lecture) Directed study on approved problem requiring both oral and written presentation. **Staff**

367-495D,N. SEMINAR. (2) (1 lab) **Staff**

367-525B ADVANCED MICROPROPAGATION. (3) (One 3-hour lecture) A detailed study of the principles and techniques of plant micro propagation. Includes lectures, laboratories, discussion sessions and visits to local laboratories. Evaluation is based on contribution to discussions, laboratory reports and an individualized project. **Professor Donnelly**

367-535B PLANT BREEDING. (3) Principles and practices of plant breeding, including reproduction of crop plants; plant hybridization; sources of genetic variation; selection methods used for self- and cross-pollinated crops and for clonally reproduced crops; breeding for diseases and pest resistance; applications of biotechnology in plant breeding. **Professor Mather**

Certain graduate courses are available to undergraduates. Please consult the Graduate Calendar.

7.18 Soil Science

372-200B INTRODUCTION TO EARTH SCIENCE. (3) (3 lectures, one 3-hour lab) Introductory concepts of geology and geomorphology will be presented including: rocks and minerals, surface deposits, history and structure of the earth. **Professor Hendershot**

372-210A PRINCIPLES OF SOIL SCIENCE. (3) (3 lectures and one 3-hour lab) Origin, development and classification of soils, biology, chemical and physical properties related to crop production, soil conservation and land use. **Professor Hamel**

★ **372-315B SOIL FERTILITY AND FERTILIZERS.** (3) (3 lectures and one lab) (Prerequisite 372-210A or permission of instructor) Plant nutrients in the soil, influence of soil properties on nutrient absorption and plant growth, use of organic and inorganic fertilizers. **Professor Hamel**

★ **372-326A SOIL GENESIS AND CLASSIFICATION.** (3) (3 lectures and one 3-hour lab) (Prerequisite: 372-200A or equivalent) Theories and processes of soil genesis. Canadian classification system and effect of pedogenesis on soil properties. **Professor Hendershot**

★ **372-331B SOIL PHYSICS.** (3) (3 lectures and one 3-hour lab) Soil structure; fluxes of water, heat, gases and solids in soils; physical properties and plant growth; applications to soil dynamics. **Professor Mehuys**

372-410B SOIL CHEMISTRY. (3) (3 lectures and one lab) (Prerequisite: 372-210A or permission of instructor.) Chemical composition of soils, pH, ion exchange; redox potentials; chemistry of soil pollution. **Professor Hendershot**

7.19 Natural Resource Sciences

373-330A INSECT BIOLOGY. (3) (2 lectures and one 2-hour lab) An introduction to insect structure, physiology, development, systematics, evolution, ecology and control. **Professor Lewis**

373-331B MICROBIAL ECOLOGY. (3) (Prerequisites: 333-211A and 356-204A) Aspects of microbial ecology and environmental microbiology ecology and environmental microbiology will be studied, emphasizing the underlying microbial genetics and physiology. Microbial interactions, diversity, evolution (the position of microorganisms in the universal phylogenetic tree), and the roles of microbes in biogeochemical cycles, biodegradation, and bioremediation will be discussed. **Professor Driscoll**

373-338A BACTERIAL MOLECULAR GENETICS. (3) (Prerequisites: 356-204A, 344-202B or permission of instructor) Bacterial molecular biology with an emphasis on genetic processes, gene regulation, and metabolism. Laboratory sessions will provide the student with practical experience in the methodology of bacterial genetics and in basic recombinant DNA techniques. **Professor Driscoll**

● **373-350A BIOLOGICAL ILLUSTRATION I.** (3) (2 lectures, 2 hours research/reading and 2 hours tutorial)

● **373-351B BIOLOGICAL ILLUSTRATION II.** (3) (2 lectures, 2 hours research/reading and 2 hours tutorial) (Prerequisite: Preference for students with 373-350A or equivalent.)

373-370A,B,C SPECIAL TOPICS. (1) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

373-371A,B,C SPECIAL TOPICS. (1) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

373-372A,B,C SPECIAL TOPICS. (2) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

373-373A,B,C SPECIAL TOPICS. (2) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

373-374A,B,C SPECIAL TOPICS. (3) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

373-375A,B,C SPECIAL TOPICS. (3) Students will pursue topics that are not otherwise available in formal courses. An individualized course of studies will be followed under the supervision of a member of staff qualified in the appropriate discipline or area. **Staff**

The following four courses constitute the Macdonald Summer Field Semester. For more information, consult the McGill Summer Studies Calendar or the Summer Studies website (<http://www.mcgill.ca/Summer/>).

373-381C FIELD RESEARCH METHODS. (3) Tutorials introduce the principal theories, concepts, tools, and challenges of quantitative and qualitative field research. Includes conceptualization, design methodologies and analysis necessary for the research project (373-384), and introduces potential research topics. This course also includes an introduction to participatory action research and how to incorporate sociological data into environmental research.

Professor Driscoll

373-382L ECOLOGICAL MONITORING & ANALYSIS. (3) Students use a variety of methods to sample physical, biological and human systems, to analyse and interpret these data to assess ecosystem health. Methods include GIS, population sampling, land use, resource and biodiversity mapping.

Professor Titman

373-383L LAND USE: REDESIGN & PLANNING. (3) (Prerequisite: 24 credits of university training in a field relating to the environment, including one course in statistics, 360-310A, or equivalent.) Issues related to historical and modern land use, environmental impacts, current structures of governance. Needs assessment, and the re-design of human systems of organization and decision making according to ecological principles. Land use in peri-urban and rural settings, and the use of participatory action research.

Professor Henning

373-384L FIELD RESEARCH PROJECT. (3) (Prerequisite: 24 credits of university training in a field relating to the environment, including one course in statistics, 360-310A, or equivalent. Pre- or co-requisite: 373-381/) Small group field research project.

Professor Smith

373-421B TOPICS IN WILDLIFE CONSERVATION. (3) (3 lectures) Study of current controversial issues focusing on wildlife conservation. Topics include: animal rights, exotic species, ecotourism, urban wildlife, multi-use of national parks, harvesting of wildlife, biological controls, and endangered species.

Professor Bird

373-442A FOOD MICROBIOLOGY AND SANITATION. (3) (3 lectures and 1 3-hour lab) (Prerequisite: 362-230B) Microorganisms, and their products important to the food industry. These will be discussed in terms of production of foods, preservation and processing of foods, facility sanitation and waste disposal, potential for causing food borne disease outbreaks.

Professor Idziak

373-496D,N PROJECT I. (3) Development of research techniques through selection of problem, formulation of hypotheses and objectives, research design, review of pertinent literature, experimental work, discussion and conclusion of results with oral presentation of completed report, all in consultation with research director.

Professor Wheeler

373-497D,N PROJECT II. (5) Development of research techniques through selection of problem, formulation of hypotheses and objectives, research design, review of pertinent literature, experimental work, discussion and conclusion of results with oral presentation of completed report, all in consultation with research director. Similar to 373-496D,N, with a more elaborate research program.

Professor Wheeler

● ★ **373-515B PARASITOID BEHAVIORAL ECOLOGY.** (3) (3 lectures and one 2-hour seminar) (Prerequisite: 373-330A or equivalent)

373-520B INSECT PHYSIOLOGY. (3) (Prerequisite: Permission of instructor) Organismal approach to insects, emphasizing the physiology and development, and the physiological relations of insects to their environment.

Professor Dunphy

● ★ **373-521B SOIL MICROBIOLOGY AND BIOCHEMISTRY.** (3) (Prerequisite: 372-210A)

373-550B VETERINARY AND MEDICAL ENTOMOLOGY. (3) (Prerequisite: Permission of instructor) Environmental aspects of veterinary and medical entomology. An advanced course dealing with the biology and ecology of insects and acarines as aetiological agents and vectors of disease, and their control. Integrated approaches to problem solving.

Professor Rau

373-772A ADVANCED MICROBIAL GENETICS. (3)

373-773B ADVANCED MICROBIAL PHYSIOLOGY. (3)

7.20 Forest Resources

374-300A URBAN FORESTS AND TREES. (3) (3 lectures and one 3-hour lab) (Prerequisites: 367-201B and 372-210A) The effects of environmental factors such as soil fertility, soil contamination and compaction, extremes of temperature and air pollutants on trees and forests growing in an urban environment, and means to increase their tolerance will be discussed. Emphasis in the laboratory will be on diagnosis and solving of tree problems in urban environments.

Professor Côté

● **374-311A FOREST ENVIRONMENTAL INTERPRETATION.** (3) (2 lectures and one 3-hour lab) (Prerequisite: 344-205B or permission of instructor.)

374-410A THE FOREST ECOSYSTEM. (3) (3 lectures and one 3-hour lab) (Prerequisites: 367-201B and 372-210A or permission of instructor.) Interactions among biotic and abiotic components of forests, and their direct and indirect control of productivity and nutrient cycling in forest ecosystems. The laboratory involves a series of 3-hour field trips to local forests during September and October, followed by analysis of data collected.

Professor Fyles

374-420B ENVIRONMENTAL ISSUES IN FORESTRY. (3) (3 lectures and one 2-hour tutorial) (Prerequisites: 367-201B and 372-210A or permission of instructor.) The science behind current environmental issues relating to forests including the effects of management on productivity and biodiversity, conservation of old-growth forests and endangered species, pesticide use, and industrial pollution. The role of scientific knowledge, relative to social and economic forces, in forest resource decision-making is discussed.

Professor Fyles

374-441B INTEGRATED FOREST MANAGEMENT. (3) (3 lectures and one 3-hour lab) (Prerequisite: 344-205B or permission of instructor.) The study of silviculture and silvics and their application to forest management to sustain the production of wood and other resources such as wildlife, water and landscape in natural forests and rural environments (agroforestry). Acquisition of practical skills in forest survey and computer simulation of forest growth.

Professor Côté

7.21 Renewable Resources

375-333A PHYSICAL AND BIOLOGICAL ASPECTS OF POLLUTION. (3) (3 lectures) The environmental contaminants which cause pollution; sources, amounts and transport of pollutants in water, air and soil; waste management.

Professor Mehuys and Staff

375-375B ISSUES IN ENVIRONMENTAL SCIENCES. (3) (3 lectures) Principles and trends in global ecology as they pertain to agricultural and natural ecosystems and the impact of environmental change on food production.

Staff

● **375-380B LAW AND LAND USE POLICY.** (3) (3 lectures, 3 hours tutorial)

● ★ **375-382A FISH AND WILDLIFE PROPAGATION.** (3) (2 lectures and field trips) (Enrollment limited to 20)

375-401A FISHERIES AND WILDLIFE MANAGEMENT. (4) (3 lectures, one 2-hour lab and one week field laboratory prior to fall term) Principles of fisheries and wildlife management are considered and current practices of research and management are discussed.

Professors Berteaux, Bird and Curtis

375-410B WILDLIFE ECOLOGY. (3) (3 hours) (Pre-requisite: 344-205 or permission.) Ecological processes and theories in animal populations. Interrelationships among biological processes, biotic and abiotic factors, and life history strategies. Topics include population dynamics, optimization strategies, predation, habitat selection, risks and decision making, and social behaviour. Application of problem-solving approach to wildlife ecology through individual and group work.

Professor Scott

375-415A CONSERVATION LAW. (2) (2 lectures) A study of the various federal, provincial and municipal laws affecting wildlife habitat. Topics include: laws to protect wild birds and animals; the regulation of hunting; legal protection of trees and flowers, sanctu-

aries, reserves, parks; techniques of acquiring and financing desirable land, property owner rights. **Mr. Marcil**

375-420A TOPICS IN ORNITHOLOGY. (3) (3 lectures and occasional field trips) (Prerequisite: 349-307A or permission of instructor.) Taxonomic relationships and evolution of birds are outlined. Reproduction, migration and population processes of North American birds are examined. **Professor Bird**

375-437B ASSESSING ENVIRONMENTAL IMPACT. (3) (2 lectures) Theories and procedures of assessing environmental impact. An examination of the environmental impact of existing programs and projects to examine their accuracy in predicting consequences and attenuating undesirable effects. **Staff**

★ **375-475B DESERT ECOLOGY.** (3) (Field course) (Prerequisites: 367-460A, 349-307A, 375-420A) (Enrolment limited to 20) This course deals with adaptations to heat and drought. Representative areas of Coastal Bend, Chihuahuan and Sonoran deserts are visited over a two-week period. In the third week, emphasis is on the high desert and historical and cultural aspects of desert life observed in at the Mesa Verde cliff dwellings. A pre-trip analysis of an area to be visited and field notes are the principal bases of evaluation. Students must bear transportation costs. **Professor Titman**

375-491D,N SEMINAR. (2) Includes basic lectures on synthesis and interpretation of multifaceted subjects; preparation and publication of one semi-technical article; participation in two oral presentations of technical subjects all under the supervision of academic or staff adviser. **Staff**

7.22 Nutrition and Dietetics

* **Successful completion of all components parts of each level of Professional Practice (Stage) in Dietetics is a prerequisite for the next level. All required and complementary courses listed in semesters prior to or with a Stage are prerequisites for that level. Undergraduate registration is restricted to students in the Dietetics Major, CGPA greater than or equal to 2.50. Visiting students contact the Advising Coordinator regarding eligibility for specific courses.**

Students are reminded that unethical conduct on Professional Practice (Stage) rotations is considered a serious offence. The Faculty reserves the right to require the withdrawal of any student at any time if it (Faculty) feels the student has displayed unprofessional conduct or demonstrates incompetence.

382-200C CONTEMPORARY NUTRITION. (3) (Not open for credit to students with a biology or chemistry course in their program, or to students registered in the School of Dietetics and Human Nutrition, or to students who take 382-207A,B.) Provides students without a biology/chemistry background with the fundamental tools to critically assess nutrition related information, to evaluate their own diets, and to implement healthy changes. Emphasis is on current issues and maximizing health and disease prevention at different stages of the lifecycle. **Professor Wykes**

382-207A,B NUTRITION AND HEALTH. (3) (3 lectures) (Prerequisite: Biology 401 at CEGEP or equivalent.) (Not open to students who take 382-200C or 382-307A/B or who have taken 552-311A or 507-311A.) Provides students who have a basic biology/chemistry background with the fundamental information on how macronutrients, vitamins and minerals are metabolized in the body, followed by application to evaluate current issues of maximizing health and disease prevention at different stages of the lifecycle. **Professors Wykes and Kubow**

* **382-208J PROFESSIONAL PRACTICE (STAGE) IN DIETETICS – LEVEL I.** (4) (Six weeks directed experience: 2 weeks equivalent during the winter and 4 weeks in the summer) Two modules, consisting of 3 weeks directed experience each, in the areas of nutrition and food service administration. Clinical experience to be provided on campus and in participating health and food service centres. **Professor Jacobs Starkey**

382-214A FOOD FUNDAMENTALS. (3) (2 lectures and one 4-hour lab) (Prerequisite: 333-230A. Corequisite 333-211A and 333-

212A) Study of composition, structure and chemical and physical properties of foods. To understand the scientific principals underlying chemical and physical phenomena that occur during the preparation of food. Laboratory emphasis on developing skills in handling and preparing food, and food assessment by sensory evaluation. **Professor Thibault**

382-217B APPLICATION OF FOOD FUNDAMENTALS. (3) (2 lectures and one 4-hour lab) (Prerequisite, 382-214A) A more intensive study of food and complex food mixtures, including their chemical and physical properties. Learning how to control the changes that take place during the preparation of food to obtain palatable, nutritious and safe food. An introduction to culturally determined food habits. Laboratory emphasis on acquiring new knowledge and application to basic food preparation and cooking principles. **Professor Thibault**

382-301A PSYCHOLOGY. (3) (2 lectures and 1 conference) A study of the general characteristics of physical, social, emotional and intellectual development, the psychology of learning, and the growth and development of personality. **Dr. Stojak**

382-307B HUMAN NUTRITION. (3) (3 lectures and 1 project) (Pre- or co-requisites: 177-201, 180-212) (Not open to students who have taken 382-207A,B.) Cellular and organismal aspects of nutrition with emphasis on biochemical and physiological roles of carbohydrates, lipids, proteins, minerals and vitamins in disease prevention and promotion of optimum health. **Professor Jones**

* **382-310B PROFESSIONAL PRACTICE (STAGE) IN DIETETICS – LEVEL IIA.** (1) (One 2-hour conference/week) Human food intake assessment and evaluation will be practiced including modules on dietary interviewing, nutrition education teaching plans and documentation for the medical record. Practical aspects of health and food service administration will be addressed. **Professor Jacobs Starkey**

* **382-311C PROFESSIONAL PRACTICE (STAGE) IN DIETETICS – LEVEL IIB.** (5) (7 weeks; summer) Two interrelated modules of directed experience in normal and clinical nutrition and foodservice management, in health care settings and the private sector. **Professor Jacobs Starkey**

382-322A INSTRUCTIONAL COMMUNICATIONS. (2) (2 lectures, 1 lab) (Prerequisite: 382-207A/B) Instructional communication principles and techniques as applied to individuals and groups; from children to seniors and from non-professionals to professionals. Using nutrition principles, effective public speaking; development and use of audiovisual aids, brochures and handouts; writing for the media; non-verbal communication; giving and receiving feedback; group management techniques will be covered. **M. Lucas and Clinical Coordinators**

382-337B NUTRITION THROUGH LIFE. (3) (3 lectures, 1 conference) (Prerequisite 342-330A or 382-307B) Emphasis on applied quantitative aspects of human nutrition. Nutrient utilization, evaluation and requirements, as related to dietary standards. **Professor Kubow**

382-344B CLINICAL NUTRITION I. (3) (Two 2-hour lectures) (Pre/co-requisite: 342-323A, 382-337B) Clinical nutrition assessment and dietary modification of pathological conditions including hypertension, lipid disorders and cardiovascular disease, obesity, diverticulosis, cancer, COPD, anorexia nervosa and bulimia. **Professor Koski**

382-345D FOOD SERVICE SYSTEMS MANAGEMENT. (5) (2-hour lecture and one 3 to 5-hour lab) (Prerequisite: 382-214A, 382-217B) An introductory course applying the principles of organization and management in the direction of a food service department. Emphasis on establishing standards to control and measure performance of the system and evaluate performance against standards. Students learn quantity food production principles and sanitation and safety regulations involved in operation of a food service establishment. **Professor Bissonnette**

382-361B ENVIRONMENTAL TOXICOLOGY. (3) (3 lectures) Basic principles of environmental toxicology. Effects of pollutants includ-

ing inorganic ions and anions, metals, hydrocarbons, polychlorinated biphenyls and polychlorodibenzo-p-dioxins, insecticides, herbicides, rodenticides, detergents, organometallic compounds, radioactive isotopes and air pollutants on individual organisms, populations, communities and ecosystems. Paradigms for measurement, evaluation and regulation. **Professor Chan**

382-403B COMMUNITY NUTRITION. (3) (3 hour conference) (Prerequisite: 382-337B) A study of the characteristics and prevention aspects of community health problems. Methods of nutritional assessment, dietary surveys and program planning will be examined. Opportunity to plan a nutrition program for a target population will be provided. **Professor Gray-Donald**

382-406A ECOLOGY OF HUMAN NUTRITION. (3) (3 lectures) (Prerequisite: 382-214A) (Not open to students who have taken 382-502A,B.) The scientific basis of contemporary food selection for human nutrition; change in North American food availability and use patterns; sociological, behavioural, and economic influences on food choice; topics on the interaction of environment and food availability, quality and consumption. **Professor Kuhnlein**

* **382-409B PROFESSIONAL PRACTICE (STAGE) IN DIETETICS – LEVEL III.** (8) (Ten weeks) Four interrelated modules of directed experience in clinical nutrition, foodservice management, normal nutrition education and community nutrition, in health care settings and the private sector. **Professor Jacobs Starkey**

* **382-410A PROFESSIONAL PRACTICE (STAGE) IN DIETETICS – LEVEL IV.** (14) (16 weeks) (Prerequisite 382-409B) Interrelated modules of directed experience in clinical nutrition, foodservice management, normal nutrition education and community nutrition, in health care settings and the private sector. **Professor Jacobs Starkey**

382-420A FOOD TOXICANTS AND HEALTH RISKS. (3) (3 lectures) (Prerequisite: 333-211A, 177-201B or 507-212B) The course provides an overview of the basic principles of food toxicology. The occurrence of health effects of the following toxicants will be discussed; food additives and preservatives; natural toxins in plants and marine foods; food borne molds and mycotoxins, heavy metals and pesticides; and products of food processing. Methods for safety evaluation, risk assessment and basis for current Canadian law and regulatory procedures. **Professor Chan**

382-430A,B DIRECTED STUDIES IN DIETETICS/NUTRITION I. (3) An individualized course of study in dietetics/human nutrition under the supervision of a staff member with expertise on a topic not otherwise available in a formal course. A written agreement between student and staff member must be made before registration and filed with the Program Coordinator. **Staff**

382-431D,N DIRECTED STUDIES IN DIETETICS/NUTRITION II. (3) An individualized course of study in dietetics/human nutrition under the supervision of a staff member with expertise on a topic not otherwise available in a formal course. A written agreement between student and staff member must be made before registration and filed with the Program Coordinator. **Staff**

382-432A,B DIRECTED STUDIES IN DIETETICS/NUTRITION III. (3) An individualized course of study in dietetics/human nutrition under the supervision of a staff member with expertise on a topic not otherwise available in a formal course. A written agreement between student and staff member must be made before registration and filed with the Program Coordinator. **Staff**

382-433A,B,C DIRECTED STUDIES IN DIETETICS/NUTRITION IV. (5) (Prerequisite: registration in 382-409B or equivalent. Restricted to students in the Dietetics Major or documentation of requirement for professional registration.) (Limited enrolment.) An individualized course of study in dietetics and human nutrition not available through other courses in the School. Emphasis will be placed on application of foods and nutrition knowledge, analytic and synthesis skills, and time management. A written agreement between student and instructor must be made before registration. A "C" grade is required to pass the course. **Professor Jacobs Starkey**

382-436A NUTRITIONAL ASSESSMENT. (2) (2 lectures) (Prerequisite: 382-337B) Review of literature covering current methodology and information related to the assessment of nutritional status in health and disease. Nutritional and clinical implications of nutrient interactions and how they relate to nutritional status. **Professor Bissonette**

382-438B INTERVIEWING AND COUNSELLING. (1) (One 2-hour conference) (Prerequisite: 382-344B and 382-311C) Techniques and strategies to increase proficiency in interpersonal skills, specifically "helping skills". To review skills used in professional practice in the dietitian's role as communicator, interviewer, counsellor, educator, motivator and behavioral change specialist. **Professor Jacobs Starkey**

382-445A CLINICAL NUTRITION II. (4) (Two 2.5-hour lectures) (Prerequisite: 382-344B and 342-424B) Rationale for clinical nutrition intervention for gastrointestinal and liver disease, hypermetabolic states, diabetes mellitus, renal disease and inborn errors of metabolism. Introduction to enteral/parenteral feedings. **Professor Koski**

382-446A PERSONNEL MANAGEMENT. (3) (3 lectures, 1 conference) (Prerequisite: 334-242A) The management of people at work. Employee development and the leadership role. The nature of collective bargaining, the role of unions and management. **Staff**

382-450A RESEARCH METHODS IN HUMAN NUTRITION. (3) (2 lectures, 3 hours research, 4 hours other) (Prerequisite: 382-337B, 360-310A/B or 177-373A) Introduction to methods of clinical, community, international, and laboratory-based nutrition research. Lectures, readings and assignments will cover basic research concepts. Students undertake a computer directed literature search and analysis. **Professor Jones**

382-451A NUTRITION RESEARCH. (3) (Prerequisite: 382-337B. Corequisite: 382-450A) An applied course in analysis and interpretation of nutrition data sets. Introduction to specialized dietary and anthropometric computer programs. Written and oral presentation of results. **Professor Chan**

Graduate courses available to undergraduate students at the U3 level, with permission of instructor. Note: not all graduate courses are offered each year.

382-501A NUTRITION IN DEVELOPING COUNTRIES. (3) (2 lectures and one seminar) (Prerequisite: consent of instructor.) This course will cover the major nutritional problems in developing countries. The focus will be on nutrition and health and emphasize young children and other vulnerable groups. The role of diet and disease for each major nutritional problem will be discussed. **TBA**

● **382-504A,B SENSORY EVALUATION OF FOOD.** (3) (2 lectures, one 3-hour lab) (Prerequisite: a university level course in each of food/ food science and statistics.)

382-511B NUTRITION AND BEHAVIOUR. (3) (2 lectures and one seminar) (Prerequisite: 382-445A for undergraduate students or consent of instructor.) Discussion of knowledge in the area of nutrition and behaviour through lectures and critical review of recent literature; to discuss the theories and controversies associated with relevant topics; to understand the limitations of our knowledge. Topics such as diet and brain biochemistry, stress, feeding behaviour and affective disorders will be included. **Professor Thibault**

382-512A HERBS, FOODS AND PHYTOCHEMICALS. (3) (3 lectures and a project.) (Prerequisite: 333-211A or 177-201B or 507-212B) An overview of the use of herbal medicines and food phytochemicals and the benefits and risks of their consumption. The physiological basis for activity and the assessment of toxicity will be presented. Current practices relating to the regulation, commercialization and promotion of herbs and phytochemicals will be considered. **Professor Johns**

7.23 Parasitology

Professors at the Institute of Parasitology are prepared to supervise students doing undergraduate projects within the Faculty of Agricultural and Environmental Sciences.

391-400B EUKARYOTIC CELLS AND VIRUSES. (3) (4 lectures) (Prerequisite: 356-204A) The basic principles of molecular biology and the underlying molecular basis for various methodologies in molecular biology are covered. The molecular genetic basis for viral infections and tumorigenesis will be covered as examples of the use of molecular genetic approaches to address biological problems. **Professor Zadworny**

391-410B ENVIRONMENT AND INFECTION. (3) (2 lectures per week) (Prerequisite: 177-111A or 344-120A or equivalent) Infectious pathogens of humans and animals and their impact on the global environment are considered. The central tenet is that infectious pathogens are environmental risk factors. The course considers their impact on the human condition and juxtaposes the impact of control and treatment measures and environmental change. **Professor Smith**

391-438A IMMUNOLOGY. (3) (2 lectures per week) (Prerequisite: 344-202B or permission of instructor.) An in-depth analysis of the principles of cellular and molecular immunology. The emphasis of the course is on host defense against infection and on diseases caused by abnormal immune responses **Professor Chadee**

7.24 Biotechnology

202-505A,B SELECTED TOPICS IN BIOTECHNOLOGY. (3) (1 3-hour lecture per week) Current methods used in the biotechnology industry and research, as applied to medical, biological, environmental, agricultural and food sciences aspects of biotechnology, will be described and discussed. This multidisciplinary course will include lectures from outstanding biotechnology researchers from industry and McGill professors, and visits to leading centres of biotechnology in the region. **Professor Prichard**

394-501A,B BIOINFORMATICS. (3) (2 lectures and 1 laboratory) This course introduces the application of computer software for analysis of biological sequence information. An emphasis is placed on the biological theory behind analytical techniques, the algorithms used and methods of developing a statistical framework for various types of analysis. **Professor Beech**

8 Graduate Programs

Graduate work, in the Faculty of Graduate Studies and Research, McGill University, Montreal, may be undertaken on the Macdonald Campus, through the Departments of Agricultural and Biosystems Engineering, Agricultural Economics, Animal Science, Food Science and Agricultural Chemistry, Natural Resource Sciences, and Plant Science; the Institute of Parasitology; and the School of Dietetics and Human Nutrition.

The advanced courses of study offered lead to the degrees of Master of Science, and Doctor of Philosophy, Master of Science/Master of Business Administration, Graduate Certificate in Biotechnology, Graduate Certificate in Ecological Agriculture, and Graduate Diploma in Environment.

Information on these programs and related fellowships is available from the Student Affairs Office, Macdonald Campus of McGill University, Sainte-Anne-de-Bellevue, QC H9X 3V9.

The Faculty of Graduate Studies and Research Calendar and full information regarding graduate courses, theses, registration, fellowships, etc. can be accessed on the Faculty of Graduate Studies and Research Website <http://www.mcgill.ca/fgsr/>.

9 Farm Management and Technology Program

Farm Management and Technology Program
Faculty of Agricultural and Environmental Sciences
P.O. Box 204, Macdonald Campus of McGill
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue, Quebec, H9X 3V9
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Website: <http://www.agrenv.mcgill.ca/fmt>

Director - Marcel J. Couture

This 3-year academic and practical program is offered on the Macdonald Campus and taught by the staff of the Faculty of Agricultural and Environmental Sciences of McGill University. The program is funded by the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec and authorized by the Ministère de l'Éducation du Québec (M.E.Q.).

The educational goals of the program are: 1) to develop the professional competencies needed to operate and manage an agricultural enterprise; 2) to help the student's integration into professional life; 3) to develop the student's knowledge and learning abilities related to agriculture; 4) to favour professional mobility. The learning methods used are a blend of practical experience on farms, lectures, laboratory experiments, assignments and case studies.

Six (6) academic terms are spent on the Macdonald Campus studying a sequence of courses in Soil, Plant and Animal Science, as well as Engineering, Ecology, Economics and Management. Two summer "stages" or practicums are spent on selected farms where the student learns the many skills and encounters the many problems related to modern commercial agriculture. Students will also spend time on farms during some of the academic semesters. This will enable them to relate their academic work to the reality of farming. Courses in English, French, Humanities and Physical Education taken during the program will entitle the student to receive a Diplôme d'études collégiales (D.E.C.) from the Ministère de l'Éducation du Québec. The students will also receive a diploma attesting that they have successfully completed the requirements of the Farm Management and Technology Program on the Macdonald Campus of McGill University.

Entrance Requirements

1. Students should have a good practical knowledge of farming under Eastern Canadian conditions. One year of experience is recommended but under special conditions a four-month summer season is acceptable.
2. The minimum academic entrance requirement is a Quebec High School Leaving Certificate (Secondary V), or its equivalent including Mathematics 436, Physical Sciences 436 and Secondary V English and French courses.
3. Students who graduated from high school before June 1997 are not required to have the courses mentioned above if they enter the program before the year 2000. High school graduation is, however, still required.
4. All candidates for admission must make arrangements to come to the Macdonald Campus for an interview prior to admission to the program.

Admission to this program is in the Fall Semester only.

Academic Standing

Attendance at class is compulsory. Students with an attendance of less than 80% may not be permitted to write examinations.

Examinations and other work in courses will be marked according to the percentage system. The minimum passing mark in a course is 60%

When a student's cumulative percent average (CPA) or semestrial percent average (SPA) first drops below 60%, withdrawal is

advised. Students who choose to remain in the program are on probation.

Students on probation are normally permitted to register for not more than 10 credits per semester. They are not permitted to be on probation for more than one semester unless they obtain a SPA of 70% or higher.

Students who do not raise their CPA to 60% (or obtain a SPA of 70%) while on probation are not permitted to re-register. They are required to withdraw from the Program for one year. If after this period students wish to be readmitted, they must apply in writing to the Director of the Program.

Students have other specific rights and responsibilities that are found in the McGill Student Rights and Responsibilities booklet and in the Macdonald Policy on the Evaluation of Learning.

Fees

Tuition fees for all full-time students who are eligible for the Farm Management and Technology Program are paid by the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec.

Student Services and Student Societies' fees will be charged according to the schedule in effect for all Macdonald Campus students.

Textbooks and Supplies

The cost of textbooks and supplies is estimated at \$300 per semester.

Sessional Dates

The number of teaching and examination days is set by the Ministère de l'Éducation du Québec. The sessional dates vary from year to year. At the present time, each semester has 75 teaching days and 7 days of exams.

Program Outline

Students take a common core of courses during the first year and then continue into one of the three following streams: 1) Dairy and one choice of Crops; 2) Livestock Production and one choice of Crops; 3) Two Crops. The following Animal and Crop Production courses will be offered when numbers warrant: Dairy, Beef, Swine, Poultry, Cereals and Forages, Industrial Crops, and Horticultural Crops (Vegetables, Fruits and Greenhouse Crops).

REQUIRED COMMON CORE COURSES

General Agriculture

Agricultural Practice, Environment, Health and Safety
 Farm Practice 1: School and Professional Life
 Farm Practice 2: Integration in the Workplace
 Farm Practice 3: Management Skills
 Pesticide Use
 Agricultural Systems

Agricultural Economics

Introduction to Farm Economics
 Farm Accounting
 Farm Administration
 Farm Budgeting and Analysis
 Agricultural Marketing and Policies
 Financial Management
 Management of Human Resources
 Enterprise Management
 Farm Planning
 Law and Taxation
 Farm Project 1
 Farm Project 2

Agricultural and Biosystems Engineering

Microcomputing on the Farm
 Tools and Machinery Maintenance
 Farm Buildings
 Tractors and Motors
 Building Maintenance
 Soil Preparation

Animal Science

Animal Anatomy and Physiology
 Introduction to Animal Nutrition

English

English 1
 (B10) English for Farm Management and Technology
 English 2
 (A10) Literature
 (A11) Literature & Composition
 English 3
 (A20) Literary Genre
 English 4
 (A30) Literary Themes

French

Français 1: Communication
 Français 2: Communication en Agriculture

Humanities

Humanities 1: Knowledge...Learning...To Be
 Humanities 2: World Views and Ethical Issues
 Humanities 3: Social and Organizational Issues

Natural Resource Sciences

Soil Fertilization and Amendments
 Soil and Water Conservation
 Organic Matter Management

Physical Education

Physical Education and Health
 Physical Education: Practical
 Physical Education in Daily Life

Plant Science

Plant Anatomy and Physiology
 Crop Pest Identification

For *each* of the following courses, students must choose one of the following crops: Cereals and Forages; Horticulture (Vegetables, Fruits, and Greenhouse crops).

Crop Establishment 1
 Crop Maintenance 1
 Harvest and Storage 1
 Crop Planning 1

PRODUCTION COURSES

(to be selected according to the student's chosen stream)

Livestock Production

Marketing Strategies
 Agricultural Sales
 Milking and Milk Quality
 Planning of an Animal Feeding Program
 Planning Milk Production

For the following *set of courses*, students must choose one of the following animal productions: Dairy; Poultry; Beef; Swine.

Application of an Animal Feeding Program
 Introduction to Animal Genetics and Reproduction
 Animal and Herd Health
 Application of an Improvement Program
 Planning of an Animal & Herd Health Program
 Planning of an Animal Breeding Program

Crop Production

For *each* of the following courses, students must choose one of the following crop productions: Horticulture (Vegetables, Fruits and Greenhouse Crops) or Industrial Crops.

Marketing Strategies
 Agricultural Sales
 Applied Plant Propagation
 Environmental Control in Greenhouses
 Irrigation

The following four courses are only for students who take two sets of Crop Production courses.

Crop Planning 2

Crop Establishment 2
Crop Maintenance 2
Harvest and Storage 2

ELECTIVE COURSES

Students must take 1 or 2 courses to fulfill the 90 and 1/3 credit program requirement depending on their chosen stream. The following elective courses are offered but others can be substituted in consultation with the academic adviser.

Silviculture
Showmanship
Farm Scale Experimentation
Organic Agriculture Techniques

COMPLEMENTARY COURSES

Students must take the following two (2) complementary courses to meet the program requirement:

Ecology
Zoology

ENGLISH EXIT TEST

All students who wish to graduate and obtain a D.E.C. must pass the Uniform English Exit Test that is offered by the M.E.Q.

COMPREHENSIVE ASSESSMENT

The comprehensive assessment has been designed to meet the following objective: to determine whether the student is capable of integrating the different aspects of the program into a coherent farm management plan. The method chosen to achieve this objective is the preparation of a written document and an oral presentation exposing a complete management plan for a farm for a period of 5 years. This assessment is situated in the two Farm Project courses taken by the students in their last two semesters.

10 Instructional Staff

Alli, Inteaz; B.Sc.(Guyana), M.Sc., Ph.D.(McG.); Professor of Food Science and Chair of the Department
Babarutsi, Sofia; B.Sc.(Greece), M.Eng., Ph.D.(McG.); Assistant Professor (Special Category) of Agricultural and Biosystems Engineering
Baker, Laurence; B.B., M.Sc.(Man.), Ph.D.(McG.); Assistant Professor in Agricultural Economics
Barrington, Suzelle; B.Sc.(Agr.Eng.), Ph.D.(McG.); Professor of Agricultural and Biosystems Engineering
Barthakur, Nayana N.; B.Sc.(Gauh.), M.Sc.(Allahabad), Ph.D.(Sask.); Professor of Agricultural Physics
Beech, Robin N.; B.Sc.(Nottingham), Ph.D.(Edinburgh); Assistant Professor of Parasitology
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Bird, David M.; B.Sc.(Guelph), M.Sc., Ph.D.(McG.); Professor of Wildlife Biology
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Buckland, Roger B.; B.Sc.(Agr.), M.Sc.(McG.), Ph.D.(Maryland); Professor of Animal Science
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Dunphy, Gary B.; B.Sc.(U.N.B.), M.Sc., Ph.D.(Mem.); Associate Professor of Entomology
Dutilleul, Pierre R.; B.Sc., Ph.D.(Belgium); Associate Professor of Statistics
Ellyett, William R.; B.A.(Sir G. Wms.), B.Ed.(P.E.)(McG.); Faculty Lecturer, Diploma Program and Director of Athletics
Enright, Peter; B.Sc.(Agr. Eng.)(McG.); Faculty Lecturer, Agricultural and Biosystems Engineering
Estey, Ralph H.; B.Ed.(U.N.B.), M.S.(Maine), D.I.C.(Imp. Coll.), B.Sc.(Agr.), Ph.D.(McG.), F.L.S.; Emeritus Professor of Plant Pathology
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Hayes, J. Flannan; B.Agr.Sc., M.Agr.Sc.(Dub.), Ph.D.(N.C.St.); Professor of Animal Science
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Hsuang, George; B.Sc.(Taiwan), B.Ed.(Queen's), Ph.D.(McG.); Curator, Lyman Entomological Museum and Research Laboratory
Idziak, Edmund S.; B.Sc.(Agr.), M.Sc.(McG.), D.Sc.(Delft); Professor of Microbiology and Food Science

- Ismail, Ashraf A.; B.Sc., Ph.D.(McG.); Assistant Professor of Food Science and Agricultural Chemistry
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- Jones, Peter J.; B.Sc.(U.B.C.), M.Sc.(U.B.C.), Ph.D.(Tor.); Professor of Dietetics and Human Nutrition
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- Kuhnlein, Urs; B.Sc.(Fed. Inst. of Tech., Zurich), Ph.D.(Geneva); Professor of Animal Science
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