Faculty of Agricultural and Environmental Sciences, including School of Human Nutrition (Graduate)
Programs, Courses and University Regulations 2019-2020
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This publication provides guidance to prospects, applicants, students, faculty and staff.

1. McGill University reserves the right to make changes to the information contained in this online publication - including correcting errors, altering fees, schedules of admission, and credit requirements, and revising or cancelling particular courses or programs - without prior notice.

2. In the interpretation of academic regulations, the Senate is the final authority.

3. Students are responsible for informing themselves of the University's procedures, policies and regulations, and the specific requirements associated with the degree, diploma, or certificate sought.

4. All students registered at McGill University are considered to have agreed to act in accordance with the University procedures, policies and regulations.

5. Although advice is readily available on request, the responsibility of selecting the appropriate courses for graduation must ultimately rest with the student.

6. Not all courses are offered every year and changes can be made after publication. Always check the Minerva Class Schedule link at https://horizon.mcgill.ca/pban1/bwckschd.p_disp_dyn_sched for the most up-to-date information on whether a course is offered.

7. The academic publication year begins at the start of the Fall semester and extends through to the end of the Winter semester of any given year. Students who begin study at any point within this period are governed by the regulations in the publication which came into effect at the start of the Fall semester.

8. Notwithstanding any other provision of the publication, it is expressly understood by all students that McGill University accepts no responsibility to provide any course of instruction, program or class, residential or other services including the normal range of academic, residential and/or other services in circumstances of utility interruptions, fire, flood, strikes, work stoppages, labour disputes, war, insurrection, the operation of law or acts of God or any other cause (whether similar or dissimilar to those enumerated) which reasonably prevent their provision.

Note: Throughout this publication, "you" refers to students newly admitted, readmitted or returning to McGill.
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1 Dean’s Welcome

To Graduate Students and Postdoctoral Fellows:

Welcome to Graduate and Postdoctoral Studies (GPS) at McGill. You are joining a community of world-class researchers and more than 10,000 graduate students in over 400 programs. GPS is here to support you from admissions through to graduation and beyond. We take a holistic approach to graduate student success; we support not only your academic development, but also your career-planning and professional development, and your well-being and student life. I invite you to consult the website Resources for Your Success, which is a one-stop-shop for the many resources and support systems in place for you across the University.

I would like to wish you all the best in your studies at McGill. We are here to make sure that you have the best possible experience.

Josephine Nalbantoglu, Ph.D.
Dean, Graduate and Postdoctoral Studies

2 Graduate and Postdoctoral Studies

2.1 Administrative Officers

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<tr>
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<th>Role</th>
</tr>
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<tbody>
<tr>
<td>Josephine Nalbantoglu; B.Sc., Ph.D.(McG.)</td>
<td>Dean (Graduate and Postdoctoral Studies)</td>
</tr>
<tr>
<td>Robin Beech; B.Sc.(Nott.), Ph.D.(Edin.)</td>
<td>Associate Dean (Graduate and Postdoctoral Studies)</td>
</tr>
<tr>
<td>France Bouthillier; B.Ed., C.Admin.(UQAM), M.B.S.I.(Montr.), Ph.D.(Tor.)</td>
<td>Associate Dean (Graduate and Postdoctoral Studies)</td>
</tr>
<tr>
<td>Lorraine Chalifour; B.Sc., Ph.D.(Manit.)</td>
<td>Associate Dean (Graduate and Postdoctoral Studies)</td>
</tr>
<tr>
<td>Elisa Pylkkänen; B.A., M.A.(McG.)</td>
<td>Director (Graduate and Postdoctoral Studies)</td>
</tr>
</tbody>
</table>

2.2 Location

James Administration Building, Room 400
845 Sherbrooke Street West
Montreal QC H3A 0G4
Website: www.mcgill.ca/gps

Note: For inquiries regarding specific graduate programs, please contact the appropriate department.

2.3 Graduate and Postdoctoral Studies’ Mission

The mission of Graduate and Postdoctoral Studies (GPS) is to promote university-wide academic excellence for graduate and postdoctoral education at McGill. GPS provides leadership and strategic direction across the university in close collaboration with the academic and administrative units, and the graduate and postdoctoral community.

3 Important Dates

For all dates relating to the academic year, consult www.mcgill.ca/importantdates.
4 Graduate Studies at a Glance

Please refer to University Regulations & Resources > Graduate > : Graduate Studies at a Glance for a list of all graduate departments and degrees currently being offered.

5 Program Requirements

Refer to University Regulations & Resources > Graduate > Regulations > : Program Requirements for graduate program requirements for the following:

- Master's Degrees
- Doctoral Degrees
- Ad Personam Programs (Thesis Option Only)
- Coursework for Graduate Programs, Diplomas, and Certificates

6 Graduate Admissions and Application Procedures

Please refer to University Regulations & Resources > Graduate > : Graduate Admissions and Application Procedures for information on:

- Application for Admission
- Admission Requirements
- Application Procedures
- Competency in English

and other important information regarding admissions and application procedures for Graduate and Postdoctoral Studies.

7 Fellowships, Awards, and Assistantships

Please refer to University Regulations & Resources > Graduate > : Fellowships, Awards, and Assistantships for information and contact information regarding fellowships, awards, and assistantships in Graduate and Postdoctoral Studies.

8 Postdoctoral Research

Students must inform themselves of University rules and regulations and keep abreast of any changes that may occur. The Postdoctoral Research section of this publication contains important details required by postdoctoral scholars during their studies at McGill and should be periodically consulted, along with other sections and related publications.

8.1 Postdocs

Postdocs are recent graduates with a Ph.D. or equivalent (i.e., Medical Specialist Diploma) engaged by a member of the University’s academic staff, including Adjunct Professors, to assist him/her in research.

Postdocs must be appointed by their department and registered with Enrolment Services in order to have access to University facilities (library, computer, etc.).
8.2 Guidelines and Policy for Academic Units on Postdoctoral Education

The general guidelines listed below are meant to encourage units to examine their policies and procedures to support postdoctoral education. Every unit hosting Postdocs should have explicitly stated policies and procedures for the provision of postdoctoral education as well as established means for informing Postdocs of policies, procedures, and privileges (e.g., orientation sessions, handbooks, etc.), as well as mechanisms for addressing complaints. Academic units should ensure that their policies, procedures and privileges are consistent with these guidelines and the Charter of Students’ Rights. For their part, Postdocs are responsible for informing themselves of policies, procedures, and privileges.

1. Definition and Status
   i. Postdoctoral status will be recognized by the University in accordance with Quebec provincial regulations. Persons may only be registered with postdoctoral status for a period of up to five years from the date they were awarded a Ph.D. or equivalent degree. Time allocated to parental or health leave is added to this period of time. Leaves for other reasons, including vacation leave, do not extend the term. Postdocs must do research under the supervision of a McGill professor, including Adjunct Professors, who is a member of McGill’s academic staff qualified in the discipline in which training is being provided and with the abilities to fulfill responsibilities as a supervisor of the research and as a mentor for career development. They are expected to be engaged primarily in research with minimal teaching or other responsibilities.

2. Registration
   i. Postdocs must be registered annually with the University through Enrolment Services. Initial registration will require an original or notarized copy of the Ph.D. diploma. Registration will be limited to persons who fulfill the definition above and for whom there is an assurance of appropriate funding and where the unit can provide assurance of the necessary resources to permit postdoctoral education.
   ii. Upon registration, the Postdoc will be eligible for a University identity card issued by Enrolment Services.

3. Appointment, Pay, Agreement of Conditions
   i. Appointments may not exceed your registration eligibility status.
   ii. In order to be registered as a Postdoc, you must be assured of financial support other than from personal means during your stay at McGill University, equivalent to the minimal stipend requirement set by the University in accordance with guidelines issued by federal and provincial research granting agencies. There are no provisions for paid parental leave unless this is stipulated in the regulations of a funding agency outside the University.
   iii. At the outset of a postdoctoral appointment, a written Letter of Agreement for Postdoctoral Education should be drawn up and signed by the Postdoc, the supervisor, and the department head or delegate (see template Letter of Agreement and supporting document—Commitments of Postdoctoral Scholars and Supervisors—available at www.mcgill.ca/gps/postdocs/fellows/responsibilities). This should stipulate, for example, the purpose of the postdoctoral appointment (research training and the advancement of knowledge), the duration of the fellowship, financial support, the modality of pay, the work space, travel funds, and expectations and compensation for teaching and student research supervision. Leaves from postdoctoral education must comply with the Graduate and Postdoctoral Studies Policies for Vacation, Parental/Familial, and Health Leave (see section 8.3: Vacation Policy for Graduate Students and Postdocs and University Regulations & Resources > Graduate > Regulations > Categories of Students > Leave of Absence Status). Any breach of these conditions may result in grievance procedures or the termination of the postdoctoral appointment.
   iv. Postdocs with full responsibility for teaching a course should be compensated over and above their fellowship at the standard rate paid to lecturers by their department. This applies to all postdocs, except those for whom teaching is part of the award (e.g., Mellon grantees).
   v. The amount of research, teaching, or other tasks that Postdocs engage in over and above postdoctoral activities should conform to the regulations for Postdocs specified by the Canadian research council of their discipline. This applies to all Postdocs, including those whose funding does not come from the Canadian research councils.

4. Privileges
   i. Postdocs have the same pertinent rights as the ones granted to McGill students under www.mcgill.ca/students/srr, and those granted by the policies listed at www.mcgill.ca/secretariat/policies-and-regulations.
   ii. Postdocs have full graduate student borrowing privileges in McGill libraries through their identity card.
   iii. As a rule, Postdocs who are Canadian citizens or who have Permanent Resident status may take courses for credit. Admission to such courses should be sought by submitting application documents directly to the appropriate program by the Postdoc. They must be admitted by the department offering the courses as Special Students. These Postdocs may only be enrolled as part-time students in non-degree granting programs. They will be charged fees for these courses.
   iv. Postdocs may be listed in the McGill directory. The Computing Centre will grant Postdocs email privileges on the same basis as graduate students upon presentation of a valid identity card.
   v. The Department of Athletics will grant Postdocs access to sports facilities upon presentation of their identity card. A fee will be charged on an annual or term basis.
   vi. Postdocs are mandatory members of the Post-Graduate Students’ Society (PGSS) and an annual association fee is automatically charged. PGSS fees are mandatory. Postdocs are permitted membership in the Faculty Club; an annual fee will be charged for this membership.
   vii. Postdocs are encouraged to participate in Professional Development Workshops provided by Graduate and Postdoctoral Studies and Teaching and Learning services. These sessions are usually free of charge.
   viii. Postdocs have access to the services provided by the Ombudsperson.
   ix. Postdocs may enrol as part-time students in the second language written and spoken English/French courses offered by the School of Continuing Studies/French Language Centre. Postdocs will be charged tuition for these courses. International Postdocs may be required to obtain a CAQ and a Study Permit.
x. Access to student services and athletic services are available to the Postdoc on an opt-in basis. Fees are applicable.

5. Responsibilities

i. Postdocs are subject to the responsibilities outlined at www.mcgill.ca/students/srr and must abide by the policies listed at www.mcgill.ca/secretariat/policies-and-regulations.

ii. Each academic unit hosting Postdocs should clearly identify Postdocs’ needs and the means by which they will be met by the unit.

iii. Each academic unit should assess the availability of research supervision facilities, office space, and research funding before recruiting Postdocs.

iv. Some examples of responsibilities of the department are:

- to verify the Postdoc’s eligibility period for registration;
- to provide Postdocs with departmental policy and procedures that pertain to them;
- to oversee the registration and appointment of Postdocs;
- to assign departmental personnel (e.g., Postdoc coordinator and Graduate Program Director) the responsibility for Postdocs;
- to oversee and sign off on the Letter of Agreement for Postdoctoral Education;
- to ensure that each Postdoc has a supervisor, lab and/or office space, access to research operating costs and necessary equipment;
- to include Postdocs in departmental career and placement opportunities;
- to refer Postdocs to the appropriate University policies and personnel for the resolution of conflict that may arise between a Postdoc and a supervisor.

v. Some examples of responsibilities of the supervisor are:

- to uphold and transmit to their Postdocs the highest professional standards of research and/or scholarship;
- to provide research guidance;
- to meet regularly with their Postdocs;
- to provide feedback on research submitted by the Postdocs;
- to clarify expectations regarding intellectual property rights in accordance with the University’s policy;
- to provide mentorship for career development;
- to prepare, sign, and adhere to a Letter of Agreement for Postdoctoral Education.

vi. Some examples of responsibilities of Postdocs are:

- to inform themselves of and adhere to the University’s policies and/or regulations for Postdocs for leaves, for research, and for student conduct as outlined at www.mcgill.ca/students/srr and the Graduate and Postdoctoral Studies University Regulations and Resources;
- to submit a complete file for registration to Enrolment Services;
- to sign and adhere to their Letter of Agreement for Postdoctoral Education;
- to communicate regularly with their supervisor;
- to inform their supervisor of their absences.

vii. Some examples of the responsibilities of the University are:

- to register Postdocs;
- to provide an appeal mechanism in cases of conflict;
- to provide documented policies and procedures to Postdocs;
- to provide Postdocs with the necessary information on McGill University student services.

Approved by Senate, April 2000; revised May 2014

8.3 Vacation Policy for Graduate Students and Postdocs

Graduate students and Postdocs should normally be entitled to vacation leave equivalent to university holidays and an additional total of fifteen (15) working days in the year. Funded students and Postdocs with fellowships and research grant stipends taking additional vacation leave may have their funding reduced accordingly.

Council of FGSR April 23, 1999

8.4 Leave of Absence for Health and Parental/Familial Reasons

A leave of absence may be granted for maternity or parental reasons or for health reasons (see University Regulations & Resources > Graduate > Leave of Absence Status).

Such a leave must be requested on a term-by-term basis and may be granted for a period of up to 52 weeks. For a maternity or parental leave, the eligibility period of a maximum of 52 consecutive weeks is determined based on when the child is born; if the leave is interrupted for one or two terms, the eligibility period cannot be extended. Students and Postdocs must make a request for such a leave in writing to their department and submit a medical certificate. The
department shall forward the request to Enrolment Services. See the procedure in University Regulations & Resources > Graduate > Leave of Absence Status.

Students who have been granted such a leave will have to register for the term(s) in question and their registration will show as “leave of absence” on their record. No tuition fees will be charged for the duration of the authorized leave. Research supervisors are not obligated to remunerate students and Postdocs on leave. A summary table of various leave policies (paid or unpaid) for students and Postdocs paid from the Federal and Quebec Councils through fellowships or research grants is available at www.mcgill.ca/gps/funding/getting-paid under “Leave Policies and Form.”

8.5 Postdoctoral Research Trainees

Eligibility

If your situation does not conform to the Government of Quebec’s definition of Postdoctoral Fellow, you may be eligible to attend McGill as a Postdoctoral Research Trainee. While at McGill, you can perform research only (you may not register for courses or engage in clinical practice). Medical specialists who will have clinical exposure and require a training card must register through Postgraduate Medical Education of the Faculty of Medicine—not Graduate and Postdoctoral Studies.

The category of Postdoctoral Research Trainee is for:

Category 1: An individual who has completed requirements for the Doctoral degree or medical specialty, but the degree/certification has not yet been awarded. The individual will subsequently be eligible for registration as a Postdoctoral Fellow.

Category 2: An individual who is not eligible for Postdoctoral Registration according to the Government of Quebec’s definition, but is a recipient of an external postdoctoral award from a recognized Canadian funding agency.

Category 3: An individual who holds a professional degree (or equivalent) in a regulated health profession (as defined under CIHR-eligible health profession) and is enrolled in a program of postgraduate medical education at another institution. The individual wishes to conduct the research stage or elective component of his/her program of study at McGill University under the supervision of a McGill professor. The individual will be engaged in full-time research with well-defined objectives, responsibilities, and methods of reporting. The application must be accompanied by a letter of permission from the home institution (signed by the Department Chair, Dean or equivalent) confirming registration in their program and stating the expected duration of the research stage. Individuals who are expecting to spend more than one year are encouraged to obtain formal training (master’s or Ph.D.) through application to a relevant graduate program.

Category 4: An individual with a regulated health professional degree (as defined under CIHR-eligible health profession), but not a Ph.D. or equivalent or medical specialty training, but who fulfils criteria for funding on a tri-council operating grant or by a CIHR fellowship (up to maximum of five years post-degree).

Note: Individuals who are not Canadian citizens or permanent residents must inquire about eligibility for a work permit.

General Conditions

- The maximum duration is three years
- The individual must be engaged in full-time research
- The individual must provide copies of official transcripts/diploma
- The individual must have the approval of a McGill professor to supervise the research and of the Unit
- The individual must have adequate proficiency in English, but is not required to provide official proof of English competency to Enrolment Services
- The individual must comply with regulations and procedures governing research ethics and safety and obtain the necessary training
- The individual will be provided access to McGill libraries, email, and required training in research ethics and safety. Any other University services must be purchased (e.g., access to athletic facilities)
- The individual must arrange for basic health insurance coverage prior to arrival at McGill and may be required to provide proof of coverage

9 Graduate Studies Guidelines and Policies

Refer to University Regulations & Resources > Graduate > Guidelines and Policies for information on the following:

- Guidelines and Regulations for Academic Units on Graduate Student Advising and Supervision
- Policy on Graduate Student Research Progress Tracking
- Ph.D. Comprehensives Policy
- Graduate Studies Reread Policy
- Failure Policy
- Guideline on Hours of Work
10 Graduate Student Services and Information

Graduate students are encouraged to refer to : Student Services and Information for information on the following topics:

- Service Point
- Student Rights & Responsibilities
- Student Services – Downtown & Macdonald Campuses
- Residential Facilities
- Athletics and Recreation
- Ombudsperson for Students
- Extra-Curricular and Co-Curricular Activities
- Bookstore
- Computer Store
- Day Care

11 Information on Research Policies and Guidelines, Patents, Postdocs, Associates, Trainees

Refer to University Regulations & Resources > Graduate > : Research Policy and Guidelines for information on the following:

- Policy on Research Ethics
- Regulations on Research Policy
- Policy on Research Integrity
- Guidelines for Research Involving Human Subjects
- Guidelines for Research with Animal Subjects
- Policy on Intellectual Property
- Regulations Governing Conflicts of Interest
- Safety in Field Work
- Office of Sponsored Research
- Postdocs
- Research Associates

12 Browse Academic Units & Programs

The programs and courses in the following sections have been approved for the 2019–2020 session as listed. The Faculty/School reserves the right to introduce changes as may be deemed necessary or desirable at any time throughout the year.

12.1 Agricultural Economics

12.1.1 Location

Department of Natural Resource Sciences
Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada

2019-2020, Faculty of Agricultural and Environmental Sciences, including School of Human Nutrition (Graduate), McGill University (Published March 18, 2019)
12.1.2 About Agricultural Economics

The goal of graduate training in Agricultural Economics is to provide students with the applied concepts and tools to identify, define, and analyze economic problems affecting the performance of the agri-food sector and the environment. Attention is given to:

- the development of analytical skills in Applied Economics related to agriculture, environment, and ecological economics;
- Environmental and Resource Economics;
- International Agricultural Development;
- Farm Management, Production, and Finance.

The program prepares graduates for rewarding careers in research, analysis, and decision-making in academia; private and NGO sectors; and government. For more information on the M.Sc. in Agricultural Economics, please refer to section 12.7: Natural Resource Sciences. Further details can also be found at www.mcgill.ca/nrs/academic/graduate/agricultural-economics.

12.1.3 Agricultural Economics Admission Requirements and Application Procedures

12.1.3.1 Admission Requirements

To be considered eligible for direct admission to the M.Sc. program, the applicant must have an undergraduate degree with a Cumulative Grade Point Average (CGPA) of at least 3.0 out of a possible 4.0 (second class–upper division or equivalent) or a CGPA of 3.2/4.0 for the last two full-time academic years. The ideal preparation is an undergraduate degree in Agricultural Economics or Economics, including undergraduate courses in intermediate economic theory (micro and macro), calculus, algebra, statistics, and econometrics. Candidates considered to have insufficient preparation in economics will be asked to take up to two additional undergraduate courses as part of their M.Sc. program.

When an applicant does not have sufficient background in economics for admission to the M.Sc., they may be admitted to a Qualifying program of one year of undergraduate courses. The CGPA requirement is the same as for the M.Sc.

Details on the M.Sc. are available from section 12.7: Natural Resource Sciences > section 12.7.5: Master of Science (M.Sc.) Agricultural Economics (Thesis) (45 credits). Further details can also be found at www.mcgill.ca/nrs/academic/graduate/agricultural-economics.

12.1.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > Application Procedures for detailed application procedures.

12.1.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Curriculum Vitae
- Personal Statement
- The GRE – not required, but highly recommended

12.1.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Agricultural Economics and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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McGill University, Faculty of Agricultural and Environmental Sciences, including School of Human Nutrition (Graduate), 2019-2020 (Published March 18, 2019)
Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

**12.1.4 Agricultural Economics Faculty**

**Program Director**

P.J. Thomassin

**Associate Professors**

N. Kosoy; B.Sc.(Univ. Simon Bolivar), M.Sc.(Kent), M.Sc., Ph.D.(Autonoma de Barcelona)

P.J. Thomassin; B.Sc.(Agr.)(McG.), M.S., Ph.D.(Hawaii Pac.)

**Assistant Professor**

A.P. Harou; B.S.(Sus.), M.S.(Calif., Davis), Ph.D.(Cornell)

**Associate Member**

C. Barrington-Leigh; S.M.(MIT), Ph.D.(Stan.), Ph.D.(Br. Col.)

**12.2 Animal Science**

**12.2.1 Location**

Department of Animal Science
Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/animal

**12.2.2 About Animal Science**

The Department of Animal Science provides exciting challenges to graduate students in the areas of:

- Animal Breeding and Genetics
- Animal Models for Human Medical Applications
- Dairy Cattle Welfare
- Epigenetic Modelling
- Food Safety
- Genome Editing (CRISPR tools)
- Large-data Analyses
- Metabolomics
- Reproductive Physiology
- Ruminant and Non-ruminant Nutrition and Metabolism

as they relate, not only to livestock production, but also leading into the fields of human nutrition and medicine via animal models for human disease, infertility, and obesity. Official options in Biotechnology are also available.

Departmental researchers have excellent wet-lab facilities at their disposal; large-animal studies can be carried out at the Large Animal Research Unit on the Macdonald campus farm, where other livestock species are available for research trials as well. Research can make use of the Small Animal Research Unit for studies involving rodent animal models, guinea pigs, neonatal piglets, and rabbits. Expertise is also available in applied information systems, management-software development, and large-scale data analyses. Close collaboration with the Quebec Centre for Expertise in Dairy Production (Valacta) allows for large-scale data-mining projects, software development, and the production of advising tools for the industry. The Department also has significant expertise in food safety, environmental studies related to animal production, and global food security. Our staff's many connections via research networks allow for rich learning environments for our graduate students.
section 12.2.5: Master of Science (M.Sc.) Animal Science (Thesis) (45 credits)

Two one-semester courses and three seminar courses at the postgraduate level complement an area of research (resulting in a thesis) under the supervision of one of our staff—many of whom are leaders in their respective fields. Entrance to this program is highly competitive, requiring an excellent B.Sc. and letters of reference. Graduates of this program are well prepared for careers in the animal industry, the pharmaceutical sector, and many varied fields in biotechnology.

section 12.2.6: Master of Science, Applied (M.Sc.A.) Animal Science (Non-Thesis) (45 credits)

This non-thesis degree is oriented to animal scientists already working in industry or government, to undergraduate students inspired by concepts in sustainable and integrated animal agriculture, to project leaders interested in animal resource management, and to veterinarians. The program provides graduate training in applied areas of animal production with a view toward integrating technology and management in animal production with allied areas of agricultural resource utilization.

section 12.2.7: Master of Science, Applied (M.Sc.A.) Animal Science (Non-Thesis): Sustainable Agriculture (45 credits)

For further information regarding the Master of Science, Applied (M.Sc.A.) Animal Science (Non-Thesis): Sustainable Agriculture, please click the above link.

section 12.2.8: Doctor of Philosophy (Ph.D.) Animal Science

Since the Ph.D. is primarily a research degree, the amount of coursework required will normally be considerably less than is the case for the M.Sc. It depends on the background of the individual student and must be approved by the student's Advisory Committee. At a minimum, it includes two seminar courses at the graduate level and the Ph.D. Comprehensive Examination as an admission to candidacy for the Ph.D. As with the M.Sc. (Thesis), admission is based on an excellent track record. Suitable candidates are encouraged to contact potential supervisors within their chosen area of interest. Applicants should, however, be aware that no professor is in a position to accept students without formal approval of the application by the Graduate Admissions Committee.

section 12.2.9: Doctor of Philosophy (Ph.D.) Animal Science: Bioinformatics

Bioinformatics research lies at the intersection of biological/medical sciences and mathematics/computer science/engineering. The intention of the Bioinformatics Option is to train students to become researchers in this interdisciplinary field. This includes the development of strategies for experimental design, the construction of tools to analyze datasets, the application of modelling techniques, the creation of tools for manipulating bioinformatics data, the integration of biological databases, and the use of algorithms and statistics.

12.2.3 Animal Science Admission Requirements and Application Procedures

12.2.3.1 Admission Requirements

M.Sc. (Thesis)
Candidates are required to have either a bachelor's degree in Agriculture or a B.Sc. degree in an appropriate, related discipline with an equivalent cumulative grade point average (CGPA) of 3.0/4.0 (second class–upper division) or a grade point average (GPA) of 3.2/4.0 during the last two years of full-time university study. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program.

M.Sc. (Applied)
All candidates are required to have a B.Sc. degree or equivalent.

Ph.D.
Candidates are normally required to have an M.Sc. degree in an area related to the chosen field of specialization for the Ph.D. program.

Qualifying Students
Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program.

Financial Aid
Financial aid is very limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student’s supervisor. Academic units cannot guarantee financial support via teaching assistantships or other funds.
12.2.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply. See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.2.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Acceptance to all programs depends on a staff member agreeing to serve as the student’s supervisor and the student obtaining financial support.
- The GRE – not required, but highly recommended.

12.2.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Animal Science and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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* Admission to the Winter term is open for thesis programs only.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.2.4 Animal Science Faculty

Chair

Raj Duggavathi; B.V.Sc., M.V.Sc.(Bangalore), Ph.D.(Sask.)

Emeritus Professors

Roger B. Buckland; B.Sc.(Agr.), M.Sc.(McG.), Ph.D.(Md.)
Eduardo R. Chavez; Ing.Agr.(Chile), M.Sc., Ph.D.(Calif., Davis)
Eugene Donefer; B.Sc., M.Sc.(Cornell), Ph.D.(McG.)
Urs Kühnlein; B.Sc.(Fed. Inst. of Tech., Zurich), Ph.D.(Geneva)
Sherman Touchburn; M.S.A.(Br. Col.), Ph.D.(Ohio St.)

Professors

J. Flannan Hayes; B.Agr.Sc., M.Agr.Sc.(Dublin), Ph.D.(N. Carolina St.)
Xin Zhao; B.Sc., M.Sc.(Nanjing), Ph.D.(Cornell) (James McGill Professor)

Associate Professors

Vilceu Bordignon; D.V.M.(URCAMP, Brazil), M.Sc.(UFPeL, Brazil), Ph.D.(Montr.)
Roger I. Cue; B.Sc.(Newcastle, UK), Ph.D.(Edin.)
Sarah Kimmins; B.Sc.(Dal.), M.Sc.(Nova Scotia Ag.), Ph.D.(Dal.) (CRC Chair, Tier 2)
Humberto G. Monardes; Ing. Agr.(Concepcion, Chile), M.Sc., Ph.D.(McG.)
 Associate Professors
Arif F. Mustafa; B.Sc., M.Sc.(Khartoum), Ph.D.(Sask.)
Kevin M. Wade; B.Sc.(Agr.), M.Sc.(Agr.)(Dublin), Ph.D.(Cornell)
David Zadworny; B.Sc., Ph.D.(Guelph)

Assistant Professors
Sergio Burgos; B.Sc.(Flor.), M.Sc.(Calif., Davis), Ph.D.(Guelph)
Jennifer Ronholm; B.Sc.(Wat.), Ph.D.(Ott.) (joint appt. with Food Science and Agricultural Chemistry)
Elsa Vasseur; B.Sc., M.Sc.(ISA, Lille), M.Sc.(AgroParisTech), Ph.D.(Laval) (Industrial Research Chair in the Sustainable Life of Dairy Cattle)
Jianguo (Jeff) Xia; B.M.(Peking Health Science), M.Sc., Ph.D.(Alta.) (joint appt. with Parasitology) (Canada Research Chair in Bioinformatics and Big Data Analytics)

Adjunct Professors
Baurhoo Bushansingh, Eveline Ibeagha-Awemu, Pierre Lacasse, Daniel Lefebvre, Bruce Murphy, Débora Santschi

Affiliate Member
René Lacroix

12.2.5 Master of Science (M.Sc.) Animal Science (Thesis) (45 credits)

Thesis Courses (36 credits)
ANSC 680 (9) M.Sc. Thesis 1
ANSC 681 (9) M.Sc. Thesis 2
ANSC 682 (9) M.Sc. Thesis 3
ANSC 683 (9) M.Sc. Thesis 4

Required Courses (9 credits)
6 credits of coursework at the 500 level or higher approved by the student's advisory committee, and three 1-credit seminars.
ANSC 695 (1) MSc General Topic Seminar
ANSC 696 (1) MSc Research Proposal Seminar
ANSC 697 (1) MSc Research Results Seminar

Depending on the needs and competencies of the student, additional coursework may be assigned by the supervisory committee.

12.2.6 Master of Science, Applied (M.Sc.A.) Animal Science (Non-Thesis) (45 credits)

The program aims to provide graduate training in applied areas of animal production with a view toward integrating technology and management in animal production with allied areas of agricultural resource utilization.

Research Project (15 credits)
ANSC 643 (3) Project 1
ANSC 644 (3) Project 2
ANSC 645 (3) Project 3
ANSC 646 (3) Project 4
ANSC 647 (3) Project 5

Complementary Courses (30 credits)
15-30 credits from the following:

AEMA 610 (3) Statistical Methods 2
ANSC 504 (3) Population Genetics
ANSC 530 (3) Experimental Techniques in Nutrition
ANSC 551 (3) Carbohydrate and Lipid Metabolism
ANSC 552 (3) Protein Metabolism and Nutrition
ANSC 560 (3) Biology of Lactation
ANSC 565 (3) Applied Information Systems
ANSC 600 (3) Advanced Eukaryotic Cells and Viruses
ANSC 604 (3) Advanced Animal Biotechnology
ANSC 605 (3) Estimation: Genetic Parameters
ANSC 606 (3) Selection Index and Animal Improvement
ANSC 622 (3) Experimental Techniques in Animal Science
ANSC 635 (3) Vitamins and Minerals in Nutrition
ANSC 636 (3) Analysis - Animal Breeding Research Data
ANSC 691 (3) Special Topic: Animal Sciences
ANSC 692 (3) Topic in Animal Sciences 1

0-15 credits selected from 500- and 600-level courses from across the Faculty (with the possibility of up to 9 credits from outside the Faculty if deemed appropriate by the supervisor).

12.2.7 Master of Science, Applied (M.Sc.A.) Animal Science (Non-Thesis): Sustainable Agriculture (45 credits)

** NEW PROGRAM **

Climate change and rising human population have increased the need for sustainable agricultural practices. The Sustainable Agriculture option is taken with a M.Sc. Applied (Non-Thesis) program, and designed for students who wish to supplement their basic degree with graduate studies in animal science, with a specific focus on sustainability in agriculture. Students will be exposed to different approaches to improve the sustainability of agricultural systems through specialized coursework and a research project. The program aims to provide graduate training in applied areas of animal production with a view toward integrating technology and management in sustainable animal production with allied areas of agricultural resource utilization.

Research Project (15 credits)

ANSC 643 (3) Project 1
ANSC 644 (3) Project 2
ANSC 645 (3) Project 3
ANSC 646 (3) Project 4
ANSC 647 (3) Project 5

Required Courses (12 credits)

ANSC 555 (3) The Use and Welfare of Animals
BREE 533 (3) Water Quality Management
IGFS 611 (3) Advanced Issues on Development, Food and Agriculture
PLNT 602 (3) Advances in Agronomy

Complementary Courses (18 credits)

3 credits from the following list:

AEMA 610 (3) Statistical Methods 2
AEMA 611  (3)  Experimental Designs 1
AEMA 614  (3)  Temporal and Spatial Statistics 1

9-15 credits from the following list:

ANSC 530  (3)  Experimental Techniques in Nutrition
ANSC 551  (3)  Carbohydrate and Lipid Metabolism
ANSC 552  (3)  Protein Metabolism and Nutrition
ANSC 560  (3)  Biology of Lactation
ANSC 565  (3)  Applied Information Systems
ANSC 604  (3)  Advanced Animal Biotechnology
ANSC 611D1  (1.5)  Advanced Reproductive Biology
ANSC 611D2  (1.5)  Advanced Reproductive Biology
ANSC 622  (3)  Experimental Techniques in Animal Science
ANSC 635  (3)  Vitamins and Minerals in Nutrition
ANSC 637  (3)  Livestock Breeding Systems
FDSC 545  (3)  Advances in Food Microbiology
PLNT 662  (3)  Advances in Plant Biotechnology

0-6 credits of sufficient 500-, or 600-level courses (with Adviser's approval) to bring the total credits to 45.

12.2.8  Doctor of Philosophy (Ph.D.) Animal Science

Since the Ph.D. is primarily a research degree, the amount of coursework required will depend on the background of the individual student, and must be approved by the student's advisory committee.

Thesis

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses

ANSC 701  (0)  Doctoral Comprehensive Examination

Two seminar courses at the 500, 600, or 700 level.

12.2.9  Doctor of Philosophy (Ph.D.) Animal Science: Bioinformatics

Thesis

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses (5 credits)

ANSC 701  (0)  Doctoral Comprehensive Examination
ANSC 797  (1)  Animal Science Seminar 3
ANSC 798  (1)  Animal Science Seminar 4
### 12.3 Bioresource Engineering

#### 12.3.1 Location

Department of Bioresource Engineering  
Macdonald Campus  
21,111 Lakeshore Road  
Sainte-Anne-de-Bellevue QC H9X 3V9  
Canada  
Telephone: 514-398-7838  
Email: gradstudies.macdonald@mcgill.ca  
Website: www.mcgill.ca/bioeng

#### 12.3.2 About Bioresource Engineering

The Department offers M.Sc. and Ph.D. research programs in various areas of bioresource engineering including:

- plant and animal environments;
- ecological engineering (ecosystem modelling, design, management, and remediation);
- water resources management (hydrology, irrigation, drainage, water quality);
- agricultural machinery, mechatronics, and robotics;
- food engineering and bio-processing;
- post-harvest technology;
- waste management and protection of the environment;
- bio-energy;
- artificial intelligence.

The Department has well equipped laboratories for conducting research in all these areas.

The interdisciplinary nature of bioresource engineering often requires candidates for higher degrees to work in association with, or attend courses given by, a number of other departments at both the McGill University Macdonald campus and the Downtown campus.

### 12.3.5: Master of Science (M.Sc.) Bioresource Engineering (Thesis) (46 credits)

This option for the M.Sc. degree is oriented toward individuals who intend to develop a career in bioresource engineering research. The research areas include: plant and animal environments; ecological engineering (ecosystem modelling, design, management and remediation); water resources management (hydrology, irrigation, drainage, water quality); agricultural machinery, mechatronics and robotics; food engineering and bio-processing; post-harvest technology; waste management and protection of the environment; bio-energy; and artificial intelligence.
section 12.3.6: Master of Science (M.Sc.) Bioresource Engineering (Thesis): Environment (46 credits)

The Environmental option is coordinated through the McGill School of Environment (MSE). This option is intended for students who want to take an interdisciplinary approach in their graduate research on environmental issues. Students will learn how to transfer knowledge into action and develop an appreciation for the roles of science, politics, economics, and ethics with regard to the environment.

section 12.3.7: Master of Science (M.Sc.) Bioresource Engineering (Non-Thesis): Integrated Water Resources Management (45 credits)

Integrated Water Resource Management is a one-year program providing an essential approach for sustainable management of our natural watershed resources. The 13-credit internship is a central feature of this master’s program. The degree gives students the unique opportunity to study the biophysical, environmental, legal, institutional, and socio-economic aspects of water use and management, in an integrated context. The degree is directed at practising professionals who wish to upgrade and/or focus their skill set to address water management issues.

As a graduate from this program, you will be well suited to opportunities in diverse fields of employment, such as water resources consulting, international development project management, research with governments or universities, public policy and governance development, and climate change impact assessment.

section 12.3.8: Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis) (45 credits)

The non-thesis option is aimed at individuals already employed in industry or seeking to improve their skills in specific areas (soil and water, structures and environment, waste management, environment protection, post-harvest technology, food process engineering, environmental engineering) in order to attain a higher level of engineering qualification. Candidates must be qualified to be members of a Canadian professional engineering association such as the Ordre des ingénieurs du Québec (OIQ) and must maintain contact with their academic adviser in the Department of Bioresource Engineering before registration to clarify objectives, investigate project possibilities, and plan a program of study.

section 12.3.9: Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Environment (45 credits)

The non-thesis Environment option is aimed at individuals already employed in industry or seeking to improve their skills in specific areas with the coordination of the McGill School of Environment.

section 12.3.10: Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Environmental Engineering (45 credits)

The Environmental Engineering program emphasizes interdisciplinary fundamental knowledge, practical perspective, and awareness of environmental issues through a wide range of technical and non-technical courses offered by collaborating departments and faculties at the University.

The primary objective of the program is to train environmental professionals at the advanced level. The program is thus designed for individuals with a university undergraduate degree in engineering. Through this program, students will master specialized skills in their home disciplines and acquire a broader perspective and awareness of environmental issues.

section 12.3.11: Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Integrated Food and Bioprocessing (45 credits)

This graduate program will provide students with the tools to understand how food and agricultural production interact to better manage agricultural, food, and biomass systems for the adequate supply of wholesome food, feed, fiber, biofuel, and any other bio-based material. This course-based program will present students with the skills needed to assess existing production, delivery, and quality management systems; introduce improvements; and communicate effectively with policy makers and with colleagues in multi-disciplinary teams.

The goals of this program are to provide up-to-date world class knowledge on techniques for adequate process design and management of biomass production strategies for the delivery of quality food, natural fiber, biochemicals, biomaterials, and biofuels, in a sustainable and environment-friendly way that benefits all. Training activities will include laboratory research and/or industrial/government internships.

section 12.3.12: Doctor of Philosophy (Ph.D.) Bioresource Engineering

This is a research-based degree and is offered in the following areas: plant and animal environments; ecological engineering (ecosystem modelling, design, management and remediation); water resources management (hydrology, irrigation, drainage, water quality); agricultural machinery, mechatronics and robotics; food engineering and bio-processing; post-harvest technology; waste management and protection of the environment; bio-energy; and artificial intelligence.

section 12.3.13: Doctor of Philosophy (Ph.D.) Bioresource Engineering: Environment

The Ph.D. Bioresource Engineering: Environment – MSE Option is coordinated through the McGill School of Environment (MSE). This option is intended for students who want to take an interdisciplinary approach in their graduate research on environmental issues. Students will learn how to transfer knowledge into action and develop an appreciation for the roles of science, politics, economics, and ethics with regard to the environment.
12.3.3 Bioresource Engineering Admission Requirements and Application Procedures

12.3.3.1 Admission Requirements

Candidates for M.Sc. and Ph.D. degrees should indicate in some detail their fields of special interest when applying for admission. An equivalent cumulative grade point average (CGPA) of 3.0/4.0 (second class–upper division) or a grade point average (GPA) of 3.2/4.0 during the last two years of full-time university study is required at the bachelor's level. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program. Experience after the undergraduate degree is an additional asset.

Qualifying Students

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program.

Financial Aid

Financial aid is very limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student’s supervisor. Academic units cannot guarantee financial support via teaching assistantships or other funds.

12.3.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply. See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.3.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Acceptance to all programs depends on a staff member agreeing to serve as the student’s supervisor and the student obtaining financial support.
- The GRE – not required, but highly recommended.

12.3.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Bioresource Engineering and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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* Admission to the Winter term is open for thesis programs only.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.3.4 Bioresource Engineering Faculty

Chair

Viacheslav I. Adamchuk
Graduate Program Director
G.S. Vijaya Raghavan

Associate Graduate Program Director
Valérie Orsat

Emeritus Professors
Robert S. Broughton; B.S.A., B.A.Sc.(Tor.), S.M.(MIT), Ph.D.(McG.), LL.D.(Dal.)
Robert Kok; B.E.Sc., Ph.D.(W. Ont.)

Professors
Chandra A. Madramootoo; B.Sc.(Agr.Eng.), M.Sc., Ph.D.(McG.), D.Sc.(Guelph) (James McGill Professor)
Michael O. Ngadi; B.Eng.(Agr.Eng.), M.A.Sc., Ph.D.(Dal.Tech.) (James McGill Professor)
Valérie Orsat; B.Sc., M.Sc., Ph.D.(McG.)
Shiv O. Prasher; B.Tech., M.Tech.(Punj.), Ph.D.(Br. Col.), LL.D.(Dal.) (James McGill Professor)
G.S. Vijaya Raghavan; B.Eng.(B'l ore), M.Sc.(Guelph), Ph.D.(Colo. St.), D.Sc.(TNAU), D.Sc.(UAS Dharwad) (James McGill Professor)

Associate Professors
Viacheslav I. Adamchuk; B.Sc.(NULES, Kyiv), M.Sc., Ph.D.(Purd.)
Jan Adamowski; B.Eng.(RMC), M.Phil.(Camb.), M.B.A.(WUT, LBS, HEC Montr., NHH), Ph.D.(Warsaw) (Liliane and David M. Stewart Scholar in Water Resources) (William Dawson Scholar)
Grant Clark; B.Sc.(Alta.), M.Sc., Ph.D.(McG.)
Marie-Josée Dumont; B.Eng, M.Sc.(Laval), Ph.D.(Alta.) (William Dawson Scholar)
Mark Lefsrud; B.Sc.(Sask.), M.Sc.(Rutg.), Ph.D.(Tenn.) (William Dawson Scholar)
Valérie Orsat; B.Sc., M.Sc., Ph.D.(McG.)
Zhiming Qi; B.Sc., M.Sc.(China Agr.), Ph.D.(Iowa)

Assistant Professor
Shafaroud Abdolhamid Akbarzadeh; B.Sc.(Isfahan Univ. of Tech.), M.Sc.(Amirkabir Univ. of Tech., Tehran), Ph.D.(New Br.)

Adjunct Professors
Luis Del Rio; B.Sc., M.Sc.(S. Fraser), Ph.D.(Br. Col.)
Satyanarayan Dev; B.Sc.(TNAU), M.Sc., Ph.D.(McG.)
Pierre Jutras; B.Sc.(McG.), M.Sc.(Montr.), Ph.D.(McG.)
Arun Mujumdar; B.Eng.(Bom.), M.Eng., Ph.D.(McG.) (Post-Retirement Professor)
Boris Tartakovsky; M.Sc., Ph.D.(Moscow St.)

Faculty Lecturers
Alice Cherestes; B.Sc., M.Sc.(Queens College), Ph.D.(CUNY)
David Titley-Peloquin; B.Sc., Ph.D.(McG.)

Research/Academic Associates
Yvan Gariepy; B.Sc., M.Sc.(McG.)
Ebenezer Kwofie; B.Sc., M.Sc.(Boros), Ph.D.(McG.)
Li (Laura) Liu; B.Sc., M.Sc.(Harbin Inst. Tech.), Ph.D.(PolyU, Hong Kong)
Darwin Lyew; B.Sc., M.Sc., Ph.D.(McG.)
12.3.5 Master of Science (M.Sc.) Bioresource Engineering (Thesis) (46 credits)

This option for the M.Sc. degree is oriented toward individuals who intend to develop a career in bioresource engineering research.

Thesis Courses (32 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 691</td>
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<td>M.Sc. Thesis 1</td>
</tr>
<tr>
<td>BREE 692</td>
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<td>M.Sc. Thesis 2</td>
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<td>BREE 697</td>
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<td>M.Sc. Thesis 7</td>
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<td>BREE 698</td>
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Required Courses (5 credits)

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<tr>
<td>BREE 652</td>
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<td>Departmental Seminar M.Sc. 2</td>
</tr>
<tr>
<td>BREE 699</td>
<td>3</td>
<td>Scientific Publication</td>
</tr>
</tbody>
</table>

Complementary Courses (9 credits)

500-, 600-, or 700-level courses in bioresource engineering and other fields to be determined in consultation with the Research Director.

12.3.6 Master of Science (M.Sc.) Bioresource Engineering (Thesis): Environment (46 credits)

Thesis Courses (32 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 691</td>
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<td>M.Sc. Thesis 1</td>
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<tr>
<td>BREE 692</td>
<td>4</td>
<td>M.Sc. Thesis 2</td>
</tr>
<tr>
<td>BREE 693</td>
<td>4</td>
<td>M.Sc. Thesis 3</td>
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<tr>
<td>BREE 694</td>
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<td>M.Sc. Thesis 4</td>
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<tr>
<td>BREE 695</td>
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<td>M.Sc. Thesis 5</td>
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<tr>
<td>BREE 696</td>
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<td>M.Sc. Thesis 6</td>
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<tr>
<td>BREE 697</td>
<td>4</td>
<td>M.Sc. Thesis 7</td>
</tr>
<tr>
<td>BREE 698</td>
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<td>M.Sc. Thesis 8</td>
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Required Courses (11 credits)

<table>
<thead>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 651</td>
<td>1</td>
<td>Departmental Seminar M.Sc. 1</td>
</tr>
<tr>
<td>BREE 652</td>
<td>1</td>
<td>Departmental Seminar M.Sc. 2</td>
</tr>
<tr>
<td>BREE 699</td>
<td>3</td>
<td>Scientific Publication</td>
</tr>
<tr>
<td>ENVR 610</td>
<td>3</td>
<td>Foundations of Environmental Policy</td>
</tr>
<tr>
<td>ENVR 650</td>
<td>1</td>
<td>Environmental Seminar 1</td>
</tr>
<tr>
<td>ENVR 651</td>
<td>1</td>
<td>Environmental Seminar 2</td>
</tr>
</tbody>
</table>
Complementary Courses (3 credits)

Chosen from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVR 519</td>
<td>3</td>
<td>Global Environmental Politics</td>
</tr>
<tr>
<td>ENVR 544</td>
<td>3</td>
<td>Environmental Measurement and Modelling</td>
</tr>
<tr>
<td>ENVR 620</td>
<td>3</td>
<td>Environment and Health of Species</td>
</tr>
<tr>
<td>ENVR 622</td>
<td>3</td>
<td>Sustainable Landscapes</td>
</tr>
<tr>
<td>ENVR 630</td>
<td>3</td>
<td>Civilization and Environment</td>
</tr>
<tr>
<td>ENVR 680</td>
<td>3</td>
<td>Topics in Environment 4</td>
</tr>
</tbody>
</table>

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

12.3.7 Master of Science (M.Sc.) Bioresource Engineering (Non-Thesis): Integrated Water Resources Management (45 credits)

Research Project (6 credits)

BREE 631 (6) Integrated Water Resources Management Project

Required Courses (27 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 503</td>
<td>3</td>
<td>Water: Society, Law and Policy</td>
</tr>
<tr>
<td>BREE 510</td>
<td>3</td>
<td>Watershed Systems Management</td>
</tr>
<tr>
<td>BREE 630</td>
<td>13</td>
<td>Integrated Water Resources Management Internship</td>
</tr>
<tr>
<td>BREE 651</td>
<td>1</td>
<td>Departmental Seminar M.Sc. 1</td>
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<tr>
<td>BREE 652</td>
<td>1</td>
<td>Departmental Seminar M.Sc. 2</td>
</tr>
<tr>
<td>BREE 655</td>
<td>3</td>
<td>Integrated Water Resources Management Research Visits</td>
</tr>
<tr>
<td>PARA 515</td>
<td>3</td>
<td>Water, Health and Sanitation</td>
</tr>
</tbody>
</table>

Elective Courses (12 credits)

12 credits, at the 500 level or higher, of any relevant course(s) chosen in consultation with the Program Director.

12.3.8 Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis) (45 credits)

The non-thesis option is aimed toward individuals already employed in industry or seeking to improve their skills in specific areas (soil and water/structures and environment/waste management/environment protection/post-harvest technology/food process engineering/environmental engineering) in order to enter the engineering profession at a higher level.

Candidates must meet the qualifications of a professional engineer either before or during their M.Sc. Applied program.

Each candidate for this option is expected to establish and maintain contact with his/her academic adviser in the Department of Bioresource Engineering some time before registration in order to clarify objectives, investigate project possibilities and plan a program of study.

Research Project (12 credits)

BREE 671 (6) Project 1
BREE 672 (6) Project 2

Required Courses (2 credits)

BREE 651 (1) Departmental Seminar M.Sc. 1
Complementary Courses (31 credits)
31 credits of 500-, 600-, or 700-level courses in bioresource engineering and other fields* to be determined in consultation with the Project Director.
* Note: 12 of the 31 credits are expected to be from collaborative departments, e.g., food process engineering: 12 credits divided between Food Science and Chemical Engineering.

12.3.9 Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Environment (45 credits)
Candidates must meet the qualifications of a professional engineer either before or during their M.Sc. Applied program.

Research Project (12 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 671</td>
<td>6</td>
</tr>
<tr>
<td>BREE 672</td>
<td>6</td>
</tr>
</tbody>
</table>

Required Courses (8 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>BREE 652</td>
<td>1</td>
</tr>
<tr>
<td>ENVR 610</td>
<td>3</td>
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<tr>
<td>ENVR 650</td>
<td>1</td>
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<td>ENVR 651</td>
<td>1</td>
</tr>
<tr>
<td>ENVR 652</td>
<td>1</td>
</tr>
</tbody>
</table>

Complementary Courses (25 credits)
3 credits from the following courses below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVR 519</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 544</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 620</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 622</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 630</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 680</td>
<td>3</td>
</tr>
</tbody>
</table>

or another course at the 500, 600, or 700 level recommended by the Advisory Committee and approved by the Environment Option Committee.

22 additional credits of 500-, 600-, or 700-level courses chosen in consultation with the academic adviser.

12.3.10 Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Environmental Engineering (45 credits)
This inter-departmental graduate program leads to a master's degree in Environmental Engineering. The objective of the program is to train environmental professionals at an advanced level. The program is designed for individuals with an undergraduate degree in engineering. This non-thesis degree falls within the M.Eng. and M.Sc. programs which are offered in the Departments of Bioresource, Chemical, Civil, and Mining, Metals, and Materials Engineering.

Research Project (6 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 671*</td>
<td>6</td>
</tr>
<tr>
<td>BREE 672</td>
<td>6</td>
</tr>
</tbody>
</table>
* BREE 671 may also be taken as part of this requirement.

**Required Courses (9 credits)**

- BREE 533 (3) Water Quality Management
- CHEE 591 (3) Environmental Bioremediation
- CIVE 615 (3) Environmental Engineering Seminar

**Complementary Courses (19 credits)**

**Data Analysis Course**

3 credits from the following:

- AEMA 611 (3) Experimental Designs 1
- CIVE 555 (3) Environmental Data Analysis
- PSYC 650 (3) Advanced Statistics 1

**Toxicology Course**

3 credits from the following:

- OCCH 612 (3) Principles of Toxicology
- OCCH 616 (3) Occupational Hygiene

**Water Pollution Engineering Course**

4 credits from the following:

- CIVE 651 (4) Theory: Water / Wastewater Treatment
- CIVE 652 (4) Bioprocesses for Wastewater Resource Recovery
- CIVE 660 (4) Chemical and Physical Treatment of Waters

**Air Pollution Engineering Course**

3 credits from the following:

- CHEE 592 (3) Industrial Air Pollution Control
- MECH 534 (3) Air Pollution Engineering

or an approved 500-, 600-, or 700-level alternative course.

**Environmental Impact Course**

3 credits from the following:

- GEOG 501 (3) Modelling Environmental Systems
- GEOG 551 (3) Environmental Decisions

or an approved 500-, 600-, or 700-level alternative course.

**Environmental Policy Course**

3 credits from the following:

- URBP 506 (3) Environmental Policy and Planning

or an approved 500-, 600-, or 700-level alternative course.
Further complementary courses (balance of coursework to meet the 45-credit program requirement):

Remaining Engineering or Non-Engineering courses from an approved list of courses, at the 500, 600, or 700 level, from the Faculty of Engineering, Faculty of Agricultural and Environmental Sciences, Faculty of Law, Faculty of Religious Studies, Desautels Faculty of Management, and Departments of Atmospheric and Oceanic Sciences, Biology, Chemistry, Earth and Planetary Sciences, Economics, Epidemiology and Biostatistics, Geography, Occupational Health, Political Science, Sociology, and the McGill School of Environment.

12.3.11 Master of Science, Applied (M.Sc.A.) Bioresource Engineering (Non-Thesis): Integrated Food and Bioprocessing (45 credits)

Required Courses (6 credits)

- BREE 600 (1) Project/Internship Proposal
- BREE 651 (1) Departmental Seminar M.Sc. 1
- BREE 652 (1) Departmental Seminar M.Sc. 2
- BREE 699 (3) Scientific Publication

Complementary Courses (39 credits)

Minimum of 3 credits of graduate-level Statistics in any department

Minimum of 9 credits from courses selected from the following:

- BREE 518 (3) Ecological Engineering
- BREE 519 (3) Advanced Food Engineering
- BREE 520 (3) Food, Fibre and Fuel Elements
- BREE 530 (3) Fermentation Engineering
- BREE 531 (3) Post-Harvest Drying
- BREE 532 (3) Post-Harvest Storage
- BREE 535 (3) Food Safety Engineering
- BREE 603 (3) Advanced Properties: Food and Plant Materials

Minimum of 12 credits selected from the following:

- BREE 601 (6) Integrated Food and Bioprocessing Internship 1
- BREE 602 (6) Integrated Food and Bioprocessing Internship 2
- BREE 671 (6) Project 1
- BREE 672 (6) Project 2

Minimum of 3 credits selected from the following:

- AGEC 630 (3) Food and Agricultural Policy
- AGEC 633 (3) Environmental and Natural Resource Economics
- AGEC 642 (3) Economics of Agricultural Development
- AGRI 510 (3) Professional Practice

Minimum of 3 credits selected from the following:

- BTEC 502 (3) Biotechnology Ethics and Society
- FDSC 519 (3) Advanced Food Processing
- FDSC 535 (3) Food Biotechnology
9 credits of any relevant graduate-level course chosen in consultation with the Program Director.

### 12.3.12 Doctor of Philosophy (Ph.D.) Bioresource Engineering

Candidates for the Ph.D. degree will normally register for the M.Sc. degree first. In cases where the research work is proceeding very satisfactorily, or where the equivalent of the M.Sc. degree has been completed previously, candidates may be permitted to proceed directly to the Ph.D. degree.

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>Ph.D. Comprehensive Examination</td>
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<tr>
<td>BREE 751</td>
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<td>Departmental Seminar Ph.D. 1</td>
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<tr>
<td>BREE 752</td>
<td>0</td>
<td>Departmental Seminar Ph.D. 2</td>
</tr>
<tr>
<td>BREE 753</td>
<td>0</td>
<td>Departmental Seminar Ph.D. 3</td>
</tr>
<tr>
<td>BREE 754</td>
<td>0</td>
<td>Departmental Seminar Ph.D. 4</td>
</tr>
</tbody>
</table>

**Complementary Courses**

Courses of study selected for a Ph.D. program will depend on the existing academic qualifications of the candidate, and on those needed for effective pursuit of research in the chosen field. Candidates are encouraged to take an additional course of study of their own choice in some field of the humanities, sciences, or engineering not directly related to their research. The program will be established by consultation of the candidate with a committee that will include the Research Director and at least one other professor.

### 12.3.13 Doctor of Philosophy (Ph.D.) Bioresource Engineering: Environment

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

Note: BREE 701, the comprehensive component, must be taken either late in the first, or early in the second, registration year to qualify to proceed to the completion of the Ph.D. degree.

<table>
<thead>
<tr>
<th>Course</th>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 701</td>
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<td>Ph.D. Comprehensive Examination</td>
</tr>
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<td>BREE 752</td>
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<td>Departmental Seminar Ph.D. 2</td>
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</tr>
<tr>
<td>ENVR 652</td>
<td>1</td>
<td>Environmental Seminar 3</td>
</tr>
</tbody>
</table>
Complementary Courses

One course chosen from the following:

- ENVR 519 (3) Global Environmental Politics
- ENVR 544 (3) Environmental Measurement and Modelling
- ENVR 620 (3) Environment and Health of Species
- ENVR 622 (3) Sustainable Landscapes
- ENVR 630 (3) Civilization and Environment
- ENVR 680 (3) Topics in Environment 4

or another course at the 500, 600, or 700 level recommended by the Advisory Committee and approved by the Environment Option Committee.

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12.4 Biotechnology

12.4.1 Location

Institute of Parasitology
Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/biotechgradprog

12.4.2 About Biotechnology

The non-thesis M.Sc.(Applied) degree in Biotechnology offers a course-based curriculum with practical training in laboratory courses and internships offered through the Institute of Parasitology. The Institute is housed on Macdonald Campus of McGill University in beautiful Sainte-Anne-de-Bellevue about 30 kilometers from the Montreal main campus downtown.

Graduates typically enter the biotechnology sector in research, management, or sales, or accept government positions.

Biotechnology Programs

section 12.4.5: Master of Science, Applied (M.Sc.A.) Biotechnology (Non-Thesis) (45 credits)

Candidates must possess a bachelor's degree in the biological/molecular sciences or an equivalent program. This applied master's program is unique in Quebec. It aims to prepare students for entry into the biotechnology and pharmaceutical industry or to pursue further graduate studies in biomedicine, agriculture, or the environment. Students can choose from a wide range of complementary courses given throughout the McGill campuses to “design” their own program toward a future career choice. The program provides in-house training in molecular biology with a strong focus on the molecular/biochemical sciences. Concurrently, it provides teaching in management and gives students the opportunity to look at the business aspect of biotechnology.

A research internship of four to eight months is carried out in an active laboratory, and students learn to present and write research results. Graduates will find jobs ranging from positions as research assistants and/or technicians in biomedical or pharmaceutical laboratories to managerial or supervisory positions. They may also pursue a career in the business of biotechnology including patent and intellectual property management.

section 12.4.6: Graduate Certificate (Gr. Cert.) Biotechnology (16 credits)

This program is currently not offered.

Candidates must possess a bachelor's degree in the biological/molecular sciences or an equivalent program. This is a short, intense program for students wishing to deepen their understanding of biotechnology and gain hands-on experience via an intensive laboratory course using the latest molecular biology techniques. Students can choose from a wide range of complementary courses given throughout the McGill campuses to “design” their own program toward a future career choice. Graduates will find employment in research or industrial laboratories as assistants and/or technicians.
12.4.3 Biotechnology Admission Requirements and Application Procedures

12.4.3.1 Admission Requirements

Candidates for the M.Sc.(Applied) in Biotechnology must possess a bachelor’s degree in biological sciences or equivalent with a minimum cumulative grade point average (CGPA) of 3.2/4.0, as well as all prerequisites or their equivalents. Applicants are required to have sufficient background in biochemistry, cellular biology, and molecular biology, preferably at an advanced level for the Master's Applied.

Financial Support

Financial support for the Biotechnology program is very limited. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student. Students, whether Canadian or international, must secure funding from available sources, or must be self-financed. International students are strongly encouraged to secure funding from their home country or international agencies. Academic units cannot guarantee financial support via teaching assistantships or other funds. More information is found at www.mcgill.ca/biotechgradprog/admissions/tuition.

12.4.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.4.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- An English Proficiency test is required for most international applicants.
- The GRE (optional).
- Other Supporting Documents – Other documents may be required for the admission process. Please consult the Biotechnology website at www.mcgill.ca/biotechgradprog/admissions for full details of the admission process.

12.4.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Institute of Parasitology and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

<table>
<thead>
<tr>
<th>Application Opening Dates</th>
<th>Application Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Applicants</td>
<td>Non-Canadian citizens (incl. Special, Visiting &amp; Exchange)</td>
</tr>
<tr>
<td>Fall Term:</td>
<td>Sept. 15</td>
</tr>
<tr>
<td>Winter Term:</td>
<td>N/A</td>
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<tr>
<td>Summer Term:</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.4.4 Biotechnology Faculty

Biotechnology programs are offered through the Institute of Parasitology. For a complete faculty listing, please refer to section 12.8.4: Parasitology Faculty.

12.4.5 Master of Science, Applied (M.Sc.A.) Biotechnology (Non-Thesis) (45 credits)

Research Project (16 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTEC 622</td>
<td>(2)</td>
<td>Biotechnology Research Project 1</td>
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<tr>
<td>BTEC 623</td>
<td>(6)</td>
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### Required Courses (20 credits)

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<tr>
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<tbody>
<tr>
<td>BIOT 505</td>
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<td>Selected Topics in Biotechnology</td>
</tr>
<tr>
<td>BTEC 501</td>
<td>3</td>
<td>Bioinformatics</td>
</tr>
<tr>
<td>BTEC 619</td>
<td>4</td>
<td>Biotechnology Laboratory 2</td>
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<tr>
<td>BTEC 620</td>
<td>4</td>
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</tr>
<tr>
<td>BTEC 621</td>
<td>3</td>
<td>Biotechnology Management</td>
</tr>
<tr>
<td>HGEN 660</td>
<td>3</td>
<td>Genetics and Bioethics</td>
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</tbody>
</table>

### Complementary Courses (9 credits)

9 credits at the 500 level or higher, selected within the Faculties of Agricultural and Environmental Sciences, Medicine, Science, or Management in consultation with the academic adviser of the program in line with the interests of the student.

### 12.4.6 Graduate Certificate (Gr. Cert.) Biotechnology (16 credits)

**This program is currently not offered.**

**Required Courses (10 credits)**

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
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<tr>
<td>BIOT 505</td>
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<td>Selected Topics in Biotechnology</td>
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<tr>
<td>BTEC 620</td>
<td>4</td>
<td>Biotechnology Laboratory 1</td>
</tr>
<tr>
<td>BTEC 621</td>
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<td>Biotechnology Management</td>
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</table>

**Complementary Courses (6 credits)**

Two courses chosen from the following:

#### General Topics

<table>
<thead>
<tr>
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<tr>
<td>ANSC 622</td>
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<td>Experimental Techniques in Animal Science</td>
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<tr>
<td>BINF 511</td>
<td>3</td>
<td>Bioinformatics for Genomics</td>
</tr>
<tr>
<td>BIOL 524</td>
<td>3</td>
<td>Topics in Molecular Biology</td>
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<tr>
<td>BIOL 568</td>
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<td>Topics on the Human Genome</td>
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<td>BTEC 501</td>
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<td>BTEC 502</td>
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<td>Biotechnology Ethics and Society</td>
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<td>BTEC 535</td>
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<td>Functional Genomics in Model Organisms</td>
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<td>BTEC 555</td>
<td>3</td>
<td>Structural Bioinformatics</td>
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<td>BTEC 691</td>
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<td>Biotechnology Practicum</td>
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<td>EXMD 511</td>
<td>3</td>
<td>Joint Venturing with Industry</td>
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<tr>
<td>EXMD 602</td>
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<td>Techniques in Molecular Genetics</td>
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#### Health

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<tr>
<td>EXMD 610</td>
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<td>Molecular Methods in Medical Research</td>
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<tr>
<td>PARA 635</td>
<td>3</td>
<td>Cell Biology and Infection</td>
</tr>
<tr>
<td>PHGY 518</td>
<td>3</td>
<td>Artificial Cells</td>
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</table>

#### Environment and Food
12.5  Food Science and Agricultural Chemistry

12.5.1  Location

Department of Food Science and Agricultural Chemistry
Macdonald-Stewart Building, Room MS1-033
Macdonald Campus of McGill University
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/foodscience

12.5.2  About Food Science and Agricultural Chemistry

The Department of Food Science and Agricultural Chemistry offers M.Sc. (thesis and non-thesis) and Ph.D. programs. These programs provide training in evolving interdisciplinary areas of:

- food quality;
- food safety/food microbiology;
- food chemistry;
- food biotechnology;
- functional ingredients;
- applied infrared spectroscopy;
- food processing;
- thermal generation of aromas and toxicants;
- marine biochemistry;
- food chemical toxicants.

The Department has key infrastructure with all major equipment necessary for conducting research in all these areas. Our graduate program provides strong mentoring/advisory support while maintaining high flexibility for individual research projects.

section 12.5.6: Master of Science (M.Sc.) Food Science and Agricultural Chemistry (Non-Thesis) (45 credits)

The program offers advanced food science courses in a broad range of areas. It is suitable for students with an undergraduate degree in food science or a closely related discipline. Students must complete a total of 45 credits including ten graduate-level courses, the graduate seminar, and the research project. The program may be completed in three to four academic terms (12 to 16 months). Entry is possible from other disciplines; however, students may be required to complete selected undergraduate courses as determined by the Department at the time of admission in order to orient themselves to food science. Subsequent career paths include work within the food industry and government agencies.

section 12.5.7: Master of Science (M.Sc.) Food Science & Agricultural Chemistry: Food Safety (Non-Thesis) (45 credits)

The Food Safety concentration is offered to candidates who seek further specialization in the area of food safety but do not wish to pursue independent research. It is intended to train graduate students as specialists in food safety with the expectation that graduates will be well-prepared academically to take on the challenging food safety events and issues that emerge in Canada and globally. The program covers food safety through the entire food supply chain from food production through processing/manufacturing to the food consumer. A strong undergraduate background in food science and particularly in microbiology is required. Students must complete a total of 45 credits including ten graduate-level courses, the graduate seminar, and the research project. The program may be completed in three to four academic terms (12 to 16 months). Students may also be required to complete selected undergraduate courses as determined by the Department at the time of admission.

section 12.5.5: Master of Science (M.Sc.) Food Science and Agricultural Chemistry (Thesis) (45 credits)

This program is a research-based degree in various areas related to food science for candidates entering the M.Sc. program without restrictions (i.e., not requiring a Qualifying term/year). Entry into the M.Sc. (Thesis) program also hinges on the availability of supervisory staff and financing. Therefore, it is

BREE 530  (3)  Fermentation Engineering
FDSC 535  (3)  Food Biotechnology
section 12.5.5: Master of Science (M.Sc.) Food Science and Agricultural Chemistry (Thesis) (45 credits)

It is advisable that the applicant for the M.Sc. (Thesis) degree select the M.Sc. (Non-Thesis) as a second choice in the application form, to enhance the possibility of entry into the Food Science graduate program. Subsequent career paths include work within the food industry, government agencies, and in research.

section 12.5.8: Doctor of Philosophy (Ph.D.) Food Science and Agricultural Chemistry

A Ph.D. in food science is suitable for students with an M.Sc. degree in food science or related areas who wish to become independent researchers and/or leaders in the field of food science. Candidates with a B.Sc. degree applying for the Ph.D. need to register first for the M.Sc. degree. In cases where the candidates are performing well during their first year, they may be permitted to fast track to the Ph.D. degree. Entry into the Ph.D. graduate program hinges on the availability of supervisory staff and financing.

12.5.3 Food Science and Agricultural Chemistry Admission Requirements and Application Procedures

12.5.3.1 Admission Requirements

Applicants to the M.Sc. programs must be graduates of a university of recognized reputation and hold a B.Sc. in Food Science or a related discipline such as Chemistry, Biochemistry, or Microbiology with a minimum cumulative grade point average (CGPA) of 3.0/4.0 (second class–upper division) and a minimum grade point average (GPA) of 3.2/4.0 during the last two years of full-time university study. Applicants to the Ph.D. program must hold an M.Sc. degree in Food Science or related areas with a minimum CGPA of 3.4 in their M.Sc. and a minimum GPA of 3.2 for the last two years of their B.Sc. degree. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program.

Qualifying Students

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program.

Financial Aid

Financial aid for students in thesis programs is very limited and highly competitive. Students in non-thesis master's programs must be self-funded. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student's supervisor. While the Department cannot guarantee financial support, students can apply for teaching assistantships and other scholarships.

12.5.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply. See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > Application Procedures for detailed application procedures.

12.5.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Final acceptance to the M.Sc. Thesis or Ph.D. program depends on a faculty member agreeing to serve as the student's supervisor. A supervisor is not required for acceptance to the M.Sc. Non-Thesis program.
- The GRE – not required, but highly recommended.
- Proof of funding (all graduate programs, international applicants only): Documents must be provided in the application to prove that funding is available for the entire duration of the applied-for degree (including tuition, fees, surcharges, books and supplies, living and personal expenses, and any mandatory medical insurance required for the applicant's studies).
- An interview with the applicant may be requested by the Department of Food Science and Agricultural Chemistry in order to assist in the evaluation of the application.

12.5.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Food Science and Agricultural Chemistry and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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<tr>
<th>Application Opening Dates</th>
<th>Application Deadlines</th>
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<td>All Applicants</td>
<td>Non-Canadian citizens (incl. Special, Visiting &amp; Exchange)</td>
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<td>Canadian citizens/Perm. residents of Canada (incl. Special, Visiting &amp; Exchange)</td>
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<td>Current McGill Students (any citizenship)</td>
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Application Deadlines

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</tr>
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<tbody>
<tr>
<td>Fall Term:</td>
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<td>March 15</td>
<td>March 15</td>
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<td>Winter Term*:</td>
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<td>Feb. 15*</td>
<td>Aug. 31*</td>
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<tr>
<td>Summer Term:</td>
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</tr>
<tr>
<td>N/A</td>
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</tr>
</tbody>
</table>

* Admission to the Winter term is open for thesis programs only.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.5.4 Food Science and Agricultural Chemistry Faculty

Chair
Varoujan A. Yaylayan

Graduate Program Director
Ashraf Ismail

Professors
Hosahalli S. Ramaswamy; B.Sc.(B'lore), M.Sc., Ph.D.(Br. Col.)
Benjamin K. Simpson; B.Sc.(KNUST, Ghana), Ph.D.(Nfld.)
Varoujan A. Yaylayan; B.Sc.(Beirut), M.Sc., Ph.D.(Alta.)

Associate Professors
Saji George; B.Sc., M.Sc.(Mahatma Gandhi, Kerala), Ph.D.(NUS)
Ashraf A. Ismail; B.Sc., Ph.D.(McG.)
Salwa Karboune; B.Sc., M.Sc.(Hassan II, Rabat), D.E.A., Ph.D.(Marseille)

Assistant Professor
Stephane Bayen; B.Sc.(ENSCM), M.Sc.(NUS), M.Eng.(ENSCM), Ph.D.(NUS)
Jennifer Ronholm; B.Sc.(Wat.), Ph.D.(Ott.) (*joint appt. with Animal Science*)
Yixiang Wang; B.Sc., Ph.D.(Wuhan)

Adjunct Professors
Luis Garcia; M.Sc.(Guelph)
Jocelyn Pare; B.Sc.(McG.), Ph.D.(Car.)

Professors Post-Retirement
Inteaz Alli; B.Sc.(Guyana), M.Sc., Ph.D.(McG.)
Selim Kermasha; B.Sc.(Baghdad), D.Sc.(Nancy)
Frederik R. van de Voort; B.Sc., M.Sc., Ph.D.(Br. Col.)

12.5.5 Master of Science (M.Sc.) Food Science and Agricultural Chemistry (Thesis) (45 credits)

For candidates entering the M.Sc. program without restrictions, i.e., those not requiring a qualifying term/year, the M.Sc. degree consists of 45 graduate credits. These credits are obtained through a combination of graduate courses and a research thesis.

The residence time for a M.Sc. degree is three academic terms based on unqualified entry into the M.Sc. program. Students are encouraged to complete their studies within this time frame.

Thesis (30 credits)
Required Courses (6 credits)
FDSC 695 (3) M.Sc. Graduate Seminar 1
FDSC 696 (3) M.Sc. Graduate Seminar 2

Complementary Courses (9 credits)
At least 9 credits, normally from 500- or 600-level departmental courses.

12.5.6 Master of Science (M.Sc.) Food Science and Agricultural Chemistry (Non-Thesis) (45 credits)
This 45-credit program is offered to candidates who seek further training in Food Science, but do not wish to pursue independent research. These credits are obtained through a combination of graduate courses.

The residence time for a M.Sc. degree (Non-Thesis) is three academic terms.

PROGRAM REQUIREMENTS

Research Project (12 credits)
FDSC 697 (6) M.Sc. Project Part 1
FDSC 698 (6) M.Sc. Project Part 2

Complementary Courses (18 credits)
3 credits chosen from the following:
FDSC 695 (3) M.Sc. Graduate Seminar 1
FDSC 696 (3) M.Sc. Graduate Seminar 2

15 credits chosen from the following:
AGRI 510 (3) Professional Practice
FDSC 515 (3) Enzymology
FDSC 516 (3) Flavour Chemistry
FDSC 519 (3) Advanced Food Processing
FDSC 520 (3) Biophysical Chemistry of Food
FDSC 535 (3) Food Biotechnology
FDSC 536 (3) Food Traceability
FDSC 537 (3) Nutraceutical Chemistry
FDSC 538 (3) Food Science in Perspective
FDSC 540 (3) Sensory Evaluation of Foods
FDSC 545 (3) Advances in Food Microbiology
FDSC 634 (3) Food Toxins & Toxicants
FDSC 651 (3) Principles of Food Analysis 2
FDSC 652 (3) Separation Techniques in Food Analysis 2

Elective Courses (15 credits)
At the 500 level or higher, and chosen in consultation with the academic adviser.

12.5.7 Master of Science (M.Sc.) Food Science & Agricultural Chemistry: Food Safety (Non-Thesis) (45 credits)

The program is intended to train graduate students as specialists in food safety with the expectation that graduates will be well prepared academically to take on the challenging food safety events and issues that emerge both in Canada and globally. The program will cover food safety through the entire food supply chain from food production through processing/manufacturing to the food consumer; the courses which make up the program reflect the food safety considerations at the different stages of the farm to table food supply chain.

**Required Courses (12 credits)**

- FDSC 545 (3) Advances in Food Microbiology
- FDSC 624 (3) Current Food Safety Issues
- FDSC 626 (3) Food Safety Risk Assessment
- FDSC 634 (3) Food Toxins & Toxicants

**Research Project (12 credits)**

- FDSC 697 (6) M.Sc. Project Part 1
- FDSC 698 (6) M.Sc. Project Part 2

**Complementary Courses (15 credits)**

- 3 credits chosen from the following:
  - FDSC 695 (3) M.Sc. Graduate Seminar 1
  - FDSC 696 (3) M.Sc. Graduate Seminar 2

- 12 credits chosen from the following:
  - AGRI 510 (3) Professional Practice
  - BREE 535 (3) Food Safety Engineering
  - FDSC 525 (3) Food Quality Assurance
  - FDSC 536 (3) Food Traceability
  - FDSC 555 (3) Comparative Food Law
  - NUTR 512 (3) Herbs, Foods and Phytochemicals
  - OCCH 612 (3) Principles of Toxicology
  - PARA 515 (3) Water, Health and Sanitation

**Elective Courses (6 credits)**

At the 500 level or higher, and selected in consultation with the academic adviser.

12.5.8 Doctor of Philosophy (Ph.D.) Food Science and Agricultural Chemistry

Candidates will be judged principally on their research ability. Coursework will be arranged in consultation with the student's departmental graduate advisory committee.

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.
Required Courses (9 credits)

Note: Candidates should be prepared to take the Comprehensive Preliminary Examination before the end of the second year of the program.

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<td>FDSC 725</td>
<td>(3)</td>
<td>Advanced Topics in Food Science</td>
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<td>FDSC 797</td>
<td>(3)</td>
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</tr>
<tr>
<td>FDSC 798</td>
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<td>Ph.D. Graduate Seminar 2</td>
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</tbody>
</table>

12.6 Human Nutrition

12.6.1 Location

School of Human Nutrition
Macdonald-Stewart Building
McGill University, Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/nutrition

12.6.2 About Human Nutrition

In the School of Human Nutrition, cutting-edge nutrition research is conducted by its 12.5 tenure-track professors and six faculty lecturers in all areas recommended by North American Nutrition Societies. These include molecular and cellular nutrition, clinical, community, and international nutrition. Domains emphasized by School researchers include:

- nutritional biochemistry and metabolism;
- fetal, perinatal and childhood origins of health and disease;
- clinical and epidemiological studies optimizing health in at-risk populations including Aboriginal populations, mothers and children, and the elderly;
- development of novel nutritional and/or nutraceutical approaches to maintain health and for treatment during surgery and recovery from disease.

Research is conducted in our on-site research labs, the Centre for Indigenous Peoples' Nutrition and Environment (CINE), the McGill Institute for Global Food Security, the Mary Emily Clinical Nutrition Research Unit (MECNRU), and the MUHC Teaching Hospitals. Students can conduct research or participate in clinical rotations in Ghana and field sites in Asia, Africa, Latin America, and the Caribbean.

section 12.6.5: Master of Science (M.Sc.) Human Nutrition (Thesis) (45 credits)

A master’s degree in Human Nutrition offers advanced Nutrition courses in a broad range of research areas. The program is suitable for students with an undergraduate degree in nutritional sciences, exercise physiology, kinesiology, food science, biochemistry, medicine, or another closely related field. Students are required to complete advanced nutrition coursework and activities related to their thesis research. Graduates of our M.Sc. thesis degree have pursued successful careers in research, international health agencies, government agencies, and industry.


The M.Sc. Applied program is a course-based master’s program. It allows students to further develop knowledge and expertise in nutrition. Students are required to complete advanced Nutrition courses and activities related to a research project or an advanced practicum (reserved for registered dietitians). Careers include managerial positions for practising dietitians, and careers in nutrition programs, government, and industry.

section 12.6.6: Master of Science, Applied (M.Sc.A.) Human Nutrition (Non-Thesis): Dietetics Credentialing (83 credits)

The M.Sc. Applied program in Dietetics Credentialing is a course-based master's program with a dietetics Stage (internship) included. At the end of the program, students are qualified to be licensed with one of the provincial regulatory bodies in Canada, as well as in other countries, and practise in the areas of clinical nutrition, community nutrition, and foodservice management; French competency is an asset. The program is preceded by a Qualifying year, if necessary, to complete certain courses required for licensure. This is followed by three semesters of graduate-level courses and three semesters of Stage, which include a practice-based graduate project.
section 12.6.9: Doctor of Philosophy (Ph.D.) Human Nutrition

A Ph.D. degree in Human Nutrition is suitable for students with an M.Sc. degree in Nutritional Sciences or related areas who wish to become independent researchers and/or leaders in the field of nutritional sciences. The School offers a stimulating research environment with opportunities in a wide range of areas of basic science, clinical research with our many hospital clinicians, as well as population health in Canada and abroad. Careers include academic, senior government, and industry positions within Canada and internationally.

section 12.6.10: Graduate Diploma (Gr. Dip.) Registered Dietitian Credentialing (30 credits)

In the School of Human Nutrition at McGill, students pursuing a Ph.D. in human nutrition have the opportunity to apply to our Graduate Diploma in R.D. Credentialing, upon completion of the Ph.D. program and upon completion of the undergraduate courses required by l'Ordre professionnel des diététistes du Québec (OPDQ). Additional preparatory courses for Stages (internships) are NUTR 513, NUTR 628, NUTR 515. This Diploma consists of two semesters of Stage (internship) in Clinical Nutrition, Community Nutrition, and Foodservice Management. Upon completion of the Diploma, the recipient is eligible to register and practice as a Dietitian in Quebec, as well as in other Canadian provinces and other countries.

12.6.3 Human Nutrition Admission Requirements and Application Procedures

12.6.3.1 Admission Requirements

M.Sc. Thesis and M.Sc. Applied (Project, Practicum, and Dietetics Credentialing)

Applicants must be graduates of a university of recognized reputation and hold a B.Sc. degree equivalent to a McGill degree in a subject closely related to the one selected for graduate work. Applicants must have a minimum cumulative grade point average (CGPA) in McGill University’s credit equivalency of 3.2/4.0 (second class–upper division) for the M.Sc. Thesis and M.Sc. Applied Project/Practicum and 3.5/4.0 for the M.Sc. Applied Credentialing during their bachelor’s degree program. Eligible candidates to the M.Sc. (Applied) program may select one of three options:

1. The project option;
2. The practicum option, which is reserved for those who have completed a dietetics internship and six months of work experience and wish to further develop their skills in a particular area of practice through an advanced internship;
3. The dietetics credentialing option, for those who wish to follow a program combining courses and internship, leading to licensure as a dietitian.

Ph.D.

Applicants must be graduates of a university of recognized reputation and hold a B.Sc. and M.Sc. degree equivalent to a McGill degree in a subject closely related to the one selected for graduate work. Applicants must have a minimum cumulative grade point average (CGPA) in McGill University’s credit equivalency of 3.2/4.0 (second class–upper division) during their bachelor’s and master’s degree programs. Exceptional students may apply to transfer to the Ph.D. program after one year of study in the M.Sc. (Thesis) program.

Qualifying Students

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a Qualifying program if they have met the School's minimum CGPA of 3.2 out of 4.0. The courses to be taken in a Qualifying program will be prescribed by the academic unit. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year (two terms) is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program. Students must re-apply for admission to a degree program.

Financial Support

Financial support is highly competitive. Teaching assistantships, scholarships, and stipends from research grants may be available; however, the School cannot guarantee financial support.

12.6.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.6.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Final acceptance to the M.Sc. (Thesis) and Ph.D. programs depends on a faculty member agreeing to serve as the student's supervisor. A supervisor is not required for acceptance to the M.Sc. (Applied) program.
- Graduate Record Exam (GRE) – The GRE is required for all Ph.D. applicants to the School of Human Nutrition who are submitting non-Canadian or non-USA transcripts.
12.6.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the School of Human Nutrition and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at [www.mcgill.ca/gps/contact/graduate-program](http://www.mcgill.ca/gps/contact/graduate-program).

<table>
<thead>
<tr>
<th></th>
<th>All Applicants</th>
<th>Non-Canadian citizens (incl. Special, Visiting &amp; Exchange)</th>
<th>Canadian citizens/Perm. residents of Canada (incl. Special, Visiting &amp; Exchange)</th>
<th>Current McGill Students (any citizenship)</th>
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<td>Fall Term:</td>
<td>Sept. 15</td>
<td>March 1</td>
<td>March 1</td>
<td>March 1</td>
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<td>Winter Term*:</td>
<td>Feb. 15*</td>
<td>June 1*</td>
<td>Oct. 1*</td>
<td>Oct. 1*</td>
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<td>N/A</td>
<td>N/A</td>
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</tbody>
</table>

* Admission to the Winter term is open for thesis programs only.

Admission to graduate studies is competitive; accordingly, late applications are considered only as time and space permit.

International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.6.4 Human Nutrition Faculty

**Director**

Linda J. Wykes

**Emeritus Professor**

Harriet V. Kühnlein; B.S.(Penn. St.), M.S.(Ore. St.), Ph.D.(Calif.), R.D.

Timothy A. Johns; B.Sc.(McM.), M.Sc.(Br. Col.), Ph.D.(Mich.)

**Professors**

Luis B. Agellon; B.Sc., Ph.D.(McM.)

Hope Weiler; B.A.Sc.(Guelph), Ph.D.(McM.), R.D.(CDO) (*Canada Research Chair* (*Director, Mary Emily Clinical Nutrition Research Unit*)

Linda J. Wykes; B.Sc., M.Sc., Ph.D.(Tor.)

**Associate Professors**

Niladri Basu; B.Sc., M.Sc.(Br. Col.), Ph.D.(McG.) (*Canada Research Chair* (*joint appt. with Natural Resource Sciences*) (*Assoc. Member of Epidemiology and Biostatistics, Faculty of Medicine*)

Stéphanie Chevalier; B.Sc., M.Sc., Ph.D.(Montr.), Ph.D.(OPDQ) (*Assoc. Member Dept of Medicine*)

Treena Delormier: B.Sc., M.Sc.(McG.), Ph.D.(Montr.), P. Dt.(OPDQ)

Kristine G. Koski; B.S., M.S.(Wash.), Ph.D.(Calif.), R.D.(U.S.)

Stan Kubow; B.Sc.(McG.), M.Sc.(Tor.), Ph.D.(Guelph)

Grace S. Marquis; B.A.(Ind.), M.Sc.(Mich. St.), Ph.D.(Cornell)

Hugo Melgar-Quinonez; M.Sc.(SPHM), M.D.(USAC), D.Sc.(Friedrich Schiller Univ.) (*Director, McGill Institute for Global Food Security*)

**Assistant Professors**

Anne-Sophie Brazeau; B.Sc., Ph.D.(Montr.), P. Dt.(OPDQ) (*Director, Dietetics Education and Practice*)

Daiva Nielsen; B.Sc., Ph.D.(Tor.)

**Senior Faculty Lecturers**

Sandy Phillips; B.Sc., M.Sc.(A.)McG.), P. Dt. (*University Coordinator, Professional Practice (Stage) in Dietetics*)

Maureen Rose; B.Sc., M.Ed., Ph.D.(McG.), P. Dt. (*Director, Food and Nutrition Laboratories*)
Faculty Lecturers

Paul-Guy Duhamel; B.Sc. (McG.), M.Sc. (Montr.), Dt. P. (Manager, Food and Nutrition Laboratories)
Mary Hendrickson; B.A. (St. Benedict), B.Sc. (Minn.), M.Sc. (Colo. St.), Dt. P.
Hugues Plourde; B.Sc. (McG.), M.Sc., Ph.D. (Montr.), Dt. P.
Joane Routhier; B.Sc. (McG.)

Sessional Lecturers

Peter Bender (PT); B.Ed., M.A. (McG.), Ph.D. (Flor. St.)
Francesca Cambria; B.Com., Gr.Dip (C'dia)
Steven Landry (PT); B.Com., B. Ed., M.B.A. (McG.)
Dina Spigelski; B.A., B.Sc. (Nutr. Sc.), M.Sc. (McG.)

Associate Members

Anaesthesia: Franco Carli, Ralph Lattermann, Thomas Schricker
Food Science & Agricultural Chemistry: Stephane Bayen
Kinesiology: Ross Andersen
Medicine: Louis Beaumier, L. John Hoffer, Larry Lands, Errol B. Marliiss, José Morais, Jean-François Yale
Natural Resource Sciences: Sebastien Faucher
Parasitology: Marilyn E. Scott

Adjunct Professor

Kevin A. Cockell; B.Sc., Ph.D. (Guelph) (Health Canada)

12.6.5 Master of Science (M.Sc.) Human Nutrition (Thesis) (45 credits)

Thesis Courses (33 credits)

NUTR 680 (7) Human Nutrition M.Sc. Thesis 1
NUTR 681 (8) Human Nutrition M.Sc. Thesis 2
NUTR 682 (9) Human Nutrition M.Sc. Thesis 3
NUTR 683 (9) Human Nutrition M.Sc. Thesis 4

Required Courses (3 credits)

NUTR 695 (1) Human Nutrition Research Orientation
NUTR 696 (1) Human Nutrition Seminar
NUTR 697 (1) MSc Final Presentation

Complementary Courses (9 credits)

3 credits in graduate-level statistics
3 credits in graduate-level research methods
3 credits in graduate-level courses (chosen in consultation with supervisory committee)

12.6.6 Master of Science, Applied (M.Sc.A.) Human Nutrition (Non-Thesis): Dietetics Credentialing (83 credits)

This program is open to students with a B.Sc. in nutrition or an allied health profession, including biochemistry, kinesiology, physiology, or other related field, who would like to become a member of the Ordre professional des diététistes du Québec. Students may be required to complete a qualifying year (a variable number of required undergraduate credits), before taking the required M.Sc. Applied professional course, complementary courses, and elective courses (46 credits), followed by a Stage (Internship) component, which includes a practice based project (37 credits). On completion, students will meet
OPDQ credits and professional practice requirements for licensure as a registered dietitian. A basic level or professional French competency will be required to complete the professional practice Stage component. The entrance requirements of a CGPA of 3.5 must be maintained throughout the program.

### Required Courses (74 credits)

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<td>Emerging Issues for Nutritionists</td>
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6 credits from the following:

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<td>ANSC 551</td>
<td>3</td>
<td>Carbohydrate and Lipid Metabolism</td>
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<td>ANSC 552</td>
<td>3</td>
<td>Protein Metabolism and Nutrition</td>
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<td>ANSC 560</td>
<td>3</td>
<td>Biology of Lactation</td>
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<td>EDKP 654</td>
<td>3</td>
<td>Sport Psychology</td>
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<td>EDPC 501</td>
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<td>Facilitating Relationships</td>
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<td>EDPF 504</td>
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<td>Communication and Critical Conflict Resolution</td>
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<td>EDPE 502</td>
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<td>Theories of Human Development</td>
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<td>EPIB 507</td>
<td>3</td>
<td>Biostats for Health Sciences</td>
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<td>FDSC 537</td>
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<td>Nutraceutical Chemistry</td>
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<td>Herbs, Foods and Phytochemicals</td>
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NUTR 608  (3)  Special Topics 1
NUTR 610  (3)  Maternal and Child Nutrition
NUTR 641  (3)  Advanced Global Food Security
PSYC 650  (3)  Advanced Statistics 1

Elective Courses (3 credits)
To be chosen, at the 500 level or higher, in consultation with the Program Coordinator.

12.6.7  Master of Science, Applied (M.Sc.A.) Human Nutrition (Non-Thesis): Practicum (45 credits)

Practicum (12 credits)
NUTR 656  (3)  M.Sc. (Applied) Practicum 1
NUTR 657  (3)  M.Sc. (Applied) Practicum 2
NUTR 658  (3)  M.Sc. (Applied) Practicum 3
NUTR 659  (3)  M.Sc. (Applied) Practicum 4

Required Courses (6 credits)
NUTR 651  (3)  M.Sc. (Applied) Literature Review
NUTR 660  (1)  M.Sc. (Applied) Nutrition 2
NUTR 695  (1)  Human Nutrition Research Orientation
NUTR 696  (1)  Human Nutrition Seminar

Complementary Courses (18 credits)
3 credits in statistics at the 500 level or higher
3 credits in research methods at the 500 level or higher
12 credits of course work, at the 500 level or higher, in Nutrition, Animal Science, or Food Science chosen in consultation with the student's supervisor.

Elective Courses (9 credits)
9 credits of 500-level or higher courses in consultation with the student’s academic adviser or supervisor.

12.6.8  Master of Science, Applied (M.Sc.A.) Human Nutrition (Non-Thesis): Project (45 credits)

Research Project (12 credits)
NUTR 652  (3)  M.Sc. (Applied) Project 1
NUTR 653  (3)  M.Sc. (Applied) Project 2
NUTR 654  (3)  M.Sc. (Applied) Project 3
NUTR 655  (3)  M.Sc. (Applied) Project 4

Required Courses (6 credits)
NUTR 651  (3)  M.Sc. (Applied) Literature Review
NUTR 660  (1)  M.Sc. (Applied) Nutrition 2
NUTR 695  (1)  Human Nutrition Research Orientation
NUTR 696  (1)  Human Nutrition Seminar
Complementary Courses (18 credits)
3 credits of 500-level or higher Statistics.
3 credits in research methods at the 500 level or higher.
12 credits of course work, at the 500 level or higher, in Nutrition, Animal Science, or Food Science chosen in consultation with the student's supervisor.

Elective Courses (9 credits)
9 credits of 500-level or higher courses in consultation with the student’s academic adviser or supervisor.

12.6.9 Doctor of Philosophy (Ph.D.) Human Nutrition

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses

<table>
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<th>Course</th>
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<th>Description</th>
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<td>NUTR 701</td>
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<td>Doctoral Comprehensive Examination</td>
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<tr>
<td>NUTR 796</td>
<td>(1)</td>
<td>PhD Research Presentation</td>
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12.6.10 Graduate Diploma (Gr. Dip.) Registered Dietitian Credentialing (30 credits)

The Graduate Diploma in Registered Dietitian Credentialing is open to students with a Ph.D. in Human Nutrition from the School of Human Nutrition who would like to become a member of the Ordre professionnel des diététistes du Québec (OPDQ). The Diploma consists of 30 weeks of stage placements in Clinical, Community, and Management rotations. Before acceptance into the program, students will be required to complete courses in clinical nutrition, and certain required courses in preparation for Stage; and to demonstrate a basic level of French competency. This preparation may be done during the Ph.D. program, or in a qualifying year after the Ph.D. On completion, students will meet OPDQ credits and professional practice requirements for licensure as a registered dietitian.

The Graduate Diploma is open to students who have completed a graduate degree with the School of Human Nutrition including NUTR 513 Credentialing in Dietetics.

Required Courses (30 credits)

<table>
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<th>Course</th>
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</tbody>
</table>

12.7 Natural Resource Sciences

12.7.1 Location

Department of Natural Resource Sciences
McGill University, Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/hrsc

2019-2020, Faculty of Agricultural and Environmental Sciences, including School of Human Nutrition (Graduate), McGill University (Published March 18, 2019)
12.7.2 About Natural Resource Sciences

The Department of Natural Resource Sciences offers programs leading to M.Sc. and Ph.D. degrees in:

- Agricultural Economics (M.Sc. only)
- Entomology (Environment and Neotropical Environment options available)
- Microbiology (Bioinformatics and Environment options available)
- Renewable Resources (this includes Forest Science, Micrometeorology, Soil Science, and Wildlife Biology; Environment and Neotropical Environment options available)

An interdisciplinary option in Bioinformatics for doctoral students in Microbiology is also available.

The Department possesses, or has access to, excellent facilities for laboratory and field research. Affiliated with the Department are the Lyman Entomological Museum and Research Laboratory, the Molson Nature Reserve, the Morgan Arboretum, and the Ecomuseum of the St. Lawrence Valley Natural History Society; details are available on the Natural Resource Sciences website.

Master of Science Degrees

section 12.7.5: Master of Science (M.Sc.) Agricultural Economics (Thesis) (45 credits)

This program provides students with applied economic concepts and tools to identify, define, and analyze economic problems affecting the performance of the agri-food sector and the environment. The ideal prior preparation is an undergraduate degree in Agricultural Economics or Economics, including undergraduate courses in intermediate economic theory (micro and macro), calculus, algebra, statistics, and econometrics.

Attention is given to the development of analytical skills in the broad areas of agricultural, environmental, and ecological economics. Students may specialize, by way of their research program, in agribusiness, development, finance, marketing and trade, policy, and resource economics. The program prepares graduates for rewarding careers in research, analysis, and decision-making in academia, private and NGO sectors, and government.

section 12.7.6: Master of Science (M.Sc.) Entomology (Thesis) (45 credits)

Graduate students in the entomology program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program include terrestrial arthropod ecology, physiology, zoogeography, diversity, and systematics. Our students typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances both theory and applied management of ecosystems. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.

section 12.7.7: Master of Science (M.Sc.) Entomology (Thesis): Environment (46 credits)

Please contact the Department for more information about this program.

section 12.7.8: Master of Science (M.Sc.) Entomology (Thesis): Neotropical Environment (48 credits)

Please contact the Department for more information about this program.

section 12.7.9: Master of Science (M.Sc.) Microbiology (Thesis) (45 credits)

Graduate students in the microbiology program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program range from the study of microbial diversity in extreme environments, either natural or man-induced, to the role of microbes in managed ecosystems, such as in agriculture and forests. Our students typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances our fundamental knowledge about microorganisms as well as leads to improved efficiencies of our managed ecosystems. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.

section 12.7.10: Master of Science (M.Sc.) Microbiology (Thesis): Environment (46 credits)

Please contact the Department for more information about this program.

section 12.7.11: Master of Science (M.Sc.) Renewable Resources (Thesis) (45 credits)

Graduate students in the renewable resources program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program include environmental and ecological economics, environmental health and toxicology, forest ecology, fish and fisheries biology, landscape ecology, limnology, micrometeorology, soil science, and wildlife biology. They typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances both theory and applied management of natural resources. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.
section 12.7.12: Master of Science (M.Sc.) Renewable Resources (Thesis): Environment (46 credits)

Please contact the Department for more information about this program.

section 12.7.13: Master of Science (M.Sc.) Renewable Resources (Thesis): Neotropical Environment (48 credits)

Please contact the Department for more information about this program.

section 12.7.14: Master of Science (M.Sc.) Renewable Resources (Non-Thesis): Environmental Assessment (45 credits)

This program is currently not offered.

Ph.D. Degrees in Entomology, Microbiology, or Renewable Resources (Includes Micrometeorology, Forest Science, Soil Science, and Wildlife Biology)

section 12.7.15: Doctor of Philosophy (Ph.D.) Entomology

Graduate students in the entomology program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program include terrestrial arthropod ecology, physiology, zoogeography, diversity, and systematics. Our students typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances both theory and applied management of ecosystems. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.

section 12.7.16: Doctor of Philosophy (Ph.D.) Entomology: Environment

Please contact the Department for more information about this program.

section 12.7.17: Doctor of Philosophy (Ph.D.) Entomology: Neotropical Environment

Please contact the Department for more information about this program.

section 12.7.18: Doctor of Philosophy (Ph.D.) Microbiology

Graduate students in the microbiology program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program range from the study of microbial diversity in extreme environments, either natural or man-induced, to the role of microbes in managed ecosystems, such as in agriculture and forests. Our students Typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances our fundamental knowledge about microorganisms and leads to improved efficiencies of our managed ecosystems. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.

section 12.7.19: Doctor of Philosophy (Ph.D.) Microbiology: Bioinformatics

Please contact the Department for more information about this program.

section 12.7.20: Doctor of Philosophy (Ph.D.) Microbiology: Environment

Please contact the Department for more information about this program.

section 12.7.21: Doctor of Philosophy (Ph.D.) Renewable Resources

Graduate students in the renewable resources program work within, and often across, multiple disciplines of basic and applied environmental sciences. Specialties within the program include environmental and ecological economics, environmental health and toxicology, forest ecology, fish and fisheries biology, landscape ecology, limnology, micrometeorology, soil science, and wildlife biology. They typically have exceptionally strong backgrounds in one or more of these specialties and an interest in research that advances both theory and applied management of natural resources. After completing their degrees they go on to careers in academia, environmental policy, government agencies, industry, and other fields.

section 12.7.22: Doctor of Philosophy (Ph.D.) Renewable Resources: Environment

Please contact the Department for more information about this program.

section 12.7.23: Doctor of Philosophy (Ph.D.) Renewable Resources: Neotropical Environment

Please contact the Department for more information about this program.
12.7.3 Natural Resource Science Admission Requirements and Application Procedures

12.7.3.1 Admission Requirements

M.Sc. Thesis (Agricultural Economics)

Direct admission to the M.Sc. requires the completion of a B.Sc. in Agricultural Economics or a closely related area, with the minimum equivalent cumulative grade point average (CGPA) of 3.0/4.0 (second class–upper division) or minimum grade point average (GPA) of 3.2/4.0 during the last two years of full-time university study. High grades are expected in courses considered by the department to be preparatory to the graduate program.

The ideal preparation includes courses in agricultural economics, economic theory (intermediate micro and macro), calculus, linear algebra, and statistics. Students with deficiencies in these areas will be required to take additional courses as part of their degree program.

M.Sc. Thesis (Entomology, Microbiology, Renewable Resources)

Candidates are required to have a bachelor's degree with a minimum equivalent CGPA of 3.0/4.0 (second class–upper division) or a minimum GPA of 3.2/4.0 during the last two years of full-time university study. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program.

M.Sc. in Renewable Resources (Non-Thesis) – Environmental Assessment Option

Applications are not being accepted for the current academic year; the program is currently under review.

Ph.D. Thesis (Entomology, Microbiology, Renewable Resources)

Candidates are normally required to hold an M.Sc. degree and will be judged primarily on their ability to conduct an original and independent research study.

Qualifying Program

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected, may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program.

Financial Aid

Financial aid is available but limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided through a scholarship/award and/or by the student’s supervisor. Academic units cannot guarantee financial support via teaching assistantships.

12.7.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.7.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Acceptance to all programs normally depends on a staff member agreeing to serve as the student’s supervisor and the student obtaining financial support.
- The GRE – not required, but highly recommended.

12.7.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Natural Resource Sciences and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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<tr>
<th>Application Opening Dates</th>
<th>Application Deadlines</th>
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<td>Non-Canadian citizens (incl. Special, Visiting &amp; Exchange)</td>
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<td>Sept. 15</td>
</tr>
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<td>Winter Term:</td>
<td>Feb. 15</td>
</tr>
<tr>
<td>Summer Term:</td>
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</table>

International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.
## Natural Resource Sciences Faculty

### Chair
Brian Driscoll

### Graduate Program Director
Benoît Côté

### Program Director - Agricultural Economics
Paul J. Thomassin

### Emeritus Professors
- David M. Bird; B.Sc.(Guelph), M.Sc., Ph.D.(McG.) – *Wildlife Biology*
- William H. Hendershot; B.Sc.(Tor.), M.Sc.(McG.), Ph.D.(Br. Col.) – *Soil Science*
- Edmund S. Idziak; B.Sc.(Agr.), M.Sc.(McG.), D.Sc.(Delft) – *Microbiology*
- Angus F. MacKenzie; B.S.A., M.Sc.(Sask.), Ph.D.(Cornell) – *Soil Science*
- Peter H. Schuepp; Dipl.Sc. Nat.(Zür.), Ph.D.(Tor.) – *Agricultural Physics*
- Robin K. Stewart; B.Sc.(Agr.), Ph.D.(Glas.) – *Entomology*

### Professors
- Peter Brown; B.A.(Haver.), M.A., Ph.D.(Col.) (*joint appt. with Geography and McGill School of Environment*) – *Environmental Policy and Ethics*
- Christopher Buddle; B.Sc.(Guelph), Ph.D.(Alta.) – *Forest Insect Ecology*
- James W. Fyles; B.Sc., M.Sc.(Vic., BC), Ph.D.(Alta.) (*Tomlinson Chair in Forest Ecology*) – *Forest Resources*
- Paul J. Thomassin; B.Sc.(McG.), M.S., Ph.D.(Hawaii Pac.) – *Agricultural and Environmental Economics*
- Joann Whalen; B.Sc.(Agr.)(Dal.), M.Sc.(McG.), Ph.D.(Ohio St.) – *Soil Science (William Dawson Scholar)*
- Lyle G. Whyte; B.Sc.(Regina), Ph.D.(Wat.) – *Microbiology*

### Associate Professors
- Niladri Basu; B.Sc.(Qu.), M.Sc.(Br. Col.), Ph.D.(McG.) (*Canada Research Chair*) (*joint appt. with School of Human Nutrition*) – *Ecotoxicology*
- Elena Bennett; B.A.(Oberlin), M.S., Ph.D.(Wisc.) (*joint appt. with McGill School of Environment*) – *Ecosystem Ecology (EWR Steacie Fellowship)*
- Jeffrey Cardille; B.Sc.(Carn. Mell), M.Sc.(Georgia Tech.), M.Sc., PhD.(Wisc.) (*joint appt. with McGill School of Environment*) – *Landscape Ecology*
- Benoît Côté; B.Sc., Ph.D.(Laval) – *Forest Resources*
- Brian T. Driscoll; B.Sc., Ph.D.(McM.) – *Microbiology*
- Gary B. Dunphy; B.Sc.(New Br.), M.Sc., Ph.D.(Nfld.) – *Entomology*
- Sebastien Faucher; B.Sc., Ph.D.(Montr.) – *Microbiology*
- Gordon Hickey; B.Sc.(Mell.), Ph.D.(Br. Col.), EMPA(ANZSOG, Monash) – *Sustainable Natural Resource Management (William Dawson Scholar)*
- Murray Humphries; B.Sc.(Manit.), M.Sc.(Alta.), Ph.D.(McG.) – *Wildlife Biology (Northern Research Chair)*
- Nicolas Kosoy; B.Sc.(Univ. Simon Bolivar), M.Sc.(Kent & Univ. Autonoma de Barcelona), Ph.D.(Univ. Autonoma de Barcelona) (*joint appt. with McGill School of Environment*) – *Ecological Economics*
- Ian B. Strachan; B.Sc.(Tor.), M.Sc., Ph.D.(Qu.) – *Micrometeorology*

### Assistant Professors
- Kyle Elliott; B.Sc.(Br. Col.), M.Sc., Ph.D.(Manit.) (*Canada Research Chair*) – *Avian Conservation Biology*
- Aurélie Harou; B.Sc.(Sus.), M.Sc.(Calif., Davis), Ph.D.(Cornell)
- Jessica Head; B.Sc.(McG.), Ph.D.(Ott.) – *Ecotoxicology*
- Cynthia Kallenback; B.Sc.(Sonoma St.), M.Sc., M.Sc.(Calif., Davis), Ph.D.(N. Hamp.)
- Melissa McKinney; B.Sc.(Br. Col.), M.Sc.,(Windsor), Ph.D.(Car.)
Assistant Professors
Denis Roy; B.Sc.(Qu.), M.Sc., Ph.D.(Windsor)

Associate Member
Christopher Barrington (School of Environment)
David Green (Redpath Museum)

Adjunct Professors
Asim Biswas
Kimberly Fernie
Charles W. Greer
Baoluo Ma
Christopher Solomon

Affiliate Member
Geoffrey Sunahara

12.7.5 Master of Science (M.Sc.) Agricultural Economics (Thesis) (45 credits)

Graduate students receive rigorous training in economic theory, institutional economics, and quantitative methods, with a focus on applying economic concepts and tools to identify, define, analyze, and solve economic problems in the agri-food sector and the environment. The ideal prior preparation is an undergraduate degree in Agricultural Economics or Economics, including undergraduate courses in intermediate economic theory (micro and macro), calculus, algebra, statistics, and econometrics.

Attention is given to analytical skills in the broad areas of agricultural and environmental economics. Students may specialize, by way of their research program, in agribusiness, resource economics, development, finance, marketing, trade, policy, and environmental economics. The program is intended to prepare graduates for rewarding careers in research, analysis, and decision-making in academia, private, NGO, and government sectors.

Thesis Courses (24 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Course Title</th>
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<tbody>
<tr>
<td>AGEC 691</td>
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<td>M.Sc. Thesis 1</td>
</tr>
<tr>
<td>AGEC 692</td>
<td>3</td>
<td>M.Sc. Thesis 2</td>
</tr>
<tr>
<td>AGEC 693</td>
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Required Course (3 credits)

<table>
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<tr>
<td>AGEC 690</td>
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Complementary Courses (18 credits)

6 credits, two theory courses chosen from:

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<tr>
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<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 633</td>
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<td>Environmental and Natural Resource Economics</td>
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<tr>
<td>ECON 610</td>
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<td>Microeconomic Theory 1</td>
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<tr>
<td>ECON 620</td>
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<td>Macroeconomic Theory 1</td>
</tr>
<tr>
<td>ECON 621</td>
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<td>Macroeconomic Theory 2</td>
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</tbody>
</table>

or a theory course, at the 500 level or higher, approved by the Graduate Program Director.

At least 3 credits, one quantitative methods course chosen from:
ECON 662D1  (3)  Econometrics
ECON 662D2  (3)  Econometrics
ECON 665  (3)  Quantitative Methods

or a quantitative course, at the 500 level or higher, approved by the Graduate Program Director.

A minimum of 3 credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 630</td>
<td>3</td>
<td>Food and Agricultural Policy</td>
</tr>
<tr>
<td>AGEC 633</td>
<td>3</td>
<td>Environmental and Natural Resource Economics</td>
</tr>
<tr>
<td>AGEC 642</td>
<td>3</td>
<td>Economics of Agricultural Development</td>
</tr>
<tr>
<td>AGEC 685</td>
<td>3</td>
<td>Selected Topics in Agricultural Economics</td>
</tr>
</tbody>
</table>

Additional Complementary Courses: To complete the 45 credit program requirement from courses in your field or thesis area at the 500 level or higher in consultation with the Agricultural Economics Adviser.

### 12.7.6 Master of Science (M.Sc.) Entomology (Thesis) (45 credits)

**Thesis Courses (36 credits)**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Title</th>
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</thead>
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<td>M.Sc. Thesis Research 2</td>
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<tr>
<td>NRSC 693</td>
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<td>M.Sc. Thesis Research 3</td>
</tr>
</tbody>
</table>

**Required Courses (3 credits)**

<table>
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<tr>
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<th>Credits</th>
<th>Title</th>
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</thead>
<tbody>
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<td>NRSC 644</td>
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<td>Graduate Seminar 2</td>
</tr>
<tr>
<td>NRSC 651</td>
<td>1</td>
<td>Graduate Seminar 3</td>
</tr>
</tbody>
</table>

**Complementary Courses (6 credits)**

Two 3-credit courses at the 500, 600, or 700 level; normally one of these will be a course in statistics.

### 12.7.7 Master of Science (M.Sc.) Entomology (Thesis): Environment (46 credits)

**Thesis Courses (36 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRSC 691</td>
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<td>M.Sc. Thesis Research 1</td>
</tr>
<tr>
<td>NRSC 692</td>
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<td>M.Sc. Thesis Research 2</td>
</tr>
<tr>
<td>NRSC 693</td>
<td>12</td>
<td>M.Sc. Thesis Research 3</td>
</tr>
</tbody>
</table>

**Required Courses (7 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVR 610</td>
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<td>Foundations of Environmental Policy</td>
</tr>
<tr>
<td>ENVR 650</td>
<td>1</td>
<td>Environmental Seminar 1</td>
</tr>
<tr>
<td>ENVR 651</td>
<td>1</td>
<td>Environmental Seminar 2</td>
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<tr>
<td>ENVR 652</td>
<td>1</td>
<td>Environmental Seminar 3</td>
</tr>
<tr>
<td>NRSC 651</td>
<td>1</td>
<td>Graduate Seminar 3</td>
</tr>
</tbody>
</table>

**Complementary Courses (3 credits)**
One of the following courses:

- ENVR 519 (3) Global Environmental Politics
- ENVR 544 (3) Environmental Measurement and Modelling
- ENVR 620 (3) Environment and Health of Species
- ENVR 622 (3) Sustainable Landscapes
- ENVR 630 (3) Civilization and Environment
- ENVR 680 (3) Topics in Environment 4

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

### 12.7.8 Master of Science (M.Sc.) Entomology (Thesis): Neotropical Environment (48 credits)

**Thesis Courses (36 credits)**

- NRSC 691 (12) M.Sc. Thesis Research 1
- NRSC 692 (12) M.Sc. Thesis Research 2
- NRSC 693 (12) M.Sc. Thesis Research 3

**Required Courses (9 credits)**

- BIOL 640 (3) Tropical Biology and Conservation
- ENVR 610 (3) Foundations of Environmental Policy
- NRSC 643 (1) Graduate Seminar 1
- NRSC 644 (1) Graduate Seminar 2
- NRSC 651 (1) Graduate Seminar 3

Note: Participation in the MSE-Panama Symposium presentation in Montreal is also required.

**Elective Courses (3 credits)**

3 credits, at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student’s supervisor AND the Neotropical Environment Options Director.

### 12.7.9 Master of Science (M.Sc.) Microbiology (Thesis) (45 credits)

**Thesis Courses (36 credits)**

- NRSC 691 (12) M.Sc. Thesis Research 1
- NRSC 692 (12) M.Sc. Thesis Research 2
- NRSC 693 (12) M.Sc. Thesis Research 3

**Required Courses (3 credits)**

- NRSC 643 (1) Graduate Seminar 1
- NRSC 644 (1) Graduate Seminar 2
- NRSC 651 (1) Graduate Seminar 3

**Complementary Courses (6 credits)**

Two 3-credit 500-, 600-, or 700-level courses; normally one of these will be a course in statistics.
12.7.10 Master of Science (M.Sc.) Microbiology (Thesis): Environment (46 credits)

**Thesis Courses (36 credits)**
- NRSC 691 (12) M.Sc. Thesis Research 1
- NRSC 692 (12) M.Sc. Thesis Research 2
- NRSC 693 (12) M.Sc. Thesis Research 3

**Required Courses (7 credits)**
- ENVR 610 (3) Foundations of Environmental Policy
- ENVR 650 (1) Environmental Seminar 1
- ENVR 651 (1) Environmental Seminar 2
- ENVR 652 (1) Environmental Seminar 3
- NRSC 651 (1) Graduate Seminar 3

**Complementary Course (3 credits)**
One of the following courses:
- ENVR 519 (3) Global Environmental Politics
- ENVR 544 (3) Environmental Measurement and Modelling
- ENVR 620 (3) Environment and Health of Species
- ENVR 622 (3) Sustainable Landscapes
- ENVR 630 (3) Civilization and Environment
- ENVR 680 (3) Topics in Environment 4

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

12.7.11 Master of Science (M.Sc.) Renewable Resources (Thesis) (45 credits)

Includes Micrometeorology, Forest Science, Soil Science and Wildlife Biology as areas of research.

**Thesis Courses (36 credits)**
- NRSC 691 (12) M.Sc. Thesis Research 1
- NRSC 692 (12) M.Sc. Thesis Research 2
- NRSC 693 (12) M.Sc. Thesis Research 3

**Required Courses (3 credits)**
- NRSC 643 (1) Graduate Seminar 1
- NRSC 644 (1) Graduate Seminar 2
- NRSC 651 (1) Graduate Seminar 3

**Complementary Courses (6 credits)**
Two 3-credit courses at the 500 level or higher recommended by the supervisory committee; one of which must be in quantitative methods/techniques.

12.7.12 Master of Science (M.Sc.) Renewable Resources (Thesis): Environment (46 credits)

**Thesis Courses (33 credits)**
Required Courses (7 credits)

- **ENVR 610 (3)** Foundations of Environmental Policy
- **ENVR 650 (1)** Environmental Seminar 1
- **ENVR 651 (1)** Environmental Seminar 2
- **ENVR 652 (1)** Environmental Seminar 3
- **NRSC 651 (1)** Graduate Seminar 3

Complementary Courses (6 credits)

3 credits, one of the following courses:

- **ENVR 519 (3)** Global Environmental Politics
- **ENVR 544 (3)** Environmental Measurement and Modelling
- **ENVR 620 (3)** Environment and Health of Species
- **ENVR 622 (3)** Sustainable Landscapes
- **ENVR 630 (3)** Civilization and Environment
- **ENVR 680 (3)** Topics in Environment 4

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

3 credits of statistics at the 500, 600, or 700 level.

**12.7.13 Master of Science (M.Sc.) Renewable Resources (Thesis): Neotropical Environment (48 credits)**

Thesis Courses (36 credits)

- **NRSC 691 (12)** M.Sc. Thesis Research 1
- **NRSC 692 (12)** M.Sc. Thesis Research 2
- **NRSC 693 (12)** M.Sc. Thesis Research 3

Required Courses (9 credits)

- **BIOL 640 (3)** Tropical Biology and Conservation
- **ENVR 610 (3)** Foundations of Environmental Policy
- **NRSC 643 (1)** Graduate Seminar 1
- **NRSC 644 (1)** Graduate Seminar 2
- **NRSC 651 (1)** Graduate Seminar 3

Note: Participation in the MSE-Panama Symposium presentation in Montreal is also required.

Elective Courses (3 credits)

3 credits, at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student’s supervisor AND the Neotropical Environment Options Director.
12.7.14 Master of Science (M.Sc.) Renewable Resources (Non-Thesis): Environmental Assessment (45 credits)

**This program is currently not offered.**

The non-thesis master’s in Renewable Resources: Environmental Assessment option is normally taken over a one year cycle beginning in the Winter term and concluding in the Fall term. It is comprised of three interrelated elements: graduate-level courses, primarily given in the Winter term, a Summer term internship, and a project-related research paper, which is completed in the Fall term. The program is aimed at environmental assessment professionals and advanced environmental science scholars planning for careers in the public and private sector agencies, which guide environmental impact assessment, integrated assessment, and sustainable development in Canada and internationally. McGill's non-thesis master’s in Environmental Assessment is offered in conjunction with a Memorandum of Understanding (MOU) with the United Nations Environment Program (UNEP - 2003), which designates the Faculty of Agricultural and Environmental Sciences as a UNEP Collaborating Centre on Environmental Assessment. An important component of the MOU is that the Faculty advance teaching and training through the development of course offerings that enable students to prepare for contributing to sustainable development by utilizing the excellent materials provided by UNEP and other national and international agencies.

Research Project (9 credits)
NRSC 616 (9) Environmental Assessment Project Paper

Required Internship (15 credits)
NRSC 615 (15) Environmental Assessment Internship

Required Courses (15 credits)
NRSC 610 (3) Advanced Environmental Assessment
NRSC 611 (3) Environmental Assessment Knowledge Base
NRSC 612 (3) Environmental Assessment and Sustainable Development
NRSC 613 (3) Strategic and Sectoral Environmental Assessment
NRSC 614 (3) Special Topics 7

Complementary Courses (6 credits)
500- or 600-level relevant courses to be chosen in consultation with the Supervisor and Program Director.

12.7.15 Doctor of Philosophy (Ph.D.) Entomology

Includes Micrometeorology, Forest Science, Soil Science, and Wildlife Biology.

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses
NRSC 701 (0) Ph.D. Comprehensive Examination
NRSC 751 (0) Graduate Seminar 4
NRSC 752 (0) Graduate Seminar 5
NRSC 753 (0) Graduate Seminar 6
NRSC 754 (0) Graduate Seminar 7

Coursework
Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.
12.7.16 Doctor of Philosophy (Ph.D.) Entomology: Environment

**Thesis**
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

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<td>ENVR 650</td>
<td>(1)</td>
<td>Environmental Seminar 1</td>
</tr>
<tr>
<td>ENVR 651</td>
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</tr>
<tr>
<td>ENVR 652</td>
<td>(1)</td>
<td>Environmental Seminar 3</td>
</tr>
<tr>
<td>NRSC 701</td>
<td>(0)</td>
<td>Ph.D. Comprehensive Examination</td>
</tr>
<tr>
<td>NRSC 754</td>
<td>(0)</td>
<td>Graduate Seminar 7</td>
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</tbody>
</table>

**Coursework**
Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.

**Complementary Courses**
One course chosen from the following:

- ENVR 519 (3) Global Environmental Politics
- ENVR 544 (3) Environmental Measurement and Modelling
- ENVR 620 (3) Environment and Health of Species
- ENVR 622 (3) Sustainable Landscapes
- ENVR 630 (3) Civilization and Environment
- ENVR 680 (3) Topics in Environment 4

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

12.7.17 Doctor of Philosophy (Ph.D.) Entomology: Neotropical Environment

**Thesis**
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

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<tr>
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<th>Credits</th>
<th>Title</th>
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<tr>
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<td>Tropical Biology and Conservation</td>
</tr>
<tr>
<td>ENVR 610</td>
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<td>Foundations of Environmental Policy</td>
</tr>
<tr>
<td>NRSC 701</td>
<td>(0)</td>
<td>Ph.D. Comprehensive Examination</td>
</tr>
<tr>
<td>NRSC 751</td>
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</tr>
<tr>
<td>NRSC 754</td>
<td>(0)</td>
<td>Graduate Seminar 7</td>
</tr>
</tbody>
</table>
Note: Participation in the MSE-Panama Symposium presentation in Montreal is also required.

**Elective Courses**

3 credits, at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student’s supervisor AND the Neotropical Environment Options Director.

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**Doctor of Philosophy (Ph.D.) Microbiology**

12.7.18

Includes Micrometeorology, Forest Science, Soil Science, and Wildlife Biology.

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>NRSC 701</td>
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<td>Ph.D. Comprehensive Examination</td>
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<tr>
<td>NRSC 751</td>
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<td>NRSC 754</td>
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</table>

**Coursework**

Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.

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**Doctor of Philosophy (Ph.D.) Microbiology: Bioinformatics**

Thesis

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

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<thead>
<tr>
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<th>Credits</th>
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<td>Bioinformatics Seminar</td>
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<tr>
<td>COMP 616D2</td>
<td>1.5</td>
<td>Bioinformatics Seminar</td>
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<tr>
<td>NRSC 701</td>
<td>0</td>
<td>Ph.D. Comprehensive Examination</td>
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<tr>
<td>NRSC 751</td>
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<td>NRSC 754</td>
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<td>Graduate Seminar 7</td>
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</table>

**Complementary Courses**

6 credits from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BINF 621</td>
<td>3</td>
<td>Bioinformatics: Molecular Biology</td>
</tr>
<tr>
<td>BMDE 652</td>
<td>3</td>
<td>Bioinformatics: Proteomics</td>
</tr>
<tr>
<td>BTEC 555</td>
<td>3</td>
<td>Structural Bioinformatics</td>
</tr>
</tbody>
</table>
Additional courses at the 500, 600, or 700 level may be required at the discretion of the candidate's supervisory committee.

### 12.7.20 Doctor of Philosophy (Ph.D.) Microbiology: Environment

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

- **ENVR 610** (3) Foundations of Environmental Policy
- **ENVR 650** (1) Environmental Seminar 1
- **ENVR 651** (1) Environmental Seminar 2
- **ENVR 652** (1) Environmental Seminar 3
- **NRSC 701** (0) Ph.D. Comprehensive Examination
- **NRSC 754** (0) Graduate Seminar 7

**Coursework**

Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.

**Complementary Courses**

One course chosen from the following:

- **ENVR 519** (3) Global Environmental Politics
- **ENVR 544** (3) Environmental Measurement and Modelling
- **ENVR 620** (3) Environment and Health of Species
- **ENVR 630** (3) Civilization and Environment
- **ENVR 680** (3) Topics in Environment 4

or another 500-, 600-, or 700-level course recommended by the Advisory Committee and approved by the Environment Option Committee.

### 12.7.21 Doctor of Philosophy (Ph.D.) Renewable Resources

Includes Micrometeorology, Forest Science, Soil Science, and Wildlife Biology.

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses**

- **NRSC 701** (0) Ph.D. Comprehensive Examination
Coursework
Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.

12.7.22 Doctor of Philosophy (Ph.D.) Renewable Resources: Environment

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses

- ENVR 610 (3) Foundations of Environmental Policy
- ENVR 650 (1) Environmental Seminar 1
- ENVR 651 (1) Environmental Seminar 2
- ENVR 652 (1) Environmental Seminar 3
- NRSC 701 (0) Ph.D. Comprehensive Examination
- NRSC 754 (0) Graduate Seminar 7

Complementary Courses
One course chosen from the following:

- ENVR 519 (3) Global Environmental Politics
- ENVR 544 (3) Environmental Measurement and Modelling
- ENVR 620 (3) Environment and Health of Species
- ENVR 622 (3) Sustainable Landscapes
- ENVR 630 (3) Civilization and Environment
- ENVR 680 (3) Topics in Environment 4

or other graduate course recommended by the Advisory Committee and approved by the Environment Option Committee.

12.7.23 Doctor of Philosophy (Ph.D.) Renewable Resources: Neotropical Environment

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses
Note: Participation in the MSE-Panama Symposium presentation in Montreal is required.

**Elective Courses**

3 credits, at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student’s supervisor AND the Neotropical Environment Options Director.

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### 12.8 Parasitology

#### 12.8.1 Location

Institute of Parasitology
Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/parasitology

#### 12.8.2 About Parasitology

The Institute of Parasitology offers M.Sc. and Ph.D. thesis research degrees in Parasitology and a non-thesis M.Sc. (Applied) degree in Biotechnology (Information on the Biotechnology programs is found in the section 12.4: Biotechnology section). For the Ph.D. program, it is possible to add a Bioinformatics or Environment option.

The Institute of Parasitology teaches and researches the phenomenon of parasitism in humans, livestock, and other animals, and the control of parasitic diseases. The interface of parasitism/immunity/nutrition is also examined in the context of the host-parasite interaction. Current research involves:

- molecular biology;
- molecular genetics;
- biochemistry;
- bioinformatics;
- pharmacology;
- control and drug resistance;
- immunology;
- epidemiology;
- biology;
- neurobiology;
- drug discovery;
- the ecology of parasitic organisms, such as helminths and protozoa, viruses, and cancer cells.

The non-thesis program in Biotechnology offers course-based curricula with practical training in laboratory courses and internships.

The Institute is housed in its own building adjacent to the Macdonald Campus Library and has well-equipped modern laboratories with excellent facilities for molecular research, and includes a confocal suite. Small and large animal facilities are available on the Macdonald campus. The Institute is affiliated with the J.D. MacLean Centre for Tropical Diseases at the McGill University Health Centre (MUHC).
Parasitology Programs

**section 12.8.5: Master of Science (M.Sc.) Parasitology (Thesis) (45 credits)**

A research project is undertaken in an area of parasitology under the direction of a supervisor, and a thesis is produced. Coursework is minimal. Graduates have gone on to medical school, to teaching positions, or have found employment in scientific fields.

**section 12.8.6: Doctor of Philosophy (Ph.D.) Parasitology**

An advanced, original research project is undertaken in an area of parasitology supervised by faculty staff. Coursework is minimal. Graduates are well suited for teaching positions in academia or scientific careers in a university, private industry, or government.

**section 12.8.7: Doctor of Philosophy (Ph.D.) Parasitology: Bioinformatics**

An advanced, original research project in an area of parasitology is undertaken supervised by faculty staff, and a thesis is produced. Additional coursework in the field of bioinformatics is required for this option. Graduates are well suited for a teaching or research career, especially where there is particular emphasis on the science of bioinformatics.

**section 12.8.8: Doctor of Philosophy (Ph.D.) Parasitology: Environment**

An advanced, original research project in an area of parasitology is undertaken supervised by faculty staff, and a thesis is produced. There is additional coursework on environmental topics for this option. Graduates are prepared for careers in academia, industry, or government, especially where the focus is on environmental protection or management of valuable natural resources, such as water.

### 12.8.3 Parasitology Admission Requirements and Application Procedures

#### 12.8.3.1 Admission Requirements

Candidates for either the M.Sc. or the Ph.D. thesis research degree should possess a bachelor's degree in the biological or medical sciences with a minimum cumulative grade point average (CGPA) of 3.2/4.0 (second class–upper division). High grades are expected in courses considered by the academic unit to be preparatory to the graduate program. Previous experience in parasitology is not essential.

#### Qualifying Students

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected, may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a Qualifying program does not guarantee admission to a degree program.

#### Financial Support

Financial support is very limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student’s supervisor. Academic units cannot guarantee financial support via teaching assistantships or other funds. For information on awards and funding opportunities, see:

- [www.mcgill.ca/gradapplicants/funding](http://www.mcgill.ca/gradapplicants/funding);
- [www.mcgill.ca/parasitology/graduatestudies/admissions](http://www.mcgill.ca/parasitology/graduatestudies/admissions);
- [www.mcgill.ca/macdonald/prospective/gradstudies/funding](http://www.mcgill.ca/macdonald/prospective/gradstudies/funding);
- [www.mcgill.ca/macdonald/gradstudents/gradawards](http://www.mcgill.ca/macdonald/gradstudents/gradawards); and

#### 12.8.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at [www.mcgill.ca/gradapplicants/apply](http://www.mcgill.ca/gradapplicants/apply).

See [University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > Application Procedures](http://www.mcgill.ca/graduate-studies/apply) for detailed application procedures.

#### 12.8.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:
Acceptance to all thesis research programs depends on a staff member agreeing to serve as the student’s supervisor and the student obtaining financial support.

International students are strongly encouraged to secure funding from their home country or international agencies.

Other Supporting Documents – Other documents may be required for the admission process. Please consult the Parasitology website at www.mcgill.ca/parasitology/graduatestudies/admission for full details.

### 12.8.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Institute of Parasitology and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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</tbody>
</table>

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

### 12.8.4 Parasitology Faculty

**Director**

Armando Jardim

**Professors**

- Timothy G. Geary; B.Sc. (Notre Dame), Ph.D. (Mich.) (*Canada Research Chair in Parasite Biotechnology*)
- Roger Prichard; B.Sc., Ph.D. (NSW) (*James McGill Professor*)
- Marilyn Scott; B.Sc. (New Br.), Ph.D. (McG.)

**Associate Professors**

- Robin N. Beech; B.Sc. (Nott.), Ph.D. (Edin.)
- Elias Georges; B.Sc., Ph.D. (McG.) (*Canadian Pacific Chair in Biotechnology*)
- Armando Jardim; B.Sc., Ph.D. (Vic., BC)
- Petra Rohrbach; B.Sc. (McG.), Ph.D. (Heidel.)
- Reza Salavati; B.A., M.A., Calif. St., Ph.D. (WesL.)

**Assistant Professors**

- Igor Cestari; B.Sc. (UFPE, Brazil), M.Sc., Ph.D. (FIOCRUZ, Brazil)
- Fernando Lopes; B.Sc. (UniBH, Brazil), M.Sc., Ph.D. (UFMG, Brazil)
- Jianguo Xia; B.Sc. (Peking), M.Sc., Ph.D. (Alta.) (*Canada Research Chair in Bioinformatics and Big Data Analytics*)

**Associate Members**

- Gregory J. Matlashewski; B.Sc. (C’dia), Ph.D. (Ott.)
- Momar Ndao; B.Sc., DVM (Dakar), M.Sc., Ph.D. (IMFA, Belgium)
- Martin Olivier; B.Sc., M.Sc. (Montr.), Ph.D. (McG.)
- Mary Stevenson; B.A. (Hood Coll.), M.Sc., Ph.D. (CUA)
- Brian Ward; M.Sc. (Oxf.), M.D., C.M. (McG.), DTM&H (Lond.)
Adjunct Professors
Boakye Boatin; M.D.(Ghana), M.Sc.(Liv.), M.Phil.(Lond.)
Tatiana Scorza Dagert; B.Sc.(Los Andes, Venezuela), M.Sc., Ph.D.(Vrije, Belgium)
Traian Sulea; M.Sc.(Polytechnic, Timisoara), Ph.D.(West, Timisoara)
Karine Thivierge; B.Sc.(Laval), M.Sc., Ph.D.(McG.)

12.8.5 Master of Science (M.Sc.) Parasitology (Thesis) (45 credits)

Thesis Courses (35 credits)
- PARA 687 (10) Thesis Research 1
- PARA 688 (10) Thesis Research 2
- PARA 689 (12) Thesis Research 3

Required Courses (10 credits)
- PARA 606 (2) Parasitology Seminar
- PARA 607 (2) Parasitology Research Seminar
- PARA 635 (3) Cell Biology and Infection
- PARA 655 (3) Host-Parasite Interactions

Other course work in related subjects may be required, depending upon the candidate's background and research orientation.

12.8.6 Doctor of Philosophy (Ph.D.) Parasitology

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses (10 credits)
- PARA 635 (3) Cell Biology and Infection
- PARA 655 (3) Host-Parasite Interactions
- PARA 701 (0) PhD Comprehensive Exam
- PARA 710 (2) Parasitology Ph.D. Seminar 1
- PARA 711 (2) Parasitology Ph.D. Seminar 2

* Note: In the first year of the doctoral program, the candidates must successfully complete a written thesis proposal and make an oral presentation on their proposed research to fulfil PARA 700, the comprehensive component.

Depending upon the candidate's background, other course work may be required.

12.8.7 Doctor of Philosophy (Ph.D.) Parasitology: Bioinformatics

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Courses (13 credits)
Complementary Courses (6 credits)
6 credits chosen from the following:

- **Bioinformatics: Molecular Biology** (BINF 621)
- **Bioinformatics: Proteomics** (BMDE 652)
- **Structural Bioinformatics** (BTEC 555)
- **Bioinformatics: Functional Genomics** (COMP 618)
- **Systems Biology and Biophysics** (PHGY 603)

Additional courses at the 500, 600, or 700 level may be required at the discretion of the candidate's supervisory committee.

**12.8.8 Doctor of Philosophy (Ph.D.) Parasitology: Environment**

**Thesis**
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Courses (14 credits)**

- **Foundations of Environmental Policy** (ENVR 610)
- **Environmental Seminar 1** (ENVR 650)
- **Environmental Seminar 2** (ENVR 651)
- **Environmental Seminar 3** (ENVR 652)
- **PhD Comprehensive Exam** (PARA 701)
- **Parasitology Ph.D. Seminar 1** (PARA 710)
- **Parasitology Ph.D. Seminar 2** (PARA 711)

**Complementary Courses (6 credits)**
One of the following courses:

- **Cell Biology and Infection** (PARA 635)
- **Host-Parasite Interactions** (PARA 655)

One course chosen from the following:

- **Global Environmental Politics** (ENVR 519)
- **Environmental Measurement and Modelling** (ENVR 544)
- **Environment and Health of Species** (ENVR 620)
- **Sustainable Landscapes** (ENVR 622)
12.9  Plant Science

12.9.1  Location

Department of Plant Science
Macdonald Campus
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Canada
Telephone: 514-398-7838
Email: gradstudies.macdonald@mcgill.ca
Website: www.mcgill.ca/plant

12.9.2  About Plant Science

The Department offers an M.Sc. and a Ph.D. in Plant Science with options in Bioinformatics, Environment, or Neotropical Environment, and provides for study in all fields of plant science. Research facilities—both field and laboratory—are available for investigations in plant breeding, crop physiology, crop management, crop quality, plant ecology, the epidemiology and biology of plant diseases, epigenetics, biosystematics, recombinant DNA technology, mycology, weed biology, tissue culture, plant biochemistry, and bioinformatics. Facilities include:

- Horticultural Research Centre;
- Emile A. Lods Agronomy Research Centre;
- greenhouses;
- growth cabinets;
- McGill University Herbarium;
- multi-scale imaging facility;
- genome editing laboratory;
- plant-pest containment laboratory;
- field phenomics platform.

An advisory committee is named for each student and has the responsibility of developing the program of study appropriate to the student's background and area of specialization.

section 12.9.5: Master of Science (M.Sc.) Plant Science (Thesis) (45 credits)

This M.Sc. in Plant Science requires approximately two years for completion. Overall, the program consists of two graduate-level courses, seminars, and a research project leading to a thesis. The courses and the research project are chosen and defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, the private sector, or further graduate studies in a related field.

section 12.9.6: Master of Science (M.Sc.) Plant Science (Thesis): Bioinformatics (48 credits)

This M.Sc. in Plant Science requires approximately two years for completion. Overall, the program consists of two graduate-level courses, seminars, and a research project leading to a thesis. The courses and the research project are chosen and defined with the help of an advisory committee. The goal of the Bioinformatics option is to train students to become researchers in the interdisciplinary field of bioinformatics, which lies at the intersection of biological/medical sciences and mathematics/computer science/engineering. This option has an added emphasis on bioinformatics, including additional seminars. Subsequent career paths are varied, but include work with government agencies, the private sector, or further graduate studies in a related field.

section 12.9.7: Master of Science (M.Sc.) Plant Science (Thesis): Environment (48 credits)

This M.Sc. in Plant Science requires approximately two years for completion. Overall, the program consists of two graduate-level courses, seminars, and a research project leading to a thesis. The courses and the research project are chosen and defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, the private sector, or further graduate studies in a related field. This Environment graduate option has an added emphasis on environmental sciences, including additional courses and seminars. It is aimed at students who wish to take an
section 12.9.7: Master of Science (M.Sc.) Plant Science (Thesis): Environment (48 credits)

interdisciplinary approach in their graduate research on environmental issues and who wish to benefit from interactions with students from a wide range of disciplines.

section 12.9.8: Master of Science (M.Sc.) Plant Science (Thesis): Neotropical Environment (48 credits)

This M.Sc. in Plant Science requires approximately two years for completion. Overall, the program consists of two graduate-level courses, seminars, and a research project leading to a thesis. The courses and the research project are chosen and defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, the private sector, or further graduate studies in a related field. This option has an added emphasis on neotropical environments, including additional courses and seminars. Part of the program takes place in Panama.

section 12.9.9: Master of Science, Applied (M.Sc.A.) Plant Science (Non-Thesis) (45 credits)

This M.Sc. in Plant Science requires about 18 months or four to five terms for completion. Overall, the program consists of graduate-level courses, seminars, and a research project. The courses and the research project are chosen and defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, the private sector, or further graduate studies in a related field.

section 12.9.10: Doctor of Philosophy (Ph.D.) Plant Science

This Ph.D. in Plant Science requires approximately three years for completion. Overall, the program consists of seminars and a research project leading to a thesis. Students must also complete a comprehensive examination within their first year of study. The research project is defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, universities, or the private sector.

section 12.9.11: Doctor of Philosophy (Ph.D.) Plant Science: Bioinformatics

This Ph.D. in Plant Science requires approximately three years for completion. Overall, the program consists of seminars and a research project leading to a thesis. Students must also complete a comprehensive examination within their first year of study. The research project is defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, universities, or the private sector. This Bioinformatics option has an added emphasis on bioinformatics, including additional courses and seminars. The goal of this option is to train students to become researchers in the interdisciplinary field of bioinformatics, which lies at the intersection of biological/medical sciences and mathematics/computer science/engineering.

section 12.9.12: Doctor of Philosophy (Ph.D.) Plant Science: Environment

This Ph.D. in Plant Science requires approximately three years for completion. Overall, the program consists of seminars and a research project leading to a thesis. Students must also complete a comprehensive examination within their first year of study. The research project is defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, universities, or the private sector. This Environment graduate option has an added emphasis on environmental sciences, including additional courses and seminars. It is aimed at students who wish to take an interdisciplinary approach in their graduate research on environmental issues and who wish to benefit from interactions with students from a wide range of disciplines.

section 12.9.13: Doctor of Philosophy (Ph.D.) Plant Science: Neotropical Environment

This Ph.D. in Plant Science requires approximately three years for completion. Overall, the program consists of seminars and a research project leading to a thesis. Students must also complete a comprehensive examination within their first year of study. The research project is defined with the help of an advisory committee. Subsequent career paths are varied, but include work with government agencies, universities, or the private sector. This option has an added emphasis on neotropical environments, including additional courses and seminars. Part of the program takes place in Panama.

section 12.9.14: Graduate Certificate (Gr. Cert.) Bioinformatics (15 credits)

The Graduate Certificate in Bioinformatics is a new cross-disciplinary program that teaches students the foundations of bioinformatics thinking, methodology, and applications through hands-on experience with computers and bioinformatics tools. The program introduces students to many areas of application such as medicine, agriculture, and chemistry. Required courses include basic UNIX skills, genomics data, common bioinformatics software, relational databases, and web resources. The Certificate is completed in one term (Winter term only) after which graduates may go on to pursue successful careers in the biomedical, biotechnology, and biosciences fields.

12.9.3 Plant Science Admission Requirements and Application Procedures

12.9.3.1 Admission Requirements

General

The minimum cumulative grade point average (CGPA) is 3.0/4.0 (second class--upper division) or a minimum GPA of 3.2/4.0 during the last two years of full-time university study. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program.
Ph.D.

Ph.D. candidates are required to have an M.Sc. degree in an area related to the chosen field of specialization for the Ph.D. program. Outstanding M.Sc. students may be permitted to transfer to the second year of the Ph.D. program following one year of study.

Qualifying Students

Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a Qualifying program if they have met the Graduate and Postdoctoral Studies minimum CGPA of 3.0/4.0. The course(s) to be taken in a Qualifying program will be prescribed by the academic unit concerned. Qualifying students are registered in graduate studies, but not as candidates for a degree. Only one Qualifying year is permitted. Successful completion of a qualifying program does not guarantee admission to a degree program.

Financial Aid

Financial aid is very limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student’s supervisor. Academic units cannot guarantee financial support via teaching assistantships or other funds.

12.9.3.2 Application Procedures

McGill’s online application form for graduate program candidates is available at www.mcgill.ca/gradapplicants/apply. See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > : Application Procedures for detailed application procedures.

12.9.3.2.1 Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Acceptance to all programs depends on a staff member agreeing to serve as the student’s supervisor and the student obtaining financial support.
- The GRE – not required, but highly recommended.

12.9.3.3 Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Plant Science and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at www.mcgill.ca/gps/contact/graduate-program.

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Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit. International applicants are advised to apply well in advance of these dates because immigration procedures may be lengthy.

12.9.4 Plant Science Faculty

Chair
Martina V. Stromvik

Emerita Professor
Deborah J. Buszard; B.Sc.(Bath), Ph.D.(Lond.)

Professors
Pierre Dutilleul; B.Sc., Ph.D.(Univ. catholique de Louvain)
Anja Geitmann; Diplom(Konstanz), Ph.D.(Siena) (Canada Research Chair in Biomechanics of Plant Development)
Suha Jabaji; B.Sc.(Beirut), M.Sc.(Guelph), Ph.D.(Wat.)
Professors
Ajjamada C. Kushalappa; B.Sc., M.Sc.(B'Lore), Ph.D.(Flor.)
Philippe Seguin; B.Sc.(Agr.), M.Sc.(McG.), Ph.D.(Minn.)
Donald L. Smith; B.Sc., M.Sc.(Acad.), Ph.D.(Guelph) (*James McGill Professor*)
Alan K. Watson; B.Sc.(Agr.), M.Sc.(Br. Col.), Ph.D.(Sask.)

Associate Professors
Jacqueline C. Bede; B.Sc.(Calg.), M.Sc., Ph.D.(Tor.)
Sylvie de Blois; B.Sc.(Agr.)(McG.), M.Sc., Ph.D.(Montr.)
Jean-Benoit Charron; B.Sc.(Montr.), M.Sc., Ph.D.(UQAM)
Jaswinder Singh; B.Sc.(Agr.), M.Sc.(Punjab), Ph.D.(Syd.)
Martina V. Stromvik; B.A., M.Sc.(Stockholm), Ph.D.(Ill.)

Assistant Professors
Valérie Gravel; B.Sc.(Agr.), M.Sc., Ph.D.(Laval)
Valerio Hoyos-Villegas; B.Sc.(Caldas), M.Sc.(Missouri/Col.), Ph.D.(Mich.)
Olivia Wilkins; B.Sc.(Manit.), Ph.D.(Tor.)

Faculty Lecturers
Caroline Begg; B.Sc.(Agr.)(McG.), M.Sc.(Sask.), Ph.D.(McG.)
David Wees; B.Sc.(Agr.), M.Sc.(McG.)

Adjunct Professors
Konstantinos Aliferis
Annick Bertrand

12.9.5 Master of Science (M.Sc.) Plant Science (Thesis) (45 credits)

Thesis Courses (39 credits)
PLNT 664 (12) M.Sc. Thesis 1
PLNT 665 (12) M.Sc. Thesis 2
PLNT 666 (15) M.Sc. Thesis 3

Required Invitational Seminar
PLNT 690 (0) Research Horizons in Plant Science 1

Complementary Courses (6 credits)
Two graduate-level courses

Additional courses may be required at the discretion of the candidate's supervisory committee.

12.9.6 Master of Science (M.Sc.) Plant Science (Thesis): Bioinformatics (48 credits)

Thesis Courses (39 credits)
PLNT 664 (12) M.Sc. Thesis 1
PLNT 665 (12) M.Sc. Thesis 2
### Master of Science (M.Sc.) Plant Science (Thesis): Environment (48 credits)

#### Thesis Courses (39 credits)

<table>
<thead>
<tr>
<th>Course</th>
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<th>Description</th>
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</thead>
<tbody>
<tr>
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#### Required Invitational Seminar

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#### Required Courses (6 credits)

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<td>ENVR 610</td>
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</tr>
<tr>
<td>ENVR 650</td>
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<td>Environmental Seminar 1</td>
</tr>
<tr>
<td>ENVR 651</td>
<td>1</td>
<td>Environmental Seminar 2</td>
</tr>
<tr>
<td>ENVR 652</td>
<td>1</td>
<td>Environmental Seminar 3</td>
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</table>

#### Complementary Courses (3 credits)

Chosen from one of the following courses:

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</tbody>
</table>
or other graduate course recommended by the Advisory Committee and approved by the Environment Option Committee.

Additional courses may be required at the discretion of the candidate's Supervisory Committee.

12.9.8 Master of Science (M.Sc.) Plant Science (Thesis): Neotropical Environment (48 credits)

Candidates must participate in the STRI seminar series when in residence in Panama, and in the MSE-Panama Symposium Presentation in Montreal.

Thesis Courses (39 credits)

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</tr>
</tbody>
</table>

Elective Courses (3 credits)

3 credits at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student's supervisor AND the Neotropical Environment Options Director.

Additional courses may be required at the discretion of the candidate's supervisory committee.

12.9.9 Master of Science, Applied (M.Sc.A.) Plant Science (Non-Thesis) (45 credits)

N.B. this program is under revision. Please contact Ms. Carolyn Bowes for information.

12.9.10 Doctor of Philosophy (Ph.D.) Plant Science

Students who have taken their M.Sc. degree at McGill University will be required to spend one term in study at another research institution.

Thesis

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Invitational Seminar

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</tbody>
</table>
Required Courses
* Must be taken within one year of registering

PLNT 701 (0) Doctoral Comprehensive Examination

Complementary Courses
Any courses at the 500 or 600 level deemed necessary for the chosen area of specialization.

12.9.11 Doctor of Philosophy (Ph.D.) Plant Science: Bioinformatics

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Invitational Seminar

PLNT 690 (0) Research Horizons in Plant Science 1

Required Courses (3 credits)
* Must be taken within one year of registering.

COMP 616D1 (1.5) Bioinformatics Seminar
COMP 616D2 (1.5) Bioinformatics Seminar
PLNT 701* (0) Doctoral Comprehensive Examination

Complementary Courses (6 credits)
Two courses to be chosen from the following:

BINF 511 (3) Bioinformatics for Genomics
BINF 621 (3) Bioinformatics: Molecular Biology
BMDE 652 (3) Bioinformatics: Proteomics
BTEC 555 (3) Structural Bioinformatics
COMP 618 (3) Bioinformatics: Functional Genomics
PHGY 603 (3) Systems Biology and Biophysics

Additional courses at the 500 or 600 level may be required at the discretion of the candidate's advisory committee.

12.9.12 Doctor of Philosophy (Ph.D.) Plant Science: Environment

Thesis
A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

Required Invitational Seminar

PLNT 690 (0) Research Horizons in Plant Science 1

Required Courses (6 credits)
* Must be taken within the first year of registering

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<td>PLNT 701*</td>
<td>(0)</td>
<td>Doctoral Comprehensive Examination</td>
</tr>
</tbody>
</table>

**Coursework**

Course requirements are specified by the staff in the discipline, but are flexible and depend largely on the student's background, immediate interests, and ultimate objectives.

**Complementary Courses (3 credits)**

One course chosen from the following:

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<td>ENVR 622</td>
<td>(3)</td>
<td>Sustainable Landscapes</td>
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<td>ENVR 630</td>
<td>(3)</td>
<td>Civilization and Environment</td>
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<tr>
<td>ENVR 680</td>
<td>(3)</td>
<td>Topics in Environment 4</td>
</tr>
</tbody>
</table>

or other graduate course recommended by the Advisory Committee and approved by the Environment Option Committee.

**12.9.13 Doctor of Philosophy (Ph.D.) Plant Science: Neotropical Environment**

Students who have taken their M.Sc. degree at McGill University will be required to spend one term in study at another research institution.

The required thesis for this Ph.D. degree must display original scholarship expressed in proper literate style and must be a distinct contribution to knowledge. Candidates must participate in the STRI seminar series when in residence in Panama, and in the MSE-Panama Symposium Presentation in Montreal.

**Thesis**

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner.

The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

**Required Invitational Seminar**

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**Required Courses (6 credits)**

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**Elective Courses (3 credits)**

3 credits at the 500 level or higher, on environmental issues to be chosen in consultation with and approved by the student's supervisor AND the Neotropical Environment Options Director.
12.9.14 Graduate Certificate (Gr. Cert.) Bioinformatics (15 credits)

**Required Courses (9 credits)**

- BINF 511 (3) Bioinformatics for Genomics
- BINF 660 (3) Advances in Bioinformatics
- BTEC 555 (3) Structural Bioinformatics

**Complementary Courses (6 credits)**

6 credits from the following:

- ANSC 565 (3) Applied Information Systems
- BMDE 652 (3) Bioinformatics: Proteomics
- COMP 616D1 (1.5) Bioinformatics Seminar
- COMP 616D2 (1.5) Bioinformatics Seminar
- COMP 616N1 (1.5) Bioinformatics Seminar
- COMP 616N2 (1.5) Bioinformatics Seminar
- COMP 618 (3) Bioinformatics: Functional Genomics
- GLIS 673 (3) Bioinformatics Resources
- HGEN 663 (3) Beyond the Human Genome