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1 The Faculty

1.1 Location

McGill University, Macdonald Campus
 21,111 Lakeshore Road
 Sainte-Anne-de-Bellevue, QC H9X 3V9
 Canada

Telephone: (514) 398-7928

Website: <http://www.macdonald.mcgill.ca>

The Faculty of Agricultural and Environmental Sciences, and the School of Dietetics and Human Nutrition, are located on the Macdonald Campus of McGill in Sainte-Anne-de-Bellevue at the western end of Montreal Island.

Served by public transport (MUCTC bus and train), it is easily reached from the McGill Downtown Campus and from Dorval International airport. A McGill intercampus shuttle bus service is also available.

1.2 Administrative Officers

DEBORAH J.I. BUSZARD, B.Sc.(Bath), Ph.D.(Lond.)
Dean, Faculty of Agricultural and Environmental Sciences, and Associate Vice-Principal (Macdonald Campus)

WILLIAM H. HENDERSHOT, B.Sc.(Tor.), M.Sc.(McG.), Ph.D.(U.B.C.)
Associate Dean (Academic)

ERIC R. NORRIS, B.S.A.(Tor.), M.Sc.(Guelph), Ph.D.(Mich. St.)
Associate Dean (Student Affairs)

MARCEL J. COUTURE, B.Sc.(Agr.)(McG.), M.Sc.(Guelph)
Associate Dean (Community Relations)

DIANE E. MATHER, B.Sc.(Agr.)(McG.), M.Sc., Ph.D.(Guelph)
Associate Dean (Research)

GARY O'CONNELL, B.Comm.(C'dia)
Director, Administrative Services

WILLIAM R. ELLYETT, B.A.(Sir G. Wms.), B.Ed.(Phys.Ed.)(McG.)
Director of Athletics

PHILIP LAVOIE, Dip.Agr., B.Sc.(Agr.)(McG.)
Manager, Macdonald Campus Farm

GINETTE LEGAULT
Manager, Campus Housing

SUZANNE HIGGINS, B.A.(McG.)
Manager, Admissions and Student Affairs

PETER D.L. KNOX, B.Sc.(Agr.)(McG.)
Supervisor, Property Maintenance

1.3 Programs and Academic Units

The Faculty of Agricultural and Environmental Sciences and the School of Dietetics and Human Nutrition offer B.Sc., M.Sc. and Ph.D. programs in the areas of study of: Agricultural and Biosystems Engineering, Agricultural Sciences, Biological Sciences, Environmental Sciences, Food Science, and Nutritional Sciences. Also offered are a Diploma in Environment, and Certificates in Ecological Agriculture and in Entrepreneurship.

The Faculty is comprised of eight academic units: the School of Dietetics and Human Nutrition; the departments of Agricultural and Biosystems Engineering, Agricultural Economics, Animal Science, Food Science and Agricultural Chemistry, Natural Resource Sciences, and Plant Science; and the Institute of Parasitology.

The Faculty of Agricultural and Environmental Sciences is also one of the three faculties in partnership with the McGill School of Environment.

The School of Dietetics and Human Nutrition offers programs in dietetics and nutrition, the former leading to membership in various professional associations. Professional Practice experiences to complete the dietetics practicum are provided in the McGill teaching hospitals and in a wide variety of health, education, business, government and community agencies.

The Institute of Parasitology offers graduate programs leading to M.Sc. and Ph.D. degrees as well as a Graduate

Certificate in Biotechnology. Major areas of research include the molecular biology, immunology, and population biology of parasites and their hosts and the biochemical pharmacology of antiparasite drugs. The underlying orientation of all research is to apply relevant modern biological techniques to reduce parasite transmission and to improve methods of diagnosis and control. The research background and activities of the staff encompass many disciplines applied to the study of host-parasite interactions, ranging from research involving viruses and cancer cells to studies on protozoa and helminth parasites of humans, livestock, and other animals. The Institute has been designated by the Quebec Government as a Centre d'excellence for research on parasites.

1.3.1 Co-op Experience

Most undergraduate programs offered in the Faculty include the opportunity for a Co-op work experience.

Students are able to profit from a Co-op experience of approximately 12 weeks duration where they will be exposed to the main areas of operation of their employer. Each student registered in a Co-op work experience will benefit from a program developed by both the employer and the instructor exclusively for that individual student.

Students who register for a Co-op experience benefit from practical learning arising from work-term employment in a meaningful job situation. Students also benefit from the non-tangible learning experience arising from the increased responsibilities required to obtain and successfully complete the work term.

1.4 Macdonald Campus Facilities

The Morgan Arboretum has over 245 hectares of managed and natural woodlands and tree plantations used for environmental research and teaching in a wide range of courses. Groups of all the Canadian native trees and many useful and important exotics are also present. The Arboretum features three self-guided interpretation trails, 20 kilometres of wooded trails, a variety of forest ecosystems, soil and water conservation projects, forest operations such as plantation management, timber harvesting and maple syrup production, and related forestry-wildlife ecological activities. A nature interpretation program is offered.

Macdonald Campus Library

The Library is located in the Barton Building. The collection includes materials in the agricultural, biological, environmental, food and nutritional sciences. The Library is a depository for many print and electronic government publications. The print collection numbers approximately 97,000 volumes of books and journals, 17,000 volumes of government publications, and 700 current print journal subscriptions. The online catalogue includes the holdings of all McGill Libraries. Remote access to the catalogue, circulation, reference, electronic resources, and interlibrary loan service is available. An extensive collection of electronic information is available from the McGill Libraries homepage (<http://www.library.mcgill.ca>) which provides access to an excellent range of electronic indexing and abstracting services, and full-text journals and documents via local area networks and licensed websites. Reference service is available to assist users in obtaining necessary print or electronic resources, and a comprehensive library instruction service is provided throughout the year. Further information is available on the Web, <http://www.library.mcgill.ca/macdonald.htm>.

Lyman Entomological Museum and Research Laboratory

Originally established in 1914 and formerly housed in the Redpath Museum, the Lyman Entomological Museum was moved to the Macdonald Campus in 1961. It houses the largest university collection of insects in Canada, second only in size to the National Collection. The Museum also has an active graduate research program in association with the Department of Natural Resource Sciences. Study facilities are available, on request from the Curator, to all bona fide students of entomology. Visits by other interested parties can also be arranged by calling (514) 398-7914.

Brace Centre for Water Resources Management

The Brace Centre for Water Resources Management is located on the Macdonald Campus. It is a multidisciplinary and advanced research and training centre of McGill University, dedicated to solving problems of water management related to food production, the environment, and rural development. It brings together staff from several McGill faculties to undertake research, teaching, specialized training, and policy and strategic studies, both in Canada and internationally. The Centre draws on the wide range of facilities available within the University.

2 Summary of Academic Programs

2.1 Outline of Academic Programs

Programs leading to five degrees are offered on the Macdonald Campus, with Majors associated with each degree. In addition, Certificates are offered in Ecological Agriculture and in Entrepreneurship. Detailed information can be found in the section on the administering department that is indicated in brackets beside each program.

2.1.1 Major Programs

Bachelor of Science in Agriculture - B.Sc.(Agr.)

This is a three-year (90 credit) program [or three and one-half years (102 credits) for Agricultural Science Internship Options] following the Diploma of Collegial Studies and leading to professional qualification in Agricultural Science or in one of its related specialized branches in Biological Science, Environmental Science or Renewable Resources. (Graduates of programs marked with an asterisk * are eligible for membership in l'Ordre des agronomes du Québec.)

Agricultural Economics* (Agricultural Economics, [page 458](#))
Agribusiness Option

Agricultural Systems Option
Natural Resource Economics Option

Agricultural Sciences* (Interdisciplinary Studies, [page 464](#))

Ecological Agriculture Option
Ecological Agriculture Internship Option
International Agriculture Option
International Agriculture Internship Option
General Option
General Internship Option
Soil Science Option
Soil Science Internship Option

Animal Biology (Animal Science, [page 461](#))

Animal Science* (Animal Science, [page 460](#))

Applied Zoology (Natural Resource Sciences, [page 467](#))

Botanical Science (Plant Science, [page 469](#))

Ecology Option
Molecular Option

Environmental Biology (Natural Resource Sciences, [page 467](#))

Microbiology (Natural Resource Sciences, [page 468](#))

Plant Science* (Plant Science, [page 470](#))

Resource Conservation (Natural Resource Sciences, [page 468](#))

Wildlife Biology (Natural Resource Sciences, [page 468](#))

Bachelor of Science in Agricultural Engineering - B.Sc.(Agr.Eng.)

This is normally a three and one-half year (109 credit) program following the Diploma of Collegial Studies in Pure and Applied Sciences and leading to professional qualification in both Agricultural Engineering and Agrology.

Agricultural Engineering (Agricultural and Biosystems Engineering, [page 456](#))

Bachelor of Science in Food Science - B.Sc.(F.Sc.)

This is a three-year (90 credit) program following the Diploma of Collegial Studies leading to professional qualification in Food Science.

Food Science (Food Science and Agricultural Chemistry, [page 463](#))

Bachelor of Science in Nutritional Sciences - B.Sc.(Nutr.Sc.)

Two programs are offered by the School of Dietetics and Human Nutrition, a three-year (90 credit) program for Nutrition and a three and one-half year (115 credit) program for Dietetics, following the Diploma of Collegial Studies.

Dietetics (School of Dietetics and Human Nutrition, [page 461](#))

Nutrition (School of Dietetics and Human Nutrition, [page 462](#))

Nutritional Biochemistry Option

Nutrition and Populations Option

Nutrition of Food Option

Bachelor of Science - B.Sc.

This is a three-year (90 credit) program following the Diploma of Collegial Studies.

Environment (McGill School of Environment, [page 496](#))

2.1.2 Minor Programs

Agricultural Economics (Agricultural Economics, [page 459](#))

Agricultural Engineering (Agricultural and Biosystems Engineering, [page 457](#))

Agricultural Production (Plant Science, [page 470](#))

Ecological Agriculture (Interdisciplinary Studies, [page 464](#))

Entrepreneurship (Agricultural Economics, [page 459](#))

Environment (McGill School of Environment, [page 492](#))

Environmental Engineering (Agricultural and Biosystems Engineering, [page 457](#))

Human Nutrition (School of Dietetics and Human Nutrition, [page 463](#))

2.1.3 Certificate Programs

Ecological Agriculture (Ecological Agriculture Program, [page 464](#))

Entrepreneurship ((Agricultural Economics, [page 460](#))

2.1.4 Diploma Programs

Farm Management and Technology Program, [page 486](#)

Environment (McGill School of Environment, [page 505](#))

2.2 Environmental Sciences Programs

McGill School of Environment (MSE)

The McGill School of Environment (MSE), a joint initiative of the Faculty of Agricultural and Environmental Sciences, the Faculty of Arts, and the Faculty of Science, offers a B.Sc. Major in Environment, a B.A. Faculty Program in Environment, a Minor in Environment and a Diploma in Environment. Many of the MSE programs allow students to choose to study exclusively on the Macdonald or downtown campuses, or to take advantage of both. For further information on these programs, please refer to the McGill School of Environment, [page 451](#).

Other Environmental Programs at Macdonald Campus

A number of other integrated environmental science programs are also offered on the Macdonald Campus. The objective of these interdepartmental programs is to provide the student with a well-rounded training in a specific interdisciplinary subject as well as the basis for managing the natural resource. The programs include:

Agricultural Economics Major, Natural Resource Economics Option, [page 459](#)

Applied Zoology Major, [page 467](#)

Botanical Science Major, [page 469](#)

Environmental Biology Major, [page 467](#)

Microbiology Major, [page 468](#)

Resource Conservation Major, [page 468](#)

Wildlife Biology Major, [page 468](#)

3 Application and Admission Requirements

The programs in the Faculty of Agricultural and Environmental Sciences, and the School of Dietetics and Human Nutrition, are normally of three years' duration following the completion of a two-year Quebec post-secondary Collegial program (CEGEP).

Holders of the Diplôme d'études collégiales (DEC)/Diploma of Collegial Studies (DCS) are considered for admission to the first year of a program requiring the completion of a minimum of 90 credits – 102 credits for Agricultural Science Major Internship Options, 109 credits for Agricultural Engineering, and 115 credits for Dietetics. Students who complete the “DEC en sciences, lettres et arts” may be considered for any university program. Students who have completed a technical or professional DEC will be considered on an individual basis.

Based upon entry with the appropriate DEC, the B.Sc.(Agr.) and the B.Sc.(F.Sc.) are both three-year programs. The B.Sc.(Agr.Eng.) is normally a three and one-half year program. Two B.Sc.(Nutr.Sc.) programs are offered, a three-year program for Nutrition, and a three and one-half year program for Dietetics.

Students from outside Quebec who are admitted on the basis of a high school diploma enter a program which is extended by one year to include the 30 credits of the Freshman Year (see [section 5.1](#)). Advanced standing of up to 30 credits may be granted to students who obtain satisfactory results in International Baccalaureate, French Baccalaureate, or Advanced Placement Tests.

Applications may also be submitted on-line via the Web at <http://www.mcgill.ca>. Please note that the same application is used for all undergraduate programs at McGill and two program choices can be entered.

For information, or to obtain a printed application package for students unable to apply via the Web, contact:

Student Affairs Office
 Macdonald Campus of McGill University
 21,111 Lakeshore Road
 Sainte-Anne-de-Bellevue, Quebec, H9X 3V9
 Telephone: (514) 398-7928
 Email: studentinfo@macdonald.mcgill.ca
 Website: <http://www.macdonald.mcgill.ca>

More specific information on application deadlines and admission requirements can be found on the Web or in the Application Procedures and Admission Requirements section beginning on [page 13](#).

4 Student Information

4.1 Student Services

Students who study on Macdonald Campus may make full use of all Student Services available at McGill as listed in the General University Information chapter, [section 9](#). The Office of the Dean of Students, in cooperation with the Faculty of Agricultural and Environmental Sciences, offers students direct access to the services listed in [section 9.3](#).

Further information can be found via the Faculty Website <http://www.mcgill.ca/macdonald/campus/services/students/> and the Student Services Website <http://www.mcgill.ca/stuserv>.

4.2 Macdonald Campus Residences

For more than 90 years, residence life has been an integral part of Macdonald Campus activities. Students may apply for residence in either of two distinctive facilities:

Laird Hall, with a capacity of more than 210 students, is arranged on a co-educational basis and provides single and double room accommodation for both undergraduate and graduate students.

The EcoResidence, Canada's first ecologically-friendly student residence and recent winner of the prix d'excellence from l'Ordre

des architectes du Québec, accommodates 100 students in apartment-style living.

For further information, please refer to "University Residences – Macdonald Campus" on page 40 or the Faculty website, <http://www.macdonald.mcgill.ca>.
Email: residences@macdonald.mcgill.ca.

4.3 Extracurricular Activities

All undergraduate, postgraduate, and Farm Management and Technology students are members of the Macdonald Campus Students' Society. The MCSS, through the 19-member Students' Council, is involved in numerous campus activities such as social events, academic affairs, and the coordination of clubs and organizations. Student life is informal and friendly and student groups range from the Outdoor Adventure Club to the Photography Society. Major social events include Orientation, the Halloween Party, Winter Carnival and International Night. The Ceilidh, a student-run bar located in the Centennial Centre, is open every Thursday night.

The Centennial Centre is the students' building and the centre of student life, offering facilities for student activities, such as meeting rooms, a Yearbook room, pool tables, great places to relax, listen to music and meet friends. Also located in the Centre are the Students' Council offices, an information desk, the campus store – the Robber's Roost, bookstore and cafeteria.

4.4 Student Conduct and Discipline

The Associate Vice-Principal (Macdonald Campus) and Dean of the Faculty of Agricultural and Environmental Sciences has jurisdiction over all offenses committed by students registered at Macdonald and over all offenses committed by students on or about the Macdonald Campus. Directors of residences have jurisdiction over all offenses committed in or about their respective residences.

Students found guilty of improper conduct, violation of rules or willful damage to persons or property, shall be liable to discipline as set forth in the Code of Student Conduct and Disciplinary Procedures as printed in the *Handbook of Student Rights and Responsibilities*. A copy of the Handbook can be found on the Web (<http://www.mcgill.ca/Secretariat/Students/>) or obtained from the Student Affairs Office or the Macdonald Campus Student Services Office. The Code specifies that discipline may include: imposition of fines or assessments for damage caused by individuals or groups; posting of security for good behaviour; reprimand; imposition of conduct probation; suspension or expulsion from classes or residence; expulsion from the University.

Any student who is unwilling to submit to the demands of university life, or whose work is definitely unsatisfactory, may be placed on probation, or may be required to withdraw from the University.

All students are obliged to inform themselves of the current rules and regulations. A few of these are listed below, but the main body of them will be found in other available documents.

Possession or consumption of alcohol by students is forbidden on the Campus, except in authorized places and with special permission.

Initiation or hazing in any form is forbidden.

Unauthorized entrance to buildings is forbidden. Violation of this rule is sufficient reason for expulsion.

Gambling is not permitted on Campus.

Tampering with fire fighting equipment is forbidden.

Students are not permitted to bring firearms into a Residence nor is the use of firearms allowed on University property.

4.5 Fees

The University reserves the right to make changes without notice in its published scale of tuition, residence and other fees.

All certified cheques, money orders, etc., should be drawn to the order of McGill University, and made payable in Canadian funds. Payment of student fees can also be made through any Chartered Bank in Canada.

The University shall have no obligation to issue any transcript of record, award any diploma or re-register a student in case of non-payment of tuition fees, library fines, residence fees, or loans on their due date.

Tuition Fees

General information on Tuition and other fees will be found under Fees, page 23.

Other Expenses

In addition to tuition fees and the cost of accommodation and meals, students should be prepared to spend a minimum of \$1000 (dependent on program) on prescribed textbooks and classroom supplies. These may be purchased at the campus book store in Centennial Centre.

Uniforms are required for food laboratories. Students in the B.Sc.(Nutr.Sc.) program will be advised of the uniform requirements on acceptance or promotion.

4.6 Immunization for Dietetics Majors

Students in the Dietetics Major are required to complete the Compulsory Immunization Program for Health Care students prior to registration. Participation in Professional Practices (Stages) in Dietetics will only be permitted for those students who have completed all immunization requirements.

4.7 Language Requirement for Professions

Quebec law requires that candidates seeking admission to provincially-recognized Quebec professional corporations or orders possess a working knowledge of the French language, i.e. be able to communicate verbally and in writing in that language. Agrologists, Chemists, Dietitians, and Engineers are among those within this group.

For additional information see the General University Information section, page 37.

5 Faculty Information and Regulations

Each student in the Faculty of Agricultural and Environmental Sciences must be aware of the Faculty Regulations as stated in this Calendar. While departmental and faculty advisers and staff are always available to give advice and guidance, the ultimate responsibility for completeness and correctness of course selection and registration, for compliance with, and completion of program and degree requirements, and for the observance of regulations and deadlines *rests with the student*. It is the student's responsibility to seek guidance if in any doubt; misunderstanding or misapprehension will not be accepted as cause for dispensation from any regulation, deadline, program or degree requirement.

5.1 Freshman Entry Program

Given below is the Freshman Year program outline for recent high school graduates from Canada (except Quebec) and the United States. Individual course descriptions can be found at the end of this section of the Calendar.

		CREDITS
Fall		
AEBI 120	General Biology	3
AEMA 101	Calculus 1	3
AEPH 112	Introductory Physics 1	4
FDSC 230	Organic Chemistry	<u>4</u> 14
Winter		
AEMA 102	Calculus 2	3
AEPH 114	Introductory Physics 2	4
FDSC 110	Inorganic Chemistry	4
	Electives*	<u>5</u> 16
Total Credits		30

* AEBI 202 Cellular Biology must be substituted for students in programs in the B.Sc.(Nutr.Sc.) degree and ABEN 103 Linear Algebra must be substituted for students in the B.Sc.(Agr.Eng) degree.

5.2 Academic Advisers

Before registration, all students entering the Faculty must consult with the Academic Adviser of their program for selection and scheduling of required, complementary, and elective courses.

The Academic Adviser will normally continue to act in this capacity during the whole of the student's studies in the Faculty.

5.3 Minimum Credit Requirement

Each student's minimum credit requirement for the degree is determined at the time of acceptance and is specified in the letter of admission or its attached documentation.

Normally, Quebec students who have completed the Diplôme d'études collégiales (DEC) or equivalent diploma are admitted to to the first year of a program requiring the completion of a minimum of 90 credits – 102 credits for Agricultural Science Major Internship Options, 109 credits for Agricultural Engineering, and 115 credits for Dietetics.

Students from outside Quebec who are admitted on the basis of a high school diploma enter a program that is extended by one year to include the 30 credits of the Freshman Year (see [section 5.1](#)). Advanced standing of up to 30 credits may be granted to students who obtain satisfactory results in International Baccalaureate, French Baccalaureate, or Advanced Placement Tests under certain conditions; refer to [section 3](#).

5.4 Categories of Students

Full-Time Students

Full-time students in satisfactory standing take a minimum of 12 credits per semester.

Full-time students in probationary standing are not normally permitted to take more than 12 credits per semester. In exceptional circumstances the Committee on Academic Standing may give permission to attempt more.

Part-time students

Part-time students carry fewer than 12 credits per semester. New students apply through the Student Affairs Office of the Faculty and the applicant must have the qualifications to enter a full-time program. Full-time students who wish to become part-time must consult the Office of the Associate Dean (Student Affairs). Certain programs must be completed within a specified number of years; such information is available from the Associate Dean.

5.5 Academic Standing

All students are required to give satisfactory evidence of mastery of the material of lectures and laboratories. Examinations are normally held at the end of each course but other methods of evaluation may also be used. The grade assigned for a course represents the standing of the student in all the work of the course.

5.6 Examinations

Students should refer to the General University Information [section 5](#) for information about final examinations and deferred examinations.

Every student has a right to write essays, examinations and theses in English or in French except in courses where knowledge of a language is one of the objects of the course.

Oral presentations made as part of course requirements shall be in English.

5.6.1 Reassessments and Rereads

In accordance with the Charter of Student Rights, and subject to the conditions stated therein, students have the right to consult any written submission for which they have received a mark as well as the right to discuss this submission with the examiner.

If, after discussion with the instructor, students request a formal final examination re-read, they must apply in writing to the Associate Dean (Student Affairs). The following conditions apply:

- grades may be either raised or lowered as the result of a reread;
- rereads in courses outside the Faculty of Agricultural and Environmental Sciences are subject to the deadlines, rules and regulations of the relevant faculty.

Application for rereads must be made by March 31 for fall-term courses and by September 30 for winter-term and summer-term courses. Students are assessed a fee for formal rereads. Any request to have term work re-evaluated must be made directly to the instructor concerned. Students should consult the Student Affairs Office for further information.

5.7 Credit System

The credit assigned to a particular course reflects the amount of effort it demands of the student. As a guideline, one credit would represent approximately 45 hours total work per course. This is, in general, a combination of lecture hours and other contact hours such as laboratory periods, tutorials and problem periods as well as personal study hours.

Please refer to General University Information [section 4.7](#).

5.8 Academic Credit Transfer

Transfer of credits (maximum of 30) based on courses taken at other institutions before entrance to this Faculty is made by the Admissions Committee prior to entrance.

Transfer of credits may be made for work at other educational institutions during a student's attendance at McGill University. Permission to apply such credits to a McGill program must be secured by the student from the Academic Adviser of their program before the work is undertaken. Forms are available in the Student Affairs Office of the Faculty. Grades obtained in such courses do not enter into calculations of grade point averages (GPA) in this Faculty.

Exemption from a required or complementary course on the basis of work completed at another institution must be approved by both the Academic Adviser and the instructor of the appropriate McGill course.

Full-time students may, with the written approval of the Student Affairs Office, register for 3 credits, or exceptionally 6 credits, in each semester at any university in the province of Quebec. These courses successfully completed with a minimum grade of C (according to the standards of the university giving the course), will be recognized for the purpose of the degree but the grades obtained will not enter into calculations of GPA in this Faculty. Further details on the Quebec Inter-University Transfer Agreement are found in the General University Information [section 6.6](#).

5.9 Standing

The program for the degree will normally be completed in three academic years; three and one half years for Agricultural Engineering, Agricultural Science Major Internship Options, and Dietetics. For the purpose of student classification, the years will be termed U1, U2 and U3.

U1 to be used during the first 12 months following each admission to a degree program in which the student is required to complete 72 or more credits at the time of admission.

U2 to be used for all students who are not U1 or U3.

U3 to be used during the term in which it is expected the student will qualify to graduate, and the preceding term.

Students' academic standing is based on the CGPA that is calculated on the courses taken while registered as a full-time or part-time undergraduate in a degree program. If the CGPA drops below 2.00, the student is in academic difficulty.

5.10 Students in Academic Difficulty

1. When a student's CGPA (or SGPA in the first semester of the program) drops below 2.00, withdrawal is advised. Students who choose to re-register are on probation until the CGPA is raised to 2.00.
2. Students on probation are normally permitted (see "[Categories of Students](#)" on page 455) to register for not more than 12 credits per semester. They are not permitted to be on probation for more than one semester unless they obtain a SGPA of 2.50 or higher.
3. Students who do not raise their CGPA to 2.00 (or obtain a SGPA of 2.50) while on probation are not permitted to register. They are required to withdraw from the Faculty for at least one semester. Application for readmission after this period must be made in writing to the Committee on Academic Standing.

5.11 Course Change Information

1. Courses: please refer to the General Information and Regulations [section 3.8 "Change of Course \(Drop/Add\)"](#) and the Calendar of Dates.
2. Course withdrawal (Transcript notation of "W"): please refer to the General Information and Regulations [section 3.9 "Regulations Concerning Withdrawal"](#) and the Calendar of Dates.
3. Other changes: Information about changes may be obtained from the Student Affairs Office of the Faculty. Application for changes must be made to the Committee on Academic Standing.

5.12 Graduate Courses Available to Undergraduates

Undergraduates wishing to take such courses must have a cumulative grade point average (CGPA) of at least 3.20.

5.13 Attendance and Conduct in Class

Matters of discipline connected with, or arising from, the general arrangement for teaching are under the jurisdiction of the Dean of the Faculty or Director of the School concerned.

Students may be admonished by a professor or instructor for dishonest or improper conduct or may be reported to the Dean or Director concerned for disciplinary action.

Punctual attendance at all classes, laboratory periods, tests, etc., is expected of all students. Absences are excused only on grounds of necessity or illness, of which proof may be required. Special attention is called to the fact that the completion of all laboratory work is obligatory and the opportunity to make up work missed will be provided only in the case of properly excused absences.

The Faculty has the power to refuse examination to those students who persist in absenting themselves from classes without permission.

Students are requested not to make application for additional leave either before or after holiday periods, as such leaves are granted only in case of illness or other exceptional circumstances.

5.14 Degree Requirements

To be eligible for a B.Sc.(Agr.), B.Sc.(Agr.Eng.), B.Sc.(F.Sc.), or B.Sc.(Nutr.Sc.) degree, students must have passed, or achieved exemption in, all required and complementary courses of the program. They must have a CGPA of at least 2.00.

They must have completed the minimum credit requirement for the degree as specified in their letter of admission or its attached documentation, see [section 5.3](#). At least 60 of these credits must have been taken at McGill.

In addition, students in the Dietetics program must have completed the stages of professional formation.

Students majoring in Agricultural Engineering are also required to have at least 650 hours experience in some phase of agricultural engineering work approved by the Agricultural and Biosystems Engineering Department.

5.15 Distinction or Great Distinction

Students in Major programs whose academic performance is appropriate may be awarded their degrees with *Distinction* or *Great Distinction* under the following conditions:

- students must have completed a minimum of 60 McGill credits to be eligible;
- for *Distinction*, the CGPA at graduation must be 3.30* to 3.49 (*pending Faculty approval);
- for *Great Distinction*, the CGPA at graduation must be 3.50 or greater.

5.16 Dean's Honour List

The designation *Dean's Honour List* may be awarded to graduating students under the following conditions:

- students must have completed a minimum of 60 McGill credits to be considered;
- students must be in the top 10% of the Faculty's graduating students.

5.17 Medals and Prizes

Various medals, scholarships and prizes are open to graduating students. No application is required. Full details of these are set out in the *Undergraduate Scholarships and Awards Calendar*, available in the Student Affairs Office, Laird Hall, Room 106 or on the Web <http://www.mcgill.ca>.

6 Academic Programs

6.1 Department of Agricultural and Biosystems Engineering

Macdonald Stewart Building – Room MS1-027

Telephone: (514) 398-7773

Fax: (514) 398-8387

Email: Raghavan@macdonald.mcgill.ca

Website: <http://agrenv.mcgill.ca/agreng>

Chair — G.S. Vijaya Raghavan

Emeritus Professor — Robert S. Broughton

Professors — Suzelle Barrington, Robert Kok, Chandra Madramootoo (*James McGill Professor*), Edward McKyes, Shiv O. Prasher, G.S. Vijaya Raghavan (*James McGill Professor*)

Associate Professors — Robert B. Bonnell (*Brace Centre for Water Resources Management*), Eric R. Norris, John D.J. Sheppard

Assistant Professor — Michael O. Ngadi

Assistant Professor (Special Category) — Sofia Babarutsi (PT)

Adjunct Professors — Darakhshan Ahmad, Geoffrey I. Sunahara, Clement Vigneault

AGRICULTURAL ENGINEERING MAJOR

The Department of Agricultural and Biosystems Engineering collaborates with other departments and the Faculty of Engineering, in providing courses of instruction for a curriculum in Agricultural and Biosystems Engineering. Graduates qualify for registration as professional engineers in any province of Canada. The curriculum integrates engineering fundamentals and branch specialties with the agricultural, biological and environmental sciences. The program is oriented to the design, construction and management of the agro-ecosystem; various facets of any, or several of these areas may be emphasized by the student via the appropriate choice of elective course sets. Academic advisers can aid the student to structure her or his studies along any of the following main streams: Agro-Environmental; Irrigation and Drainage; Agricultural Machinery and Buildings; Food and Bio-Processing; and Information and Computing Technologies. For all streams, a typical engi-

neering approach is followed; the relationship is stressed between decision-making/option-evaluation during the design stage and the resultant performance of the unit once implemented. This approach is applicable to practically any case, be it a simple cultivation tool, a harvesting machine, a post-harvest conditioning process or an entire ecosystem.

In order to learn some of the fundamentals of engineering design, and appreciate and understand other branches of engineering, students are required to spend the second semester of the penultimate year taking courses in the Faculty of Engineering. Furthermore, students in Agricultural Engineering may wish to increase their competence in specialized fields by pursuing one of the Minors offered by the Faculty of Engineering. **Minors** which would be of particular interest include: **Biotechnology, Computer Science, Construction Engineering and Management, and Environmental Engineering.** Details of these Minors can be found in the Faculty of Engineering [section 5](#). In order to complete a Minor, students will need to spend at least one extra semester beyond the requirements of the B.Sc.(Agr.Eng.) program.

All required courses must be passed with a minimum grade of C.

Required Courses: 85 credits.

Complementary Courses: 24 credits.

Required Courses:		CREDITS
		85
ABEN 210	Mechanics 1	4
ABEN 211	Mechanics 2	4
ABEN 214	Surveying	3
ABEN 216	Materials Science	3
ABEN 217	Hydrology and Drainage	3
ABEN 252	Structured Computer Programming	3
ABEN 305	Fluid Mechanics	4
ABEN 312	Circuit Analysis	3
ABEN 314	Agricultural Structures	3
ABEN 315	Design of Machines	4
ABEN 319	Applied Mathematics	3
ABEN 325	Food Engineering	3
ABEN 341	Strength of Materials	4
ABEN 412	Agricultural Machinery	3
ABEN 418	Soil Mechanics and Foundations	3
ABEN 490	Design 1	2
ABEN 491D1	Seminar 1	.5
ABEN 491D2	Seminar 1	.5
ABEN 492D1	Seminar 2	.5
ABEN 492D2	Seminar 2	.5
ABEN 495	Design 2	3
AEMA 202	Calculus	3
AEMA 205	Differential Equations	4
AEMA 310	Statistical Methods 1	3
ANSC 250	Principles of Animal Science	3
MECH 346	Heat Transfer	3
MECH 362	Mechanical Laboratory 1	2
MIME 221	Engineering Professional Practice	1
MIME 310	Engineering Economy	3
PLNT 211	Principles of Plant Science	3
SOIL 210	Principles of Soil Science	3
Complementary Courses:		24
One 3-credit course on the impact of technology on society from the following list:		3
CHEE 230	(3) Environmental Aspects of Technology	
ENVR 203	(3) Knowledge, Ethics and Environment	
EPSC 243	(3) Environmental Geology	
GEOG 302	(3) Environmental Management 1	
MIME 308	(3) Social and Economic Impacts of Technology	

Two 3-credit courses in the humanities and social sciences/administrative studies and law/language courses. (Any language course which is deemed by the academic adviser to have a sufficient cultural component or, in the case of the student who is not proficient in a specific language, program credit will be given for the second of two successfully completed, academically approved 3-credit language courses.)

15 additional credits selected in consultation with Academic Adviser 15

6 credits, two of the following courses:

ABEN 212 (3) Graphics

or MECH 291 (3) Graphics

ABEN 301 (3) Biothermodynamics

or MECH 240 (3) Thermodynamics 1

Advanced Agricultural and Biosystems Engineering – 9 or more credits (with the permission of the instructor, graduate level courses may be taken) from :

ABEN 322 (3) Food Prod/Processing Waste Mgmt

ABEN 323 (3) Physical Properties of Biological Materials

ABEN 330 (3) GIS for Biosystems Management

ABEN 411 (3) Off-Road Power Machinery

ABEN 416 (3) Engineering for Land Development

ABEN 419 (3) Structural Design

ABEN 500 (3) Adv Applications of Micro in Agriculture

ABEN 504 (3) Instrumentation and Control

ABEN 506 (3) Advances in Drainage and Water Management

ABEN 509 (3) Hydrologic Systems and Modelling

ABEN 512 (3) Soil Cutting and Tillage

ABEN 514 (3) Drain Pipe and Envelope Materials

ABEN 515 (3) Computer Models in Drainage Engineering

ABEN 516 (3) Preparation and Appraisal of Drainage Projects

ABEN 517 (3) Drainage Project Contracts, Installation and Management

ABEN 518 (3) Pollution Control for Agriculture

ABEN 525 (3) Ventilation of Agr. Structures

ABEN 530 (3) Advanced Food & Fermentation Engineering

ABEN 605 (3) Functional Analysis of Agricultural Machines

ABEN 607 (3) Engineering Aspects of Plant Environment

ABEN 612 (3) Simulation and Modelling

ABEN 616 (3) Advanced Soil & Water Engineering

AGRI 435 (3) Soil and Water Quality Management

ENVIRONMENTAL ENGINEERING MINOR

The Minor program consists of 27 credits in courses environment related. By a judicious choice of complementary and elective courses, Agricultural and Biosystems Engineering students may obtain this Minor with a minimum of 12 additional credits. The Environmental Engineering Minor Program is administered by the Department of Civil Engineering and Applied Mechanics, see [page 239](#) in the Faculty of Engineering section.

Courses available in the Faculty of Agricultural and Environmental Sciences: (partial listing)

ABEN 322 Food Prod/Processing Waste Mgmt

ABEN 416 Engineering for Land Development

ABEN 518 Pollution Control in Agriculture

MICR 331 Microbial Ecology

WILD 333 Physical and Biological Aspects of Pollution

MINOR IN AGRICULTURAL ENGINEERING

Academic Adviser: Professor R.B. Bonnell

Engineering systems are now being emphasized in animal and crop production, management and utilization of waste products, production of value-added materials and by-products, protection of natural resources, conservation and management of ecosystems, soil and water decontamination, and the development of new food,

fibre and pharmaceutical products. Computer-based systems play a major role in the management of information, and process control in many of the above technologies. A non-professional Minor in Agricultural Engineering, consisting of 24 credits of Agricultural and Biosystems Engineering courses is available for students registered in the B.Sc.(Agr.) and B.Sc.(F.Sc.) programs. A total of 18 credits of required Agricultural and Biosystems Engineering courses will demonstrate basic engineering applications. Selection of 6 complementary credits from a wide range of Agricultural and Biosystems Engineering courses will allow more focused study in one of the 6 streams of Agricultural Engineering, viz. Agro-Environmental; Irrigation and Drainage; Agricultural Machinery and Buildings; Food and Bio-Processing; and Information and Computing Technologies.

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 Engineering. 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 Engineering Minor. The Academic Adviser of the Agricultural Engineering 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 Engineering, students must:

- a) 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.
- b) 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: 18 credits.

Complementary Courses: 6 credits.

	CREDITS
Required Courses:	18
ABEN 252 Structured Computer Programming	3
ABEN 314 Agricultural Structures	3
ABEN 324 Elements of Food Engineering	3
ABEN 412 Agricultural Machinery	3
Complementary Courses:	6
6 credits chosen from the following list in consultation with the Academic Adviser for the Minor:	
ABEN 411 (3) Off-Road Power Machinery	
ABEN 413 (3) Materials Handling Systems	
ABEN 416 (3) Engineering for Land Development	
ABEN 418 (3) Soil Mechanics and Foundations	
ABEN 500 (3) Adv Applications of Micro in Agriculture	
ABEN 512 (3) Soil Cutting and Tillage	
ABEN 514 (3) Drain Pipe and Envelope Materials	
ABEN 515 (3) Computer Models in Drainage Engineering	
ABEN 516 (3) Preparation and Appraisal of Drainage Projects	
ABEN 517 (3) Drainage Project Contracts, Installation and Management	
ABEN 518 (3) Pollution Control for Agriculture	
ABEN 525 (3) Ventilation of Agricultural Structures	
ABEN 530 (3) Advanced Food and Fermentation Engineering	

Notes:

- 1) 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.
- 2) Not all courses are available in any given year. Consult departmental listings for full course descriptions and offerings.

6.2 Department of Agricultural Economics

Raymond Building – Room R3-019
 Telephone: (514) 398-7820
 Website: <http://www.agrenv.mcgill.ca/agrecon>

Chair — John C. Henning

Associate Professors — Laurence Baker, Kisan R. Gunjal, John C. Henning, Paul Thomassin

Assistant Professor — William Mark Brown (*joint appt. with Geography*)

Lecturer — Robert Oxley

AGRICULTURAL ECONOMICS MAJOR

Increasingly complex economic problems facing the agriculture and food system and our natural environment have intensified the need for specialized knowledge and training in the field of agricultural economics. The curriculum is designed to provide students with the knowledge, analytical and decision-making skills required in a career in agribusiness, resource management, international development, and research. The selection of courses from the agribusiness, agricultural system or natural resource economics options permits a degree of specialization along those lines, in conjunction with the core courses listed below. Graduates are eligible to apply for membership in l'Ordre des agronomes du Québec (OAQ) if they fulfill the agronomic course requirements (consult the academic adviser).

Core Required Courses: 39 credits.

Core Complementary Courses: 12 credits.

	CREDITS
Required Courses:	39
AGEC 200 Principles of Microeconomics	3
AGEC 201 Principles of Macroeconomics	3
AGEC 230 Agricultural and Food Marketing	3
AGEC 231 Economic Systems of Agriculture	3
AGEC 242 Management Theories and Practices	3
AGEC 320 Economics of Agricultural Production	3
AGEC 333 Resource Economics	3
AGEC 343 Accounting and Cost Control	3
AGEC 425 Agricultural Econometrics	3
AGEC 430 Agri-Food and Resource Policy	3
AGEC 440 Advanced Agriculture & Food Marketing	3
AGEC 442 Economics of International Agricultural Development	3
AGEC 491 Research Seminar in Agricultural Economics	3
Complementary Courses:	12
One course in introductory statistics course (approved by adviser)	3
plus 9 credits chosen from the following list	9
ABEN 300 (3) Elements of Agricultural Engineering	
ANSC 250 (3) Principles of Animal Science	
FDSC 200 (3) Introduction to Food Science	
PLNT 211 (3) Principles of Plant Science	
SOIL 210 (3) Principles of Soil Science	

AGRIBUSINESS OPTION

Whether one has interests in agricultural supply, production, marketing, finance, food processing or retailing, professional management skills are the key to success. The agribusiness option prepares students for managerial responsibility by drawing on the resources of both the Faculty of Management and the Faculty of Agricultural and Environmental Sciences. This special partnership provides students with not only a first-class business training but also a specialization in the field of agriculture.

Core Required and Complementary Courses: 51 credits.
Option Required and Complementary Courses: 21 credits.
Electives: to meet the minimum 90-credit requirement for the degree.

	CREDITS
Option Required Courses:	12
AGEC 331 Farm Business Management	3
AGEC 350 Agricultural Finance	3
AGEC 450 Agribusiness Management	3
AGEC 453 Venture Capital Opportunities	3
Option Complementary Courses:	9
9 credits chosen from the following list:	9
ACCT 311 (3) Financial Accounting 1	
ACCT 313 (3) Management Accounting 1	
AGEC 344 (3) Entrepreneurial Leadership	
BUSA 364 (3) Business Law 1	
FINE 448 (3) Options and Futures	
MGCR 341 (3) Finance 1	
MGCR 382 (3) International Business	
MRKT 451 (3) Marketing Research	
NUTR 446 (3) Applied Human Resources	

AGRICULTURAL SYSTEMS OPTION

The smooth functioning of the agriculture and food system requires good market analysis and appropriate policy and program development and management in the public sector. Agricultural economists are called upon to perform these tasks, utilizing their knowledge of the economic forces that affect the industry and the methods of analysis to predict the outcome of the numerous changes that occur. The agricultural systems orientation is intended to provide students with a broad understanding of the many dimensions of agriculture and food systems, including economic development, international agriculture, and food and agricultural policy.

Core Required and Complementary Courses: 51 credits.
Option Required and Complementary Courses: 21 credits.
Electives: to meet the minimum 90-credit requirement for the degree.

	CREDITS
Option Required Courses:	12
AGEC 331 Farm Business Management	3
AGEC 350 Agricultural Finance	3
AGEC 450 Agribusiness Management	3
AGRI 250 Principles of Ecological Agriculture	3
Option Complementary Courses:	9
9 credits chosen from the following list:	9
AGEC 344 (3) Entrepreneurial Leadership	
AGRI 210 (3) Agro-Ecological History	
AGRI 411 (3) International Agriculture	
AGRI 435 (3) Soil and Water Quality Management	
ENVR 201 (3) Society and Environment	
ENVR 203 (3) Knowledge, Ethics and Environment	
NUTR 207 (3) Nutrition and Health	

NATURAL RESOURCE ECONOMICS OPTION

This option integrates biological sciences and environmental decision making with the economics of natural resource use and development. The natural resource economics option is intended to prepare students for careers in the management of natural resources and the analysis of natural resource problems and policies.

Core Required and Complementary Courses: 51 credits.
Option Required and Complementary Courses: 32 credits.
Electives: to meet the minimum 90-credit requirement for the degree.

	CREDITS
Option Required Courses:	12
AEBI 205 Principles of Ecology	3
AEMA 306 Mathematical Methods in Ecology	3

WILD 333	Physical and Biological Aspects of Pollution	3
WILD 437	Assessing Environmental Impacts	3
Option Complementary Courses:		9
9 credits chosen from the following list:		9
AEPH 201 (3)	Introductory Meteorology	
AGEC 344 (3)	Entrepreneurial Leadership	
AGRI 210 (3)	Agro-Ecological History	
ECON 405 (3)	Natural Resource Economics	
ENVR 203 (3)	Knowledge, Ethics and Environment	
NUTR 361 (3)	Environmental Toxicology	
WILD 415 (3)	Conservation Law	
WILD 421 (3)	Wildlife Conservation	

MINOR IN AGRICULTURAL ECONOMICS

A Minor in Agricultural Economics will complement a student's education in four ways. First, as a social science, Economics will provide an alternative perspective for students in the Faculty. Second, the Minor will provide an excellent foundation of the workings of the economy at large. Third, it will aid students to understand the business environment surrounding the agri-food industry. Finally, it will challenge students to analyze the interaction between the agricultural economy and the natural resource base.

General Regulations:

To obtain a Minor in Agricultural Economics, students must:

- Ensure that their academic record at the University includes a C grade or higher in the courses specified in the course requirements below.
- Complete a minimum total of 24 credits from the courses given below, of which not more than 6 credits may be counted for both Major and 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
AGEC 200 Principles of Microeconomics	3
AGEC 201 Principles of Macroeconomics	3
AGEC 230 Agricultural and Food Marketing	3
AGEC 231 Economic Systems of Agriculture	3
Complementary Courses	12
Chosen in consultation with the academic adviser for the Minor from the offerings of the Department of Agricultural Economics.	
AGEC 242 (3) Management Theories and Practices	
AGEC 320 (3) Economics of Agriculture Production	
AGEC 331 (3) Farm Business Management	
AGEC 333 (3) Resource Economics	
AGEC 343 (3) Accounting and Cost Control	
AGEC 350 (3) Agricultural Finance	
AGEC 425 (3) Agricultural Econometrics	
AGEC 430 (3) Agriculture, Food, and Resource Policy	
AGEC 440 (3) Advanced Agricultural and Food Marketing	
AGEC 442 (3) Economics of International Development	
AGEC 450 (3) Agribusiness Management	
AGEC 491 (3) Research Seminar in Agricultural Economics	
AGEC 492 (3) Special Topics in Agricultural Economics	

MINOR IN ENTREPRENEURSHIP

The Minor is concerned with the genesis and development of entrepreneurial activities. It deals with marketing, finance, organization, and policy in the development and expansion of small businesses in the agri-food and environment sectors. This 24-credit Minor will be of interest to students who wish to develop the skills

and perspectives necessary to be successful in an entrepreneurial environment, whether it be self-employed in a start-up business or within an established corporation that employs entrepreneurial management strategies.

General Regulations:

To obtain a Minor in Entrepreneurship, students must:

- a) Ensure that their academic record at the University includes a C grade or higher in the courses as specified in the course requirements listed below.
- b) Complete a minimum total of 24 credits from the courses listed below, of which not more than 6 credits may be counted for both the Major and the Minor programs.

Required Courses (24 credits)

AGEC 200	(3)	Principles of Microeconomics
AGEC 230	(3)	Agricultural and Food Marketing
AGEC 242	(3)	Management Theories and Practices
AGEC 343	(3)	Accounting and Cost Control
AGEC 344	(3)	Entrepreneurial Leadership
AGEC 450	(3)	Agribusiness Management
AGEC 453	(3)	Venture Capital Opportunities
NUTR 446	(3)	Applied Human Resources

CERTIFICATE IN ENTREPRENEURSHIP

Academic Adviser: Robert Oxley

This 30-credit Certificate Program is very similar to the Minor Program and is concerned with the genesis and development of entrepreneurial activities. It deals with marketing, finance, organization, and policy in the development and expansion of small businesses in the agri-food and environment sectors. The Certificate will be of interest to students who already hold a bachelor's degree and wish to develop the skills and perspectives necessary to be successful in an entrepreneurial environment, whether it be self-employed in a start-up business or within an established corporation that employs entrepreneurial management strategies.

Students holding a B.Sc. in agriculture or a related area are eligible to register for this program provided that they are otherwise acceptable for admission to the University. Students who have completed the Minor in Entrepreneurship are not permitted to register for this program.

General Regulations

To obtain a Certificate in Entrepreneurship, students must offer a minimum total of 30 credits from the courses as given below.

Required Courses: 27 credits.

Complementary Course: 3 credits

Required Courses:

	CREDITS	
AGEC 200	Principles of Microeconomics	3
AGEC 230	Agricultural and Food Marketing	3
AGEC 242	Management Theories and Practices	3
AGEC 343	Accounting and Cost Control	3
AGEC 344	Entrepreneurial Leadership	3
AGEC 450	Agribusiness Management	3
AGEC 453	Venture Capital Opportunities	3
AGEC 492	Special Topics in Agricultural Economics	3
NUTR 446	Applied Human Resources	3

Complementary Course:

one of the following courses:

ENVR 201	(3)	Society and Environment
ENVR 203	(3)	Knowledge, Ethics and Environment
RELG 270	(3)	Ethics and the Environment

6.3 Department of Animal Science

Macdonald Stewart Building - Room MS1-084

Telephone: (514) 398-7794

Email: info@AnimSci.AgrEnv.McGill.CA

Website: <http://animsci.agrenv.mcgill.ca>

Chair — Xin Zhao

Emeritus Professor — John E. Moxley

Professors — Roger B. Buckland, Eduardo R. Chavez, Bruce R. Downey, Kwet Fane Ng Kwai Hang, Flannan Hayes, Urs Kuhnlein

Associate Professors — Roger I. Cue, Humberto G. Monardes, Leroy E. Phillip, Kevin Wade, David Zadworny, Xin Zhao (William Dawson Scholar)

Assistant Professors — René Lacroix (PT), Arif F. Mustafa

Associate Member — Ri-Cheng Chian

Adjunct Professors — Carol Keefer, Pierre Lacasse, Daniel Lefebvre, Bruce Murphy, Denis Peticlec, Jeffrey Turner

The Department of Animal Science offers Majors in Animal Science and Animal Biology.

ANIMAL SCIENCE MAJOR

Academic Advisers: E.R. Chavez (U1), J.F. Hayes (U2), A. Mustafa (U3)

The curriculum in Animal Science involves intensive training in both the basic and applied biological sciences as related to domestic animals and qualifies the graduate for membership in l'Ordre des agronomes du Québec and other professional organizations. Graduates generally enter agricultural industries, mainly sales and marketing, government service (Provincial or Federal), extension, teaching or post-graduate studies. Some students go on to study veterinary medicine. Students are strongly advised to obtain at least 3 months practical experience on a commercial live-stock farm before graduation.

Required Courses: 63 credits.

Complementary Courses: 6 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

CREDITS

Required Courses:	63	
ABEN 322	Food Prod/Processing Waste Mgmt	3
AEMA 310	Statistical Methods 1	3
AGEC 200	Principles of Microeconomics	3
AGRI 430	Ecological Agriculture Systems	3
ANSC 250	Principles of Animal Science	3
ANSC 301	Principles of Animal Breeding	3
ANSC 312	Animal Health and Disease	3
ANSC 323	Mammalian Physiology	4
ANSC 324	Animal Reproduction	3
ANSC 330	Fundamentals of Nutrition	3
ANSC 433	Animal Nutrition	3
ANSC 450	Dairy Cattle Production	3
ANSC 452	Beef Cattle and Sheep Production	3
ANSC 454	Swine Production	3
ANSC 456	Poultry Production	3
ANSC 495D1	Seminar	1
ANSC 495D2	Seminar	1
FDSC 211	Biochemistry 1	3
MICR 230	Microbial World	3
PLNT 211	Principles of Plant Science	3
SOIL 210	Principles of Soil Science	3
WILD 375	Issues in Environmental Sciences	3

Complementary Courses:

One Ethics course:	6
ENVR 203 (3) Knowledge, Ethics and Environment	3
or RELG 270 (3) Ethics and the Environment	
One additional Economics course	3

ANIMAL BIOLOGY MAJOR

Academic Adviser: H. Monardes

The Animal Biology Major is directed towards students who wish to further their studies in the basic biology of the larger mammals and birds. Successful completion of the program will enable students to qualify in applying to most professional schools in North America, to post-graduate schools in a variety of biological-oriented programs, and to work in most laboratory settings. The program is not intended for students wishing to become professional agrologists.

Required Courses: 34 credits

Complementary Courses: 24 credits, minimum

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

		CREDITS
Required Courses:		34
AEBI 202	Cellular Biology	3
AEMA 310	Statistical Methods 1	3
ANSC 234	Biochemistry 2	3
ANSC 250	Principles of Animal Science	3
ANSC 251	Comparative Anatomy	3
ANSC 323	Mammalian Physiology	4
ANSC 330	Fundamentals of Nutrition	3
ANSC 495D1	Seminar	1
ANSC 495D2	Seminar	1
CELL 204	Genetics	4
FDSC 211	Biochemistry 1	3
MICR 230	Microbial World	3

Complementary Courses:

A minimum of 24 credits selected from the following list in consultation with the Academic Adviser:

- ANSC 312 (3) Animal Health and Disease
- ANSC 324 (3) Animal Reproduction
- ANSC 424 (3) Metabolic Endocrinology
- ANSC 433 (3) Animal Nutrition
- ANSC 460 (3) Biology of Lactation
- MICR 341 (3) Mechanism of Pathogenicity
- NRSC 550 (3) Veterinary & Medical Entomology
- PARA 400 (3) Eukaryotic Cells and Viruses
- PARA 438 (3) Immunology
- WILD 410 (3) Wildlife Ecology
- ZOOL 307 (3) Natural History of the Vertebrates
- ZOOL 311 (3) Ethology
- ZOOL 424 (3) Parasitology
- or WILD 350 (3) Mammalogy

The student may replace up to 12 credits of the complementary courses listed above by choosing, with the student adviser's approval, any course offerings (300 level or higher) in Anatomy and Cell Biology, Biochemistry, Biology, Microbiology and Immunology, Neurology and Neurosurgery, Pharmacology and Therapeutics, Physiology, and Psychology. Any prerequisites for these courses must be taken as electives.

6.4 School of Dietetics and Human Nutrition

Macdonald Stewart Building – Room MS2-039
 Telephone: (514) 398-7842
 Email: dietstage@macdonald.mcgill.ca
 Website: <http://dietetics.mcgill.ca>

Director — Katherine Gray-Donald

Emeritus Professor — Helen R. Neilson

Professors — Peter J.H. Jones, Harriet V. Kuhnlein

Associate Professors — Laurie Chan, Grace Egeland (*Canada Research Chair*), Katherine Gray-Donald, Timothy A. Johns, Kristine G. Koski, Stan Kubow, Louise Thibault, Linda Wykes (*William Dawson Scholar*)

Assistant Professor — David Bissonnette

Lecturers — Stuart Bedard, Lynda Fraser (PT), Linda Jacobs Starkey, Maureen Rose-Lucas, Joane Routhier Mayrand, Sandy Phillips, Hugues Plourde, Heidi Ritter, Donna Schafer, Richard Stojak (PT)

Adjunct Professors — Kevin A. Cockell, Jeffrey S. Cohn, Marie L'Abbeé, Shi-Hsiang Shen

Cross-Appointed Staff —

Food Science and Agricultural Chemistry: Selim Kermasha
 Medicine: Louis Beaumier, Franco Carli, Katherine Cianflone, Réjeanne Gougeon, L. John Hoffer, Errol Marliiss, Jean-François Yale

Parasitology: Marilyn E. Scott

Psychiatry: Simon Young

Health and well-being of individuals in relation to food choices and physiological status prevails as the unifying theme of the programs in the School of Dietetics and Human Nutrition. The availability of food, normal metabolism and clinical nutrition, community nutrition at the local and international level, the evaluation of nutritional products and their use in nutrition, and the communication of information about food and health form the core of academic programs.

DIETETICS MAJOR

Academic Advising Coordinator:

Linda Jacobs Starkey, Ph.D., RD, FDC

Graduates are qualified for challenging professional and leadership positions related to food and health, as dietitians, nutritionists and food administrators. The designations "Dietitian" and "Nutritionist" are reserved titles in the province of Quebec. As clinical nutritionists, dietitians may work in health and food service centres and hospitals, nutrition counselling centres, clinics and private practice. As community nutritionists, dietitians are involved in nutrition education programs through schools, sports centres and local and international health agencies. The dietitian in the food service sector participates in all aspects of management to assure quality food products. Postgraduate programs are available to qualified graduates. The duration of the program is three and one-half years. Successful graduates are qualified for membership in Dietitians of Canada and the Ordre professionnelle de diététistes du Québec. Forty weeks supervised professional experience in clinical and community nutrition and food service systems management are included.

Required Courses: 103 credits.

Note: The School firmly applies prerequisite requirements (with C grade as pass) for registration in all required courses in the Dietetics Major.

Complementary Courses: 6 credits.

Electives: 6 credits, selected in consultation with an Academic Adviser, to meet the minimum 115-credit requirement for the degree.

All required and complementary courses must be passed with a minimum grade of C.

		CREDITS
Term 1		15
AGEC 242	Management Theories and Practices	3
FDSC 211	Biochemistry 1	3
NUTR 207	Nutrition and Health	3
NUTR 214	Food Fundamentals	3
One Elective or Complementary (see list below)		3
Term 2		16
ABEN 251	Microcomputer Applications	3
ANSC 234	Biochemistry 2	3
MICR 230	Microbial World	3
NUTR 208*	Stage in Dietetics 1	1
NUTR 217	Application of Food Fundamentals	3
One Elective or Complementary (see list below)		3
Summer		3
NUTR 209*	Professional Practice Stage 1B	3

Term 3		17
AEMA 310	Statistical Methods 1	3
AGEC 343	Accounting and Cost Control	3
ANSC 323	Mammalian Physiology	4
ANSC 330	Fundamentals of Nutrition	3
NUTR 322	Applied Sciences Communications	2
NUTR 345	Food Service Systems Management	2
Term 4		16
ANSC 424	Metabolic Endocrinology	3
NUTR 310*	Stage in Dietetics 2A	1
NUTR 337	Nutrition Through Life	3
NUTR 344	Clinical Nutrition 1	4
NUTR 346	Quantity Food Production	2
One Elective or Complementary (see list below)		3
Summer		5
NUTR 311*	Stage in Dietetics 2B	5
Term 5		17
NUTR 403	Nutrition in Society	3
NUTR 445	Clinical Nutrition 2	5
NUTR 446	Applied Human Resources	3
NUTR 450	Research Methods in Human Nutrition	3
One Elective or Complementary (see list below)		3
Term 6		12
NUTR 409*	Stage in Dietetics 3	8
NUTR 436	Nutritional Assessment	2
NUTR 438	Interviewing and Counselling	2
Term 7		14
NUTR 410*	Professional Practice - Stage 4	14

Two Complementary Courses are to be selected from the following, as specified

3 credits of Human Behavioural Science courses chosen from:

- NUTR 301 (3) Psychology
- or equivalent course from another faculty.

3 credits from the social sciences:

- AGEC 200 (3) Principles of Microeconomics
- AGEC 230 (3) Agricultural and Food Marketing
- ENVR 201 (3) Society and Environment
- ENVR 203 (3) Knowledge, Ethics and Environment
- RELG 270 (3) Ethics and the Environment

Elective Courses:

Two Elective courses should be chosen in consultation with the academic adviser. The following courses most often fit the timetable; elective choice is not limited to these courses.

- FDSC 200 (3) Introduction to Food Science
- FDSC 212 (3) Biochemistry Lab
- FDSC 251 (3) Food Chemistry 1
- FDSC 425 (3) Principles of Quality Assurance
- NUTR 420 (3) Food Toxicants and Health Risks
- NUTR 430 (3) Directed Studies in Dietetics/Nutrition 1
- NUTR 501 (3) Nutrition in Developing Countries
- NUTR 511 (3) Nutrition and Behaviour
- NUTR 512 (3) Herbs, Foods and Phytochemicals

* Successful completion of all component parts of each level of Stage (Professional Practice) in Dietetics courses is a prerequisite for the next level and must be passed with a minimum grade of C. All required and complementary courses must be passed with a grade of C or better. Undergraduate registration is restricted to students in the Dietetics Major, CGPA greater than or equal to 2.50. Visiting students must contact the Academic Advising Coordinator (Dietetics) regarding course registration eligibility.

A compulsory immunization program exists at McGill which is required by the teaching hospitals before they will permit Dietetics students to practice. Students should complete their immunization before arriving at Macdonald. Medical/health documentation must be received prior to commencement of each level of Stage. There are no exceptions possible.

NUTRITION MAJOR

Academic Advising Coordinator: Kristine G. Koski

This Major covers the many aspects of human nutrition and food and gives first, an education in the scientific fundamentals of these disciplines and second, an opportunity to develop specialization in nutritional biochemistry, nutrition and populations or nutrition of food. Graduates normally will continue on to further studies preparing for careers in research, medicine or as specialists in nutrition. Research nutritionists, aside from working as university teachers and researchers, may be employed by government and health protection agencies, in world development programs, or by the food sector.

Required Courses: 52 credits.

Note: The School firmly applies prerequisite requirements (with C grade as pass) for registration in all required courses in the Nutrition Major.

Option Required and Complementary Courses: 12 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90 credit requirement for the degree.

All required courses must be passed with a minimum grade of C.

		CREDITS
Term 1		11
FDSC 211	Biochemistry 1	3
FDSC 212	Biochemistry Laboratory	2
NUTR 207	Nutrition and Health	3
NUTR 214	Food Fundamentals	3
Term 2		12
ABEN 251	Microcomputer Applications	3
ANSC 234	Biochemistry 2	3
MICR 230	Microbial World	3
NUTR 217	Application of Food Fundamentals	3
Term 3		12
AEMA 310	Statistical Methods 1	3
ANSC 323	Mammalian Physiology	4
ANSC 330	Fundamentals of Nutrition	3
NUTR 322	Applied Sciences Communications	2
Term 4		9
ANSC 424	Metabolic Endocrinology	3
NUTR 337	Nutrition Through Life	3
NUTR 344	Clinical Nutrition 1	3
Term 5		6
NUTR 450	Research Methods in Human Nutrition	3
NUTR 451	Nutrition Research	3
Term 6		2
NUTR 436	Nutritional Assessment	2

Additional required and complementary courses, 12 credits.

Students must select one of the following three options as part of their program.

		CREDITS
Nutritional Biochemistry Option:		12
Term 5	ANSC 552 Protein Metabolism in Animals	3
Term 6	ANSC 551 Carbohydrate and Lipid Metabolism	3
Term 3 or 5	AEPH 303 Advances in Atomic and Nuclear Science	3
	AEPH 405 Elementary Tracer Techniques	3
Nutrition and Populations Option:		12
Term 5	NUTR 406 Ecology of Human Nutrition	3
Term 6	NUTR 403 Community Nutrition	3
Select 6 credits from those listed below or any other social science courses:		6
	NUTR 301 (3) Psychology	
	ENVR 203 (3) Knowledge, Ethics and the Environment	

Nutrition of Food Option:	12
Term 2 or 4 FDSC 334 Analytical Chemistry 2	3
Term 4 FDSC 251 Food Chemistry 1	3
Term 5 FDSC 300 Food Analysis 1	3
Term 6 FDSC 315 Food Analysis 2	3

Electives: Selected in consultation with the academic adviser to meet the minimum 90 credits for the degree.

MINOR IN HUMAN NUTRITION

Academic Adviser: Linda Wykes

The Minor in Human Nutrition is intended to complement a student's primary field of study by providing a focused introduction to the metabolic aspects of human nutrition. It is particularly accessible to students in Biochemistry, Biology, Physiology, Anatomy and Cell Biology, Microbiology and Immunology, Animal Science or Food Science programs. The completion of 24 credits is required, of which at least 18 must not overlap with the primary program. All courses must be taken in the appropriate sequence and passed with a minimum grade of C. Students may declare their intent to follow the Minor program at the beginning of their U2 year. They must then consult with the Academic Adviser for the Human Nutrition Minor in the School of Dietetics and Human Nutrition to obtain approval for their course selection. Since not all courses are offered every year and many have prerequisites, students are cautioned to plan their program in advance.

The Minor program does not carry professional recognition, therefore, it is not suitable for students wishing to become nutritionists or dietitians. However, successful completion may enable students to qualify for many post-graduate nutrition programs.

Required Courses: 6 credits.

Complementary Courses: 18 or 19 credits

Required Courses:	CREDITS
NUTR 337 Nutrition Through Life	3
NUTR 450 Research Methods in Human Nutrition	3
Complementary Courses:	18 or 19
3 credits in biochemistry, one of:	
ANSC 234 (3) Biochemistry 2	
BIOC 311 (3) Metabolic Biochemistry	
3 or 4 credits in physiology, one of:	
ANSC 323 (4) Mammalian Physiology	
PHGY 210 (3) Mammalian Physiology 2	
PHGY 202 (3) Human Physiology: Body Functions	
3 credits in nutrition, one of:	
ANSC 330 (3) Fundamentals of Nutrition	
NUTR 307 (3) Human Nutrition	
8 or 9 credits from the following list:	
ANSC 551 (3) Carbohydrate and Lipid Metabolism	
ANSC 552 (3) Protein Metabolism and Nutrition	
IMED 300 (3) Human Disease	
MIMM 314 (3) Immunobiology	
or PARA 438 (3) Immunology	
NUTR 406 (3) Ecology of Human Nutrition	
NUTR 451 (3) Analysis of Nutrition Data	
NUTR 436 (2) Nutritional Assessment	
NUTR 420 (3) Food Toxicants and Health Risks	
NUTR 512 (3) Herbs, Foods and Phytochemicals	
NUTR 501 (3) Nutrition in Developing Countries	
NUTR 430 (3) Directed Studies: Dietetics and Nutrition 1	
or NUTR 431 (3) Directed Studies: Dietetics and Nutrition 2	

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.

6.5 Department of Food Science and Agricultural Chemistry

Macdonald Stewart Building – Room MS1-034

Telephone: (514) 398-7898

Email: foodscience@macdonald.mcgill.ca

Website: <http://agrenv.mcgill.ca/foodscience/>

Chair — Inteaz Alli

Professors — Inteaz Alli, William D. Marshall, James P. Smith, Frederik R. Van De Voort

Associate Professors — Ashraf A. Ismail, Selim Kermasha, Hosahalli Ramaswamy, Benjamin K. Simpson, Varoujan Yaylayan

Adjunct Professors — John W. Austin, Byong H. Lee, Yasuo Konishi, Michèle Marcotte, Andre Morin, J.R. Jocelyn Pare

MAJOR IN FOOD SCIENCE

This program is intended for those students interested in the multi-disciplinary field of Food Science. The courses are integrated to acquaint the student with food processing, food chemistry, quality assurance, analytical procedures, food products, standards and regulations. The program prepares graduates for employment as scientists in industry or government, in regulatory, research, quality assurance, or product development capacities. Graduates have the academic qualifications for membership in the Canadian Institute of Food Science and Technology and the Institute of Food Technologists. Graduates can also qualify for admission to the Ordre des chimistes du Québec by careful selection of additional courses.

Required Courses: 66 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree. A portion of these credits should be in the humanities/social sciences.

Required Courses:	CREDITS
FDSC 200 Introduction to Food Science	3
FDSC 211* Biochemistry 1	3
FDSC 213 Analytical Chemistry 1	3
FDSC 233 Physical Chemistry	3
FDSC 251 Food Chemistry 1	3
FDSC 300 Food Analysis 1	3
FDSC 305 Food Chemistry 2	3
FDSC 310 Post Harvest Fruit & Vegetable Technology	3
FDSC 315 Food Analysis 2	3
FDSC 319 Food Chemistry 3	3
FDSC 330 Food Processing	3
FDSC 334 Analytical Chemistry 2	3
FDSC 400 Food Packaging	3
FDSC 410 Flavour Chemistry	3
FDSC 425 Principles of Quality Assurance	3
FDSC 495D1 Food Science Seminar	1.5
FDSC 495D2 Food Science Seminar	1.5
ABEN 251 Microcomputer Applications	3
ABEN 324 Elements of Food Engineering	3
AEMA 310 Statistical Methods 1	3
MICR 230 Microbial World	3
MICR 442 Food Microbiology and Sanitation	3
NUTR 207 Nutrition and Health	3

* Students who have not taken CEGEP objective 00XV or equivalent (formerly Chemistry 202) must take Organic Chemistry (FDSC 230) as a prerequisite for FDSC 211.

The following courses must be taken by students who wish to meet the course requirements for admission to the Ordre des chimistes du Québec.

FDSC 212 (2) Biochemistry Laboratory
FDSC 230 (4) Organic Chemistry
FDSC 490 (3) Research Project 1

FDSC 491	(3)	Research Project 2
FDSC 510	(3)	Food Hydrocolloid Chemistry
FDSC 515	(3)	Enzyme Thermodynamics/Kinetics
FDSC 520	(3)	Biophysical Chemistry of Food

6.6 Interdisciplinary Studies

Ecological Agriculture Program
 Telephone: (514) 398-7928
 Website: <http://www.agrenv.mcgill.ca/agrecon/ecoagr>

MINOR IN ECOLOGICAL AGRICULTURE

Academic Adviser: Professor J. Henning
 This Minor program is designed to focus on the principles underlying the practice of ecological agriculture and is suitable for students wishing to farm, do extension and government work, and those intending to pursue post graduate studies in this field. 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 Ecological Agriculture. 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 Ecological Agriculture Minor. The Academic Adviser of the Ecological Agriculture 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 Ecological Agriculture, students must:

- a) 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.
- b) 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: 9 credits. These are the same as for the Certificate in Ecological Agriculture.

Complementary Courses: 15 credits. Courses are chosen from the same list as for the Certificate in Ecological Agriculture.

CERTIFICATE IN ECOLOGICAL AGRICULTURE

Academic Adviser: Professor J. Henning
 This 30-credit Certificate Program is very similar to the Minor Program and is designed to focus on the principles underlying the practice of ecological agriculture. The Certificate may be of special interest to professional agrologists who wish further training, as well as formal recognition that they have completed a coherent program of courses beyond their B.Sc. studies.

Students holding a B.Sc. in agriculture or a related area are eligible to register for this program provided that they are otherwise acceptable for admission to the University. Students who have completed the Minor in Ecological Agriculture are not permitted to register for this program.

General Regulations

To obtain a Certificate in Ecological Agriculture, students must offer a minimum total of 30 credits from the courses as given below.

Required Courses: 9 credits.

Complementary Courses: 21 credits.

		CREDITS
Required Courses:		9
AGRI 210	Agro-Ecological History	3
AGRI 250	Principles of Ecological Agriculture	3
AGRI 430	Ecological Agriculture Systems	3

Complementary Courses:

21

21 credits chosen from the following, in consultation with the Academic Adviser for Ecological Agriculture

with at least 3 credits chosen from: 3-6

NRSC 521	(3)	Soil Microbiology and Biochemistry	
SOIL 490D1	(1.5)	Plan global de fertilisation	
SOIL 490D2	(1.5)	Plan global de fertilisation	
and the remaining credits to be chosen from:			15-18
AEBI 205	(3)	Principles of Ecology	
AGEC 333	(3)	Resource Economics	
AGRI 435	(3)	Soil and Water Quality Management	
AGRI 491D1	(1.5)	Co-op Experience	
AGRI 491D2	(1.5)	Co-op Experience	
ENTO 452	(3)	Biocontrol of Insect Pests	
MICR 331	(3)	Microbial Ecology	
NUTR 512	(3)	Herbs and Phytochemicals	
PLNT 300	(3)	Cropping Systems	
PLNT 361	(3)	Pest Management & the Environment	
PLNT 434	(3)	Weed Biology and Control	
PLNT 460	(3)	Plant Ecology	
RELG 270	(3)	Ethics and the Environment	
WILD 375	(3)	Issues in Environmental Sciences	
WOOD 410	(3)	The Forest Ecosystem	
ZOOL 311	(3)	Ethology	

Notes:

- 1) 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 to ensure that they have met all conditions.
- 2) Not all courses are available in any given year. Consult departmental listings for full course descriptions and offerings.
- 3) Students using AGRI 491D1/AGRI 491D2 towards the requirements of the Certificate/Minor are limited to an experience on farms or other enterprises that are either organic, biodynamic, or practicing permaculture. The placement must be approved by the academic adviser for the Certificate/Minor.
- 4) NRSC 521 is an alternate year course.

AGRICULTURAL SCIENCES MAJORS

Professor K.A. Stewart
 Raymond Building Room R2-022A
 Telephone: (514) 398-7851 ext. 7872

The Agricultural Sciences Majors are designed to provide students with a broad appreciation of the scientific and applied aspects of modern agriculture and the flexibility to pursue individual interests.

Students can choose to keep their summers free in the Agricultural Sciences Major (90 credits) or gain valuable practical summer field experience (and obtain additional course credit) in the Agricultural Sciences Internship Major (102 credits).

Both majors consist of a similar core of required courses that lead to accreditation from the Ordre des agronomes du Québec.

Students in the Agricultural Sciences Majors can enrol in the General option, or obtain more specialized experience by selecting the Ecological Agriculture, International Agriculture, or Soil Science Options.

AGRICULTURAL SCIENCES MAJOR – GENERAL OPTION (90 credits)

Required Courses: 52 credits.

Complementary Courses: 19 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

		CREDITS
Required Courses:		52
RELG 270	Ethics and the Environment	3
AGRI 210	Agro-Ecological History	3
AGRI 220	Professional Practice Seminar 1	0.5

AGRI 221	Professional Practice Seminar 2	0.5
AGRI 320	Professional Practice Seminar 3	0.5
AGRI 321	Professional Practice Seminar 4	0.5
AGRI 420	Professional Practice Seminar 5	0.5
AGRI 421	Professional Practice Seminar 6	0.5
AGRI 490	Agri-food Industry Project	3
FDSC 211	Biochemistry 1	3
AGEC 200	Principles of Microeconomics	3
AGEC 231	Economic Systems of Agriculture	3
ABEN 300	Elements of Agricultural Engineering	3
ANSC 250	Principles of Animal Science	3
ENTO 352	Control of Insect Pests	3
CELL 204	Genetics	4
AEMA 310	Statistical Methods 1	3
MICR 230	Microbial World	3
PLNT 211	Principles of Plant Science	3
PLNT 300	Cropping Systems	3
SOIL 210	Principles of Soil Science	3
SOIL 315	Soil Fertility and Fertilizers	3

Complementary Courses:

at least one of:

- ANSC 323 (4) Mammalian Physiology
- PLNT 353 (4) Plant Structure and Function

at least one production course in Agricultural Science:

- AGEC 331 (3) Farm Business Management
- ANSC 450 (3) Dairy Cattle Production
- ANSC 452 (3) Beef Cattle and Sheep Production
- ANSC 454 (3) Swine Production
- ANSC 456 (3) Poultry Production
- PLNT 331 (3) Field Crops

plus a minimum of 12 credits chosen in consultation with the Academic Adviser from courses with Subject Codes AGRI, AGECE, ABEN, AEPH, ANSC, ENTO, PLNT, and SOIL (see section 7).

AGRICULTURAL SCIENCES INTERNSHIP MAJOR – GENERAL OPTION (102 credits)

Required Courses: 64 credits.

Complementary Courses: 19 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 102-credit requirement for the degree.

CREDITS
64

Required Courses:

All of the required courses (52 credits) specified for the Agricultural Sciences Major – General Option, with the addition of:

AGRI 201D1	Agri-Environment Internship	3
AGRI 201D2	Agri-Environment Internship	3
AGRI 301D1	Agri-Environment Internship	3
AGRI 301D2	Agri-Environment Internship	3

Complementary Courses:

As described for the Agricultural Sciences Major – General Option.

19

AGRICULTURAL SCIENCES MAJOR – ECOLOGICAL AGRICULTURE OPTION (90 credits)

Required Courses: 61 credits.

Complementary Courses: 16 - 19 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

CREDITS
61

Required Courses:

All of the required courses (52 credits) specified for the Agricultural Sciences Major – General Option, with the addition of:

AGRI 250	Principles of Ecological Agriculture	3
AGRI 430	Ecological Agriculture Systems	3
AGEC 205	Principles of Ecology	3

Complementary Courses:16 to 19

at least one of:

- ANSC 323 (4) Mammalian Physiology
- PLNT 353 (4) Plant Structure and Function

at least one production course in Agricultural Science:

- AGEC 331 (3) Farm Business Management
- ANSC 450 (3) Dairy Cattle Production
- ANSC 452 (3) Beef Cattle and Sheep Production
- ANSC 454 (3) Swine Production
- ANSC 456 (3) Poultry Production
- PLNT 331 (3) Field Crops

at least 3 credits must be chosen from three of the four blocks below:

- AGRI 201D1 (3) Agri-Environment Internship and AGRI 201D2(3) Agri-Environment Internship
- AGRI 435 (3) Soil and Water Quality Management
- NRSC 521 (3) Soil Microbiology and Biochemistry
- SOIL 490D1 (1.5) Plan global de fertilisation and SOIL 490D2 (1.5) Plan global de fertilisation
- MICR 331 (3) Microbial Ecology
- PLNT 434 (3) Weed Biology and Control
- PLNT 460 (3) Plant Ecology
- AGEC 333 (3) Resource Economics
- ENVR 201 (3) Society and Environment
- ENVR 400 (3) Environmental Thought

AGRICULTURAL SCIENCES INTERNSHIP MAJOR – ECOLOGICAL AGRICULTURE OPTION (102 credits)

Required Courses: 73 credits.

Complementary Courses: 13 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 102-credit requirement for the degree.

CREDITS

73

Required Courses:

All of the required courses (52 credits) specified for the Agricultural Sciences Major – Ecological Agriculture Option, with the addition of:

AGRI 201D1	Agri-Environment Internship	3
AGRI 201D2	Agri-Environment Internship	3
AGRI 301D1	Agri-Environment Internship	3
AGRI 301D2	Agri-Environment Internship	3

Complementary Courses:13

at least one of:

- ANSC 323 (4) Mammalian Physiology
- PLNT 353 (4) Plant Structure and Function

at least one production course in Agricultural Science:

- AGEC 331 (3) Farm Business Management
- ANSC 450 (3) Dairy Cattle Production
- ANSC 452 (3) Beef Cattle and Sheep Production
- ANSC 454 (3) Swine Production
- ANSC 456 (3) Poultry Production
- PLNT 331 (3) Field Crops

at least 3 credits must be chosen from two of the three blocks below:

- AGRI 435 (3) Soil and Water Quality Management
- NRSC 521 (3) Soil Microbiology and Biochemistry
- SOIL 490D1 (1.5) Plan global de fertilisation and SOIL 490D2 (1.5) Plan global de fertilisation
- MICR 331 (3) Microbial Ecology
- PLNT 434 (3) Weed Biology and Control
- PLNT 460 (3) Plant Ecology
- AGEC 333 (3) Resource Economics
- ENVR 201 (3) Society and Environment
- ENVR 400 (3) Environmental Thought

AGRICULTURAL SCIENCES MAJOR – INTERNATIONAL AGRICULTURE OPTION (90 credits)

Required Courses: 58 credits.

Complementary Courses: 16 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

Required Courses: **CREDITS 58**
All of the required courses (52 credits) specified for the Agricultural Sciences Major – General Option, with the addition of:

AGRI 411	International Agriculture	3
AGEC 442	Economics of International Agricultural Development	3

Complementary Courses: **CREDITS 16**
at least one of:

ANSC 323	(4) Mammalian Physiology
PLNT 353	(4) Plant Structure and Function

at least one production course in Agricultural Science:

AGEC 331	(3) Farm Business Management
ANSC 450	(3) Dairy Cattle Production
ANSC 452	(3) Beef Cattle and Sheep Production
ANSC 454	(3) Swine Production
ANSC 456	(3) Poultry Production
PLNT 331	(3) Field Crops

a minimum of 9 credits chosen from the following:

ANTH 212	(3) Anthropology of Development
POLI 227	(3) Developing Areas/Introduction
SOCI 254	(3) Development and Underdevelopment
GEOG 216	(3) Geography of the World Economy
GEOG 404	(3) Environmental Management for Developing Areas
AGRI 430	(3) Ecological Agriculture Systems
AGRI 305	(3) Barbados Agro-Ecosystems
AGEC 430	(3) Agriculture, Food and Resource Policy
NUTR 501	(3) Nutrition in Developing Countries

AGRICULTURAL SCIENCES INTERNSHIP MAJOR – INTERNATIONAL AGRICULTURE OPTION (102 credits)

Required Courses: 70 credits.

Complementary Courses: 16 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 102-credit requirement for the degree.

Required Courses: **CREDITS 70**
All of the required courses (52 credits) specified for the Agricultural Sciences Major – International Agriculture Option, with the addition of:

AGRI 201D1	Agri-Environment Internship	3
AGRI 201D2	Agri-Environment Internship	3
AGRI 301D1	Agri-Environment Internship	3
AGRI 301D2	Agri-Environment Internship	3

Complementary Courses: **CREDITS 16**
As described for the Agricultural Sciences Major – International Agriculture Option.

AGRICULTURAL SCIENCES MAJOR – SOIL SCIENCE OPTION (90 credits)

Required Courses: 52 credits.

Complementary Courses: 25 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 90-credit requirement for the degree.

Required Courses: **CREDITS 52**
All of the required courses (52 credits) specified for the Agricultural Sciences Major – General Option.

Complementary Courses: **CREDITS 25**
at least one of:

ANSC 323	(4) Mammalian Physiology
PLNT 353	(4) Plant Structure and Function

at least one production course in Agricultural Science:

AGEC 331	(3) Farm Business Management
ANSC 450	(3) Dairy Cattle Production
ANSC 452	(3) Beef Cattle and Sheep Production
ANSC 454	(3) Swine Production
ANSC 456	(3) Poultry Production
PLNT 331	(3) Field Crops

a minimum of 18 credits chosen from the following:

AGRI 435	(3) Soil and Water Quality Management
ABEN 217	(3) Hydrology and Drainage
SOIL 200	(3) Introduction to Earth Science
SOIL 326	(3) Soil Genesis and Classification
SOIL 331	(3) Soil Physics
SOIL 410	(3) Soil Chemistry
SOIL 521	(3) Soil Microbiology and Biochemistry

AGRICULTURAL SCIENCES INTERNSHIP MAJOR – SOIL SCIENCE OPTION (102 credits)

Required Courses: 64 credits.

Complementary Courses: 25 credits.

Electives: selected in consultation with Academic Adviser, to meet the minimum 102-credit requirement for the degree.

Required Courses: **CREDITS 64**
All of the required courses (52 credits) specified for the Agricultural Sciences Major – Soil Science, with the addition of:

AGRI 201D1	Agri-Environment Internship	3
AGRI 201D2	Agri-Environment Internship	3
AGRI 301D1	Agri-Environment Internship	3
AGRI 301D2	Agri-Environment Internship	3

Complementary Courses: **CREDITS 25**
As described for the Agricultural Sciences Major – Soil Science Option.

6.7 Department of Natural Resource Sciences

Macdonald Stewart Building – Room MS3-040

Telephone: (514) 398-7890

Fax: (514) 398-7990

Email: info@nrs.mcgill.ca

Website: <http://www.nrs.mcgill.ca>

Chair — Benoît Côté

Emeritus Professors — A. Clark Blackwood, Roger Knowles, Angus F. Mackenzie, Robert A. MacLeod, Peter H. Schuepp, Robin K. Stewart

Professors — David M. Bird, Peter Brown (*joint appt. with Geography and McGill School of Environment*), William H. Hendershot

Associate Professors — Benoît Côté, Mark A. Curtis, Gary B. Dunphy, James W. Fyles, David J. Lewis, Guy R. Mehuys, Donald F. Niven, Manfred E. Rau, Rodger D. Titman, Terry A. Wheeler

Assistant Professors — Brian T. Driscoll, Chantal Hamel, Ian Strachan, Joann Whalen

Faculty Lecturer — Derek Nelligen

Associate Members — Laurie Chan (*School of Dietetics and Human Nutrition*), David Green (*Redpath Museum*), William D. Marshall (*Dept. of Food Science and Agricultural Chemistry*), Greg T. Matlashewski (*Dept. of Microbiology and Immunology*), Donald L. Smith (*Dept. of Plant Science*)

Adjunct Professors — Robert Anderson, Frederick S. Archibald, Guy Boivin, Helene Chiasson, Jeffrey Cumming, Charles W. Greer, Thomas Herman, Carlos Miguez,

Pierre Mineau, Elizabeth Pattey, Marc St-Arnaud,
Jean-Pierre Savard, Anton Scheuhammer,
Norman R. Seymour, Thomas G. Smith, Charles Vincent,
Frederick G. Whoriskey

APPLIED ZOOLOGY MAJOR

[Program revisions are under consideration for September 2002.
Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

Academic Adviser: Professor D. J. Lewis

The great diversity of animals form the focus of this Major, from the invertebrates, with their many beneficial and pest insects, to vertebrates, including fish and wildlife. The interaction of animals with each other and with human populations is stressed. By careful course selection students may emphasize life in soils or water, entomology, physiology, parasitology or vertebrate biology and ecology. Career opportunities exist in both the public and private sectors in research, program development and implementation, pest control, wildlife management, etc.

Required Courses: 24 credits.

Complementary Courses: 28 or 29 credits.

Electives: to meet the minimum requirement of 90 credits; chosen in consultation with the Academic Adviser.

	CREDITS
Required Courses:	24
AEBI 200 Biology of Organisms	3
AEBI 202 Cellular Biology	3
AEBI 205 Principles of Ecology	3
AEMA 310 Statistical Methods 1	3
CELL 204 Genetics	4
FDSC 211 Biochemistry 1	3
FDSC 212 Biochemistry Laboratory	2
PLNT 201 Comparative Plant Biology	3

	CREDITS
Complementary Courses:	28 or 29
An appropriate Seminar Course	2 or 3
plus a minimum of 26 credits from the following:	26
ANSC 323 (4) Mammalian Physiology	
ENTO 335 (3) Soil Ecology and Management	
NRSC 330 (3) Insect Biology	
NRSC 496D1 (1.5) Project 1	
NRSC 496D2 (1.5) Project 1	
or NRSC 497D1 (2.5) Project 2	
NRSC 497D2 (2.5) Project 2	
WILD 401 (3) Fisheries and Wildlife Management	
WILD 410 (3) Wildlife Ecology	
WILD 420 (3) Ornithology	
WILD 475 (3) Desert Ecology	
ZOOL 307 (3) Natural History of the Vertebrates	
ZOOL 311 (3) Ethology	
ZOOL 312 (3) Zoological Systematics and Evolution	
ZOOL 313 (3) Zoogeography	
ZOOL 424 (3) Parasitology	

The following Zoology courses from the Downtown Campus may be substituted for those in the above list of Macdonald Campus Complementary Courses with the prior permission of the Academic Adviser and the Macdonald Committee on Academic Standing. When selecting electives, students are encouraged to consult with their Academic Adviser.

Department of Biology (Downtown Campus) Courses:

BIOL 307 (3) Behavioural Ecology and Sociobiology	
BIOL 327 (3) Herpetology	
BIOL 331 (3) Ecology and Behaviour Field Course	
BIOL 334 (3) Field Course, Applied Tropical Ecology	
BIOL 335 (3) Marine Mammals	
BIOL 336 (3) Marine Aquaculture	
BIOL 337 (3) Ecology and Behaviour of Fishes	
BIOL 351 (3) The Biology of Invertebrates	
BIOL 352 (3) Vertebrate Evolution	
BIOL 437 (3) Advanced Invertebrate Zoology	
BIOL 542 (3) Marine Biology	

MACDONALD SUMMER FIELD SEMESTER: HUMAN IMPACTS ON THE ENVIRONMENT

Three courses are available during Summer Session that provide students the opportunity to participate in supervised field research concerning flora and fauna not easily studied at other times of the year, and to apply knowledge from the classroom to environmental issues in the field.

Common thematic elements include: the linkages between physical, biological and human systems, field research, and human impacts on the environment. Students learn and apply research techniques and analytical skills within a multi-disciplinary, holistic approach.

Summer Session Courses:

NRSC 382 (3) Ecological Monitoring & Analysis	
NRSC 383 (3) Land Use: Redesign & Planning	
NRSC 384 (3) Field Research Project	

For more information, please consult the McGill Summer Studies Calendar, the Summer Studies Website (<http://www.mcgill.ca/Summer/>), or the Faculty Website (<http://www.agrenv.mcgill.ca/envschool>).

ENVIRONMENTAL BIOLOGY MAJOR

Academic Advisers: Professors M.E. Rau (U1), D.J. Lewis (U2),
J. Fyles (U3)

This program provides scientists with basic knowledge in Biology and strong emphasis in Ecology. As ecologists they will be equipped to investigate the scientific aspects of the relationships between organisms and their environment.

Required Courses: 29 credits.

Complementary Courses: 30 credits.

Electives: To meet the minimum requirements of 90 credits for the degree.

	CREDITS
Required Courses:	29
AEBI 200 Biology of Organisms	3
AEBI 202 Cellular Biology	3
AEBI 205 Principles of Ecology	3
AEBI 495D1 Environmental Biology Seminar	1
AEBI 495D2 Environmental Biology Seminar	1
AEMA 310 Statistical Methods 1	3
CELL 204 Genetics	4
FDSC 211 Biochemistry 1	3
FDSC 212 Biochemistry Laboratory	2
PLNT 201 Comparative Plant Biology	3
WILD 375 Issues in Environmental Sciences	3

Complementary Courses: 30

a minimum of 30 credits selected from the following list in consultation with the Academic Adviser

AEMA 306 (3) Mathematical Methods in Ecology	
AEPH 201 (3) Introductory Meteorology	
MICR 230 (3) Microbial World	
MICR 331 (3) Microbial Ecology	
NRSC 496D1 (1.5) Project	
NRSC 496D2 (1.5) Project	
PLNT 358 (3) Flowering Plant Diversity	
PLNT 460 (3) Plant Ecology	
SOIL 200 (3) Introduction to Earth Science	
SOIL 210 (3) Principles of Soil Science	
WILD 333 (3) Physical and Biological Aspects of Pollution	
WILD 401 (4) Fisheries and Wildlife Management	
WILD 410 (3) Wildlife Ecology	
WILD 437 (3) Assessing Environmental Impact	
WILD 475 (3) Desert Ecology	
WOOD 410 (3) The Forest Ecosystem	
WOOD 420 (3) Environmental Issues in Forestry	
ZOOL 307 (3) Natural History of the Vertebrates	
ZOOL 311 (3) Ethology	
ZOOL 313 (3) Zoogeography	
ZOOL 315 (3) Science of Inland Waters	

With the permission of the Academic Adviser and the Committee on Academic Standing, ecological or environmental courses offered on the Downtown Campus may be substituted for those appearing in the above list of Complementary Courses.

MICROBIOLOGY MAJOR

Academic Advisers: Professors D. Niven (U1 and U2),
B.T. Driscoll (U3)

Students receive training in fundamental principles and applied aspects of Microbiology. Successful graduates are competent to work in university, government and industrial research laboratories and in the pharmaceutical, fermentation and food industries.

Required Courses: 60 credits.

Electives: to meet the minimum requirement of 90 credits for the degree; chosen in consultation with the Academic Adviser.

	CREDITS
Required Courses:	60
AEBI 200 Biology of Organisms	3
AEBI 202 Cellular Biology	3
AEBI 205 Principles of Ecology	3
AEMA 310 Statistical Methods 1	3
CELL 204 Genetics	4
FDSC 211 Biochemistry 1	3
FDSC 212 Biochemistry Laboratory	2
MICR 200 Laboratory Methods in Microbiology	3
MICR 230 Microbial World	3
MICR 331 Microbial Ecology	3
MICR 337 Frontiers in Microbiology	1
MICR 338 Bacterial Molecular Genetics	3
MICR 341 Mechanisms of Pathogenicity	3
MICR 442 Food Microbiology and Sanitation	3
MICR 492 Research Project 1	2
MICR 493 Research Project 2	3
MICR 495 Seminar 1	1
MICR 496 Seminar 2	2
PARA 400 Eukaryotic Cells and Viruses	3
PARA 438 Immunology	3
PLNT 201 Comparative Plant Biology	3
ZOOL 424 Parasitology	3

RESOURCE CONSERVATION MAJOR

Academic Adviser: Professor B. Côté

The Major prepares students to deal with problems in integrated resource management and environmental protection with the objective of making optimal use of natural resources under any given set of economic, social and ecological conditions. Students follow a series of required courses and select complementary courses on physical, biological, soil and aquatic resources from approved lists on each of these themes.

Required Courses: 25 credits

Complementary Courses: 33 credits.

Electives: to meet the minimum 90-credit requirement for the degree.

	CREDITS
Required Courses:	25
AEBI 205 Principles of Ecology	3
AGEC 200 Principles of Microeconomics	3
AGEC 333 Resource Economics	3
FDSC 211 Biochemistry I	3
SOIL 200 Introduction to Earth Science	3
SOIL 210 Principles of Soil Science	3
WILD 437 Assessing Environmental Impact	2
WILD 491 Seminar	2
ZOOL 315 Science of Inland Waters	3
Complementary Courses:	min. 33
AEMA 310 (3) Statistical Methods 1	3
or MATH 203 ¹ (3) Principles of Statistics 1	
PLNT 201 (3) Comparative Plant Biology	3
or PLNT 211 (3) Principles of Plant Science	

At least two of the following:	6
ABEN 214 (3) Surveying	
ABEN 217 (3) Hydrology and Drainage	
or GEOG 322 ¹ (3) Hydrology	
ABEN 416 (3) Engineering for Land Development	
AEPH 201 (3) Introductory Meteorology	
WILD 333 (3) Physical and Biological Aspects of Pollution	

At least three of the following:	9 or 10
AEMA 306 (3) Mathematical Methods in Ecology	
BIOL 465 ¹ (3) Conservation Biology	
ENTO 335 (3) Soil Ecology and Management	
MICR 331 (3) Microbial Ecology	
PLNT 358 (3) Flowering Plant Diversity	
WILD 401 (4) Fisheries and Wildlife Management	
WOOD 410 (3) The Forest Ecosystem	

At least three of the following:	9
AGRI 435 (3) Soil and Water Quality Management	
SOIL 315 (3) Soil Fertility and Fertilizers	
SOIL 326 (3) Soil Genesis and Classification	
SOIL 331 (3) Soil Physics	
SOIL 410 (3) Soil Chemistry	
NRSC 521 (3) Soil Microbiology and Biochemistry	

At least one of the following:	3
GEOG 201 ¹ (3) Geographical Information Systems 1	
ABEN 350 (3) GIS & Biosystems	
WILD 310 (3) Air Photo and Imagery Interpretation	

¹ Downtown Campus

Note: Other courses on the Downtown Campus may be equivalent to some required courses; consult the Academic Adviser. Course substitutions must be approved by the Committee on Academic Standing.

WILDLIFE BIOLOGY MAJOR

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

Academic Advisers: Professors D. Bird (U1), R. Titman (U2),
M. Curtis (U3)

This program emphasizes understanding the ecology of vertebrate animals, their biological and physical environment and the interactions that are important in the management of ecological communities and wildlife species. Employment opportunities exist in resource planning, nature interpretation, wildlife management and environmental impact assessment. By careful course selection students may meet requirements for certification by the Wildlife Society.

Required Courses: 34 credits.

Complementary Courses: 26 credits.

Electives: to meet the requirement of 90 credits for the degree.

	CREDITS
Required Courses:	34
AEBI 200 Biology of Organisms	3
AEBI 205 Principles of Ecology	3
AEMA 310 Statistical Methods 1	3
CELL 204 Genetics	4
FDSC 211 Biochemistry 1	3
PLNT 201 Comparative Plant Biology	3
PLNT 358 Flowering Plant Diversity (Prereq: AEBI 201)	3
WILD 401 Fisheries and Wildlife Management (Prereq: PLNT 358)	4
WILD 410 Wildlife Ecology	3
WILD 491 Seminar or appropriate substitute	2
ZOOL 307 Natural History of the Vertebrates	3

Complementary Courses:

a minimum of 26 credits, 20 of which should be at the 300 level or above, selected from the following list in consultation with the Academic Adviser

AEMA 306	(3)	Mathematical Methods in Ecology
AEPH 201	(3)	Introductory Meteorology
AGEC 333	(3)	Resource Economics
ANSC 323	(4)	Mammalian Physiology
BIOL 203	(3)	Knowledge, Ethics and Environment
ENVR 200	(3)	The Global Environment
ENVR 201	(3)	Society and Environment
ENVR 202	(3)	The Evolving Earth
EXTM 300	(3)	Communication - Extension Methods
NRSC 496D1	(1.5)	Project 1
and NRSC 496D2	(1.5)	Project 1
or NRSC 497D2	(2.5)	Project 2
and NRSC 497D2	(2.5)	Project 2
NUTR 361	(3)	Environmental Toxicology
PLNT 460	(3)	Plant Ecology
WILD 421	(3)	Wildlife Conservation
WILD 375	(3)	Issues in Environmental Science
WILD 382	(3)	Fish and Wildlife Propagation
WILD 415	(2)	Conservation Law
WILD 420	(3)	Ornithology
WILD 437	(3)	Assessing Environmental Impact
WILD 475	(3)	Desert Ecology
WOOD 420	(3)	Environmental Issues in Forestry
WOOD 441	(3)	Integrated Forest Management
ZOOL 311	(3)	Ethology
ZOOL 315	(3)	Science of Inland Waters
ZOOL 424	(3)	Parasitology

Department of Biology (Downtown Campus) Courses:

BIOL 305	(3)	Biodiversity of Life
BIOL 307	(3)	Behavioural Ecology/Sociobiology
BIOL 327	(3)	Herpetology
BIOL 331	(3)	Ecology/Behaviour Field Course
BIOL 334	(3)	Field Course, Applied Tropical Ecology
BIOL 335	(3)	Marine Mammals
BIOL 336	(3)	Marine Aquaculture
BIOL 337	(3)	Ecology and Behaviour of Fishes
BIOL 352	(3)	Vertebrate Evolution
BIOL 465	(3)	Conservation Biology
BIOL 542	(3)	Marine Biology

6.8 Department of Plant Science

Raymond Building – Room R2-019

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Website: <http://www.mcgill.ca/plant>

Chair — Marc Fortin

Emeritus Professors — Ralph H. Estey, William F. Grant, W.E. Sackston, Howard A. Steppler

Professors — Deborah J. Buszard, Donald L. Smith, Alan K. Watson

Associate Professors — Danielle J. Donnelly, Pierre Dutilleul, Marc Fortin (*William Dawson Scholar*), Suha J.-Hare, Ajjamada C. Kushalappa, Diane E. Mather, Salvatore A. Sparace, Katrine A. Stewart, Marcia J. Waterway

Assistant Professors — Sylvie de Blois, Philippe Seguin

Lecturers — Serge Lussier, David D. Wees

Associate Member — Timothy A. Johns (*School of Dietetics and Human Nutrition*)

Adjunct Professors — Miles R. Bullen, Todd Capson, Daniel Cloutier, Sylvie Jenni, Shahrokh Khanizadeh, Jean-François Laliberté, Louise O'Donoghue

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The Department of Plant Science administers Majors in Botanical Science and Plant Science, and participates in administering Majors in Agricultural Sciences and the Environmetrics and Food Production and Environment Domains of the McGill School of Environment. (Full descriptions of these Majors are available at <http://www.mcgill.ca/plant/undergraduate>.) A minimum of 90 credits is needed to complete each Major. It is recommended that students take organic chemistry prior to entering these Majors.

BOTANICAL SCIENCE MAJOR

Academic Adviser: Professor D.J. Donnelly
email: donnely@nrs.mcgill.ca

The Botanical Science Major offers two options for those interested in working with plants, one emphasizing the ecology of plants and their environment and the other emphasizing the physiology and molecular biology of plants. The Ecology Option emphasizes ecology, conservation, and environmental sciences. The Molecular Option emphasizes molecular genetics, plant improvement, and biotechnology. These two options form botanists prepared for exciting careers in the knowledge economy. Graduates are finding employment within private industries, government services, consulting, teaching, and many have gone on to do postgraduate research. These programs can be completed entirely on the Macdonald Campus or one semester can be spent taking courses on the Downtown Campus during the final year.

Required Courses: 42 credits.

Complementary Courses: 18 credits, selected from an approved list in consultation with the Academic Adviser; taken in either the Ecology or the Molecular Option.

Electives: to meet the minimum requirement of 90 credits for the degree.

Note: courses marked with an asterisk (*) are offered on the Downtown Campus.

		CREDITS
Required Courses:		42
AEBI 200	Biology of Organisms	3
AEBI 202	Cellular Biology	3
AEBI 205	Principles of Ecology	3
AEMA 310	Statistical Methods 1	3
CELL 204	Genetics	4
FDSC 211	Biochemistry I	3
PLNT 201	Comparative Plant Biology	3
PLNT 220	Introduction to Vascular Plants	1
PLNT 221	Introduction to Fungi	1
PLNT 353	Plant Structure and Function	4
PLNT 358	Flowering Plant Diversity	3
PLNT 458	Flowering Plant Systematics	3
PLNT 460	Plant Ecology	3
PLNT 490D1	Projects	1.5
PLNT 490D2	Projects	1.5
PLNT 495	Seminar 1	1
PLNT 496	Seminar 2	1
Complementary Courses		18
Either the Ecology Option or the Molecular Option		
Ecology Option:		18
at least 12 credits must be chosen from the following:		
AEMA 306	(3)	Mathematical Methods in Ecology
AGRI 250	(3)	Principles of Ecological Agriculture
*BIOL 324	(3)	Ecological Genetics
*BIOL 331	(3)	Ecology and Behaviour Field Course
*BIOL 334	(3)	Field course in Applied Tropical Ecology
*BIOL 465	(3)	Conservation Biology
*BIOL 483	(3)	Stat. Approaches in Ecology and Evolution
*GEOG 350	(3)	Ecological Biogeography
MICR 331	(3)	Microbial Ecology
WILD 415	(2)	Conservation Law
WILD 437	(3)	Assessing Environmental Impact

WOOD 410	(3)	The Forest Ecosystem
WOOD 420	(3)	Environmental Issues in Forestry
ZOOL 315	(3)	Science of Inland Waters

the remaining credits, if any, to be chosen from Molecular Option Complementary Course list or from the General Complementary Course list given below.

Molecular Option: **18**

at least 12 credits must be chosen from the following:

AEBI 306	(3)	Biological Instrumentation
*BIOL 301	(3)	Laboratory in Molecular and Cellular Biology
*BIOL 303	(3)	Developmental Biology
*BIOL 333	(3)	Plant Biotechnology
CELL 500	(3)	Plant Molecular Genetics
CELL 501	(3)	Plant Molecular Biology and Genetics
FDSC 212	(2)	Biochemistry Laboratory
MICR 200	(3)	Laboratory Methods in Microbiology
MICR 230	(3)	Microbial World
MICR 338	(3)	Bacterial Molecular Genetics
PARA 400	(3)	Eukaryotic Cells and Viruses
PARA 501	(3)	Bioinformatics
PLNT 525	(3)	Advanced Micropropagation
PLNT 535	(3)	Plant Breeding

the remaining credits, if any, to be chosen from Ecology Option Complementary Course list or from the General Complementary Course list given below.

**BOTANICAL SCIENCE MAJOR,
GENERAL COMPLEMENTARY COURSES:**

*BIOL 555	(3)	Functional Ecology of Trees
NUTR 512	(3)	Herbs, Food, and Phytochemicals
PLNT 215	(1)	Orientation in Plant Science
PLNT 304	(3)	Biology of Fungi
PLNT 305	(3)	Plant Pathology
PLNT 310	(3)	Plant Propagation
PLNT 434	(3)	Weed Biology and Control
PLNT 450	(2)	Special Topics Plant Science
PLNT 451	(3)	Special Topics Plant Science
SOIL 210	(3)	Principles of Soil Science

PLANT SCIENCE MAJOR

Academic Adviser: Professor P. Sequin
email: psequin@nrs.mcgill.ca

The Plant Science Major offers intensive training in agricultural plant science. Comprehensive studies are offered in all aspects of biology and production practices related to important crop plant species. Studies include laboratory, greenhouse, and field exposure relating to agronomic, horticultural, or field crop development, production and management. Graduates are eligible to apply for membership in l'Ordre des agronomes du Québec (OAQ) and the Agricultural Institute of Canada (AIC). Graduates rapidly find employment in agricultural industries, government services, extension, consulting, teaching, or go on to do postgraduate research.

Required Courses: 49 credits

Complementary Courses: 18 credits.

Electives: Chosen in consultation with the Academic Adviser, to meet the minimum 90 credit requirement for the degree.

		CREDITS
Required Courses:		49
AEMA 310	Statistical Methods 1	3
AGEC 200	Microeconomics	3
ANSC 250	Principles of Animal Science	3
CELL 204	Genetics	4
FDSC 211	Biochemistry 1	3
MICR 230	Microbial World	3
PLNT 211	Principles of Plant Science	3
PLNT 300	Cropping Systems	3
PLNT 305	Plant Pathology	3
PLNT 310	Plant Propagation	3
PLNT 353	Plant Structure and Function	4

PLNT 358	Flowering Plant Diversity	3
PLNT 434	Weed Biology and Control	3
PLNT 495	Seminar 1	1
PLNT 496	Seminar 2	1
SOIL 210	Principles of Soil Science	3
SOIL 315	Soil Fertility and Fertilizers	3

Complementary Courses: **18**

at least one of:

ABEN 300	(3)	Elements of Agricultural Engineering
ENTO 452	(3)	Control of Insect Pests

A minimum of 3 credits selected from the following list:

AGEC 231	(3)	Economic Systems of Agriculture
AGEC 320	(3)	Economics of Agriculture Production
AGEC 331	(3)	Farm Business Management
AGEC 350	(3)	Agricultural Finance

plus a minimum of 12 credits selected from the course list given below

FDSC 310	(3)	Postharvest Fruit & Vegetable Technology
PLNT 215	(1)	Orientation in Plant Sciences
PLNT 220	(1)	Introduction to Vascular Plants
PLNT 221	(1)	Introduction to Fungi
PLNT 322	(3)	Greenhouse Management
PLNT 331	(3)	Field Crops
PLNT 341	(1)	Horticulture - the Alliums
PLNT 342	(1)	Horticulture - Perennial Vegetable Crops
PLNT 343	(1)	Horticulture - Root Crops
PLNT 344	(1)	Horticulture - Salad Crops
PLNT 345	(1)	Horticulture - Solanaceous Crops
PLNT 346	(1)	Horticulture - Temperate Tree Fruits
PLNT 347	(1)	Horticulture - Small Fruits
PLNT 348	(1)	Horticulture - the Brassicas
PLNT 421	(3)	Landscape Plant Materials
PLNT 460	(3)	Plant Ecology
PLNT 535	(3)	Plant Breeding

MINOR IN AGRICULTURAL PRODUCTION

Academic Adviser: Professor K. A. Stewart
email: stewartk@macdonald.mcgill.ca

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
ANSC 250 Principles of Animal Science	3
PLNT 211 Principles of Plant Science	3
PLNT 300 Cropping Systems	3
SOIL 210 Principles of Soil Science	3

Complementary Courses: 12

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

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

Notes:

- 1) 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.
- 2) Not all courses are available in any given year. Consult departmental listings for full course descriptions and offerings.

7 Description of Courses

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

Agricultural and Biosystems Engineering – ABEN (formerly 336) (page 471)

Animal Science – ANSC (formerly 342) (page 476)

Biology – AEBI (formerly 344) (page 473)

Biotechnology – BTEC (formerly 394) (page 477)

Economics, Agricultural – AGEC (formerly 334) (page 474)

English – AEHM (formerly 348) (page 473)

Entomology – ENTO (formerly 350) (page 477) and 373

Ethics [Religious Studies – RELG (formerly 260)] (page 484)

Extension – EXTM (formerly 352) (page 478)

Food Science and Agricultural Chemistry – FDSC (formerly 333) (page 478)

Forest Resources [Woodland Resources] – WOOD (formerly 374) (page 485)

General Agriculture – AGRI (formerly 330) (page 475)

Genetics – CELL (formerly 356) (page 477)

Mathematics – AEMA (formerly 360) (page 474)

McGill School of Environment – ENVR (formerly 170) (page 478)

Microbiology – MICR (formerly 362) (page 479)

Natural Resource Sciences – NRSC (formerly 373) (page 480)

Nutrition and Dietetics – NUTR (formerly 382) (page 481)

Parasitology – PARA (formerly 391) (page 482)

Physics – AEPH (formerly 338) (page 474)

Plant Science – PLNT (formerly 367) (page 482)

Renewable Resources [Resource Development] – WILD (formerly 375) (page 484)

Soil Science – SOIL (formerly 372) (page 484)

Zoology – ZOOL (formerly 349) (page 485)

Please note: courses may have been rescheduled or new courses added after this Calendar went to press. Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

The Class Schedule includes the term(s), days, and times when courses will be offered, as well as class locations and names of instructors.

The schedule of courses to be offered in Summer 2003 will be available on the website in January.

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 is given in parentheses after the title. Term(s) offered (Fall, Winter, Summer) may appear after the credit weight to indicate when a course would normally be taught. Please check the Class Schedule to confirm this information.

● Denotes courses not offered in 2002-03.

★ Denotes courses taught only in alternate years.

□ Denotes limited enrolment.

7.1 ABEN – 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.

ABEN 103 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.

ABEN 210 MECHANICS 1. (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.

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

● **ABEN 212 GRAPHICS.** (3) (1 lecture and two 2-hour labs)

● ★ **ABEN 214 SURVEYING.** (3) (2 lectures and one 3-hour lab)

ABEN 216 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.

ABEN 217 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.

ABEN 251 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.

ABEN 252 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.

● **ABEN 300 ELEMENTS OF AGRICULTURAL ENGINEERING.** (3)

(Restriction: Not open to students who have taken ABEN 200.)

ABEN 301 BIOTHERMODYNAMICS. (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 system.

ABEN 305 FLUID MECHANICS. (4) (3 lectures and one 2-hour lab or problems) (Prerequisites: ABEN 211, AEMA 202) 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.

ABEN 312 CIRCUIT ANALYSIS. (3) (3 lectures and one 2-hour lab or problems) (Prerequisite: AEMA 205) 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.

ABEN 314 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.

ABEN 315 DESIGN OF MACHINES. (4) (3 lectures, 2 hours problems) (Prerequisite: ABEN 341) 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.

ABEN 319 APPLIED MATHEMATICS. (3) (1 lecture, two 2-hour labs) (Prerequisite: ABEN 252) 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 produces will be used; these will be updated as the technology evolves.

★ **ABEN 322 FOOD PRODUCTION/PROCESSING 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.

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

ABEN 324 ELEMENTS OF FOOD ENGINEERING. (3) (3 lectures) (Pre/Co-requisite: FDSC 330) (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.

ABEN 325 FOOD ENGINEERING 1. (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.

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

ABEN 341 STRENGTH OF MATERIALS. (4) (3 lectures and one 3-hour lab) (Prerequisite: ABEN 210) 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.

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

ABEN 412 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.

★ **ABEN 416 ENGINEERING FOR LAND DEVELOPMENT.** (3) (3 lectures and one 2-hour lab or design problems) (Prerequisite: ABEN 217) The engineering aspects of soil and water conservation, irrigation, water conveyance structures and canals, use of geosynthetics for soil protection, seepage and uplift. Students will produce an integrated development project.

ABEN 418 SOIL MECHANICS AND FOUNDATIONS. (3) (3 lectures and one 3-hour lab) (Prerequisite: ABEN 341) 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.

● ★ **ABEN 419 STRUCTURAL DESIGN.** (3) (3 lectures and one 3-hour lab or design problems) (Prerequisites: ABEN 341, CIVE 213)

ABEN 490 DESIGN 1. (2) (1 lecture) (Prerequisite: ABEN 315) The student is expected to develop a professional design project proposal with due considerations to executive summary, synthesis, methodology, milestones, budget, etc.

ABEN 491D1 UNDERGRADUATE SEMINAR 1. (0.5) (Students must also register for ABEN 491D2) (No credit will be given for this course unless both ABEN 491D1 and ABEN 491D2 are successfully completed in consecutive terms) Attendance and participation in departmental seminars.

ABEN 491D2 UNDERGRADUATE SEMINAR 1. (0.5) (Prerequisite: ABEN 491D1) (No credit will be given for this course unless both ABEN 491D1 and ABEN 491D2 are successfully completed in consecutive terms) See ABEN 491D1 for course description.

ABEN 491N1 UNDERGRADUATE SEMINAR 1. (0.5) (Students must also register for ABEN 491N2) (No credit will be given for this course unless both ABEN 491N1 and ABEN 491N2 are successfully completed in the same calendar year) See ABEN 491D1 for course description.

ABEN 491N2 UNDERGRADUATE SEMINAR 1. (0.5) (Prerequisite: ABEN 491N1) (No credit will be given for this course unless both ABEN 491N1 and ABEN 491N2 are successfully completed in the same calendar year) See ABEN 491D1 for course description.

ABEN 492D1 UNDERGRADUATE SEMINAR 2. (0.5) (Students must also register for ABEN 492D2) (No credit will be given for this course unless both ABEN 492D1 and ABEN 492D2 are successfully completed in consecutive terms) Attendance and participation in departmental seminars.

ABEN 492D2 UNDERGRADUATE SEMINAR 2. (0.5) (Prerequisite: ABEN 492D1) (No credit will be given for this course unless both ABEN 492D1 and ABEN 492D2 are successfully completed in consecutive terms) See ABEN 492D1 for course description.

ABEN 492N1 UNDERGRADUATE SEMINAR 2. (0.5) (Students must also register for ABEN 492N2) (No credit will be given for this course unless both ABEN 492N1 and ABEN 492N2 are successfully completed in the same calendar year) See ABEN 492D1 for course description.

ABEN 492N2 UNDERGRADUATE SEMINAR 2. (0.5) (Prerequisite: ABEN 492N1) (No credit will be given for this course unless both ABEN 492N1 and ABEN 492N2 are successfully completed in the same calendar year) See ABEN 492D1 for course description.

ABEN 493D1 UNDERGRADUATE SEMINAR 3. (0.5) (Students must also register for ABEN 493D2) (No credit will be given for this course unless both ABEN 493D1 and ABEN 493D2 are success-

fully completed in consecutive terms) Attendance and participation in departmental seminars.

ABEN 493D2 UNDERGRADUATE SEMINAR 3. (0.5) (Prerequisite: ABEN 493D1) (No credit will be given for this course unless both ABEN 493D1 and ABEN 493D2 are successfully completed in consecutive terms) See ABEN 493D1 for course description.

ABEN 493N1 UNDERGRADUATE SEMINAR 3. (0.5) (Students must also register for ABEN 493N2) (No credit will be given for this course unless both ABEN 493N1 and ABEN 493N2 are successfully completed in the same calendar year) See ABEN 493D1 for course description.

ABEN 493N2 UNDERGRADUATE SEMINAR 3. (0.5) (Prerequisite: ABEN 493N1) (No credit will be given for this course unless both ABEN 493N1 and ABEN 493N2 are successfully completed in the same calendar year) See ABEN 493D1 for course description.

ABEN 495 DESIGN 2. (3) (1 lecture) (Prerequisite: ABEN 490) The student is expected to implement, physically or virtually, the project proposed in the Design 1 course. The student is expected to present project outcome, in both written and oral forms and learn to be critical about their own work and those of others.

● **ABEN 500 ADVANCED APPLICATIONS: COMPUTING IN AGRICULTURE.** (3) (3 lectures and one 2-hour lab) (Prerequisite: ABEN 251 or ABEN 252)

● **ABEN 504 INSTRUMENTATION AND CONTROL.** (3) (3 lectures and one 2-hour lab) (Prerequisite: ABEN 312 or ECSE 281)

● **ABEN 506 ADVANCES IN DRAINAGE MANAGEMENT.** (3) (3 weeks intensive course)

ABEN 509 HYDROLOGIC SYSTEMS AND MODELLING. (3) (3 hour lectures) 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.

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

● **ABEN 514 DRAIN PIPE AND ENVELOPE MATERIALS.** (3) (3 lectures)

● **ABEN 515 COMPUTER MODELS IN DRAINAGE ENGINEERING.** (3) (3 lectures and one 3-hour lab)

● **ABEN 516 PREPARATION AND APPRAISAL OF DRAINAGE PROJECTS.** (3) (3 lectures)

● **ABEN 517 DRAINAGE PROJECT CONTRACTS.** (3) (3 lectures)

● ★ **ABEN 518 POLLUTION CONTROL FOR AGRICULTURE.** (3) (One 3 hour lecture)

● **ABEN 519 ADVANCED FOOD ENGINEERING.** (3) (3 lectures and one 2-hour lab) (Prerequisites: ABEN 325 and MECH 426, or permission of instructor)

● ★ **ABEN 525 VENTILATION OF AGRICULTURAL STRUCTURES.** (3) (3 lectures and one 3-hour lab) (Prerequisite: ABEN 301)

● ★ **ABEN 530 FERMENTATION ENGINEERING.** (3) (3 lectures and one 3-hour lab) (Prerequisite: ABEN 325 or equivalent)

Graduate courses available to senior undergraduates with permission of the instructor.

ABEN 605 FUNCTIONAL ANALYSIS OF AGRICULTURAL MACHINES. (3) (3 lectures) (Prerequisites: ABEN 211 and ABEN 323)

ABEN 607 ENGINEERING ASPECTS OF PLANT ENVIRONMENT. (3) (3 lectures)

ABEN 612 SIMULATION AND MODELLING. (3) (3 lectures)

ABEN 616 ADVANCED SOIL AND WATER ENGINEERING. (3) (3 lectures)

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

MECH 346 HEAT TRANSFER. (3) (3-1-5)

MECH 362 MECHANICAL LABORATORY 1. (2) (0-3-3)

MIME 310 ENGINEERING ECONOMY. (3) (3-1-5)

7.2 AEBI – Biology

AEBI 120 GENERAL BIOLOGY. (3) (Fall) (2 lectures and one 3-hour lab) (Not open to students who have passed CEGEP objective 00UK or equivalent (formerly Biology 301)) An introduction to the structure, function and adaptation of plants and animals in the biosphere.

AEBI 200 BIOLOGY OF ORGANISMS. (3) (Fall) (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.

AEBI 202 CELLULAR BIOLOGY. (3) (Winter) (3 hours of lectures per week) 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.

AEBI 205 PRINCIPLES OF ECOLOGY. (3) (Winter) (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.

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

AEBI 495D1 ENVIRONMENTAL BIOLOGY SEMINAR. (1) (Fall) (1 lecture) (Students must also register for AEBI 495D2) (No credit will be given for this course unless both AEBI 495D1 and AEBI 495D2 are successfully completed in consecutive terms) Presentation of papers on, and discussion of, topics from the field of environmental biology.

AEBI 495D2 ENVIRONMENTAL BIOLOGY SEMINAR. (1) (Winter) (Prerequisite: AEBI 495D1) (No credit will be given for this course unless both AEBI 495D1 and AEBI 495D2 are successfully completed in consecutive terms) See AEBI 495D1 for course description.

AEBI 495N1 ENVIRONMENTAL BIOLOGY SEMINAR. (1) (Winter) (Students must also register for AEBI 495N2) (No credit will be given for this course unless both AEBI 495N1 and AEBI 495N2 are successfully completed in the same calendar year) See AEBI 495D1 for course description.

● **AEBI 495N2 ENVIRONMENTAL BIOLOGY SEMINAR.** (1) (Fall) (Prerequisite: AEBI 495N1) (No credit will be given for this course unless both AEBI 495N1 and AEBI 495N2 are successfully completed in the same calendar year) See AEBI 495D1 for course description.

7.3 AEHM – English

Entrance/Placement tests for these are co-ordinated through the office of the Associate Dean (Student Affairs). Placement tests will take place during the first regularly scheduled meeting of the class. 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 students are required to attend class without fail during their first two weeks in order to retain their places. Places are assigned on a first come, first served basis.

AEHM 300 ESL: HIGH INTERMEDIATE 1. (3) (3 hours) (Prerequisite: placement test) (Restrictions: open to full-time, non-anglophone students. Not eligible for ESL courses are: 1. 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, and 2. students who have taken university-level courses judged to be equivalent to the McGill courses AEHM 300 and ESLN 300; AEHM 301 and ESLN 301. These courses are equivalent and mutually exclu-

sive.) (Students too weak in English for AEHM 300 should inquire about the ESLN 200 and ESLN 201 courses offered on the Downtown Campus by the Faculty of Arts.) 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.

AEHM 301 ESL: HIGH INTERMEDIATE 2. (3) (3 hours) (Prerequisite: AEHM 300 or placement test) (Restrictions: open to full-time, non-anglophone students. Not eligible for ESL courses are: 1. 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, and 2. students who have taken university-level courses judged to be equivalent to the McGill courses AEHM 300 and ESLN 300; AEHM 301 and ESLN 301. These courses are equivalent and mutually exclusive.) (Students too weak in English for AEHM 300 should inquire about the ESLN 200 and ESLN 201 courses offered on the Downtown Campus by the Faculty of Arts.) A continuation of AEHM 300. 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.

AEHM 330 ACADEMIC AND SCIENTIFIC WRITING. (3) (3 hours) (Prerequisite: entrance test.) 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.

7.4 AEMA – Mathematics

AEMA 101 CALCULUS 1. (3) (3 lectures) (Prerequisite: a course in functions) A review of functions and graphs. Limits, continuity, derivatives. Differentiation of elementary functions. Anti-differentiation. Applications.

AEMA 102 CALCULUS 2. (3) (3 lectures) (Prerequisite: Calculus 1 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.

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

AEMA 205 DIFFERENTIAL EQUATIONS. (4) (Winter) (4 lectures; 1 conference hour) (Prerequisite: AEMA 202 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.

AEMA 306 MATHEMATICAL METHODS IN ECOLOGY. (3) (3 hours of lectures per week) (Prerequisite: AEBI 205 or permission. Corequisite: AEMA 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.

AEMA 310 STATISTICAL METHODS 1. (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 correlation; binomial and Poisson distributions.

● **AEMA 403 ENVIRONMENTAL METRICS STAGE.** (3) (Limited enrolment: 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)

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

★ **AEMA 414 TEMPORAL AND SPATIAL STATISTICS.** (3) (2 1.5-hour lectures) (Prerequisite: AEMA 310 or equivalent) (Offered in alternate years with AEMA 411) 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.

Graduate courses available to undergraduates by permission:

AEMA 610 STATISTICAL METHODS 2. (3) (3 lectures and one 2-hour lab) (Prerequisite: AEMA 310 or equivalent)

● **AEMA 611 EXPERIMENTAL DESIGNS.** (3) (3 lectures and 1 conference) (Prerequisite AEMA 310 or equivalent) (Given in alternate years)

7.5 AEPH – Physics

AEPH 112 INTRODUCTORY PHYSICS 1. (4) (Fall) (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.

AEPH 114 INTRODUCTORY PHYSICS 2. (4) (Winter) (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.

AEPH 201 INTRODUCTORY METEOROLOGY. (3) (Fall) (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.

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

● **AEPH 405 TRACER TECHNIQUES.** (3) (3 lectures and one 3-hour lab) (Prerequisite: AEPH 303 or equivalent)

★ **AEPH 510 AGRICULTURAL MICROMETEOROLOGY.** (3) (Winter) (3 lectures) Interaction between plant communities and the atmosphere. The physical processes governing the transfer of heat, mass and momentum as they relate to research and production in agricultural and environmental systems. Experimental techniques for measuring fluxes of heat, water-vapour, CO₂ and natural and man-made pollutants.

7.6 AGECE – Agricultural Economics

AGECE 200 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.

AGECE 201 PRINCIPLES OF MACROECONOMICS. (3) (3 lectures) (Prerequisite: AGECE 200 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.

AGECE 230 AGRICULTURAL AND FOOD MARKETING. (3) (3 lectures) (Prerequisite: AGECE 200 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.

AGECE 231 ECONOMIC SYSTEMS OF AGRICULTURE. (3) (3 lectures) (Prerequisite: AGECE 200 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.

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

AGEC 320 ECONOMICS OF AGRICULTURAL PRODUCTION. (3) (3 lectures) (Prerequisite: AGEC 200 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.

AGEC 331 FARM BUSINESS MANAGEMENT. (3) (3 lectures) (Prerequisite: AGEC 200 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.).

AGEC 333 RESOURCE ECONOMICS. (3) (Prerequisites: AGEC 200 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.

AGEC 343 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.

AGEC 344 ENTREPRENEURIAL LEADERSHIP. (3) (3 lectures) Leadership concepts and theory, with applications in the context of small and medium-sized organizations. An examination of behaviour models and their relationship to various leadership functions, such as how to set objectives, give praise and instructions, mentor, resolve conflicts, and negotiate.

AGEC 350 AGRICULTURAL FINANCE. (3) (3 lectures) (Prerequisite: AGEC 331) 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.

AGEC 425 AGRICULTURAL ECONOMETRICS. (3) (3 lectures) (Prerequisites: AEMA 310, AGEC 200 and AGEC 201 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.

AGEC 430 AGRICULTURE, FOOD AND RESOURCE POLICY. (3) (3 lectures) (Prerequisites: AGEC 201 or equivalent, and AGEC 320) 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.

AGEC 440 ADVANCED AGRICULTURE AND FOOD MARKETING. (3) (3 lectures) (Prerequisites: AGEC 201 or equivalent, and AGEC 320) 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.

AGEC 442 ECONOMICS OF INTERNATIONAL AGRICULTURAL DEVELOPMENT. (3) (3 lectures) (Prerequisites: AGEC 200 or AGEC 201 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.

AGEC 450 AGRICULTURE BUSINESS MANAGEMENT. (3) (3 lectures) (Prerequisites: AGEC 230 and AEMA 310) 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.

AGEC 453 VENTURE CAPITAL OPPORTUNITIES. (3) (3 lectures) (Prerequisite: AGEC 343) A course for students in non-business programs to assist them to assist in navigating local financial markets and to obtain financing. The course examines financing for new business, expansion, and specific needs such as seasonal fluctuations, working capital, expanding sales, new product development, management buyouts, and succession planning.

AGEC 491 RESEARCH SEMINAR IN AGRICULTURAL ECONOMICS. (3) (3 lectures) (Prerequisites: AGEC 201 or equivalent, and AGEC 320) 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.

AGEC 492 SPECIAL TOPICS IN AGRICULTURAL ECONOMICS. (3) (Prerequisite: AGEC 201 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.

● **AGEC 493D1 SPECIAL TOPICS IN AGRICULTURAL ECONOMICS.** (1.5)

● **AGEC 493D2 SPECIAL TOPICS IN AGRICULTURAL ECONOMICS.** (1.5)

● **AGEC 493N1 SPECIAL TOPICS IN AGRICULTURAL ECONOMICS.** (1.5)

● **AGEC 493N2 SPECIAL TOPICS IN AGRICULTURAL ECONOMICS.** (1.5)

AGEC 495D1 PROJECT. (1.5) (Students must also register for AGEC 495D2) (No credit will be given for this course unless both AGEC 495D1 and AGEC 495D2 are successfully completed in consecutive terms) 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.

AGEC 495D2 PROJECT. (1.5) (Prerequisite: AGEC 495D1) (No credit will be given for this course unless both AGEC 495D1 and AGEC 495D2 are successfully completed in consecutive terms) See AGEC 495D1 for course description.

● **AGEC 495N1 PROJECT.** (1.5)

● **AGEC 495N2 PROJECT.** (1.5)

7.7 AGRI – Agriculture

AGRI 201D1 AGRI-ENVIRONMENT INTERNSHIP. (3) (Students must also register for AGRI 201D2) (No credit will be given for this course unless both AGRI 201D1 and AGRI 201D2 are successfully completed in consecutive terms) Internship on working farms or in other appropriate businesses of the agri-food/environment industries.

AGRI 201D2 AGRI-ENVIRONMENT INTERNSHIP. (3) (Prerequisite: AGRI 201D1) (No credit will be given for this course unless both AGRI 201D1 and AGRI 201D2 are successfully completed in consecutive terms) See AGRI 201D1 for course description.

AGRI 210 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.

AGRI 220 PROFESSIONAL PRACTICE SEMINAR 1. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 221 PROFESSIONAL PRACTICE SEMINAR 2. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 250 PRINCIPLES OF ECOLOGICAL AGRICULTURE. (3) (3 lectures and one 2-hour 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.

AGRI 301D1 AGROLOGY INTERNSHIP. (3) (Students must also register for AGRI 301D2) (No credit will be given for this course unless both AGRI 301D1 and AGRI 301D2 are successfully completed in consecutive terms) Agrology internship in industry, government or related fields.

AGRI 301D2 AGROLOGY INTERNSHIP. (3) (Prerequisite: AGRI 301D1) (No credit will be given for this course unless both AGRI 301D1 and AGRI 301D2 are successfully completed in consecutive terms) See AGRI 301D1 for course description.

AGRI 305 BARBADOS AGRO-ECOSYSTEMS. (3) An examination of agricultural enterprises and their effect on the environment and society in the tropics. Taught in conjunction with the University of the West Indies, includes fourteen-days stay at the Bellairs Research Institute, Barbados. of the West Indies, includes a 12-day session at the Bellairs Research Institute in the Barbados.

AGRI 320 PROFESSIONAL PRACTICE SEMINAR 3. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 321 PROFESSIONAL PRACTICE SEMINAR 4. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 411 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.

AGRI 420 PROFESSIONAL PRACTICE SEMINAR 5. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 421 PROFESSIONAL PRACTICE SEMINAR 6. (0.5) Experiences and responsibilities of Agrologists; legal and ethical aspects of the profession.

AGRI 430 ECOLOGICAL AGRICULTURE SYSTEMS. (3) (2 lectures and 1 conference) (Prerequisite: AGRI 250) 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.

AGRI 435 SOIL AND WATER QUALITY MANAGEMENT. (3) (Fall) (3 lectures and one 3-hour lab) Management of soil and water systems for sustainability. Cause of soil degradation, surface and groundwater 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.

AGRI 480 SPECIAL TOPICS 1. (1)

AGRI 481 SPECIAL TOPICS 2. (2)

AGRI 482 SPECIAL TOPICS 3. (3)

AGRI 490 AGRI-FOOD INDUSTRY PROJECT. (3) Interdisciplinary team project in the agri-food industry.

● **AGRI 491D1 CO-OP EXPERIENCE.** (1.5)

● **AGRI 491D2 CO-OP EXPERIENCE.** (1.5)

AGRI 495 SEMINAR AND ASSIGNMENT 1. (1) (Not open to students registered in, or who have taken AGRI 495D1, AGRI 495D2, AGRI 495N1 or AGRI 495N2) Preparation, presentation and discussion of reports upon approved agricultural subjects chosen in consultation with staff members involved in the subject concerned.

● **AGRI 496 SEMINAR AND ASSIGNMENT 2.** (1) (Not open to students registered in, or who have taken AGRI 495D1, AGRI 495D2, AGRI 495N1 or AGRI 495N2)

AGRI 550 SUSTAINED TROPICAL AGRICULTURE. (3) (Prerequisites: HISP 218 or equivalent; MATH 203 or AEMA 310 or equivalent) (Restricted Enrolment. Location in Panama. Student must be registered for a full semester of studies in Panama) Contrast theory and practice in defining agricultural environmental "challenges" in the Neotropics. Indigenous and appropriate technological means of mitigation. Soil management and erosion, water scarcity, water over-abundance, and water quality. Explore agro-ecosystem protection via field trips and project designs. Institutional context of conservation strategies, NGO links, and public participation.

7.8 ANSC – Animal Science

ANSC 234 BIOCHEMISTRY 2. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 211) Metabolism in humans and domestic animals. The chemistry of alimentary digestion, absorption, transport, intermediary metabolism and excretion.

ANSC 250 PRINCIPLES OF ANIMAL SCIENCE. (3) (Fall) (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.

ANSC 251 COMPARATIVE ANATOMY AND EMBRYOLOGY. (3) (Winter) (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.

ANSC 301 PRINCIPLES OF ANIMAL BREEDING. (3) (Winter) (3 lectures and one 2-hour lab) (Prerequisite: AEMA 310 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.

ANSC 312 ANIMAL HEALTH AND DISEASE. (3) (Winter) (3 lectures and one 2-hour conference) An introduction to the pathogenesis and control of diseases in farm animals. Immune response and other protective mechanisms. Implications of animal diseases and drug therapy for product safety and public health.

ANSC 323 MAMMALIAN PHYSIOLOGY. (4) (Fall) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 211 and one of the following; ANSC 250 or AEBI 202 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.

ANSC 324 ANIMAL REPRODUCTION. (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisites: ANSC 250, FDSC 211 and ANSC 323) 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.

ANSC 330 FUNDAMENTALS OF NUTRITION. (3) (Fall) (3 lectures) (Prerequisite: FDSC 211) 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.

ANSC 424 METABOLIC ENDOCRINOLOGY. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: ANSC 323) 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.

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

ANSC 450 DAIRY CATTLE PRODUCTION. (3) (Fall) (3 lectures and one 2-hour lab) (Prerequisite: ANSC 250) 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.

ANSC 452 BEEF CATTLE AND SHEEP PRODUCTION. (3) (Winter) (3 lectures and one 2-hour lab) (Prerequisite: ANSC 250) The application and integration of biological principles of genetics, physiology, nutrition and pathology and of economics and engineering for the maximum production efficiency of beef and sheep. Trips to beef and sheep farms and related enterprises will comprise part of the laboratory work.

ANSC 454 SWINE PRODUCTION. (3) (Winter) (3 lectures and one 2-hour lab) (Prerequisite: ANSC 250) 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.

ANSC 455 SPECIAL TOPICS: ANIMAL SCIENCE. (3) (Fall or Winter) 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.

ANSC 456 POULTRY PRODUCTION. (3) (Fall) (3 lectures and one 2-hour lab) (Prerequisite: ANSC 250) 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.

ANSC 460 BIOLOGY OF LACTATION. (3) (Winter) (3 lectures) (Prerequisites: AEBI 202 or equivalent and FDSC 211 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.

● **ANSC 465 APPLIED INFORMATION SYSTEMS.** (3) (Winter) (3 lectures and one 2-hour lab) (Prerequisite: ABEN 251 or demonstrated equivalency)

ANSC 490D1 PROJECT. (1.5) (Fall) (Students must also register for ANSC 490D2) (No credit will be given for this course unless both ANSC 490D1 and ANSC 490D2 are successfully completed in consecutive terms) 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.

ANSC 490D2 PROJECT. (1.5) (Winter) (Prerequisite: ANSC 490D1) (No credit will be given for this course unless both ANSC 490D1 and ANSC 490D2 are successfully completed in consecutive terms) See ANSC 490D1 for course description.

ANSC 490N1 PROJECT. (1.5) (Winter) (Students must also register for ANSC 490N2) (No credit will be given for this course unless both ANSC 490N1 and ANSC 490N2 are successfully completed in the same calendar year) See ANSC 490D1 for course description.

ANSC 490N2 PROJECT. (1.5) (Fall) (Prerequisite: ANSC 490N1) (No credit will be given for this course unless both ANSC 490N1 and ANSC 490N2 are successfully completed in the same calendar year) See ANSC 490D1 for course description.

ANSC 495D1 SEMINAR. (1) (Fall) (1 lecture and 1 lab) (Students must also register for ANSC 495D2) (No credit will be given for this course unless both ANSC 495D1 and ANSC 495D2 are successfully completed in consecutive terms) 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.

ANSC 495D2 SEMINAR. (1) (Winter) (Prerequisite: ANSC 495D1) (No credit will be given for this course unless both ANSC 495D1 and ANSC 495D2 are successfully completed in consecutive terms) See ANSC 495D1 for course description.

ANSC 495N1 SEMINAR. (1) (Winter) (Students must also register for ANSC 495N2) (No credit will be given for this course unless both ANSC 495N1 and ANSC 495N2 are successfully completed in the same calendar year) See ANSC 495D1 for course description.

ANSC 495N2 SEMINAR. (1) (Fall) (Prerequisite: ANSC 495N1) (No credit will be given for this course unless both ANSC 495N1 and ANSC 495N2 are successfully completed in the same calendar year) See ANSC 495D1 for course description.

Graduate courses available to undergraduates.

ANSC 501 ADVANCED ANIMAL PRODUCTION SYSTEMS. (3) (Winter) (3 lectures)

ANSC 504 POPULATION GENETICS. (3) (Fall) (3 lectures)

ANSC 551 CARBOHYDRATE AND LIPID METABOLISM. (3) (Winter) (3 lectures)

● **ANSC 552 PROTEIN METABOLISM AND NUTRITION.** (3) (Fall) (3 lectures)

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

7.9 BTEC – Biotechnology

◆ Departmental approval required for registration.

◆ **BTEC 501 BIOINFORMATICS.** (3) (2 lectures and 1 laboratory per week) 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.

7.10 CELL – Genetics

CELL 204 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.

CELL 500 TECHNIQUES 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.

● **CELL 501 PLANT MOLECULAR BIOLOGY AND GENETICS.** (3)

7.11 ENTO – Entomology

★ **ENTO 335 SOIL ECOLOGY AND MANAGEMENT.** (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisites: SOIL 210 and AEBI 205) The physical and chemical environment of soil organisms; survey of soil microflora and fauna; processes and optimal agronomic systems of management consistent with the goals of ecological agriculture.

ENTO 352 CONTROL OF INSECT PESTS. (3) (Winter) (Not open to students who have previously taken ENTO 452) (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, antimetabolites).

★ **ENTO 440 SYSTEMATIC ENTOMOLOGY.** (3) (Winter) (1 lecture, 1 lab and project) (Prerequisite: NRSC 330) Classification of principal orders, suborders and superfamilies of insects; use of keys; collecting methods.

Graduate courses available to undergraduates with permission:

★ **ENTO 525 INSECT ECOLOGY.** (3) (Winter)

● ★ **ENTO 535 AQUATIC ENTOMOLOGY.** (3)

ENTO 600 INSECT PATHOLOGY. (3)

7.12 ENVR – Environment

A listing of McGill School of Environment courses is given below. Refer to the MSE section, page 508 of this Calendar, for descriptions, prerequisites, restrictions, and information on availability of courses.

Note: all MSE courses have limited enrolment.

ENVR 200 The Global Environment. (3)

ENVR 201 Society and Environment. (3)

ENVR 202 The Evolving Earth. (3)

ENVR 203 Knowledge, Ethics and Environment. (3)

ENVR 380 Topics in Environment 1. (3)

ENVR 400 Environmental Thought. (3)

ENVR 401 Environmental Research. (3)

ENVR 451 Research in Panama. (6)

ENVR 465 Environment and Social Change. (3)

ENVR 466 Research in Atlantic Canada. (6)

ENVR 480 Topics in Environment 2. (3)

ENVR 485 Readings in Environment 1. (3)

ENVR 580 Topics in Environment 3. (3)

ENVR 585 Readings in Environment 2. (3)

7.13 EXTM – Extension Methods

● **EXTM 300 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.

7.14 FDSC – Food Science and Agricultural Chemistry

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

FDSC 200 INTRODUCTION TO FOOD SCIENCE. (3) (Fall) (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.

FDSC 211 BIOCHEMISTRY 1. (3) (Fall) (3 lectures) (Corequisite: FDSC 230) Biochemistry of carbohydrates, lipids, proteins, nucleic acids; enzymes and coenzymes. Introduction to intermediary metabolism.

FDSC 212 BIOCHEMISTRY LABORATORY. (2) (Fall) (1 lecture, 1 lab) (Corequisite: FDSC 211) 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.

FDSC 213 ANALYTICAL CHEMISTRY 1. (3) (Fall) (3 lectures and one 3-hour lab) Theoretical aspects of wet chemical techniques

including gravimetric and volumetric analyses, redoximetry, and separation techniques.

FDSC 230 ORGANIC CHEMISTRY. (4) (Fall) (3 lectures and one 3-hour lab) Atomic and molecular structure, modern concepts of bonding, overview of functional groups, conformational analysis, stereochemistry, mechanisms and reactions of aliphatic compounds.

FDSC 233 PHYSICAL CHEMISTRY. (3) (Winter) (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.

FDSC 251 FOOD CHEMISTRY 1. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 211) 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.

FDSC 300 FOOD ANALYSIS 1. (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 251) 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.

FDSC 305 FOOD CHEMISTRY 2. (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 251) 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.

FDSC 310 POST HARVEST FRUIT AND VEGETABLE TECHNOLOGY. (3) (Fall) (3 lectures and one 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.

FDSC 315 FOOD ANALYSIS 2. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 300) A more detailed treatment on the principal analytical techniques associated with the analysis of carbohydrates, lipids, proteins and vitamin constituents in food systems.

FDSC 319 FOOD CHEMISTRY 3. (3) (Winter) (2 lectures and one 3-hour lab) (Prerequisite: FDSC 305) 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.

FDSC 330 FOOD PROCESSING. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 251) 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.

FDSC 334 ANALYTICAL CHEMISTRY 2. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 213 or equivalent) Theoretical and practical aspects of potentiometric measurements (pH and other ion-selective electrodes), spectrophotometry, atomic absorption spectroscopy and automated chromatography.

FDSC 400 FOOD PACKAGING. (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisite: FDSC 305) 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.

FDSC 405 PRODUCT DEVELOPMENT. (3) (Fall) (3 lectures and one 3-hour lab) (Pre-/Co-requisite: FDSC 305) 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.

FDSC 410 FLAVOUR CHEMISTRY. (3) (Winter) (3 lectures) (Prerequisite: FDSC 305) The chemistry of the flavour constituents of foods, synthesis, modification, extraction and use.

FDSC 425 PRINCIPLES OF QUALITY ASSURANCE. (3) (Winter) (3 lectures) (Prerequisite: AEMA 310) 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.

FDSC 490 RESEARCH PROJECT 1. (3) (Fall or Winter) A course designed to give final year undergraduate students research experience.

FDSC 491 RESEARCH PROJECT 2. (3) (Fall or Winter) (Pre-/Co-requisite: FDSC 490. Registration by Department permission only) A laboratory research project.

FDSC 495D1 FOOD SCIENCE SEMINAR. (1.5) (Fall) (2 lectures) (Students must also register for FDSC 495D2) (No credit will be given for this course unless both FDSC 495D1 and FDSC 495D2 are successfully completed in consecutive terms) 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.

FDSC 495D2 FOOD SCIENCE SEMINAR. (1.5) (Winter) (Prerequisite: FDSC 495D1) (No credit will be given for this course unless both FDSC 495D1 and FDSC 495D2 are successfully completed in consecutive terms) See FDSC 495D1 for course description.

FDSC 495N1 FOOD SCIENCE SEMINAR. (1.5) (Winter) (Students must also register for FDSC 495N2) (No credit will be given for this course unless both FDSC 495N1 and FDSC 495N2 are successfully completed in the same calendar year) See FDSC 495D1 for course description.

FDSC 495N2 FOOD SCIENCE SEMINAR. (1.5) (Fall) (Prerequisite: FDSC 495N1) (No credit will be given for this course unless both FDSC 495N1 and FDSC 495N2 are successfully completed in the same calendar year) See FDSC 495D1 for course description.

★ **FDSC 500 FOOD ENZYMOLOGY.** (3) (Winter) (3 lectures) (Pre-/Co-requisite: FDSC 305) Enzymes as they pertain to the deteriorative processes, as processing aids and their use as analytical tools in food systems.

★ **FDSC 510 FOOD HYDROCOLLOID CHEMISTRY.** (3) (Winter) (3 lectures) (Prerequisite: FDSC 319. Corequisite: FDSC 305) (Course offered in even years (check with Graduate Advisor)) 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.

FDSC 515 ENZYME THERMODYNAMICS/KINETICS. (3) (Winter) Selected advanced topics on the biophysical and kinetic aspects of enzymatic reactions, particularly the fundamentals and applications of laws of biothermodynamics, biochemical equilibrium, electrochemistry and biochemical kinetics as related to the enzymatic reactions.

★ **FDSC 519 ADVANCED FOOD PROCESSING.** (3) (Winter) (3 lectures) (Prerequisite: FDSC 330) (Course offered in even years (check with Graduate Advisor)) Advanced technologies associated with food processing studied in more detail. Topics include food irradiation, reverse osmosis, super critical fluid extraction and extrusion.

★ **FDSC 520 BIOPHYSICAL CHEMISTRY OF FOOD.** (3) (Fall) (3 lectures) (Prerequisite: FDSC 233) (Course offered in even years (check with Graduate Advisor)) This course 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.

★ **FDSC 530 ADVANCED ANALYTICAL CHEMISTRY.** (3) (Fall) (3 lectures) (Prerequisite: FDSC 213) (Course offered in odd years (check with Graduate Advisor)) 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.

FDSC 535 FOOD BIOTECHNOLOGY. (3) (Fall) (3 lectures) (Prerequisite: MICR 230) 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.

7.15 MICR – Microbiology

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

MICR 230 MICROBIAL WORLD. (3) (Winter) (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.

MICR 331 MICROBIAL ECOLOGY. (3) (Winter) (Not open to students who have successfully completed NRSC 331) 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.

MICR 337 FRONTIERS IN MICROBIOLOGY. (1) (Fall and Winter) 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.

★ **MICR 338 BACTERIAL MOLECULAR GENETICS.** (3) (Fall) (Prerequisites: FDSC 211 and CELL 204) (Not open to students who have successfully completed NRSC 338.) Basic bacterial genetics, DNA damage and repair, mutagenesis, gene cloning, mapping and regulation, molecular biology. Laboratory sessions will provide the student with practical experience in the genetic manipulation of microbes and in molecular biology techniques.

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

MICR 442 FOOD MICROBIOLOGY AND SANITATION. (3) (Fall) (Prerequisite: MICR 230) (Not open to students who have successfully completed NRSC 442.) Microorganisms, and their products important to the food industry, will be discussed in terms of production of foods, preservation and processing of foods, facility sanitation and waste disposal, and potential for causing food borne disease outbreaks.

MICR 492 RESEARCH PROJECT 1. (2) (Fall and Winter) A research project involving laboratory work. Preparation of a project progress report and a literature review pertinent to the research area.

MICR 493 RESEARCH PROJECT 2. (3) (Fall and Winter) (Not open to students who have successfully completed NRSC 492D,N.) A continuation of the project begun in MICR 492. Laboratory work, preparation of a project report and journal article, and an oral presentation.

MICR 495 SEMINAR 1. (1) (Fall and Winter) Presentation on a selected topic.

MICR 496 SEMINAR 2. (2) (Fall and Winter) (Not open to students who have successfully completed NRSC 495D,N.) Advanced presentation on a selected topic.

Graduate courses available to undergraduates with permission:

MICR 764 READING AND CONFERENCE 1A. (3) (2 conferences) (2 hours)

MICR 765 READING AND CONFERENCE 1B. (3) (2 conferences) (2 hours)

7.16 NRSC – Natural Resource Sciences

NRSC 330 INSECT BIOLOGY. (3) (Fall) (2 lectures and one 2-hour lab) An introduction to insect structure, physiology, development, systematics, evolution, ecology and control.

● **NRSC 350 BIOLOGICAL ILLUSTRATION 1.** (3) (2 lectures, 2 hours research/reading and 2 hours tutorial)

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

NRSC 370 SPECIAL TOPICS. (1) (Fall and Winter) (Departmental approval required.) 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.

NRSC 371 SPECIAL TOPICS. (1) (Fall and Winter) (Departmental approval required.) 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.

NRSC 372 SPECIAL TOPICS. (2) (Fall and Winter) (Departmental approval required.) 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.

NRSC 373 SPECIAL TOPICS. (2) (Fall and Winter) (Departmental approval required.) 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.

NRSC 374 SPECIAL TOPICS. (3) (Fall and Winter) (Departmental approval required.) 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.

NRSC 375 SPECIAL TOPICS. (3) (Fall and Winter) (Departmental approval required.) 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.

NRSC 496D1 PROJECT 1. (1.5) (Fall) (Students must also register for NRSC 496D2) (No credit will be given for this course unless both NRSC 496D1 and NRSC 496D2 are successfully completed in consecutive terms) 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.

NRSC 496D2 PROJECT 1. (1.5) (Winter) (Prerequisite: NRSC 496D1) (No credit will be given for this course unless both NRSC 496D1 and NRSC 496D2 are successfully completed in consecutive terms) See NRSC 496D1 for course description.

NRSC 496N1 PROJECT 1. (1.5) (Winter) (Students must also register for NRSC 496N2) (No credit will be given for this course unless both NRSC 496N1 and NRSC 496N2 are successfully completed in the same calendar year) See NRSC 496D1 for course description.

● **NRSC 496N2 PROJECT 1.** (1.5) (Fall) (Prerequisite: NRSC 496N1) (No credit will be given for this course unless both NRSC 496N1 and NRSC 496N2 are successfully completed in the same calendar year) See NRSC 496D1 for course description.

NRSC 497D1 PROJECT 2. (2.5) (Fall) (Students must also register for NRSC 497D2) (No credit will be given for this course unless both NRSC 497D1 and NRSC 497D2 are successfully completed in consecutive terms) 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 NRSC 496, with a more elaborate research program.

NRSC 497D2 PROJECT 2. (2.5) (Winter) (Prerequisite: NRSC 497D1) (No credit will be given for this course unless both NRSC 497D1 and NRSC 497D2 are successfully completed in consecutive terms) See NRSC 497D1 for course description.

NRSC 497N1 PROJECT 2. (2.5) (Winter) (Students must also register for NRSC 497N2) (No credit will be given for this course unless both NRSC 497N1 and NRSC 497N2 are successfully completed in the same calendar year) See NRSC 497D1 for course description.

● **NRSC 497N2 PROJECT 2.** (2.5) (Fall) (Prerequisite: NRSC 497N1) (No credit will be given for this course unless both NRSC 497N1 and NRSC 497N2 are successfully completed in the same calendar year) See NRSC 497D1 for course description.

★ **NRSC 515 PARASITOID BEHAVIOURAL ECOLOGY.** (3) (Winter) (3 lectures and one 2-hour seminar) (Prerequisite: NRSC 330 or equivalent) The origin and diversity of parasitoid species will be presented. Aspects of behavioral ecology that pertain to host selection, optimal allocation of progeny and sex and host-parasitoid interactions are examined. The importance of these processes is discussed in a biological control perspective.

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

★ **NRSC 521 SOIL MICROBIOLOGY AND BIOCHEMISTRY.** (3) (Winter) (Prerequisite: SOIL 210) Soil environments, soil microorganisms and their function in the biogeochemical cycles of C, N, P and S. Basics of soil bioremediation.

NRSC 550 VETERINARY AND MEDICAL ENTOMOLOGY. (3) (Winter) (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.

The following three 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/>).

NRSC 382 ECOLOGICAL MONITORING AND ANALYSIS. (3) (Summer) 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.

NRSC 383 LAND USE: REDESIGN AND PLANNING. (3) (Summer) (Prerequisite: 24 credits of university training in a field relating to the environment, including one course in statistics, AEMA 310, or equivalent) Issues related to historical and modern land use, environmental impacts, current structures of governance. Needs assessment, and the redesign 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.

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

7.17 NUTR – 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.

● **NUTR 200 CONTEMPORARY NUTRITION.** (3) (Summer) (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 NUTR 207)

NUTR 207 NUTRITION AND HEALTH. (3) (Fall) (3 lectures) (Prerequisite: CEGEP objective 00XU or equivalent - formerly Biology 401) (Corequisite: FDSC 230) (Not open to students who take NUTR 200 or NUTR 307 or who have taken PHGY 311 or BIOC 311) 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.

‡ **NUTR 208 STAGE IN DIETETICS 1.** (1) (Winter) (Prerequisites: all Required courses in Term 1 of the Dietetics Major. Corequisites: All Required courses in Term 2 of the Dietetics Major) (Restricted to Dietetics Major or Special Students (professional credentialing)) Introduction to the dietetics profession; principles and policies in food and nutrition essential to entry-level dietetics experiences; practice in dietary interviewing, problem solving and report writing related to Level 1 Professional Practice placements.

‡ **NUTR 209D1 PROFESSIONAL PRACTICE STAGE 1B.** (1.5) (Summer: 4 weeks) (Prerequisites: all Required courses in Terms 1 and 2 of the Dietetics Major) (Restricted to Dietetics Major or Special Students (professional credentialing) (Students must also register for NUTR 209D2) (No credit will be given for this course unless both NUTR 209D1 and NUTR 209D2 are successfully completed in consecutive terms) Directed, supervised experiences in nutrition services and food service operations management; integration into the professional team.

NUTR 209D2 PROFESSIONAL PRACTICE STAGE 1B. (1.5) (Fall: 1 - 6 hours) (Prerequisite: NUTR 209D1) (No credit will be given for this course unless both NUTR 209D1 and NUTR 209D2 are successfully completed in consecutive terms) See NUTR 209D1 for course description.

NUTR 214 FOOD FUNDAMENTALS. (3) (Fall) (2 lectures and one 4-hour lab) (Prerequisite: FDSC 230 or corequisite with instructor's permission. Corequisite FDSC 211.) 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.

NUTR 217 APPLICATION: FOOD FUNDAMENTALS. (3) (Winter) (2 lectures and one 4-hour lab) (Prerequisite: NUTR 214) 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.

NUTR 301 PSYCHOLOGY. (3) (Fall) (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.

NUTR 307 HUMAN NUTRITION. (3) (Fall) (Prerequisites: BIOL 201 or AEBI 202, CHEM 212 or FDSC 230 or permission of the instructor.) (Not open to students who have taken ANSC 330) (3 lectures and 1 project) Cellular and organismal aspects of nutrition with emphases on biochemical and physiological roles of carbohydrates, lipids, proteins, minerals and vitamins in disease prevention and promotion of optimal health.

‡ **NUTR 310 STAGE IN DIETETICS 2A.** (1) (Winter) (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.

‡ **NUTR 311 STAGE IN DIETETICS 2B.** (5) (Summer: 7 weeks) Two interrelated modules of directed experience in normal and clinical nutrition and foodservice management, in health care settings and the private sector.

NUTR 322 APPLIED SCIENCES COMMUNICATION. (2) (Fall) (2 lectures, 1 lab) (Prerequisite: Completion of 15 credits in a B.Sc. program) The principles and techniques of communicating applied sciences to individuals and groups in both the professional and public milieu. Effective public speaking and group interaction techniques. Communication materials selection, development, use, and evaluation. Writing for the media. Balancing risk and reason in communicating scientific findings.

NUTR 337 NUTRITION THROUGH LIFE. (3) (Winter) (3 lectures, 1 conference) (Prerequisite: ANSC 330 or NUTR 307) Emphasis on applied quantitative aspects of human nutrition. Nutrient utilization, evaluation and requirements, as related to dietary standards.

NUTR 344 CLINICAL NUTRITION 1. (4) (Winter) (Two 2-hour lectures) (Pre-/Co-requisite: ANSC 323, NUTR 337) Clinical nutrition assessment and dietary modification of pathological conditions including hypertension, lipid disorders and cardiovascular disease, obesity, diverticulosis, cancer, COPD, anorexia nervosa and bulimia.

NUTR 345 FOOD SERVICE SYSTEMS MANAGEMENT. (2) (Fall) An introductory course applying the principles of organizational management within the healthcare foodservice industry. Emphasis on understanding standards of quality control, customer relations and sanitation. Budget preparation, scheduling and cost control as well as menu preparation, recipe standardization and costing.

NUTR 346 QUANTITY FOOD PRODUCTION. (2) (Winter) (Prerequisite: NUTR 345) Quantity food planning, costing, and evaluation. Laboratory experience with quantity food production following principles of food sanitation and safety, food quality and cost-evaluation.

● **NUTR 361 ENVIRONMENTAL TOXICOLOGY.** (3) (3 lectures)

NUTR 403 NUTRITION IN SOCIETY. (3) (Fall) (3 hour conference) (Prerequisite: NUTR 337) Sociocultural and economic influences on food choice and behaviour; health promotion and disease prevention through nutrition, particularly in high risk populations; the interaction of changing environment, food availability and quality as they affect health.

‡ **NUTR 409 STAGE IN DIETETICS 3.** (8) (Winter: 10 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.

NUTR 420 FOOD TOXICANTS AND HEALTH RISKS. (3) (Fall) (3 lectures) (Prerequisite: FDSC 211, BIOL 201 or BIOC 212) 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.

NUTR 430 DIRECTED STUDIES: DIETETICS AND NUTRITION 1. (3) (Fall and Winter) 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.

● **NUTR 431 DIRECTED STUDIES: DIETETICS AND NUTRITION 2.** (3)

NUTR 431D1 DIRECTED STUDIES: DIETETICS AND NUTRITION 2. (1.5) (Students must also register for NUTR 431D2) (No credit will be given for this course unless both NUTR 431D1 and NUTR 431D2 are successfully completed in the same calendar year) (NUTR 431D1 and NUTR 431D2 together are equivalent to NUTR 431) 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.

NUTR 431D2 DIRECTED STUDIES: DIETETICS AND NUTRITION 2. (1.5) (Prerequisite: NUTR 431D1) (No credit will be given for this course unless both NUTR 431D1 and NUTR 431D2 are successfully completed in the same calendar year) (NUTR 431D1 and NUTR 431D2 together are equivalent to NUTR 431) See NUTR 431D1 for course description.

NUTR 431N1 DIRECTED STUDIES: DIETETICS AND NUTRITION 2. (1.5) (Students must also register for NUTR 431N2) (No credit will be given for this course unless both NUTR 431N1 and NUTR 431N2 are successfully completed in the same calendar year) (NUTR 431N1 and NUTR 431N2 together are equivalent to NUTR 431) See NUTR 431D1 for course description.

NUTR 431N2 DIRECTED STUDIES: DIETETICS AND NUTRITION 2. (1.5) (Prerequisite: NUTR 431N1) (No credit will be given for this course unless both NUTR 431N1 and NUTR 431N2 are successfully completed in the same calendar year) (NUTR 431N1 and NUTR 431N2 together are equivalent to NUTR 431) See NUTR 431D1 for course description.

NUTR 432 DIRECTED STUDIES: DIETETICS AND NUTRITION 3. (3) (Fall and Winter) 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.

NUTR 433 DIRECTED STUDIES: DIETETICS AND NUTRITION 4. (5) (Fall and Winter and Summer) (Limited enrolment) (Prerequisite: registration in NUTR 409 or equivalent. Restricted to students in the Dietetics Major or documentation of requirement for professional registration) 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.

NUTR 436 NUTRITIONAL ASSESSMENT. (2) (Winter) (Prerequisite: NUTR 337) (2 lectures) An intense 4-week course focused on resolving clinically based case studies. The objectives: to develop skills in clinical problem solving, learn principles and methods for assessing the nutritional status of patients and to become skilled at interpreting clinical data relevant to assessing nutritional status and prognosis of hospitalized patients.

NUTR 438 INTERVIEWING AND COUNSELLING. (2) (Winter) (One 2-hour conference) (Prerequisite: NUTR 344 and NUTR 311) Theories of behaviour change. Techniques and skills as applicable to the dietician's role as communicator, interviewer, counsellor, educator, motivator and nutrition behaviour change specialist.

NUTR 445 CLINICAL NUTRITION 2. (5) (Fall) (Two 2.5-hour lectures) (Prerequisite: NUTR 344 and NUTR 424) Clinical nutrition intervention for gastrointestinal and liver disease, hypermetabolic states, diabetes mellitus, renal disease and inborn errors of metabolism, enteral/parenteral nutrition management.

NUTR 446 APPLIED HUMAN RESOURCES. (3) (Fall) (3 lectures, 1 conference) (Prerequisite: AGECE 242) The management of people at work. Employee development and the leadership role. The nature of collective bargaining, the role of unions and management.

NUTR 450 RESEARCH METHODS: HUMAN NUTRITION. (3) (Fall) (2 lectures, 3 hours research, 4 hours other) (Prerequisite: NUTR 337, AEMA 310 or BIOL 373) 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.

NUTR 451 ANALYSIS OF NUTRITION DATA. (3) (Fall) (Prerequisite: NUTR 337. Corequisite: NUTR 450) 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.

NUTR 510 PROFESSIONAL PRACTICE - STAGE 4. (14) (Fall) (Prerequisite: NUTR 409) (Restriction: Not open to students who have taken NUTR 410) (Restriction: Undergraduate registration is restricted to students in the Dietetics Major. CGPA greater than, or equal to 2.50) Interrelated modules of directed experience in clinical nutrition, foodservice management, nutrition education and community nutrition, in health care setting and in the private sector.

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

★ **NUTR 501 NUTRITION IN DEVELOPING COUNTRIES.** (3) (Fall) (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.

● ★ **NUTR 511 NUTRITION AND BEHAVIOUR.** (3) (2 lectures and one seminar) (Prerequisite: NUTR 445 for undergraduate students or consent of instructor)

● **NUTR 512 HERBS, FOODS AND PHYTOCHEMICALS.** (3) (3 lectures and a project) (Prerequisite: FDSC 211 or BIOL 201 or BIOC 212)

7.18 PARA – Parasitology

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

PARA 400 EUKARYOTIC CELLS AND VIRUSES. (3) (4 hours of lectures per week) (Prerequisite: CELL 204) 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.

PARA 410 ENVIRONMENT AND INFECTION. (3) (2 lectures per week) (Prerequisite: BIOL 111 or AEBI 120 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.

PARA 438 IMMUNOLOGY. (3) (2 lectures per week) (Prerequisite: AEBI 202 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.

7.19 PLNT – Plant Science

PLNT 201 COMPARATIVE PLANT BIOLOGY. (3) (3 lectures plus 1-hour conference) Comparative study of the ways in which photosynthetic organisms acquire resources, develop and grow, repro-

duce, 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.

● **PLNT 205 INTRODUCTORY PLANT PATHOLOGY.** (3)

PLNT 211 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.

● **PLNT 215 ORIENTATION IN PLANT SCIENCE.** (1)

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

PLNT 221 INTRODUCTION TO FUNGI. (1) (Four 4-hour field labs, given during the second 4 weeks of semester) (Second 4 weeks of term only) 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 importance of fungi in medicine and biotechnology will be introduced.

PLNT 300 CROPPING SYSTEMS. (3) (3 lectures and one 3-hour lab) (Prerequisite: PLNT 211) 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.

PLNT 304 BIOLOGY OF FUNGI. (3) (3 lectures and one 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.

PLNT 305 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.

PLNT 310 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.

● **PLNT 321 FRUIT PRODUCTION.** (3)

● **PLNT 322 GREENHOUSE MANAGEMENT.** (3) (3 lectures and one 3-hour lab)

PLNT 331 FIELD CROPS. (3) (Not open to students who have taken PLNT 333 and/or PLNT 332) (3 lectures and one 3-hour lab period) (Prerequisite: PLNT 211 or PLNT 201) 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.

PLNT 341 HORTICULTURE - THE ALLIUMS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 342 HORTICULTURE - COLE CROPS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 343 HORTICULTURE - ROOT CROPS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 344 HORTICULTURE - SALAD CROPS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 345 HORTICULTURE: SOLANACEOUS CROPS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 346 HORTICULTURE: TEMPERATE FRUITS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 347 HORTICULTURE - SMALL FRUITS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 348 THE BRASSICAS. (1) (Prerequisite: PLNT 211 or PLNT 201 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.

PLNT 353 PLANT STRUCTURE AND FUNCTION. (4) (3 lectures and one 3-hour lab) (Prerequisite: PLNT 211 or PLNT 201) (Not open to students who have taken PLNT 252) 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.

● **PLNT 355 SPECIAL TOPIC: PLANT PATHOLOGY.** (2)

● **PLNT 356 SYSTEMATIC BOTANY.** (4)

PLNT 358 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: PLNT 211 or PLNT 201 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.

PLNT 361 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.

PLNT 421 LANDSCAPE PLANT MATERIALS. (3) (2 lectures and one 3-hour lab) (Prerequisites: PLNT 211 or PLNT 201) 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.

PLNT 434 WEED BIOLOGY AND CONTROL. (3) (3 lectures and one 3-hour lab) (Prerequisite: PLNT 211 or PLNT 201) 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.

PLNT 450 SPECIAL TOPICS IN PLANT SCIENCE 1. (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.

PLNT 451 SPECIAL TOPICS IN PLANT SCIENCE 2. (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.

PLNT 458 FLOWERING PLANT SYSTEMATICS. (3) (1 lecture plus one 3-hour lab plus required summer plant collection) (Prerequisite: PLNT 358 or BIOL 358 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 PLNT 358 as well as on identification techniques for difficult plant families.

PLNT 460 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.

PLNT 490D1 PROJECTS. (1.5) (1 lecture) (Students must also register for PLNT 490D2) (No credit will be given for this course unless both PLNT 490D1 and PLNT 490D2 are successfully completed in consecutive terms) Directed study on approved problem requiring both oral and written presentation.

PLNT 490D2 PROJECTS. (1.5) (Prerequisite: PLNT 490D1) (No credit will be given for this course unless both PLNT 490D1 and PLNT 490D2 are successfully completed in consecutive terms) See PLNT 490D1 for course description.

PLNT 490N1 PROJECTS. (1.5) (Students must also register for PLNT 490N2) (No credit will be given for this course unless both PLNT 490N1 and PLNT 490N2 are successfully completed in the same calendar year) See PLNT 490D1 for course description.

PLNT 490N2 PROJECTS. (1.5) (Prerequisite: PLNT 490N1) (No credit will be given for this course unless both PLNT 490N1 and PLNT 490N2 are successfully completed in the same calendar year) See PLNT 490D1 for course description.

PLNT 495 SEMINAR 1. (1) (Restriction: Not open to students registered in, or who have taken PLNT 495D1, PLNT 495D2, PLNT 495N1 or PLNT 495N2)

PLNT 496 SEMINAR 2. (1)

● **PLNT 525 ADVANCED MICROPROPAGATION.** (3) (One 3-hour lecture)

● **PLNT 535 PLANT BREEDING.** (3) (Prerequisite: CELL 204, PLNT 211, or AGE 210) (Given in alternate years)

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

7.20 RELG – Ethics (Religious Studies)

RELG 270 RELIGIOUS ETHICS AND THE ENVIRONMENT. (3) (Fall: Macdonald Campus. Winter: Downtown) 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.

7.21 SOIL – Soil Science

SOIL 200 INTRODUCTION TO EARTH SCIENCE. (3) (Winter) (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.

SOIL 210 PRINCIPLES OF SOIL SCIENCE. (3) (Fall) (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.

SOIL 315 SOIL FERTILITY AND FERTILIZER USE. (3) (Winter) (3 lectures and one lab) (Prerequisite: SOIL 210 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.

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

★ **SOIL 331 SOIL PHYSICS.** (3) (Winter) (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.

● **SOIL 410 SOIL CHEMISTRY.** (3) (1 lecture, 1 tutorial, problem sets) (Prerequisite: SOIL 210 or GEOG 305 or permission of instructor)

SOIL 490 PLAN GLOBAL DE FERTILISATION INTÉGRÉE. (3) (Ce cours est offert en français) Objectifs du cours: Ce cours de trois jours vise à habiliter les professionnels à concevoir un Plan global de fertilisation intégrée selon les règles de l'art, mises de l'avant par l'Ordre des agronomes du Québec. L'accent est mis sur l'approche-système et le calcul du bilan des éléments fertilisants de la ferme. Les participants apprendront à établir la problématique de l'entreprise et à apporter des solutions correctives à partir d'exemples concrets. La relation conseiller-client, du mandat au suivi, est également abordée avec des exemples pratiques. L'impact de cette stratégie de gestion des ressources d'un agro-écosystème est évalué dans une perspective à long terme. Ce cours tient compte des exigences du MEF pour la réalisation du Plan agroenvironnemental de fertilisation (PAEF).

7.22 WILD – Renewable Resources

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

WILD 350 MAMMALOGY. (3) (Winter) (2 lectures and one 3-hour lab) (Prerequisites: AEBI 200 and ZOO 307) This course focuses on the evolution, classification, ecology and behaviour of mammals and relations between humans and mammals. Also structure, systematics and identification of local and world mammals, as well as field methods will be emphasized.

WILD 375 ISSUES: ENVIRONMENTAL SCIENCES. (3) (Winter) (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.

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

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

WILD 401 FISHERIES AND WILDLIFE MANAGEMENT. (4) (Fall) (3 lectures, one 2-hour lab and one week field laboratory prior to fall term) (Prerequisite: PLNT 358) Principles of fisheries and wildlife management are considered and current practices of research and management are discussed.

WILD 410 WILDLIFE ECOLOGY. (3) (Winter) (3 hours of lectures per week) (Prerequisite: AEBI 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.

WILD 415 CONSERVATION LAW. (2) (Fall) (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, sanctuaries, reserves, parks; techniques of acquiring and financing desirable land, property owner rights.

WILD 420 ORNITHOLOGY. (3) (Fall) (3 lectures and occasional field trips) (Prerequisite: ZOO 307 or permission of instructor) Taxonomic relationships and evolution of birds are outlined. Reproduction, migration and population processes of North American birds are examined.

WILD 421 WILDLIFE CONSERVATION. (3) (Winter) (3 lectures) (Not open to students who have taken NRSC 421.) 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.

WILD 437 ASSESSING ENVIRONMENTAL IMPACT. (3) (Winter) (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.

★ **WILD 475 DESERT ECOLOGY.** (3) (Winter) (Field course) (Prerequisites: PLNT 460, ZOO 307, WILD 420) (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.

WILD 491D1 SEMINAR. (1) (Fall) (Students must also register for WILD 491D2) (No credit will be given for this course unless both WILD 491D1 and WILD 491D2 are successfully completed in consecutive terms) 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 advisor.

WILD 491D2 SEMINAR. (1) (Winter) (Prerequisite: WILD 491D1) (No credit will be given for this course unless both WILD 491D1 and WILD 491D2 are successfully completed in consecutive terms) See WILD 491D1 for course description.

WILD 491N1 SEMINAR. (1) (Winter) (Students must also register for WILD 491N2) (No credit will be given for this course unless both WILD 491N1 and WILD 491N2 are successfully completed in the same calendar year) See WILD 491D1 for course description.

● ★ **WILD 491N2 SEMINAR.** (1) (Fall) (Prerequisite: WILD 491N1) (No credit will be given for this course unless both WILD 491N1 and WILD 491N2 are successfully completed in the same calendar year) See WILD 491D1 for course description.

7.23 WOOD – Forest Resources

● ★ **WOOD 300 URBAN FORESTS AND TREES.** (3) (3 lectures and one 3-hour lab) (Prerequisites: PLNT 201 and SOIL 210)

WOOD 410 THE FOREST ECOSYSTEM. (3) (Fall) (3 lectures and one 3-hour lab) (Prerequisites: PLNT 201 and SOIL 210 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.

WOOD 420 ENVIRONMENTAL ISSUES: FORESTRY. (3) (Winter) (3 lectures and one 2-hour tutorial) (Prerequisites: PLNT 201 and SOIL 210 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.

WOOD 441 INTEGRATED FOREST MANAGEMENT. (3) (Winter) (3 lectures and one 3-hour lab) (Prerequisite: AEBI 205 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.

7.24 ZOO – Zoology

ZOO 307 NATURAL HISTORY OF THE VERTEBRATES. (3) (Fall) (Lectures and modules) Review of higher taxonomic groups of vertebrates and prochordates, emphasizing diagnostic characters evolution and distribution.

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

★ ★ **ZOO 312 ZOOLOGICAL SYSTEMATICS AND EVOLUTION.** (3) (3 lectures, and assignments)

★ ★ **ZOO 313 ZOOGEOGRAPHY.** (3) (2 lectures, 1 conference and project) (Prerequisite: ZOO 312)

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

ZOO 424 PARASITOLOGY. (3) (Winter) (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.

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, Master of Science/Master of Business Administration, Graduate Certificate in Biotechnology and Doctor of Philosophy.

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

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

Telephone: (514) 398-7814 Fax: (514) 398-7955
Email: fmt@macdonald.mcgill.ca
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 make our graduates competent in the exercise of their profession;
- 2) to help the student's integration into professional life;
- 3) to foster professional mobility;
- 4) to foster an interest in continual development of professional knowledge.

Six (6) academic terms are spent on the Macdonald Campus studying a sequence of courses in Soil, Plant, and Animal Science; Engineering; Economics; and Management. One summer "stage" or practicum is spent on a farm other than the home farm where the student learns the many skills and encounters the many problems related to modern commercial agriculture. Students will also have a one-week internship on farms (other than the home farm) during the academic semesters in year one. This will enable them to relate their academic work to the reality of farming. Courses in English, French, Humanities, Physical Education and two complementary courses 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 document from Macdonald Campus attesting that they have successfully completed the requirements of the Farm Management and Technology Program.

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 requirements are a Quebec High School Leaving Certificate (Secondary V), or its equivalent and any other academic requirement set by the MEQ.
3. All candidates for admission must make arrangements to come to the Macdonald Campus for an interview prior to admission to the program.
4. Admission to this program is only in the Fall semester.
5. We strongly encourage incoming students to acquire their driver's permit (both for cars and farm equipment) before coming to Macdonald Campus. This is first for safety reasons given that students work with farm equipment (soil preparation) very early on as they arrive at Macdonald. As well, most farmers require that their employees and stagiaires possess a driver's license.

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 continue. 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 specific rights and responsibilities that are outlined in the *McGill Handbook of Student Rights and Responsibilities* and in the Institutional Policy on the Evaluation of Student Achievement.

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, as well as Course Material fees will be charged according to the schedule in effect for all Macdonald Campus students. At the time of printing, the fees were \$577 per semester (charged twice a year).

Textbooks and Supplies

The cost of textbooks and supplies is estimated at \$150 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

COMMON COURSES

Administrative Unit

Farm Practice 1
Farm Practice 2
Farm Practice 3
Health and Farm Safety

Agricultural and Biosystems Engineering

Building Maintenance
Farm Building Planning
Machinery Management
Microcomputing
Precision Farming
Soil and Water Conservation
Soil Preparation
Tools and Machinery Maintenance

Agricultural Economics

Agricultural Marketing
Introduction to Economics
Farm Business Management 1
Farm Business Management 2
Farm Business Management 3
Farm Project
Management of Human Resources

Animal Science

Animal Anatomy and Physiology
Introduction to Animal Science

English

Preparatory English

English 1

(B10) English for Farm Management and Technology

English 2

(A11) Composition & Literature (Section 1)

(A10) Introduction to Literature (Section 2)

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

Agro-Environmental Fertilization Plan 1 (Fr.: PAEF 1)

Agro-Environmental Fertilization Plan 2 (Fr.: PAEF 2)

Soil Fertilization

Physical Education

Physical Education and Health

Physical Education: Practical

Physical Education in Daily Life

Plant Science

Agricultural Botany

Pesticide Use

ELECTIVE PRODUCTION COURSES

We offer four production courses in the area of Animal Science and four production courses in the area of Plant Science. Students must take a minimum of two courses in each category for a total of four courses. They could elect to take more than four courses if they wish*.

Animal Science Category

Dairy Heifer Management

Dairy Herd Management

Swine and Poultry

Beef and Sheep

Plant Science Category

Feed Crops

Industrial Crops

Greenhouse Crops

Fruit and Vegetable Crops

*After consultation with their academic adviser and the timetable

COMPLEMENTARY COURSES *

Students must take the following two complementary courses to meet the program requirements:

- Fermentation Technology
- Forests, Forestry and Society

* After consultation with their academic adviser, students can take their complementary courses at another collegial institution. This could include Sciences courses which are required for further studies in a degree program.

COMPREHENSIVE ASSESSMENT

1. The objective of this examination is to ensure that the students have attained the objectives and standards for the competencies which are involved in the entire program. The passing of this exam is mandatory to obtain the D.E.C.
2. The passing grade will be 60%. The mark stating that the student has passed this examination will appear on the student's transcript. The student who failed this assessment will be offered the possibility of a second try the following year.

ENGLISH EXIT EXAMINATION

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

10 Instructional Staff

Alli, Inteaz; B.Sc.(Guyana), M.Sc., Ph.D.(McG.); Professor of Food Science and Agricultural Chemistry, and Chair of Department

Baker, Laurence; B.B., M.Sc.(Man.), Ph.D.(McG.); Associate Professor of Agricultural Economics

Barrington, Suzelle; B.Sc.(Agr.Eng.), Ph.D.(McG.); Professor of Agricultural and Biosystems Engineering

Beech, Robin N.; B.Sc.(Nottingham), Ph.D.(Edinburgh); Associate Professor of Parasitology

Berteaux, Dominique; B.Sc.(Rennes), M.Sc.(Tours), Ph.D.(Sherbrooke); Adjunct Professor of Wildlife Biology

Bird, David M.; B.Sc.(Guelph), M.Sc., Ph.D.(McG.); Fellow A.O.U.; Professor of Wildlife Biology and Director, Avian Science and Conservation Centre

Bissonnette, David; B.Sc.(F.Sc.)(McG.), Ph.D.(Tor.); Assistant Professor (Special Category) of Dietetics and Human Nutrition

Blackwood, A. Clark; B.Sc., M.Sc.(Alta.), Ph.D.(Wis.), F.R.S.C.; Emeritus Professor of Microbiology

Bonnell, Robert B.; B.Sc.(C'dia), B.Sc.(Agr.Eng.), M.Sc., Ph.D.(McG.); Associate Professor of Agricultural and Biosystems Engineering (*Brace Associate Professor*)

Broughton, Robert S.; B.S.A., B.A.Sc.(Tor.), S.M.(M.I.T.), Ph.D.(McG.), L.L.D.(Dal.); F.A.S.A.E., F.C.S.A.E. Emeritus Professor of Agricultural and Biosystems Engineering

Brown, Peter G.; B.A.(Haverford), M.A., Ph.D.(Columbia);

Professor and Director, McGill School of Environment,

Professor of Natural Resource Sciences (*joint appt. with*

Geography and McGill School of Environment)

Brown, William Mark; B.A.(St. Mary's), M.A., Ph.D.(McM.);

Assistant Professor of Agricultural Economics (*joint appt. with*

Geography)

Buckland, Roger B.; B.Sc.(Agr.), M.Sc.(McG.), Ph.D.(Maryland);

Professor of Animal Science

Buszard, Deborah J.I.; B.Sc.(Bath), Ph.D.(Lond.); Dean and

Professor of Horticulture

Chadee, Khrisendath; B.Sc.(Wpg.), M.Sc.(Manit.), Ph.D.(McG.);

Associate Professor of Parasitology

Chan, Laurie H.M.; B.Sc., M.Phil.(Hong Kong), Ph.D.(London);

Associate Professor of Dietetics and Human Nutrition

Chavez, Eduardo R.; Agr.Eng.(Chile), M.Sc., Ph.D.(Calif.);

Professor of Animal Science

Côté, Benoît; B.Sc., Ph.D.(Laval); Associate Professor of

Woodland Resources, Chair of Natural Resource Sciences

Couture, Marcel J.; B.Sc.(Agr.)(McG.), M.Sc.(Guelph); Associate

Dean (Community Relations), Faculty Lecturer of Agricultural

Economics, and Director, Farm Management and Technology

Program

Cue, Roger I.; B.Sc.(Newcastle-upon-Tyne), Ph.D.(Edin.);

Associate Professor of Animal Science

Curtis, Mark; B.Sc., M.Sc., Ph.D.(McG.); Associate Professor of

Natural Resource Sciences

de Blois, Sylvie; B.Sc.(Agr.)(McG.), M.Sc., Ph.D.(Montr.),

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Donnelly, Danielle J.; B.Sc.(Agr.)(McG.), M.Sc.(U.B.C.),

Ph.D.(S. Fraser); Associate Professor of Plant Science

Downey, Bruce R.; D.V.M.(Tor.), Ph.D.(McG.); Professor of

Animal Science

Driscoll, Brian T.; B.Sc., Ph.D.(McMaster); Assistant Professor of

Microbiology

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

Egeland, Grace M.; B.A.(Luther), Ph.D.(Pittsburg); Associate

Professor of Nutrition and Canada Research Chair

Ellyett, William R.; B.A.(Sir G. Wms.), B.Ed.(P.E.)(McG.); Faculty

Lecturer, Farm Management and Technology Program and

Director of Athletics

- Enright, Peter; B.Sc.(Agr. Eng.), M.Sc.(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
- Faubert, Gaétan M.; B.Sc.(Sherbrooke), M.Sc.(Mtl.), Ph.D.(McG.); Professor of Parasitology
- Fortin, Marc G.; B.Sc., M.Sc.(Laval), Ph.D.(McG.); Associate Professor of Plant Science and Chair of Department (*William Dawson Scholar*)
- Fyles, James W.; B.Sc., M.Sc.(Vict.), Ph.D.(Alta.); Associate Professor of Woodland Resources
- Georges, Elias; B.Sc., Ph.D.(McG.); Associate Professor of Parasitology
- Gougeon, Rejeanne; B.Sc.(Laval), M.Sc.(Col.), Ph.D.(Montr.); Assistant Professor (PT) of Dietetics and Human Nutrition
- Grant, William F.; B.A., M.A.(McM.), Ph.D.(Virginia), F.L.S.; Emeritus Professor of Genetics
- Gray-Donald, Katherine; B.Sc., Ph.D.(McG.); Associate Professor and Director of School of Dietetics and Human Nutrition
- Grenier, Aline; B.Sc., M.Sc.(McG.); Faculty Lecturer, Farm Management and Technology Program
- Gunjal, Kisan R.; B.Sc.(Poona), M.Sc.(New Delhi), Ph.D.(Iowa St.); Associate Professor of Agricultural Economics
- Hamel, Chantal; B.Sc., Ph.D.(McG.); Assistant Professor of Soil Science
- Hayes, J. Flannan; B.Agr.Sc., M.Agr.Sc.(Dub.), Ph.D.(N.C.St.); Professor of Animal Science, Acting Chair of Animal Science
- Hendershot, William H.; B.Sc.(Tor.), M.Sc.(McG.), Ph.D.(U.B.C.); Associate Dean (Academic), Professor of Soil Science
- Henning, John C.; B.Sc., Ph.D.(Guelph); Associate Professor of Agricultural Economics, Chair of Agricultural Economics
- Ismail, Ashraf A.; B.Sc., Ph.D.(McG.); Associate Professor of Food Science and Agricultural Chemistry
- Jabaji-Hare, Suha; B.Sc.(AUB), M.Sc.(Guelph), Ph.D.(Waterloo); Associate Professor of Plant Science
- Jacobs Starkey, Linda; B.Sc.(H.Ec.)(Mt.St.Vin.), M.Sc., Ph.D.(McG), RD, FDC; Faculty Lecturer, School of Dietetics and Human Nutrition
- Jardim, Armando; B.Sc., Ph.D.(U.Vic.); Assistant Professor of Parasitology
- Johns, Timothy A.; B.Sc.(McM.), M.Sc.(U.B.C.), Ph.D.(Mich.); Associate Professor of Dietetics and Human Nutrition and Director, Centre for Nutrition and the Environment of Indigenous Peoples (CINE)
- Jones, Peter J.; B.Sc.(U.B.C.), M.Sc.(U.B.C.), Ph.D.(Tor.); Professor of Dietetics and Human Nutrition
- Kavanagh, Michael J.E.; B.Sc.(Agr.)(McG.); Faculty Lecturer, Farm Management and Technology Program
- Kermasha, Selim; B.Sc.(Baghdad), D.Sc.(Nat. Polytech.Inst., Lorraine(Nancy)); Associate Professor of Food Science and Agricultural Chemistry
- Knowles, Roger; B.Sc.(Birm.), Ph.D., D.Sc.(Lond.), F.R.S.C.; Emeritus Professor of Microbiology
- Kok, Robert; B.E.Sc., Ph.D.(W.Ont.); Professor of Agricultural and Biosystems Engineering
- Koski, Kristine G.; B.S., M.S.(Wash) Ph.D.(Calif., Davis); Associate Professor of Dietetics and Human Nutrition
- Kubow, Stan; B.Sc.(McG.), M.Sc.(Tor.), Ph.D.(Guelph); Associate Professor of Dietetics and Human Nutrition
- Kuhnlein, Harriet V.; B.S.(Penn. St.), M.S.(Oregon), Ph.D.(Calif.Berkeley); Professor of Dietetics and Human Nutrition
- Kuhnlein, Urs; B.Sc.(Fed. Inst. of Tech., Zurich), Ph.D.(Geneva); Professor of Animal Science
- Kushalappa, Ajjamada C.; B.Sc., M.Sc.(B'lore), Ph.D.(Flor.); Associate Professor of Plant Science
- Lewis, David J.; B.Sc., M.Sc., Ph.D.(Mem.); Associate Professor of Entomology
- Lussier, Serge; B.Sc.(Agr.)(McG.); Assistant Director and Faculty Lecturer, Farm Management and Technology Program
- MacKenzie, Angus F.; B.S.A., M.Sc.(Sask.), Ph.D.(C'nell); Emeritus Professor of Soil Science
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- Marcil, Paul; B.A.(Bishop's), B.F.A.(Conc.), B.C.L., L.L.B.(McG.); Faculty Lecturer (PT), Department of Natural Resource Sciences
- Marshall, William D.; B.Sc.(U.N.B.), Ph.D.(McM.); Professor of Agricultural Chemistry
- Mather, Diane E.; B.Sc.(Agr.)(McG.), M.Sc., Ph.D.(Guelph); Associate Dean (Research) and Associate Professor of Plant Science
- McKyes, Edward; B.Eng., M.Eng., Ph.D.(McG.); F.C.S.A.E. Professor of Agricultural and Biosystems Engineering
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- Niven, Donald F.; B.Sc., Ph.D.(Aber.); Associate Professor of Microbiology
- Norris, Eric R.; B.S.A.(Tor.), M.Sc.(Guelph), Ph.D.(Mich. St.); F.C.S.A.E.; Associate Dean (Student Affairs) and Associate Professor of Agricultural and Biosystems Engineering
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Stepler, Howard A.; B.S.A.(Man.), M.Sc., Ph.D.(McG.), F.A.I.C.;
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Stevenson, Mary M.; B.A.(Hood College), M.S., Ph.D.(Catholic
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Stewart, Robin K.; B.Sc.(Agr.), Ph.D.(Glas.); Emeritus Professor
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Thibault, Louise; B.Sc., M.Sc., Ph.D.(Laval); Associate Professor
 of Dietetics and Human Nutrition

Thomassin, Paul; B.Sc.(Agr.)(McG.), M.S., Ph.D.(Hawaii);
 Associate Professor of Agricultural Economics

Titman, Rodger D.; B.Sc.(McG.), M.Sc.(Bishop's), Ph.D.(U.N.B.);
 Fellow A.O.U., Associate Professor of Wildlife Biology and
 Associate Director, Avian Science and Conservation Centre

Van de Voort, Frederik R.; B.Sc., M.Sc., Ph.D.(U.B.C.); Professor
 of Food Science and Agricultural Chemistry

Vickery, Vernon R.; B.Sc.(Agr.), M.Sc., Ph.D.(McG.); Emeritus
 Curator of the Lyman Entomological Museum and Research
 Laboratory

Wade, Kevin; B.Agr.Sc., M.Agr.Sc.(Dublin), Ph.D.(C'nell);
 Associate Professor of Animal Science

Waterway, Marcia J.; B.A.(Calvin Coll.), M.S.(Wis.), Ph.D.(C'nell);
 Associate Professor of Plant Science and Curator, McGill
 University Herbarium

Watson, Alan K.; B.Sc.(Agr.), M.Sc.(U.B.C.), Ph.D.(Sask.);
 Professor of Agronomy and Director, Phytarium/Biopesticide
 Quarantine Facility

Wees, David D.; B.Sc.(Agr.), M.Sc.(McG.); Faculty Lecturer,
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