The publication is produced in electronic form and the most recent version is the official university publication. Archival copies are available at www.mcgill.ca/study.

This publication provides guidance to prospects, applicants, students, f

The Concurrent B.Sc. and B.Ed. program is designed to provide you with the opportunity to obtain both a B.Sc. and a B.Ed. after a minimum of 135 credits of study. For more information, see section 13.34: Science or Mathematics for Teachers and the Faculty of Education.

In addition to the Major program in Software Engineering offered in the Faculty of Science, there is also a Bachelor of Software Engineering program offered jointly with the Faculty of Engineering (refer to Faculty of Engineering > Department of Electrical and Computer Engineering).

Finally, the Faculties of Arts and Science jointly offer the Bachelor of Arts and Science (B.A. & Sc.), which is described under Bachelor of Arts & Science.

4 About the Faculty of Science

McGill's second-largest faculty: 14 schools and departments, including the Redpath Museum, Canada's oldest museum of natural history focusing on teaching, research, and outreach; 20 research centres and institutes.

Students: 4361 undergraduate, 906 graduate, and 131 postdoctoral researchers, for a total of 5398 students.

265 faculty members, including tenured and tenure-track professors.

Has produced seven Nobel laureates: five were Faculty of Science graduates, while two winners were Science faculty members.

Research b

Laurie Hendren; B.Sc., M.Sc.(Qu.), Ph.D.(C'nell)	Associate Dean (Academic)
Nicole Allard; B.A.(W. Ont.), M.A.(Guelph), M.Ed.(McG.)	Director of Advising Services
Peter Grütter; Ph.D.(Basel) (James McGill Professor)	Associate Dean (Research and Graduate Education)
Pete Barry; B.Sc.(C'dia), M.Sc.(McG.)	Chief Academic Adviser
Josie D'Amico	Assistant to the Dean

4.3 Science Office for Undergraduate Student Advising (SOUSA)

The Science Office for Undergraduate Student Advising (SOUSA) pro

6.4 Academic Programs

The Faculty of Science offers a vast array of study and research opportunities at the undergraduate level, and it is very important that you familiarize yourself with all the alternatives open to you before deciding on a program of study. For an overview of programs offered in the B.Sc., see the Faculty of Science Programs of Study at: http://www.mcgill.ca/science/prospective/programs

6.4.1 Liberal, Major, Honours, and Joint Honours Programs

As a Science student, if you need 96 or fewer credits to complete your degree requirements, you are required to select your courses in each term with a view to timely completion of your degree and program requirements. You must register in one of the following types of departmental programs leading to the degree of Bachelor of Science:

6.4.1.1 Liberal Programs

Liberal programs provide students with the opportunity to study the core of one science discipline along with a breadth component from another area of science or from many other disciplines. In a liberal program, you must complete a Core Science Component (CSC) (45-50 credits), plus a Breadth Component (at least 18 credits). The requirements for the Core Science Components are given under departmental sections of this publication where applicable.

For the Breadth Component, you must complete one of the following:

- Minor Program (18-24 credits) one of the programs listed in section 10.2 Minor Programs
- Arts Minor or Major Concentration (18 or 36 credits) one of the programs listed in section 10.6 Faculty of Arts Major and Minor Concentration

6.4.5 Internship Year in Science (IYS)

All B.Sc. programs can include an internship component. For more details, students should refer to section 12.1 Industrial Practicum (IP) and Internship Year in Science (IYS), section 10.5 Internship Programs – Industrial Practicum (IP) and Internship Year in Science (IYS), and www.mcgill.ca/science/internships-field/internships.

6.4.6 McGill School of Environment

The Faculty of Science is one of the four faculties in partnership with the McGill School of Environment. For more information, see the McGill School of Environment section of this publication.

6.5 Course Requirements

All required and complementary courses used to fulfill program requirements, including the basic Science requirements, must be completed with a grade of C or better. If you fail to obtain a Satisfactory grade in a required course, you must either pass the supplemental examination in the course or do additional work for a supplemental grade, if these options are available, or repeat the course. Course substitution will be allowed only in special cases; you should consult your academic adviser.

Normally, you are permitted to repeat a failed course only once. (Failure is considered to be a grade of less than C or the administrative failures of J and KF.) If a required course is failed a second time, you must appeal to the Director of Advising Services for permission to take the course a third time. If permission is denied by the Director of Advising Services and/or by the Committee on Student Standing, on appeal, you must withdraw from the program. If the failed course is a complementary course required by the program, you may choose to replace it with another appropriate complementary course. If you choose to substitute another complementary course for a complementary course in which a D was received, credit for the first course will still be given, but as an elective. If you repeat a If you courses on the not-approved list for credit. Requests for permission to take courses that are not on either list should be addressed to the Director of Advising Services.

The regulations are as follows:

- You may take only 6 credits per year, up to 18 credits in all, of courses outside the Faculties of Arts and of Science.
- For a list of courses considered to be in the Faculty of Science , or in the Faculty of Arts , consult the PDF version of this publication available at www.mcgill.ca/study. Go to Courses and look under Faculty of Science or Faculty of Arts.
- Courses in other faculties that are considered as taught by Science (e.g., EXMD, IT, and PHAR) are so designated under the Faculty of Science section of this publication.
- Courses in Music are considered as outside the Faculties of Arts and of Science, except MUAR courses, which are considered Arts courses.
- All courses listed in the Religious Studies section (RELG) are considered as courses in Arts and Science except for courses restricted to B.Th. or S.T.M. students and courses that require permission of the Chair of the B.Th. Committee.
- Students should consult the list of restricted courses outside of the Faculties of Arts and of Science on the SOUSA website (www.mcgill.ca/science/sousa).
- You must have the necessary prerequisites and permission of the instructor for such courses.
- Credit for computer and statistics courses offered by faculties other than Arts and Science requires the permission of the Director of Advising Services and will be granted only under exceptional circumstances.
- If you use Minerva to register for a course, and it exceeds the speci ed limitations or it is not approved, the course will be agged for no credit after the course change period.
- Credit will not be given for any how to courses offered by other faculties that are intended to provide you with only practical or professional training in speci c applied areas. Examples include courses that teach the use of certain computer packages (databases, spreadsheets, etc.) or computer langu (SQL, COBOL, FORTRAN, etc.), machine shop or electronic shop courses, technical drawing courses, and professional practice courses.
- As a student in the McGill School of Environment, you may exceed the 18-credit limit for courses outside the Faculties of Arts and of Science, provided that all such courses are necessary to complete your program of study
- As a student in the Major in Software Engineering you may exceed the 18-credit limit for courses outside the Faculties of Arts and of Science, provided that all such courses are necessary to complete your program of study
- As a student in the B.Sc. Liberal Program taking Major Concentration in Music , you may exceed the 18-credit limit for courses outside the Faculties of Arts and of Science, provided that all such courses are necessary to complete your program of study up to a maximum of 36 Music credits.
- If you registered in the Minor in Management before September 2007, you may take 21 credits of courses outside the Faculties of Arts and of Science.
- The 18-credit limit applies to students taking the Minor in Nutrition ; equivalent courses in Science should be taken instead of courses in the Faculty of Agricultural and Environmental Sciences.

6.5.3 Cpl , DtEtb WtbCo e

As a Science student, you may obtain transfer credit for correspondence, distance education, or web-based courses if you receive prior approval from the appropriate McGill department for the course content and prior approval from the Director of Advising Services, Science, for the method of delivery and evaluation. Courses taught through distance education from institutions other than McGill will only be considered for transfer credits under the follo conditions:

- The course is given by a government-accredited, degree-granting institution acceptable to McGill.
- The course counts for credit towards degrees granted at the institution giving the course.
- The combined total of regular course credits and distance education course credits do not exceed the permitted maximum number of credits per term according to Faculty regulations.
- Courses taught through distance education may not be used to complete program requirements, except on an individual basis when serious, documented circumstances warrant it.

6.5.4 Co ırEtgaSg ge(EŞ)

ESL courses are only open to students whose primary language is not English and who have studied for fewer than ve years in English-language secondary institutions. As a student in the B.Sc., you may take a maximum of 12 credits, including academic writing courses for non-anglophones, from the list of ESL courses published at www.mcgill.ca/science/sousa/continuing_students/bsc/outside

6.5.5 Rg oFr sY aSn s

Registration for First-Year Seminars is limited to students in their rst year of study at McGill, i.e., newly admitted students in U0 or U1. These courses are designed to provide a closer interaction with professors and better working relations with peers than is available in large introductory courses. These seminars endeavour to teach the latest scholarly developments and expose participants to advanced research methods. Registration is on a rst-come, rst-served basis. The maximum number of students in any seminar is 25, although some are limited to even fewer than that.

You may take only one First-Y

10 Overview of Programs Offered

Science Program Groups, section 10.1 Bachelor of Science Program Groups, which may include Liberal Program Core Science Components, Major Programs, Joint Major Programs, Honours Programs, and Joint Honours Programs

Minor Programs, section 10.2 Minor Programs

Concurrent B.Sc. and B.Ed. Program, section 6.4.4 Concurrent B.Sc. and B.Ed. Program

Bachelor of Arts and Science, section 10.4 Bachelor of Arts and Science

Internship Year in Science (IYS), section 6.4.5 Internship Year in Science (IYS)

Science Internships and Field Studies, section 12 Science Internships and Field Studies

Faculty of Arts Major and Minor Concentration Programs Available to Science Students, section 10.6 Faculty of Arts Major and Minor Concentration Programs Available to Science Students

10.1 Bachelor of Science Program Groups

Science students admitted after September 2009 are limited to choosing liberal, majors or honours programs within the Science group to which they were admitted, but may continue to choose freely from available minor programs. Students pursuing a Liberal Science Program Core Science Component (CSC) may also select a second CSC from any group. See section 6.4.1 Liberal, Major, and Honours Programs

The groups within the B.Sc. are:

- Biological, Biomedical & Life Sciences
- Microbiology & Immunology
- Neuroscience
- Physical, Earth, Math & Computer Science
- Concurrent B.Sc./B.Ed.

For a list of speci

Computational Molecular Biology, section 13.9.8: Bachelor of Science (B.Sc.) - Minor Computational Molecular Biology (24 credits) ()

Major Concentration in Biology with a Minor in Chemistry for Teachers see Science or Mathematics for Teachers, section 13.34.5 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Minor Chemistry for Teachers (135 credits) or section 13.34.6 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Organismal with Minor Chemistry for Teachers (135 credits)

Major Concentration in Biology with a Minor in Physics for Teachers see Science or Mathematics for Teachers, section 13.34.7 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Minor Physics for Teachers (135 credits) or section 13.34.8 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Organismal with Minor Physics for Teachers (135 credits)

Major Concentration in Chemistry with a Minor in Biology for Teachers see Science or Mathematics for Teachers, section 13.34.9 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Chemistry with Minor Biology for Teachers (135 credits)

Major Concentration in Chemistry with a Minor in Physics for Teachers see Science or Mathematics for Teachers, German Literature and Culture, : Bachelor of Arts (B.A.) - Major Concentration German Studies - Literature and Culture (36 credits)

German Studies, Contemporary : Bachelor of Arts (B.A.) - Major Concentration Contemporary German Studies (36 credits)

Hispanic Languages, : Bachelor of Arts (B.A.) - Major Concentration Hispanic Studies - Languages (36 credits)

Hispanic Literature and Culture, : Bachelor of Arts (B.A.) - Major Concentration Hispanic Studies - Literature and Culture (36 credits)

History, : Bachelor of Arts (B.A.) - Major Concentration History (36 credits)

International Development Studies, : Bachelor of Arts (B.A.) - Major Concentration International Development Studies (36 credits)

Italian Studies, : Bachelor of Arts (B.A.) - Major Concentration Italian Studies (36 credits)

Jewish Studies, : Bachelor of Arts (B.A.) - Major Concentration Jewish Studies (36 credits)

Langue et littérature françaises - Études et pratiques littéraires, : Bachelor of Arts (B.A.) - Concentration majeure langue et littérature françaises - Études et pratiques littéraires (36 crédits)

Langue et littérature françaises - Traduction, : Bachelor of Arts (B.A.) - Concentration majeure langue et littérature françaises - Traduction (36 crédits)

Latin-American Studies, : Bachelor of Arts (B.A.) - Major Concentration Latin American Studies (36 credits)

Linguistics, : Bachelor of Arts (B.A.) - Major Concentration Linguistics (36 credits)
ation LTj 1 0 0 1 29703743364 Tm (W)Tj 1 0 0 1 796.6375364 Tm (omen's Studies)(36 cr

Middle East Studies, : Bachelor of Arts (B.A.) - Major Concentration Middle East Studies (36 credits)

Music (available to students in B.Sc. Liberal only), Bachelor of Arts (B.A.) - Major Concentration Music (36 credits)

North American Studies, : Bachelor of Arts (B.A.) - Major Concentration North American Studies (36 credits)

Philosophy, : Bachelor of Arts (B.A.) - Major Concentration Philosophy (36 credits)

Philosophy and Western Religions, : Bachelor of Arts (B.A.) - Major Concentration Philosophy and Western Religions (36 credits)

Political Science, : Bachelor of Arts (B.A.) - Major Concentration Political Science (36 credits)

Québec Studies, : Bachelor of Arts (B.A.) - Major Concentration Quebec Studies / La concentration Majeur en Études sur le Québec (36 credits)

Russian, : Bachelor of Arts (B.A.) - Major Concentration Russian (36 credits)

Scriptures and Interpretation - see Religious Studies, Bachelor of Arts (B.A.) - Major Concentration Scriptures and Interpretations (36 credits) Arts (B.A.) - Major Concent

Sociology, : Bachelor of Arts (B.A.) - Major Concentration Sociology (36 credits)

Women's Studies, ,

English - Cultural Studies, : Bachelor of Arts (B.A.) - Minor Concentration English - Cultural Studies (18 credits)

English - Literature, : Bachelor of Arts (B.A.) - Minor Concentration English - Literature (18 credits)

English - Drama and Theatre, : Bachelor of Arts (B.A.) - Minor Concentration English - Drama and Theatre (18 credits)

Social Studies of Medicine: Bachelor of Arts (B.A.) - Minor Concentration Social Studies of Medicine (18 credits)

Sociology: Bachelor of Arts (B.A.) - Minor Concentration Sociology (18 credits)

South Asia - see Political Science: Bachelor of Arts (B.A.) - Minor Concentration South Asia (18 credits)

World Cinemas: Bachelor of Arts (B.A.) - Minor Concentration World Cinemas (18 credits)

World Religions - see Religious Studies: Bachelor of Arts (B.A.) - Minor Concentration World Religions (18 credits)

Women's Studies: Bachelor of Arts (B.A.) - Minor Concentration Women's Studies (18 credits)

11 Undergraduate Research Opportunities

Because McGill is a research-intensive university, research informs the curriculum. There are many opportunities for talented students to take part in research during their undergraduate studies, whether at McGill, in affiliated hospitals, at other universities, or in the field. Many of these are organized through formal courses or programs organized by the Faculty of Science or its departments. For more information, see the following:

- section 11.1: Research Project Courses
- section 11.1.1: "396" Undergraduate Research Project Courses
- section 11.2: Undergraduate Student Research Awards NSERC USRA, NSERC Industrial USRA, SURA, FRSQ USRA.
- section 11.3: Undergraduate Research Conference
- section 11.4: Other opportunities
- Dean's Multidisciplinary Undergraduate Research List - see description elsewhere in this publication: University Regulations and Information > Graduation > Graduation Honours: Faculty of Science Dean's Multidisciplinary Undergraduate Research List

The Office for Undergraduate Research in Science (OURS) coordinates several of the aforementioned programs, and can help students find out about other opportunities. Visit the OURS website at www.mcgill.ca/science/ours to find out more.

Because internships and field study programs may include a research component, please also see:

- section 12.1: Industrial Practicum (IP) and Internship Year in Science (IYS)
- section 12.2: Field Study and Study Abroad

11.1 Research Project Courses

Departments offer a variety of research-based courses which allow you to perform research under the supervision of a McGill researcher for academic credit. Depending on the unit, courses featuring undergraduate research may bear names such as: majors project, honours project, lab, independent research, technical project, independent study, or research project and seminar. For more information, see the research course list online at www.mcgill.ca/science/ours/researchcourses or browse the course listings at www.mcgill.ca/students/courses/calendar/keyword.

11.1.1 "396" Undergraduate Research Project Courses

"396" undergraduate research project courses are offered by most departments and schools: ANAT 396, AT

- section 11.2.4: FRSQ Undergraduate Student Research Awards

Please also consult the Office for Undergraduate Research in Science website at www.mcgill.ca/science/ours for any new programs that may have been added.

11.2.1 NSERC Undergraduate Student Research Awards

The Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Awards (NSERC USRA) in Universities program supports 16 consecutive weeks of paid full-time research under the supervision of a professor who holds an NSERC grant. It is an excellent way to prepare for graduate studies or a future career in science. This program is offered at other universities across Canada, and a travel allowance from NSERC is available.

To apply, students must first identify a proposed supervisor who holds an NSERC grant. Students should apply at the university where they wish to hold the award. Applicants must be Canadian citizens or permanent residents of Canada. See www.mcgill.ca/science/ours/nserc for more information.

11.2.2 NSERC Industrial Undergraduate Student Research Awards

In cooperation with a company, students can also apply for an Industrial NSERC Award to provide salary support and gain industrially relevant experience. Students apply for these awards through one or more companies (not through McGill). For more information on forms, student eligibility, and company eligibility, please visit the NSERC website www.nserc.ca and look for the Industrial Undergraduate Student Research Awards.

11.2.3 SURA: Science Undergraduate Research Awards

Science Undergraduate Research Awards SURAs are for both Canadian and international McGill students registered in a science undergraduate program. SURAs are broadly similar to the NSERC USRA, two differences are, on the student side, that international students may apply, and on the supervisor side, while they must still hold a research grant, the grant may be from one of the other funding agencies, namely CRC, NSERC, CIHR, SSHRC, FQRNT, FRSQ (not only NSERC).

See www.mcgill.ca/science/ours/sura for details.

11.2.4 FRSQ Undergraduate Student Research Awards

This program is meant to stimulate interest in research on the part of students registered in an undergraduate program in Health Sciences or other disciplines offering specialization in health sciences, including social sciences, natural sciences, and engineering. For more information, see www.mcgill.ca/gps/students/fellowships/frsq-usra.

11.3 Undergraduate Research Conference

Each fall, the Faculty of Science holds an Undergraduate Research Conference to celebrate the research accomplishments of our undergraduate students. The conference also includes a public lecture by a Nobel laureate or other luminary on a topic related to scientific discovery.

Students who wish to present their research posters should contact their departments in the preceding winter, since departments nominate participants for the conference.

Everyone is welcome to attend. This is an excellent opportunity to see what McGill undergraduates undertake as research projects.

For more details and the date, please see www.mcgill.ca/science/ours/urc.

11.4 [illegible]

Science internships and field study programs may have a research component or focus. Please see their descriptions under section 10.5: Internship Programs – Industrial Practicum (IP) and Internship Year in Science (IYS) and section 12.2: Field Study and Study Abroad in this publication.

Individual departments and researchers offer many other research opportunities. These may be paid or unpaid, for academic credit or not for credit. Some of these opportunities are formal programs and are described in other sections of this publication (section 11.1: Research Project Courses, section 11.1.1: "396" Undergraduate Research Project Courses, and section 11.2: Undergraduate Student Research Awards) or on the Office for Undergraduate Research in Science website (www.mcgill.ca/science/ours); however, many opportunities arise as a result of students talking with their professors. For advice on approaching professors, and more generally on how to get involved in research, see www.mcgill.ca/science/ours/how.

In addition to opportunities available at McGill, there are several external opportunities at other institutions. Many of these are catalogued at www.mcgill.ca/science/ours/opportunities. You may also want to look for additional opportunities funded or offered by the relevant research agencies, institutions, and universities of interest: for example, a provincial cancer research society, a national science funding agency, or a national psychological association.

12 [illegible]

The Science Internships & Field Studies Office promotes field studies and internship opportunities to interested students seeking hands-on experience. The office coordinates the field study semesters offered through the Faculty of Science and provides internship opportunities to students who are in Science programs at McGill. Whether you decide to participate in a field study semester or apply classroom theory to practice, the Science Internships & Field Studies Office will offer you assistance in your decision.

12.1 [illegible]

These programs are open to all Science undergraduate students. An internship is a career-related, professionally supervised, paid work term and done during your undergraduate degree in a field related to your studies. Internships may have a basis in research. To be eligible to apply:

- You must be a full-time undergraduate student in Science before and after the IP or the IYS is completed.
- You must have completed at least 27 credits and should have at least 12 credits remaining in your degree program.
- Your CGPA must be 2.7 or higher.
- International students are eligible to apply to all IYS positions (unless otherwise indicated in the job posting) and to summer IP's (provided the student has an off-campus work permit).

For more information on IP and IYS, please see section 6.4.5edits remainif.1 Tf 1 62415 Tm (or mor:nship)Tj 1 0 0 1 251.7530Tm 6ips 8.13 .64 S821

13.1 B.Sc. Freshman Program

If you need 97-120 credits (four years) to complete your degree requirements, you must register in the Science Freshman Program, which is designed to provide the basic science foundation for your subsequent three-year Liberal, Major, or Honours program. For a detailed description of the Science Freshman Program, you should consult section 13.1.1: Bachelor of Science (B.Sc.) - Freshman Program (30 credits) and the Science Freshman Student information available on the SOUSA website, www.mcgill.ca/science/sousa/new_students/u0.

If you have completed the Diploma of Collegial Studies, Advanced Placement exams, Advanced Levels, the International Baccalaureate, the French Baccalaureate, or McGill placement examinations, you may receive exemption and/or credit for all or part of the basic science courses in biology, chemistry, mathematics, and physics. Similarly, if you have completed courses at other universities or colleges, you may receive exemptions and/or credits. You should consult www.mcgill.ca/students/transfercredit for more information.

13.1.1 Bachelor of Science (B.Sc.) - Freshman Program (30 credits)

Students who need 97-120 credits to complete their degree requirements will normally be registered in the Science Freshman Program until they complete their first year. They must consult an adviser in the Science Office for Undergraduate Student Advising (SOUSA) to obtain advice and approval of their course selection. Full details are available on the SOUSA website at http://www.mcgill.ca/science/sousa/new_students/u0. Academic advising is also available by email. The address is newstudentadvising.science@mcgill.ca.

Students normally complete 30 credits which must include at least seven courses from the list of Approved Freshman Science Courses, selected as follows:

[illegible]

Six of the Freshman courses to satisfy one of the following:

Option 1) 2 courses from MATH and 4 courses from BIOL, CHEM or PHYS;

or

Option 2) 3 courses from MATH and 3 courses from BIOL, CHEM or PHYS.

[illegible]

The seventh course is chosen from the list of Approved Freshman Science Courses.

Notes:

1. Students who have not studied all of Biology, Chemistry and Physics at the grade 12 level or equivalent are strongly advised to include at least one course in the missing discipline in their Freshman Program.

2. Many students w1 0 0 19U.l. 0 0 1ience Cours1 0 0 24ns22G1 90.352 35 19U19.142 369.3634 62n Science n their Fresh 67.v0 0ce je.346 345.06 thits t

* CHEM 115 is not open to students who are taking or have taken CHEM 110 or CHEM 120.

* CHEM 120 is not open to students who have taken CHEM 115.

First calculus course, one of:

MATH 139	(4)	Calculus 1 with Precalculus
MATH 140	(3)	Calculus 1
MATH 150	(4)	Calculus A

Second calculus course, one of:

MATH 141	(4)	Calculus 2
MATH 151	(4)	Calculus B

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses offered by departments in the Faculties of Science or Arts. A list of recommended courses is found at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/approved/. Certain courses offered by other faculties may also be taken, but some restrictions apply. Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

13.2 Anatomy and Cell Biology (ANAT)

13.2.1 Location

Strathcona Anatomy and Dentistry Building, Room 1/60
3640 University Street
Montreal, Quebec H3A 2B2

Telephone: 514-398-6335
Website: 0 0 13 Tm8.542 Tm (er648 l h f BT /6MRG 814693 239.762 Tm (2 Tm (Montreal,_sbsiow.8663ogy6 ,LRe.762 61.781 Tm (/F0 8.6 Tf 1u0 4

microscopy as well as a centre for confocal and immunofluorescence. The new cryo-electron microscope facility in the Department is unique and represents a cutting edge technology to apply fundamental discoveries to therapeutic applications.

Inquiries about programs should be directed to the Department of Anatomy and Cell Biology.

13.2.3 Anatomy and Cell Biology (ANAT) Faculty

Chair
Nathalie Lamarche-Vane (Acting Chair)

Emeritus Professors
Gary C. Bennett; B.A., B.Sc.(Sir G.Wms.), M.Sc., Ph.D.(McG.)
Yv

Assistant Professors

Fiona Bedford; B.Sc.(Birm.), Ph.D.(Lond.)

Isabelle Rouiller; Ph.D.(UK)

Associate Members

John J.M. Bergeron (Medicine)

Albert Berghuis (Biochemistry)

Colin Chalk (Neurology & Neurosurgery)

Jean-François Cloutier (Neurology & Neur

Adjunct Professors
Atilla Sik; M.Sc., Ph.D.(Hungary)
Pierre Thibault; Ph.D.(Montr.)

Faculty Lecturers
Ayman Behiery; M.B., Ch.B.(Cairo)
Geoffroy P. Noël; Ph.D.(Br. Col.)

13.2.4 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Anatomy and Cell Biology (48 credits)

Students may complete this program with a minimum of 47 credits or a maximum of 48 credits depending on their choice of complementary courses.

Required Courses (32 credits)

* Students who have taken the equivalent of CHEM 212 and/or MATH 203 in CEGEP (as defined at http://www.mcgill.ca/students/courses/plan/transfer/) are exempt and must replace these credits with elective course credits to satisfy the total credit requirement for the degree.

ANAT 212	(3)	Molecular Mechanisms of Cell Function
ANAT 214	(3)	Systemic Human Anatomy
ANAT 261	(4)	Introduction to Dynamic Histology
ANAT 262	(3)	Introductory Molecular and Cell Biology
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 212*	(4)	Introductory Organic Chemistry 1
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

One of the following statistics courses:

MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

ANAT 322	(3)	Neuroendocrinology
ANAT 365	(3)	Cellular Trafficking
ANAT 381	(3)	Basis of Embryology
ANAT 565	(3)	Diseases-Membrane Trafficking
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 301	(4)	Cell and Molecular Laboratory
BIOL 303	(3)	Developmental Biology
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 314	(3)	Molecular Biology of Oncogenes
EXMD 504	(3)	Biology of Cancer
MIMM 314	(3)	Immunology
NEUR 310	(3)	Cellular Neurobiology
PATH 300	(3)	Human Disease
PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drugs and Disease

13.2.5 Bachelor of Science (B.Sc.) - Major Anatomy and Cell Biology (67 credits)

Required Courses (43 credits)

Note: ANAT 261 must be taken in U1.

* Students who have taken the equivalent of CHEM 212, CHEM 222, and/or MATH 203 in CEGEP (as defined at http://www.mcgill.ca/students/courses/plan/transfer/) are exempt and must replace these credits with elective course credits to satisfy the total credit requirement for their degree.

ANAT 212	(3)	Molecular Mechanisms of Cell Function
ANAT 214	(3)	Systemic Human Anatomy
ANAT 261	(4)	Introduction to Dynamic Histology
ANAT 262	(3)	Introductory Molecular and Cell Biology
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
BIOL 301	(4)	Cell and Molecular Laboratory
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
MIMM 314	(3)	Immunology
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

One of the following statistics courses:

BIOL 373	(3)	Biometry
MATH 203*	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

Complementary Courses (24 credits)

Complementary courses are selected as follows with a minimum of 6 credits at the 400 level or higher:

BIOL 588	(3)	Advances in Molecular/Cellular Neurobiology
BIOT 505	(3)	Selected Topics in Biotechnology
EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 504	(3)	Biology of Cancer
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
MIMM 314	(3)	Immunology
MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis
MIMM 509	(3)	Inflammatory Processes
PATH 300	(3)	Human Disease
PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drugs and Disease
PHAR 303	(3)	Principles of Toxicology
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 314	(3)	Integrative Neuroscience
PHGY 451	(3)	Advanced Neurophysiology
PHGY 502	(3)	Exercise Physiology
PHGY 508	(3)	Advanced Renal Physiology
PHGY 513	(3)	Cellular Immunology
PHGY 515	(3)	Physiology of Blood 1
PHGY 516	(3)	Physiology of Blood 2
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells
PHGY 552	(3)	Cellular and Molecular Physiology
PHGY 556	(3)	Topics in Systems Neuroscience
PSYT 500	(3)	Advances: Neurobiology of Mental Disorders

13.2.6 Bachelor of Science (B.Sc.) - Honours Anatomy and Cell Biology (73 credits)

Students should register at the Major level in U1 and, if accepted, may enter the Honours program at the beginning of U2. To enter the program, the student must obtain a CGPA of at least 3.00 at the end of U1. For promotion to the U3 year of the Honours program, or for entry into the program at this level, the

ANAT 365	(3)	Cellular Trafficking
ANAT 381	(3)	Basis of Embryology
ANAT 416	(3)	Development, Disease and Regeneration
ANAT 432	(9)	Honours Research Project
ANAT 458	(3)	Membranes and Cellular Signaling
ANAT 541	(3)	Cell and Molecular Biology of Aging
ANAT 565	(3)	Diseases-Membrane Trafficking
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 455	(3)	Neurochemistry
BIOC 458	(3)	Membranes and Cellular Signaling
BIOC 503	(3)	Immunochemistry
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 301	(4)	Cell and Molecular Laboratory
BIOL 303	(3)	Developmental Biology
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 313	(3)	Eukaryotic Cell Biology
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOL 370	(3)	Human Genetics Applied
BIOL 514	(3)	Neurobiology Learning and Memory
BIOL 518	(3)	Advanced Topics in Cell Biology
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
BIOL 532	(3)	Developmental Neurobiology Seminar
BIOL 544	(3)	Genetic Basis of Life Span
BIOL 551	(3)	Molecular Biology: Cell Cycle
BIOL 575	(3)	Human Biochemical Genetics
BIOL 588	(3)	Advances in Molecular/Cellular Neurobiology
BIOT 505	(3)	Selected Topics in Biotechnology
EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 504	(3)	Biology of Cancer
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
MIMM 314	(3)	Immunology
MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology

MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis
	(3)	In ammatory Processes

or program,

ce,
Sc. or

s
so

13.3.3

Adjunct Professors
Charles A. Lin; B.Sc.(Br. Col.), Ph.D.(MIT)
Hai Lin; Ph.D.(McG.)
Damon Matthews; Ph.D.(Vic., BC)
Stella Melo; Ph.D.(INPE)
Ronald Stewart; Ph.D.(Tor.)

13.3.4 Bachelor of Science (B.Sc.) - Minor Atmospheric Science (18 credits)

This Minor may be taken in conjunction with any program in the Faculty of Science.

Required Courses (15 credits)

ATOC 214	(3)	Introduction: Physics of the Atmosphere
ATOC 215	(3)	Oceans, Weather and Climate
ATOC 309	(3)	Weather Radars and Satellites
ATOC 315	(3)	Thermodynamics and Convection

Either of the following courses:

ATOC 219	(3)	Introduction to Atmospheric Chemistry
CHEM 219	(3)	Introduction to Atmospheric Chemistry

Complementary Course (3 credits)

One of the following courses:

ATOC 412	(3)	Atmospheric Dynamics
ATOC 540	(3)	Synoptic Meteorology 1

13.3.5 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Atmospheric Science (46 credits)

Required Courses (37 credits)

ATOC 214	(3)	Introduction: Physics of the Atmosphere
ATOC 215	(3)	Oceans, Weather and Climate
ATOC 309	(3)	Weather Radars and Satellites
ATOC 315	(3)	Thermodynamics and Convection
ATOC 412	(3)	Atmospheric Dynamics
ATOC 540	(3)	Synoptic Meteorology 1
ATOC 546	(1)	Current Weather Discussion
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves

Complementary Courses (9 credits)

* Students may take either ATOC 419 or CHEM 419

ATOC 419*	(3)	Advances in Chemistry of Atmosphere
ATOC 521	(3)	Cloud Physics
ATOC 525	(3)	Atmospheric Radiation
ATOC 530	(3)	Paleoclimate Dynamics
ATOC 531	(3)	Dynamics of Current Climates
ATOC 541	(3)	Synoptic Meteorology 2
CHEM 419*	(3)	Advances in Chemistry of Atmosphere
COMP 208	(3)	Computers in Engineering
MATH 203	(3)	Principles of Statistics 1
MATH 319	(3)	Introduction to Partial Differential Equations
PHYS 257	(3)	Experimental Methods 1
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism

13.3.6 Bachelor of Science (B.Sc.) - Major Atmospheric Science (61 credits)

Required Courses (46 credits)

ATOC 214	(3)	Introduction: Physics of the Atmosphere
ATOC 215	(3)	Oceans, Weather and Climate
ATOC 309	(3)	Weather Radars and Satellites
ATOC 315	(3)	Thermodynamics and Convection
ATOC 412	(3)	Atmospheric Dynamics
ATOC 540	(3)	Synoptic Meteorology 1
ATOC 541	(3)	Synoptic Meteorology 2
ATOC 546	(1)	Current Weather Discussion
COMP 208	(3)	Computers in Engineering
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1

Complementary Courses (15 credits)

3-6 credits to satisfy a statistics requirement.

Students usually take MATH 203 or both MATH 323 and MATH 324.

MATH 203	(3)	Principles of Statistics 1
MATH 323	(3)	Probability

MATH 324	(3)	Statistics

3 credits selected from:

PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism

6-9 credits ordinarily selected from the courses below:

* Students may take either ATOC 419 or CHEM 419

** Students may take either PHYS 432 or MATH 555

Advances in Chemistry of

CHEM 263	(1)	Introductory Physical Chemistry 2 Laboratory
CHEM 419*	(3)	Advances in Chemistry of Atmosphere
COMP 208	(3)	Computers in Engineering
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1

Complementary Courses (6 credits)

3 credits to satisfy a statistics requirement.

Students usually take MATH 203 or MATH 324.

MATH 203	(3)	Principles of Statistics 1
MATH 324	(3)	Statistics

3 credits selected from the courses below

ATOC 515	(3)	Turbulence in Atmosphere and Oceans
ATOC 521	(3)	Cloud Physics
ATOC 525	(3)	Atmospheric Radiation
CHEM 307	(3)	Analytical Chemistry of Pollutants
CHEM 367	(3)	Instrumental Analysis 1
CHEM 575	(3)	Chemical Kinetics
EPSC 542	(3)	Chemical Oceanography
MATH 317	(3)	Numerical Analysis
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 423	(3)	Regression and Analysis of Variance
PHYS 241	(3)	Signal Processing
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 342	(3)	Majors Electromagnetic Waves

13.3.8 Bachelor of Science (B.Sc.) - Major Atmospheric Science and Physics (67 credits)

This Major provides a solid basis for postgraduate study in meteorology, atmospheric physics, or related fields, as well as the necessary preparation for embarking on a professional career as a meteorologist directly after the B.Sc.

The program is jointly administered by the Department of Physics and the Department of Atmospheric and Oceanic Sciences. Students should consult undergraduate advisers in both departments.

Required Courses (64 credits)

ATOC 214	(3)	Introduction: Physics of the Atmosphere

ATOC 215	(3)	Oceans, Weather and Climate
ATOC 309	(3)	Weather Radars and Satellites
ATOC 315	(3)	Thermodynamics and Convection
ATOC 412	(3)	Atmospheric Dynamics
ATOC 540	(3)	Synoptic Meteorology 1
ATOC 541	(3)	Synoptic Meteorology 2
ATOC 546	(1)	Current Weather Discussion
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 339	(3)	Measurements Laboratory in General Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 342	(3)	Majors Electromagnetic Waves
PHYS 446	(3)	Majors Quantum Physics

Complementary Courses (3 credits)

Students select one of the following courses:

PHYS 434	(3)	Optics
PHYS 439	(3)	Majors Laboratory in Modern Physics

13.3.9 Bachelor of Science (B.Sc.) - Honours Atmospheric Science (70 credits)

Students can be admitted to the Honours program after completion of the U1 year of the Major Atmospheric Science program with a minimum CGPA of 3.30. Students having completed a U1 year in a different program with high standing may be admitted to the Honours program on the recommendation of that department.

A minimum GPA of 3.30 in the Honours program courses (taken as a whole) is required to remain in the program. A CGPA of 3.30 on the total program is also required to graduate with honours.

Required Courses (52 credits)

ATOC 214	(3)	Introduction: Physics of the Atmosphere
ATOC 215	(3)	Oceans, Weather and Climate
ATOC 309	(3)	Weather Radars and Satellites
ATOC 315	(3)	Thermodynamics and Convection
ATOC 480	(3)	Honours Research Project
ATOC 512	(3)	Atmospheric and Oceanic Dynamics
ATOC 531	(3)	Dynamics of Current Climates
ATOC 540	(3)	Synoptic Meteorology 1
ATOC 546	(1)	Current Weather Discussion

CHEM 367	(3)	Instrumental Analysis 1
CHEM 575	(3)	Chemical Kinetics
EPSC 542	(3)	Chemical Oceanography
MATH 317	(3)	Numerical Analysis
MATH 423	(3)	Regression and Analysis of Variance
PHYS 241	(3)	Signal Processing
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 342	(3)	Majors Electromagnetic Waves

3 credits selected from:

ATOC 513	(3)	Waves and Stability
ATOC 521	(3)	Cloud Physics
ATOC 525	(3)	Atmospheric Radiation
ATOC 530	(3)	Paleoclimate Dynamics
ATOC 541	(3)	Synoptic Meteorology 2

13.3.11 Diploma in Meteorology (30 credits)

The Department offers an intensive, one-year program in theoretical and applied meteorology to B.Sc. or B.Eng. graduates of suitable standing in physics, applied mathematics or other appropriate disciplines, leading to a Diploma in Meteorology. The program is designed for students with little or no previous background in meteorology who wish to direct their experience to atmospheric or environmental applications, or who need to fulfil academic prerequisites in meteorology to qualify for employment. For further information, consult the Administrative Officer, Burnside Hall, Room 946.

An exemption of up to 6 credits may be allowed for courses already taken. Students granted such e

ATOC 513	(3)	Waves and Stability
ATOC 515	(3)	Turbulence in Atmosphere and Oceans
ATOC 525	(3)	Atmospheric Radiation
ATOC 530	(3)	Paleoclimate Dynamics
		Advanced En

theoretical training, as well as basic practical laboratory training and research in both enzymology and genetic engineering, which are the two basic components in the rapidly expanding field of Biotechnology.

There are three programs of

Professors
Joseph Shuster; B.Sc.(McG.), Ph.D.(Calif.), M.D.(Alta.)
John R. Silvius; B.Sc., Ph.D.(Alta.)
Nahum Sonenberg; M.Sc., Ph.D.(Weizmann Inst.), F.R.S.C., F.R.S. (James McGill Professor)
Michel L. Tremblay; B.Sc., M.Sc.(Sher.), Ph.D.(McM.), F.R.S.C. (James McGill Professor) (Jeanne & Jean-Louis Levesque Chair in Cancer Resear

Adjunct Professors
Tarik Möröy (IRCM)
Donald Nicholson (Merck Frosst)
Maureen D. O'Connor-McCourt (NRC/BRI)
Enrico Purisima (NRC/BRI)
René Roy (UQAM)
Alex Therien (Merck Frosst)

13.4.5 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Biochemistry (47 credits)

U1 Required Courses (20 credits)

* Students with CEGEP-level credit for CHEM 212 and/or CHEM 222 should replace these courses with elective courses.

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2

U1 Complementary Courses** (6 credits)

** Complementary courses listed for U1 and U2 may be taken in later years if necessary to accommodate courses that must be taken in U1 and U2 as part of the breadth component of the program.

6 credits selected from:

BIOL 205	(3)	Biology of Organisms
MIMM 211	(3)	Introductory Microbiology
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

U2 Required Courses (15 credits)

BIOC 300D1	(3)	Laboratory in Biochemistry
BIOC 300D2	(3)	Laboratory in Biochemistry
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
CHEM 302	(3)	Introductory Organic Chemistry 3

U2 Complementary Courses** (3 credits)

** Complementary courses listed for U1 and U2 may be taken in later years if necessary to accommodate courses that must be taken in U1 and U2 as part of the breadth component of the program.

3 credits selected from:

BIOL 373	(3)	Biometry
COMP 202	(3)	Introduction to Computing 1
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3

PSYC 204	(3)	Introduction to Psychological Statistics

U3 Complementary Courses (3 credits)

3 credits selected from:

BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	NucleicAcids

13.4.6 Bachelor of Science (B.Sc.) - Major Biochemistry (67 credits)

Students may transfer into the Major program at any time, provided they have met all course requirements.

U1 Required Courses (23 credits)

* Note: Students with CEGEP-level credit for the equivalents of CHEM 212 and/or CHEM 222 (see http://www.mcgill.ca/students/courses/plan/transfer/ for accepted equivalents) may not take these courses at McGill and should replace them with elective courses to satisfy the total credit requirement for their degree.

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 287	(2)	IntroductoryAnalytical Chemistry
CHEM 297	(1)	IntroductoryAnalytical Chemistry Laboratory

U1 Complementary Courses (6 credits)

6 credits selected from:

BIOL 205	(3)	Biology of Organisms
MIMM 211	(3)	Introductory Microbiology
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

U2 Required Courses (23 credits)

ANAT 262	(3)	Introductory Molecular and Cell Biology
BIOC 300D1	(3)	Laboratory in Biochemistry
BIOC 300D2	(3)	Laboratory in Biochemistry
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
CHEM 214	(3)	Physical Chemistry/Biological Sciences 2
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 362	(2)	Advanced Organic Chemistry Laboratory

U2 Complementary Courses (3 credits)

3 credits selected from:

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry
COMP 202	(3)	Introduction to Computing 1
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3
PSYC 204	(3)	Introduction to Psychological Statistics

U3 Co e(6 s)

BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	NucleicAcids

U3 Cpn yCo e(6 s)

At least 3 credits selected from:

BIOC 404	(3)	Biophysical Chemistry
BIOC 455	(3)	Neurochemistry
BIOC 458	(3)	Membranes and Cellular Signaling
BIOC 503	(3)	Immunochemistry

The remainder, if any, to be selected from the following list:

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 303	(3)	Developmental Biology
BIOL 304	(3)	Evolution
BIOL 313	(3)	Eukaryotic Cell Biology
BIOL 314	(3)	Molecular Biology of Oncogenes
CHEM 352	(3)	Structural Organic Chemistry
CHEM 382	(3)	Organic Chemistry: Natural Products
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 552	(3)	Physical Organic Chemistry
CHEM 572	(3)	Synthetic Organic Chemistry
EXMD 502	(3)	Advanced Endocrinology 01
MIMM 314	(3)	Immunology
MIMM 324	(3)	Fundamental Virology
PHAR 300	(3)	Drug Action
PHGY 311	(3)	Channels, Synapses & Hormones

13.4.7 Ba (B.Sc.) - H s Bio m y (76 s)

Admission to the Honours program will not be granted until U2. Students who wish to enter the Honours program in U2 shMould fa lmarknce B- Pp betHonoou

13.5.4.1 AbBh iCh

Understanding the diverse ways in which animals feed, mate, care for their offspring, avoid predators, select their habitats, communicate, and process information constitute the subject matter of behaviour. Several approaches are used to study these questions. Some focus on ecological consequences and determinants, some on physiological, genetic, and developmental mechanisms, others on evolutionary origins.

Key courses: BIOL 304, BIOL 305, BIOL 306, BIOL 307, BIOL 331 or BIOL 334D1/BIOL 334D2 or another eld course with a signi cant behavioural component, BIOL 373, BIOL 507.

Other suggested courses: BIOL 377, BIOL 466, BIOL 467, BIOL 468D1/BIOL 468D2, BIOL 469D1/BIOL 469D2.

Most courses from the elds of behaviour, ecology and evolutionary biology will be relevant for this concentration. Some courses that focus on a particular taxonomic group such as birds (Natural Resource Sciences WILD 420), amphibians and reptiles (BIOL 427), and marine mammals (BIOL 335) include a signi cant amount of behaviour.

13.5.4.2 BgDiv jsBn

The study of biological diversity deals with the maintenance, emergence, and history of the inexhaustible variety of different kinds of organisms. It is deeply concerned with the particular characteristics of different organisms and therefore emphasizes the detailed study of particular groups and forms the basis of comparative biology. Our knowledge of diversity is organized through the study of systematics, which seeks to understand the history of life and the phylogenetic and genetic relationships of living things. Appreciation and knowledge of diversity and systematics are essential in ecology and evolutionary biology and underlie all work in resource utilization and conservation biology.

Key courses: BIOL 304, BIOL 305, BIOL 373.

Other suggested courses: BIOL 240, BIOL 310, BIOL 324, BIOL 331, BIOL 334D1/BIOL 334D2, BIOL 335, BIOL 350/ENTO 350, BIOL 352, BIOL 355, BIOL 377, BIOL 418, BIOL 427, BIOL 428, BIOL 429, BIOL 463, BIOL 465, BIOL 466 or BIOL 467, BIOL 468D1/BIOL 468D2, BIOL 469D1/BIOL 469D2, BIOL 540, BIOL 555D1/BIOL 555D2, BIOL 569, BIOL 571, BIOL 573, BIOL 594, REDM 400, REDM 405.

Macdonald Campus: AEBI 212, ENTO 440, ENVB 313, PLNT 358, WILD 307, WILD 350, WILD 420, WILD 424.

13.5.4.3 Cs vtBgCh

Conservation biology is the study and protection of biological diversity. It is a scienti c discipline closely connecting ecology and evolutionary biology with applications in public policy and management. Conservation biology focuses on keeping normal evolutionary processes working within a functional ecological context and deals with issues of how the wide variety of organisms and ecosystems can be maintained and protected from declining. It considers population and habitat viability and complexity in the face of threats and perturbations. Cognizance of biological diversity, knowledge, and expertise in both ecology and evolutionary biology and appreciation for the political, social, and economic contexts of the biodiv 8452 390.46 Tm (ork in conserv)Tj 1 0 0 15425 332 390.46

Key courses: BIOL 305, BIOL 308, BIOL 331 or another field course, BIOL 342, BIOL 373, BIOL 418, BIOL 432 (or ENVB 315), BIOL 441, BIOL 465, COMP 202, COMP 273.

Other suggested courses: BIOL 307, BIOL 429, BIOL 434, BIOL 466, BIOL 467, BIOL 468D1/BIOL 468D2, BIOL 469D1/BIOL 469D2, BIOL 540, BIOL 590, GEOG 305, GEOG 306, GEOG 308, GEOG 322, REDM 405.

13.5.4.4.3 MBgCa

This concentration is designed to offer students a broad introduction to marine biology and marine ecology, which will form the basis for graduate studies in the fields, or for employment in aquatic biology and oceanography.

Key courses: BIOL 305, BIOL 308, BIOL 335, BIOL 342, BIOL 373, BIOL 441.

Other suggested courses: ATOC 512, ATOC 550, BIOL 331, BIOL 334D1/BIOL 334D2, BIOL 418, BIOL 429, BIOL 432, BIOL 434, BIOL 465, BIOL 515, BIOL 540, BIOL 590, EPSC 542.

For students intending to proceed to graduate work, one independent studies course (BIOL 466 or BIOL 467, BIOL 468D1/ BIOL 468D2, BIOL 469D1/BIOL 469D2) is recommended. Because of the importance of numerical analyses in all fields of ecology, courses in Biometry (e.g. BIOL 373) and Computer Science (COMP 202 or COMP 273) are recommended.

13.5.4.5 Evb yBgCa

Evolutionary biology is the study of processes that change organisms and their characteristics through time. Evolutionary biologists are concerned with adaptations of organisms and the process of natural selection.

Key courses: BIOL 304, BIOL 305, BIOL 307, BIOL 324, BIOL 331, BIOL 352, BIOL 373, BIOL 377, BIOL 435, BIOL 463, BIOL 466 or BIOL 467, BIOL 468D1/BIOL 468D2, BIOL 469D1/BIOL 469D2, BIOL 555 D1/BIOL 555 D2, BIOL 569, BIOL 570, BIOL 571, BIOL 572, BIOL 573, BIOL 585, BIOL 594.

Other suggested courses in Organismal Biology: BIOL 240, BIOL 335, BIOL 350/ENT 350, BIOL 355, BIOL 427, BIOL 428, BIOL 463.

Macdonald Campus: PLNT 358, WILD 420.

Genetics and Development: BIOL 300, BIOL 303.

Ecology and Behaviour: BIOL 309, BIOL 429, BIOL 434, BIOL 507, BIOL 515, BIOL 590, REDM 405.

13.5.4.6 HGCa

The courses recommended for students interested in human genetics are designed to offer a broad perspective in this rapidly advancing area of biology. Genetics is covered at all levels of organization (the gene, the chromosome, the cell, the organism, and the population), using pertinent examples from all species, but with special emphasis on humans.

Key courses: BIOL 301, BIOL 370, BIOL 373, BIOL 416, BIOL 520, BIOL 568, BIOL 575.

Other suggested courses: BIOC 311, BIOL 314, BIOL 466, BIOL 467 BIOL 468D1/BIOL 468D2, BIOL 469D1/BIOL 469D2; CHEM 203 or CHEM 204 and CHEM 214, MIMM 314.

13.5.4.7 NDe pCa

The discoveries that hav

13.5.5 Biology (BIOL) Faculty

Chair

TBA

Emeritus Professors

A. Howard Bussey; B.Sc., Ph.D.(Brist.), F.R.S.C.

Robert L. Carroll; B.S.(Mich.), M.A., Ph.D.(Harv.), F.R.S.C.

Ronald Chase; A.B.(Stan.), Ph.D.(MIT)

Jacob Kalff; M.S.A.(Tor.), Ph.D.(Ind.)

Donald L. Kramer; B.Sc.(Boston Coll.), Ph.D.(Br. Col.)

John B. Lewis; B.Sc., M.Sc., Ph.D.(McG.)

Professors

Graham A.C. Bell; B.A., D.Phil.(Oxf.), F.R.S.C. (James McGill Professor)

Gregory G. Brown; B.Sc.(Notre Dame), Ph.D.(CUNY) (on sabbatical)

Lauren Chapman; B.Sc.(Alta.), Ph.D.(McG.) (Canadian Research Chair in Respiratory Ecology and Aquatic Conservation)

Rajinder S. Dhindsa; B.Sc., M.Sc.(Punj.), Ph.D.(Wash.)

Siegfried Hekimi; M.Sc., Ph.D.(Geneva) (Strathcona Chair in Zoology; Robert Archibald & Catherine Louise Campbell Chair in Developmental Biology)

Paul F. Lasko; A.B.(Harv.), Ph.D.(MIT) (James McGill Professor) (Associate Member in Anatomy & Cell Biology)

Martin Lechowicz; B.A.(Mich. St.), M.S., Ph.D.(Wisc.) (on sabbatical)

Louis Lefebvre; B.Sc., M.A., Ph.D.(Montr.)

Michel Loreau; M.Sc., Ph.D.(Free Univ. Brussels) (Canadian Research Chair in Theoretical Ecology) (on sabbatical)

Gerald S. Pollack; M.A., Ph.D.(Princ.)

Catherine Potvin; B.Sc., M.Sc.(Montr.), Ph.D.(Duke)

Neil M. Price; B.Sc.(New Br.), Ph.D.(Br. Col.)

Daniel J. Schoen; B.Sc., M.Sc.(Mich.), Ph.D.(Calif.) (Macdonald Professor of Botany) (on sabbatical)

Associate Professors

Ehab Abouheif; M.Sc.(C'dia), Ph.D.(Duke)

Thomas Bureau; B.Sc.(Calif.), Ph.D.(Texas) (William Dawson Scholar)

Joseph A. Dent; B.Sc., Ph.D.(Colo.)

François Fagotto; Ph.D.(Neuchâtel) (Canadian Research Chair in Cell Biology)

Gregor Fussmann; Dipl.(Berlin), Ph.D.(Max-Planck-Institute)

Andrew Gonzalez; B.Sc.(Nott.), Ph.D.(Imperial Coll., Lond.) (Canadian Research Chair in Biodiversity)

Frédéric Guichard; B.Sc.(Montr.), Ph.D.(Laval)

Paul Harrison; B.Sc.(NUI), Ph.D.(Lond.) (on sabbatical)

Andrew Hendry; B.Sc.(Vic., BC), M.Sc., Ph.D.(Wash.) (joint appt. with Redpath Museum)

Rudiger Krahe; Dipl.(Alexander Univ.), Ph.D.(Humboldt)

Brian Leung; B.Sc.(Br. Col.), Ph.D.(Car.)

Robert L. Levine; B.Sc.(Brooklyn), M.Sc., Ph.D.(Yale)

Laura Nilson; B.A.(Colgate), Ph.D.(Yale) (Canada Research Chair in Developmental Genetics)

Simon Reader; B.A.(Camb.), Ph.D.(Camb.)

Richard Roy; B.Sc.(Bishop's), Ph.D.(Laval)

Associate Professors
Frieder Schoeck; Dipl.(Erhangen), Ph.D.(Max-Planck-Institute)
Jacalyn Vogel; M.Sc.(E. Ill.), Ph.D.(Kansas) (Canadian Pacific Chair in Biotechnology)
Tamara Western; B.Sc.(Dal.), Ph.D.(Br. Col.)
Monique Zetka; B.Sc., Ph.D.(Br. Col.)

Assistant Professors
Gary Brouhard; M.S.E., Ph.D.(Mich.)
David Dankort; B.Sc., Ph.D.(McM.)
Jonathan Davies; M.Sc.(Cape Town), Ph.D.(Imperial Coll., Lond.)
Irene Gregory-Eaves; B.Sc.(Vic., BC), M.Sc., Ph.D.(Qu.)
Nam-Sung Moon; B.Sc., Ph.D.(McG.)
Jon Sakata; B.A.(Cornell), Ph.D.(Texas-Austin, Institute for Neuroscience)
Alanna Watt; B.Sc.(C'dia), Ph.D.(Brandeis)
Sarah Woolley; B.Sc.(Duke), Ph.D.(Texas-Austin)
Hugo Zheng; M.Sc.(Helsinki), Ph.D.(Oxf. Brookes)

Associate Members
Anatomy and Cell Biology: Craig Mandato, Nathalie Lamarche-Vane
Anthropology: Colin Chapman
Bellairs: Judith Mendes
Biochemistry: Maxime Bouchard
Centre for Research in Neuroscience: Sal Carbonetto
Medical Genetics, Chair: David Rosenblatt
MCH: Feige Kaplan, Rima Rozen
MGH: Yong Rao, Donald Van Meyel
MNI: Robert Dunn, Kenneth Hastings, Stefano Stifani
Physics: Paul Francois
Redpath Museum: David Green, Hans Larsson, Claire de Mazancourt (Program Coordinator for Joint Major in Biology and Mathematics), Virginie Millien, Anthony Ricciardi
RVH: Hugh J. Clarke, Daniel Dufort, Teruko Taketo

Adjunct Professors
IRCM: Michel Cayouette, Frédéric Charron, Artur Kania, Marie Kmita
NRC Lab: Malcolm S. Whiteway
STRI: Eldredge Bermingham, Rachel Collin, Hector Guzman, Edward Allen Herre, Haris Lessios, Mark Torchin
U. of Montreal: Pierre Drapeau, Louis St-Amant

13.5.6 Bachelor of Science (B.Sc.) - Minor Biology (25 credits)

The Minor Biology may be taken in conjunction with any primary program in the Faculty of Science (other than programs offered by the Department of Biology). Students are advised to consult the undergraduate adviser in Biology as early as possible (preferably during their first year), in order to plan their course selection. See Nancy Nelson, Stewart Biology Building, W3/25, 514-398-4109, email: nancy.nelson@mcgill.ca.

6 credits of overlap are allowed between the Minor and the primary program.

Required Courses (15 credits)

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution

Chemistry Courses (10 hours)

BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 206	(3)	Methods in Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution

200/300-level Core Course (4 credits)

BIOL 301	(4)	Cell and Molecular Laboratory

Complementary Courses (37 credits)

Students complete a minimum of 36 credits or maximum of 37 credits selected as follows:

100-level Complementary Course

* Students who have already taken CHEM 212 or its equivalent will choose another appropriate complementary course, to be approved by the Adviser.

CHEM 212*	(4)	Introductory Organic Chemistry 1

200/300-level Complementary Courses

BIOL 205	(3)	Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution
		Quantitati

CHEM 222	(4)	Introductory Organic Chemistry 2
CHEM 243	(2)	Introductory Physical Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 514	(3)	Biophysical Chemistry
PHYS 342	(3)	Majors Electromagnetic Waves
PHYS 434	(3)	Optics
PHYS 534	(3)	Nanoscience and Nanotechnology

Fdn

*Students may select either CHEM 365 or PHYS 333

** Students may select either COMP 350 or MATH 317

CHEM 365*	(2)	Statistical Thermodynamics
COMP 206	(3)	Introduction to Software Systems
COMP 251	(3)	Data Structures and Algorithms
COMP 350**	(3)	Numerical Computing
COMP 364	(3)	Computer Tools for Life Sciences
MATH 314	(3)	Advanced Calculus
MATH 317**	(3)	Numerical Analysis
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 323	(3)	Probability
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 327	(3)	Matrix Numerical Analysis
MATH 348	(3)	Topics in Geometry
MATH 437	(3)	Mathematical Methods in Biology
MATH 447	(3)	Introduction to Stochastic Processes
PHYS 333*	(3)	Thermal and Statistical Physics

20 or 21 credits from ONE of the following two streams:

EgEv ta yBgn

0-21 credits

9 credits of:

BIOL 206	(3)	Methods in Biology of Organisms
BIOL 304	(3)	Evolution
BIOL 308	(3)	Ecological Dynamics

3 credits of Field course from the following, (or any other field course with permission):

BIOL 240	(3)	Monteregian Flora
BIOL 331	(3)	Ecology/Behaviour Field Course

BIOL 334	(3)	Applied Tropical Ecology
BIOL 432	(3)	Limnology

9 credits chosen from the following, of which 6 credits must be at the 400 level or above:

BIOL 310	(3)	Biodiversity and Ecosystems
BIOL 324	(3)	Ecological Genetics
BIOL 373	(3)	Biometry
BIOL 434	(3)	Theoretical Ecology
BIOL 435	(3)	Natural Selection
BIOL 590	(3)	Linking Community and Ecosystem Ecology
BIOL 594	(3)	Advanced Evolutionary Ecology

Physical Biology Stream

0-21 credits

8-9 credits:

* Students may select either PHYS 232 or PHYS 242

Note: PHYS 242 is required for PHYS 342 and PHYS 434

BIOL 301	(4)	Cell and Molecular Laboratory
CHEM 223	(2)	Introductory Physical Chemistry 1
PHYS 232	(3)	Heat and Waves
PHYS 242*	(2)	Electricity and Magnetism

6 credits chosen from the following:

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 303	(3)	Developmental Biology
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 309	(3)	Mathematical Models in Biology
BIOL 313	(3)	Eukaryotic Cell Biology
PHYS 319	(3)	Introduction to Biophysics

And 6 credits chosen from the following:

BIOL 518	(3)	Advanced Topics in Cell Biology
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
	(3)	Advances in Neuroethology

Advising notes for U0 students:

It is highly recommended that freshman BIOL, CHEM, MATH, and PHYS courses be selected with the program Adviser to ensure they meet the core requirements of the program.

This program is recommended for U1 students with a CGPA of 3.2 or better; and entering CEGEP students with a Math/Science R-score of 28.0 or better.

Required Courses (34 credits)

* If a student has already taken CHEM 212 or its equivalent, the credits can be made up with a complementary course in consultation with the program Adviser.

** Students who have sufficient knowledge in a programming language should take COMP 250 (3) Introduction to Computer Science rather than COMP 202.

*** Students may take either MATH 223 or MATH 247.

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 215	(3)	Introduction to Ecology and Evolution
CHEM 212*	(4)	Introductory Organic Chemistry 1
COMP 202**	(3)	Introduction to Computing 1
MATH 222	(3)	Calculus 3
MATH 223***	(3)	Linear Algebra
MATH 242	(3)	Analysis 1
MATH 243	(3)	Analysis 2
MATH 247***	(3)	Honours Applied Linear Algebra
MATH 315	(3)	Ordinary Differential Equations
MATH 323	(3)	Probability

Complementary Courses (42 credits)

For the 42 credits, students complete 24 credits of BINF, BIOL, NEUR, PHGY, PSYC courses including one of three Streams (Ecology and Evolutionary Ecology, Molecular Evolution, Neurosciences) and 18 credits of MATH courses.

Math or Biology Research Course

Note: Students selecting a BIOL course count this toward their 24 credits of BINF, BIOL, NEUR, PHGY, PSYC courses while students selecting a MATH course count this toward their 18 credits of MATH courses.

3 credits from the following Math or Biology Research courses:

BIOL 466	(3)	Independent Research Project 1
BIOL 467	(3)	Independent Research Project 2
MATH 410	(3)	Majors Project

Of the remaining complementary courses, at least 6 credits must be at the 400 level or above.

Math Courses

15-18 credits of MATH courses chosen from Sequence 1 or 2 and from "Remaining Math Courses" as follows:

Sequence 1

12 credits from the following courses:

* Students may take either MATH 317 or MATH 327

** Students may take either MATH 326 or MATH 437

BIOL 308	(3)	Ecological Dynamics
BIOL 310	(3)	Biodiversity and Ecosystems
BIOL 324	(3)	Ecological Genetics
BIOL 434	(3)	Theoretical Ecology
BIOL 435	(3)	Natural Selection
BIOL 466	(3)	Independent Research Project 1
BIOL 467	(3)	Independent Research Project 2
BIOL 468	(6)	Independent Research Project 3
BIOL 585	(3)	Game Theory and Evolutionary Dynamics
BIOL 590	(3)	Linking Community and Ecosystem Ecology
BIOL 594	(3)	Advanced Evolutionary Ecology

NEv tn

At least 16 credits selected as follows:

Co e

7 credits from:

BIOL 202	(3)	Basic Genetics
BIOL 301	(4)	Cell and Molecular Laboratory

Cp yCo e

At least 9 credits selected from the following list, of which 6 credits must be at the 400 level or above.

* Students may take either BINF 511 or BIOL 592.

BINF 511*	(3)	Bioinformatics for Genomics
BIOL 303	(3)	Developmental Biology
BIOL 304	(3)	Evolution
BIOL 435	(3)	Natural Selection
BIOL 466	(3)	Independent Research Project 1
BIOL 467	(3)	Independent Research Project 2
BIOL 468	(6)	Independent Research Project 3
BIOL 518	(3)	Advanced Topics in Cell Biology
BIOL 569	(3)	Developmental Evolution
BIOL 572	(3)	Molecular Evolution
BIOL 592*	(3)	Integrated Bioinformatics

Nl in

At least 15 credits selected as follows:

Co e

3 credits from:

BIOL 306	(3)	Neural Basis of Behaviour

Cp yCo e

At least 12 credits selected from:

BIOL 389	(3)	Laboratory in Neurobiology

18-21 credits in Biology at the 300 level or higher, of which 9 credits may be from other Science departments, with approval of the Adviser.

U3 Required Courses (4 credits)

BIOL 499D1	(2)	Honours Seminar in Biology
BIOL 499D2	(2)	Honours Seminar in Biology

U3 Complementary Courses (12 credits)

9-12 credits selected from:

BIOL 479D1	(4.5)	Honours Research Project 1
BIOL 479D2	(4.5)	Honours Research Project 1
BIOL 480D1	(6)	Honours Research Project 2
BIOL 480D2	(6)	Honours Research Project 2

Biology (BIOL)

the academic advisor, students must submit their course list to the program supervisor, who will certify that the student's complete program conforms to the requirements for the Minor. Students should ensure that they will have fulfilled the prerequisite requirements for the courses selected.

The course BIOT 505 Selected Topics in Biotechnology is considered as a course taught by the Faculty of Science.

13.6.3 [illegible]

To obtain the Minor in Biotechnology, students must:

- satisfy the requirements both for the departmental program and for the Minor;
- complete 24 credits, 18 of which must be exclusively for the Minor program;
- obtain a grade of C or better in the courses presented for the Minor.

13.6.4 [illegible] (BIO[illegible]) F[illegible]

Program Supervisor
Professor Hugh P. J. Bennett; B.A.(York, UK), Ph.D.(Brunel)

13.6.5 [illegible] (B.S[illegible]) - [illegible] (24 [illegible])

To obtain the Minor Biotechnology, Science students must:

a) satisfy both the requirements for the departmental program and for the Minor;

b) complete 24 credits, 18 of which must be exclusively for the Minor program.*

* Approved substitutions must be made for any of the required courses which are part of the student's main program.

[illegible] (15 [illegible])

* Students usually take either BIOL 201 or BIOC 212.

BIOC 212*	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 201*	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOT 505	(3)	Selected Topics in Biotechnology
MIMM 211	(3)	Introductory Microbiology

[illegible] (9 [illegible])

9 credits selected from courses outside the department of the student's main program. Alternatively, or in addition, courses may be taken from the lists below. In which case, at least three courses must be taken from one area of concentration as grouped.

[illegible]

ANAT 541	(3)	Cell and Molecular Biology of Aging
EXMD 504	(3)	Biology of Cancer
PATH 300	(3)	Human Disease

[illegible]

CHEE 200	(4)	Introduction to Chemical Engineering
		Chemical Manuf

CHEM 382	(3)	Organic Chemistry: Natural Products
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 552	(3)	Physical Organic Chemistry

[illegible]

MIME 310	(3)	Engineering Economy

[illegible]

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 503	(3)	Immunochemistry
MIMM 314	(3)	Immunology
MIMM 414	(3)	Advanced Immunology
PHGY 513	(3)	Cellular Immunology

[illegible]

ECON 208	(3)	Microeconomic Analysis and Applications
MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Finance 1
MGCR 352	(3)	Marketing Management 1
MGCR 472	(3)	Operations Management

[illegible]

MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 413	(3)	Parasitology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis

[illegible]

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
BIOL 551	(3)	Molecular Biology: Cell Cycle

[illegible]

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 455	(3)	Neurochemistry

Pr lg

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2
PHGY 517	(3)	Arti cial Internal Organs
PHGY 518	(3)	Arti cial Cells

Pb

CHEE 593	(3)	Industrial Water Pollution Control
CIVE 225	(4)	Environmental Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 553	(3)	Stream Pollution and Control

13.6.6 Bbe lg (BDO) TP gn

13.6.6.1 P gn cdSF lgEg

See Faculty of Engineering > Biotechnology Minor for details.

13.7 Chem y (CHEM)

13.7.1 la

Otto Maass Chemistry Building
801 Sherbrooke Street West
Montreal, Quebec H3A 2K6

Website: www.chemistry.mcgill.ca

Departmental Of ce: Room 322
Telephone: 514-398-6999

Student Advisory Of ce: Room 314
Website: www.chemistry.mcgill.ca/advising/index.htm

13.7.2 D cBS

The Of ce for Science and Society is dedicated to the promotion of critical thinking and the presentation of practical scienti c information to the public, educators, and students in an accurate and responsible form. The Of ce answers queries from the public as well as from the media, with a view towards establishing scienti c accuracy. The Of ce also offers a variety of educational and interesting presentations on scienti c topics and its members contribute to a number of courses under the umbrella of "World of Chemistry".

Director
Joseph A. Schwarcz; B.Sc., Ph.D.(McG.)

Members
Ariel Fenster; L.Sc., D.E.A.(Paris), Ph.D.(McG.)
David N. Harpp; A.B.(Middlebury), M.A.(Wesl.), Ph.D.(N. Carolina), F.C.I.C. (William C. Macdonald Professor of Chemistry)

13.7.3 AbCisn y

Professors

David N. Harpp; A.B.(Middlebury), M.A.(Wesl.), Ph.D.(N. Carolina), F.C.I.C. (William C. Macdonald Professor of Chemistry)

R. Bruce Lennox; B.Sc., M.Sc., Ph.D.(Tor.) (Tomlinson Professor of Chemistry)

C.J. Li; B.Sc.(Zhengzhou), M.Sc.(C.A.S.), Ph.D.(McG.) (CRC Tier I Chair)

David Ronis; B.Sc.(McG.), Ph.D.(MIT)

Eric D. Salin; B.Sc.(Calif.), Ph.D.(Ore. St.)

Bryan C. Sanctuary; B.Sc., Ph.D.(Br. Col.)

Hanadi Sleiman; B.Sc.(A.U.B.), Ph.D.(Stan.) (William Dawson Scholar)

Theo G.M. van de Ven; Kand. Doc.(Utrecht), Ph.D.(McG.) (NSERC Paprican Chair)

Associate Professors

Mark P. Andrews; B.Sc., M.Sc., Ph.D.(Tor.)

Parisa Ariya; B.Sc., Ph.D.(York) (William Dawson Scholar) (joint appt. with Atmospheric & Oceanic Sciences)

Karine Auclair; B.Sc.(UQAC), Ph.D.(Alta.)

Christopher J. Barrett; B.Sc., M.Sc., Ph.D.(Qu.)

William C. Galley; B.Sc.(McG.), Ph.D.(Calif.)

James Gleason; B.Sc.(McG.), Ph.D.(Virg.)

Ashok K. Kakkar; B.Sc.(Punjab), M.Sc.(H.P.U.), Ph.D.(Wat.)

Patanjali Kambhampati; B.A.(Car. Coll.), Ph.D.(Texas)

Nicolas Moitessier; B.Sc., M.Sc., Ph.D.(Nancy)

Dmitrii Perepichka; B.S., M.Sc., Ph.D.(Ukraine)

Joan F. Power; B.Sc., Ph.D.(C'dia)

Linda Reven; B.A.(Car. Coll.), Ph.D.(Ill.)

Youla Tsantrizos; B.Sc., M.Sc., Ph.D.(McG.)

Paul Wiseman; B.Sc.(St. FX), Ph.D.(W. Ont.) (joint appt. with Physics)

Assistant Professors

Amy S. Blum; B.S.(Princ.), M.S., Ph.D.(Wash.)

Michel Bourqui; B.Sc.(EPF Lausanne), Ph.D.(ETH Zürich) (joint appt. with Atmospheric & Oceanic Sciences)

Gonzalo Cosa; B.Sc.(Rio Cuarto), Ph.D.(Ott.)

Anthony Mittermaier; B.Sc.(Guelph), Ph.D.(Tor.)

Audrey Moores; B.Sc., M.Sc., Ph.D.(École Poly., Palaiseau, Fr.) (Fac. Sci. Tier II Chair)

Bradley Siwick; B.A.Sc., M.Sc., Ph.D.(Tor.) (joint appt. with Physics)

Associate Members

James A. Finch (Mining & Metallurgical Engineering)

P. Grütter (Physics)

Esther Schirrmacher (Medicine)

Ralf Schirrmacher (Medicine)

Adjunct Professors

Yvan Guindon; B.Sc., Ph.D.(Montr.), F.C.I.C., F.R.S.C.

Christian Reber; B.Sc., Ph.D.(Berne)

Ivor Wharf; B.Sc., Ph.D.(Lond.), A.R.C.S., D.I.C.

Adjunct Professors

Robert Zamboni; B.Sc., Ph.D.(McG.)

13.7.5 Bachelor of Science (B.Sc.) - Minor Chemistry (18 credits)

Required Courses (18 credits)

* Denotes courses with CEGEP equivalents.

Substitutions for these by more advanced courses may be made at the discretion of the Adviser.

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory

Ba

CHEE 494**	(3)	Research Project and Seminar 1
CHEE 495**	(4)	Research Project and Seminar 2
CHEE 592	(3)	Industrial Air Pollution Control
CHEE 593	(3)	Industrial Water Pollution Control
MATH 314	(3)	Advanced Calculus

13.7.7 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Chemistry - Biological Option (47 credits)

Program Prerequisites

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Basic Science Courses (26 credits)

The required courses in this program consist of 26 credits in chemistry and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at CEGEP. Students from outside Quebec or transfer students should consult the Academic Adviser.

See http://www.chemistry.mcgill.ca/advising/inside/advisors.php.

The Liberal Program: Core Science Component in Chemistry - Biological Option is not certified by the Ordre des chimistes du Québec. Students interested in pursuing a career in Chemistry in Quebec are advised to take an appropriate B.Sc. program in Chemistry.

A computer science course, either COMP 202 or COMP 208, is strongly recommended during U1 for students with no previous introduction to computer programming. Students should contact their adviser on this matter. Completion of Mathematics MATH 222 during U1 is strongly recommended.

13.7.8 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Chemistry - General Option (49 credits)

Program Requirements

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (26 credits)

The required courses in this program consist of 26 credits in chemistry and mathematics listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level. Students from outside Quebec or transfer students should consult the Academic Adviser.

See http://www.chemistry.mcgill.ca/advising/inside/advisors.php.

The Liberal Program: Core Science Component Chemistry - General Option is not certified by the Ordre des chimistes du Québec. Students interested in pursuing a career in Chemistry in Quebec are advised to take an appropriate B.Sc. program in Chemistry.

A computer science course, either COMP 202 or COMP 208, is strongly recommended during U1 for students with no previous introduction to computer programming. Students should contact their adviser on this matter. Completion of Mathematics MATH 222 during U1 is strongly recommended.

* Denotes courses with CEGEP equivalents.

** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 223	(2)	Introductory Physical Chemistry 1
CHEM 243	(2)	Introductory Physical Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 263	(1)	Introductory Physical Chemistry 2 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory
CHEM 381	(3)	Inorganic Chemistry 2
MATH 222**	(3)	Calculus 3

Required Courses (20 credits)

CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2
CHEM 392	(3)	Integrated Inorganic/Organic Laboratory
MATH 315	(3)	Ordinary Differential Equations
PHYS 242	(2)	Electricity and Magnetism

Complementary Courses (3 credits)

3 credits from:

CHEM 352	(3)	Structural Organic Chemistry
CHEM 355	(3)	Molecular Properties and Structure 2

13.7.9 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Chemistry - Physical (47 credits)

Program Requirements

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (54 credits)

The required courses in this program consist of 54 credits in chemistry and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level but the Chemistry courses must be replaced by courses in that discipline if students wish to be eligible for admission to the Ordre des chimistes du Québec. Students from outside Quebec or transfer students should cons the Academic Adviser.

See http://www.chemistry.mcgill.ca/advising/inside/advisors.php.

A computer science course, either COMP 202 or COMP 208, is strongly recommended during U1 for students with no previous introduction to computer programming. Students should contact their adviser on this matter. Completion of Mathematics MATH 222 and MATH 315 during U1 is also strongly recommended.

* Denotes courses with CEGEP equivalents.

** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 219	(3)	Introduction to Atmospheric Chemistry
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 223	(2)	Introductory Physical Chemistry 1
CHEM 243	(2)	Introductory Physical Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 263	(1)	Introductory Physical Chemistry 2 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 365	(2)	Statistical Thermodynamics
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2
CHEM 381	(3)	Inorganic Chemistry 2
CHEM 392	(3)	Integrated Inorganic/Organic Laboratory
CHEM 393	(2)	Physical Chemistry Laboratory 2
MATH 222**	(3)	Calculus 3
MATH 315	(3)	Ordinary Differential Equations

Complementary Courses (9 credits)

3 credits, one of:

CHEM 419	(3)	Advances in Chemistry of Atmosphere
CHEM 462	(3)	Green Chemistry

3 credits, one of:

ATOC 214	(3)	Introduction: Physics of the Atmosphere
CHEM 307	(3)	Analytical Chemistry of Pollutants
CHEM 352	(3)	Structural Organic Chemistry
MATH 317	(3)	Numerical Analysis

3 credits, one of:

ATOC 315	(3)	Thermodynamics and Convection
ATOC 412	(3)	Atmospheric Dynamics
CHEM 567	(3)	Chemometrics: Data Analysis
CHEM 575	(3)	Chemical Kinetics
CHEM 597	(3)	Analytical Spectroscopy
EPSC 542	(3)	Chemical Oceanography

13.7.12 Bachelor of Science (B.Sc.) - Major Chemistry - Bio[illegible] (63 credits)

Program Requirements

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (60 credits)

The required courses in this program consist of 60 credits in chemistry, biology and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level but the Chemistry courses must be replaced by courses in that discipline if students wish to be eligible for admission to the Ordre des chimistes du Québec. Students from outside Quebec or transfer students sho

(3) Integrated Inorganic/Organic Laboratory

CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 365	(2)	Statistical Thermodynamics
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2
CHEM 381	(3)	Inorganic Chemistry 2
CHEM 392	(3)	Integrated Inorganic/Organic Laboratory
CHEM 393	(2)	Physical Chemistry Laboratory 2
CHEM 574	(3)	Introductory Polymer Chemistry
MATH 222**	(3)	Calculus 3
MATH 315	(3)	Ordinary Differential Equations
PHYS 242	(2)	Electricity and Magnetism

Cpln

CHEM 281	(3)	Inorganic Chemistry 1

PHGY 202	(3)	Human Physiology: Body Functions
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

and 6 credits of additional Chemistry courses at the 400 level or higher.

13.7.16 Bachelor of Science (B.Sc.) - Honours Chemistry - Atmosphere and Environment (75 credits)

Note: Attainment of the Honours degree requires a CGPA of at least 3.00.

Program Requirements

PRE-PROGRAM REQUIREMENTS:

Students entering from1 Tf 4and s0 0 1 1 274.775 44S:

CHEM 462	(3)	Green Chemistry
MATH 222**	(3)	Calculus 3
MATH 315	(3)	Ordinary Differential Equations

Complementary Courses (15 credits)

6 credits of research*:

* Students may take up to 12 Research Project credits but only 6 of these may be used to fulfill the program requirement.

CHEM 470	(6)	Research Project 1
CHEM 480	(3)	Research Project 2
CHEM 490D1	(1.5)	Research Project 3
CHEM 490D2	(1.5)	Research Project 3

3 credits, one of:

ATOC 214	(3)	Introduction: Physics of the Atmosphere
CHEM 307	(3)	Analytical Chemistry of Pollutants
CHEM 352	(3)	Structural Organic Chemistry
MATH 317	(3)	Numerical Analysis

6 credits, two of:

ATOC 315	(3)	Thermodynamics and Convection
ATOC 412	(3)	Atmospheric Dynamics
CHEM 567	(3)	Chemometrics: Data Analysis
CHEM 575	(3)	Chemical Kinetics
CHEM 597	(3)	Analytical Spectroscopy
EPSC 542	(3)	Chemical Oceanography

13.7.17 Bachelor of Science (B.Sc.) - Honours Chemistry - Atmosphere and Environment (74 credits)

Note: Attainment of the Honours degree requires a CGPA of at least 3.00.

Program Requirements

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (65 credits)

The required courses in this program consist of 65 credits in chemistry, physics and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level but the Chemistry courses must be replaced by courses in

* Denotes courses with CEGEP equivalents.

** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

*** Students may take up to 12 Research Project credits but only 6 of these may be used to fulfill the program requirement.

CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 223	(2)	Introductory Physical Chemistry 1
CHEM 243	(2)	Introductory Physical Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 263	(1)	Introductory Physical Chemistry 2 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 334	(3)	Advanced Materials
CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 365	(2)	Statistical Thermodynamics
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2
CHEM 381	(3)	Inorganic Chemistry 2
CHEM 392	(3)	Integrated Inorganic/Organic Laboratory
CHEM 393	(2)	Physical Chemistry Laboratory 2
CHEM 470***	(6)	Research Project 1
CHEM 574	(3)	Introductory Polymer Chemistry
MATH 222**	(3)	Calculus 3
MATH 315	(3)	Ordinary Differential Equations
PHYS 242	(2)	Electricity and Magnetism

Complementary Courses (9 credits)

9 credits, three of:

* Students take either ANAT 542 or MIME 542.

ANAT 542*	(3)	Transmission Electron Microscopy
CHEM 462	(3)	Green Chemistry
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 533	(3)	Small Molecule Crystallography
CHEM 534	(3)	Nanoscience and Nanotechnology
CHEM 543	(3)	Chemistry of Pulp and Paper
CHEM 571	(3)	Polymer Synthesis
CHEM 582	(3)	Supramolecular Chemistry
CHEM 585	(3)	Colloid Chemistry
MIME 260	(3)	Materials Science and Engineering
MIME 542*	(3)	Transmission Electron Microscopy

13.7.18 Chn y(CHEM) P gn

13.7.18.1 th sP jCh y

For more information, see section 13.29: Physics (PHYS).

13.8 CgS

13.8.1 AtCgS

Cognitive Science is the multidisciplinary study of cognition in humans and machines. The goal is to understand the principles of intelligence and thought

LING 355	(3)	Language Acquisition 1
LING 360	(3)	Introduction to Semantics
LING 371	(3)	Syntax 1
LING 419	(3)	Linguistic Theory and its Foundations
LING 440	(3)	Morphology
LING 455	(3)	Second Language Syntax
LING 571	(3)	Syntax 2
LING 590	(3)	Language Acquisition and Breakdown

[illegible]

PHIL 210	(3)	Introduction to Deductive Logic 1
PHIL 304	(3)	Chomsky
PHIL 306	(3)	Philosophy of Mind
PHIL 310	(3)	Intermediate Logic
PHIL 415	(3)	Philosophy of Language
PHIL 474	(3)	Phenomenology
PHIL 506	(3)	Seminar: Philosophy of Mind
PHIL 511	(3)	Seminar: Philosophy of Logic and Mathematics

[illegible]

PSYC 213	(3)	Cognition
PSYC 301	(3)	Animal Learning & Theory
PSYC 304	(3)	Child Development
PSYC 310	(3)	Intelligence
PSYC 311	(3)	Human Cognition and the Brain
PSYC 315	(3)	Computational Psychology
PSYC 340	(3)	Psychology of Language
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 413	(3)	Cognitive Development

13.9 [illegible]

13.9.1 [illegible]

McConnell Engineering Building, Room 318
3480 University Street
Montreal, Quebec H3A 2A7
Telephone: 514-398-7071
Fax: 514-398-3883

Undergraduate Student Affairs Office
Lorne (3r.704 Tm (13.9)Tj /F0 8.6 T.52 223.704 T3 Tm (3480 Uni)20j 1 0 0 1 165.Tf (90 1481.693 363 0 0 1 115.795 161.283 Tm0 1481.693 eet)Tj

13.9.5 Aish

Students intending to pursue a major in Computer Science or a Software Engineering should have a reasonable mathematical background and should have completed MATH 140 (or MATH 150), MATH 141 (or MATH 151) and MATH 133, or their CEGEP equivalents. These three mathematics courses should have been completed with at least an a

Associate Professors

Doina Precup; B.Sc.(Cluj-Napoca), M.Sc., Ph.D.(Mass.)

Martin Robillard; B.Eng.(École Poly., Montr.), M.Sc., Ph.D.(Br.Col.)

Carl Tropper; B.Sc.(McG.), Ph.D.(Brooklyn Poly)

Hans Vangheluwe; B.Sc., M.Sc., D.Sc.(Ghent, Belgium)

Clark Verbrugge; B.A.(Qu.), Ph.D.(McG.)

Adrian Vetta; B.Sc., M.Sc.(LSE), Ph.D.(MIT)

Assistant Professors

Hamed Hatami; B.Sc.(Sharif Uni

** Students may take either COMP 203 or COMP 250, but not both.

COMP 202*	(3)	Introduction to Computing 1
COMP 203**	(3)	Introduction to Computing 2
COMP 206	(3)	Introduction to Software Systems
COMP 250**	(3)	Introduction to Computer Science

Complementary Courses (15 credits)

15 credits selected from the courses below and computer science courses at the 300 level or above (except COMP 364, COMP 396, COMP 400, COMP 431).

* Note: COMP 251 is a prerequisite for many of the other complementary courses.

COMP 251*	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
MATH 222	(3)	Calculus 3
MATH 240	(3)	Discrete Structures 1

13.9.8 Bachelor of Science (B.Sc.) - Minor Computational Molecular Biology (24 credits)

Please note that the Minor Computational Molecular Biology is currently under review. In the interim, students are encouraged to register for the Minor Computer Science.

Computational molecular biology is the sub-discipline of bioinformatics that is located at the intersection of computer science and molecular biology. The focus of this area is on techniques for managing and analyzing molecular sequence data. This program will provide undergraduate students in the biological sciences with the skills from computer science to solve computational problems arising in molecular biology and genomics and will provide students with the necessary skills to build software tools from these algorithms.

The Minor Computational Molecular Biology is NOT open to students in Computer Science or Joint Computer Science programs.

Required Courses (24 credits)

COMP 202	(3)	Introduction to Computing 1
COMP 203	(3)	Introduction to Computing 2
COMP 251	(3)	Data Structures and Algorithms
COMP 360	(3)	Algorithm Design Techniques
COMP 462	(3)	Computational Biology Methods
COMP 563	(3)	Molecular Evolution Theory
COMP 564	(3)	Computational Gene Regulation
MATH 240	(3)	Discrete Structures 1

13.9.9 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Computer Science (45 credits)

This program provides an introduction to the principles of computer science and offers opportunity to get insight into some of its sub-areas. Having only 45 credits, it allows students to combine it with minor or major concentrations in other disciplines.

Required Courses (21 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202, but it must be replaced with an additional computer science complementary course.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems

MATH 222	(3)	Calculus 3
MATH 240	(3)	Discrete Structures 1

Complementary Courses (24 credits)

3-6 credits from:

MATH 223	(3)	Linear Algebra
MATH 318	(3)	Mathematical Logic
MATH 323	(3)	Probability
MATH 324	(3)	Statistics
MATH 340	(3)	Discrete Structures 2

At least 3 credits from:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques

At least 3 credits from:

COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development

The remaining complementary courses should be selected from any COMP courses at the 300 level or above except COMP 364, COMP 396, COMP 400 and COMP 431.

Note: Advanced COMP courses have more prerequisites than the required courses for this program. Students must make sure that they have the appropriate prerequisites when choosing upper-level courses.

Bachelor of Science (B.Sc.) - Liberal Program

MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures 1

Complementary Courses (13 credits)

3 credits selected from:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 360	(3)	Algorithm Design Techniques

9-10 credits selected from the courses below

* Students take either COMP 435 or COMP 535, but not both.

COMP 322	(1)	Introduction to C++
COMP 409	(3)	Concurrent Programming
COMP 421	(3)	Database Systems
COMP 435*	(3)	Basics of Computer Networks
COMP 520	(4)	Compiler Design
COMP 525	(3)	Formal Verification
COMP 529	(4)	Software Architecture
COMP 533	(3)	Object-Oriented Software Development
COMP 535*	(3)	Computer Networks 1

Or any computer science course at the 300 level or above, excluding COMP 364, COMP 396, and COMP 431.

13.9.11 Bachelor of Science (B.Sc.) - Major Computer Science (63 credits)

This program is the standard Major program offered by the School of Computer Science. It provides a broad introduction to the principles of computer science and offers ample opportunity to acquire in-depth knowledge of several sub-disciplines. At the same time, its credit requirements allow students to take an additional minor

Students may complete this program with a maximum of 63 credits or a minimum of 60 credits if they are exempt from taking COMP 202.

Required Courses (30 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 310	(3)	Operating Systems
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures 1

Complementary Courses (33 credits)

Students should talk to an academic adviser before choosing their complementary courses.

At least 6 credits selected from:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques

At least 3 credits selected from:

COMP 303	(3)	Software Development
COMP 304	(3)	Object-Oriented Design

3-9 credits selected from:

* Must include at least one of MATH 323 and MATH 340.

MATH 318	(3)	Mathematical Logic
MATH 323*	(3)	Probability
MATH 324	(3)	Statistics
MATH 340*	(3)	Discrete Structures 2

The remaining credits selected from computer science courses at the 300 level or above (except COMP 364, COMP 396, COMP 400, COMP 431) and ECSE 508.

Note: Students have to make sure that they have the appropriate prerequisites when choosing upper-level courses.

13.9.12 Bachelor of Science (B.Sc.) - Joint Major Computer Science and Biology (73 credits)

This program will train students in the fundamentals of biology - with a focus on molecular biology - and will develop the computational and mathematical skills needed to manage, analyze, and model large biological datasets. Two integrative features of the program are a three-credit joint independent studies course, and a one-credit seminar

Students may complete this program with a maximum of 73 credits or a minimum of 69 credits. This depends upon the student's choice of required courses and whether or not the student is exempt from taking COMP 202.

Advising notes for U0 students:

It is highly recommended that Freshman BIOL, CHEM, MATH, and PHYS courses be selected with an adviser to ensure they meet the core requirements of the COMP-BIO program.

Required Courses (49 credits)

Mathematics Required Courses

6 credits from the following:

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra

Computer Science Required Courses

12-16 credits from:

* Students who have sufficient knowledge in a programming language are not required to take COMP 202.

** Students take either COMP 462 or COMP 561.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science

COMP 251	(3)	Data Structures and Algorithms
COMP 462**	(3)	Computational Biology Methods
COMP 561**	(4)	Computational Biology Methods and Research

Biology Courses

20 credits from:

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 215	(3)	Introduction to Ecology and Evolution
BIOL 301	(4)	Cell and Molecular Laboratory
CHEM 212	(4)	Introductory Organic Chemistry 1

Project Courses

4 credits from:

COMP 401	(3)	Project in Biology and Computer Science
COMP 499	(1)	Undergraduate Bioinformatics Seminar

Complementary Courses (27 credits)

6 credits, ONE of the following pairs of courses as follows:

MATH 203 and MATH 204 or MATH 323 and MATH 324 or BIOL 309 and BIOL 373.

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
MATH 204	(3)	Principles of Statistics 2
MATH 323	(3)	Probability
MATH 324	(3)	Statistics

At least 21 credits selected from the following blocks, with the following requirements:

- at least 9 credits from each of the following two blocks

- at least 9 credits at the 400 level or above

- at least 3 credits at the 400 level or above from each block

Computer Science Block

Note: All COMP courses at the 400 level (except 401, 462, and 499) and all courses at the 500 level (except 561).

COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development
COMP 304	(3)	Object-Oriented Design
COMP 310	(3)	Operating Systems
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 335	(3)	Software Engineering Methods

COMP 350	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques
MATH 240	(3)	Discrete Structures 1

Bg Bb k

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 309	(3)	Mathematical Models in Biology
BIOL 310	(3)	Biodiversity and Ecosystems
BIOL 313	(3)	Eukaryotic Cell Biology
BIOL 395	(1)	Quantitative Biology Seminar 1
BIOL 435	(3)	Natural Selection
BIOL 495	(1)	Quantitative Biology Seminar 2
BIOL 518	(3)	Advanced Topics in Cell Biology
BIOL 551	(3)	Molecular Biology: Cell Cycle
BIOL 568	(3)	Topics on the Human Genome
BIOL 569	(3)	Developmental Evolution
BIOL 572	(3)	Molecular Evolution
BIOL 583	(3)	Advanced Biometry

13.9.13 Ba (B.Sc.) - C (67)

This program is a specialization within Computer Science. It fulfills all the basic requirements of the Major Computer Science. Complementary courses focus on topics that are important to understanding the technology behind computer games and to gaining experience in software development and design needed for computer game development.

Students may complete this program with a minimum of 62 credits or a maximum of 67 credits depending on whether they are exempt from taking COMP 202 and their choice of complementary courses.

Co s (50)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202 and can replace it with additional computer science complementary course credits.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development
COMP 308	(1)	Computer Systems Lab
COMP 310	(3)	Operating Systems
COMP 322	(1)	Introduction to C++
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 361D1	(3)	Software Engineering Project
COMP 361D2	(3)	Software Engineering Project
COMP 557	(3)	Fundamentals of Computer Graphics
MATH 222	(3)	Calculus 3

MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures 1
MATH 323	(3)	Probability

Complementary Courses (17 credits)

Students complete a minimum of 15 or a maximum of 17 complementary credits selected as follows:

3 credits selected from:

COMP 350	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques

6-8 credits selected from:

COMP 424	(3)	Artificial Intelligence
COMP 507	(3)	Computational Geometry
COMP 521	(4)	Modern Computer Games
COMP 522	(4)	Modelling and Simulation
COMP 529	(4)	Software Architecture
COMP 533	(3)	Object-Oriented Software Development
COMP 559	(4)	Fundamentals of Computer Animation

6 credits selected from:

* Students take either COMP 435 or COMP 535, but not both.

COMP 409	(3)	Concurrent Programming
COMP 421	(3)	Database Systems
COMP 435*	(3)	Basics of Computer Networks
COMP 535*	(3)	Computer Networks 1

13.9.14 Bachelor of Science (B.Sc.) - Major Software Engineering (63 credits)

This program provides a broad introduction to the principles of computer science and covers in depth the design and development of software systems. Students may complete this program with a maximum of 63 credits or a minimum of 60 credits if they are exempt from taking COMP 202.

Required Courses (39 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202.

** Students may select either COMP 310 or ECSE 427, but not both.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development
COMP 310**	(3)	Operating Systems

COMP 361D1	(3)	Software Engineering Project
COMP 361D2	(3)	Software Engineering Project
ECSE 427**	(3)	Operating Systems
ECSE 429	(3)	Software Validation
MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures 1

Complementary Courses (24 credits)

At least 9 credits selected from groups A and B, with at least 3 credits selected from each:

Group A:

MATH 222	(3)	Calculus 3
MATH 323	(3)	Probability
MATH 324	(3)	Statistics

Group B:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 360	(3)	Algorithm Design Techniques

At least 15 credits selected from the following, with at least 6 credits selected from Software Engineering Specializations, and at least 6 credits selected from Applications Specialties.

Software Engineering Specializations

* Students may select either COMP 409 or ECSE 420, but not both.

COMP 409*	(3)	Concurrent Programming

COMP 558	(3)	Fundamentals of Computer Vision
ECSE 424	(3)	Human-Computer Interaction
ECSE 532*	(3)	Computer Graphics

13.9.15 Bachelor of Science (B.Sc.) - Honours Computer Science (75 credits)

Students may complete this program with a maximum of 75 credits or a minimum of 72 credits if they are exempt from taking COMP 202.

Honours students must maintain a CGPA of at least 3.00 during their studies and at graduation.

Required Courses (45 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202.

** Students take either MATH 340 or MATH 350.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 252	(3)	Algorithms and Data Structures
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 310	(3)	Operating Systems
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350	(3)	Numerical Computing
COMP 362	(3)	Honours Algorithm Design
COMP 400	(3)	Technical Project and Report
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures 1
MATH 340**	(3)	Discrete Structures 2
MATH 350**	(3)	Graph Theory and Combinatorics

Complementary Courses (30 credits)

At least 3 credits selected from:

COMP 303	(3)	Software Development
COMP 304	(3)	Object-Oriented Design

6 credits selected from:

MATH 318	(3)	Mathematical Logic
MATH 323	(3)	Probability
MATH 324	(3)	Statistics

The remaining credits selected from computer science courses at the 300 level or above (except COMP 364, COMP 396, COMP 400, COMP 431) and ECSE 508. At least 12 credits must be at the 500 level.

13.9.16 Bachelor of Science (B.Sc.) - Honours Software Engineering (75 credits)

This program provides a more challenging and research-oriented version of the Major Software Engineering program.

Students may complete this program with a maximum of 75 credits or a minimum of 72 credits if they are exempt from taking COMP 202.

Honours students must maintain a CGPA of at least 3.00 during their studies and at graduation.

Required Courses (42 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202.

** Students may select either COMP 310 or ECSE 427, but not both.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development
COMP 310**	(3)	Operating Systems
COMP 361D1	(3)	Software Engineering Project
		Software Engineering Project

COMP 409*	(3)	Concurrent Programming
COMP 523	(3)	Language-based Security
COMP 525	(3)	Formal Veri cation
COMP 529	(4)	Software Architecture
COMP 533	(3)	Object-Oriented Software Development
ECSE 420*	(3)	Parallel Computing

[illegible]

COMP 350	(3)	Numerical Computing
COMP 417	(3)	Introduction Robotics and Intelligent Systems
COMP 421	(3)	Database Systems
COMP 424	(3)	Arti cial Intelligence
COMP 512	(4)	Distributed Systems
COMP 520	(4)	Compiler Design
COMP 521	(4)	Modern Computer Games
COMP 522	(4)	Modelling and Simulation
COMP 535	(3)	Computer Networks 1
COMP 557	(3)	Fundamentals of Computer Graphics
COMP 558	(3)	Fundamentals of Computer Vision
ECSE 424	(3)	Human-Computer Interaction

At least 6 credits selected from any COMP courses at the 500 level or above. These may include courses on the Software Engineering Specializations and Application Specialties lists.

13.9.17 [illegible]

13.9.17.1 [illegible]

For more information, see section 13.21: Mathematics and Statistics (MATH).

13.9.17.2 [illegible]

For more information, see section 13.21: Mathematics and Statistics (MATH). Students must consult an Honours adviser in both departments.

13.9.17.3 [illegible]

For more information, see section 13.21: Mathematics and Statistics (MATH).

13.9.17.4 [illegible]

For more information, see section 13.21: Mathematics and Statistics (MATH). Students must consult an Honours adviser in both departments.

13.9.17.5 [illegible]

For more information, see section 13.29: Physics (PHYS)

13.9.17.6 [illegible]

Students following Major or Honours programs in Computer Science may want to consider the Minor in Cognitive Science.

13.10 Earth and Planetary Sciences (EPS)

13.10.1 Location

Frank Dawson Adams Building, Room 238
3450 University Street
Montreal, Quebec H3A 2A7

Telephone: 514-398-6767
Fax: 514-398-4680
Email: kristy.thornton@mcgill.ca
Website: www.eps.mcgill.ca

13.10.2 About Earth and Planetary Sciences

The domain of Earth and Planetary Sciences includes the solid Earth and its hydrosphere and extends to the neighbouring terrestrial planets. It is a multidisciplinary field in which the principles of chemistry, physics, and mathematics are applied to the rich problems of the real world in order to understand how planets like the Earth work; in the past, the present, and the future.

Career opportunities are many and varied for graduates in the Earth and Planetary Sciences. There is presently a demand for graduates with expertise in many disciplines of the Earth Sciences. Our students are recruited for employment in the petroleum and mining industries, and in the environmental sector.

During the summer months, undergraduate students are generally able to obtain employment from industry or government agencies, providing them with both financial benefits and first-hand geoscientific experience. Career opportunities in planetary science are present in universities and research organizations.

The Department has a full-time staff of 17 professors and one faculty lecturer. There are approximately 55 graduate and 50 undergraduate students. Classes are therefore small at all levels, resulting in an informal and friendly atmosphere throughout the Department in which most of the faculty and students interact on a first-name basis. Emphasis is placed equally on quality teaching and research, providing undergraduate students with a rich and exciting environment in which to explore and learn.

The undergraduate curriculum is designed to provide both a rigorous foundation in the physical sciences and the flexibility to create an individualized program in preparation for careers in industry, teaching, or research. In addition to the Major and Honours undergraduate programs, the Department is part of the Earth System Science Interdepartmental program, and also offers a Joint Major in Physics and Geophysics which provides a rigorous mathematics and physics preparation and a geological background in the geosciences.

The Minor in Geology offers students from other departments the opportunity to obtain exposure to the Earth Sciences, while the Minor in Geochemistry is oriented towards Chemistry Major students who want to see the application of chemistry to problems in Earth and Planetary Sciences.

A Science Major concentration in Earth, Atmosphere and Ocean Sciences is available to students pursuing the B.A. & Sc. degree. This Major concentration is described in the Bachelor of Arts and Science section of this publication; see Bachelor of Arts and Science > Earth, Atmosphere and Ocean Sciences for details.

Students interested in any of the programs should inquire at Room 238, Frank Dawson Adams Building, 514-398-6767, or should consult the Undergraduate Director:

Professor Jeanne Paquette
Frank Dawson Adams Building, Room 214
Email: jeanne.paquette@mcgill.ca
Telephone: 514-398-4402

13.10.3 Earth and Planetary Sciences (EPS) Faculty

Chair

Andrew Hynes

Emeritus Professors

Jafar Arkani-Hamed; B.Eng.(Tehran), Ph.D.(MIT)

Wallace H. MacLean; B.Geol.Eng.(Colorado Sch. of Mines), M.Sc.(Appl.), Ph.D.(McG.)

Robert F. Martin; B.Sc.(Ott.), M.S.(Penn. St.), Ph.D.(Stan.)

Colin W. Stearn; B.Sc.(McM.), M.S., Ph.D.(Yale), F.R.S.C.

Professors

Don R. Baker; A.B.(Chic.), Ph.D.(Penn. St.)

Don M. Francis; B.Sc.(McG.), M.Sc.(B.Col.), Ph.D.(MIT) (Dawson Professor of Geology)

Andrew J. Hynes; B.Sc.(Tor.), Ph.D.(Cant.) (William E. Logan Professor of Geology)

Olivia G. Jensen; B.Sc., M.Sc., Ph.D.(Br. Col.)

Alfonso Mucci; B.Sc., M.Sc.(Montr.), Ph.D.(Miami)

John Stix; A.B.(Dart.), M.Sc., Ph.D.(Tor.)

A.E. (Willy) Williams-Jones; B.Sc., M.Sc.(Natal), Ph.D.(Qu.)

Associate Professors

Galen Halverson; B.A.(Mont.), M.A.(Harv.), Ph.D.(Harv.) (T.H. Clark Chair in Sedimentary and Petroleum Geology)

Jeanne Paquette; B.Sc., M.Sc.(McG.), Ph.D.(Stonybrook) (Undergraduate Director)

Hojatollah Vali; B.Sc., M.Sc., Ph.D.(Munich) (Director, Electron Microscopy Centre)

Assistant Professors

Eric Galbraith; B.Sc.(McG.), Ph.D.(Br.Col.)

Sarah Hall; B.A.(Hamilton), Ph.D.(Calif.-Santa Cruz)

Yajing Liu; B.Sc.(Peking), Ph.D.(Harv.)

Jeffrey McKenzie; B.Sc.(McG.), M.Sc., Ph.D.(Syrac.)

Christie Rowe; A.B.(Smith), Ph.D.(Calif.-Santa Cruz)

Vincent van Hinsberg; Propadeuse(Utrecht), Doctorandus(Utrecht), Ph.D.(Brist.)

Boswell Wing; A.B.(Harv.), M.A., Ph.D.(Johns Hop.) (Canada Research Chair in Earth Systems Science (Geochemistry))

Faculty Lecturer

W. Minarik; B.A.(St. Olaf), M.Sc.(Wash.), Ph.D.(Rensselaer)

Adjunct Pr

EPSC 201	(3)	Understanding Planet Earth
EPSC 233	(3)	Earth and Life History

9 credits selected from the list below and other 300-level and higher courses in Earth and Planetary Sciences may be substituted with permission.

EPSC 203	(3)	Structural Geology
EPSC 231	(3)	Field School 1
EPSC 334	(3)	Invertebrate Paleontology
EPSC 350	(3)	Tectonics
EPSC 451	(3)	Hydrothermal Mineral Deposits
EPSC 452	(3)	Mineral Deposits
EPSC 542	(3)	Chemical Oceanography
EPSC 561	(3)	Ore-forming Processes 1

13.10.5 Bachelor of Science (B.Sc.) - Minor Geochemistry (18 credits)

Required Courses (9 credits)

EPSC 201	(3)	Understanding Planet Earth
EPSC 210	(3)	Introductory Mineralogy
EPSC 212	(3)	Introductory Petrology

Complementary Courses (9 credits)

9 credits selected from:

EPSC 220	(3)	Principles of Geochemistry
EPSC 501	(3)	Crystal Chemistry
EPSC 519	(3)	Isotope Geology
EPSC 542	(3)	Chemical Oceanography
EPSC 545	(3)	Low-Temperature Geochemistry
EPSC 561	(3)	Ore-forming Processes 1
EPSC 570	(3)	Cosmochemistry
EPSC 590	(3)	Applied Geochemistry Seminar

13.10.6 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Earth and Planetary Sciences (45 credits)

The B.Sc. (Liberal) program in Earth and Planetary Sciences provides the graduate with a solid core of knowledge of Geology, Geophysics, Earth Systems Science, and Planetary Science while allowing for a broadening of the student's educational experience with courses from the other sciences or the arts. This program is flexible, allowing students to assemble a truly interdisciplinary degree.

Required Courses (21 credits)

EPSC 203	(3)	Structural Geology
EPSC 210	(3)	Introductory Mineralogy
EPSC 212	(3)	Introductory Petrology
EPSC 220	(3)	Principles of Geochemistry
EPSC 231	(3)	Field School 1
EPSC 233	(3)	Earth and Life History

EPSC 320	(3)	Elementary Earth Physics

Complementary Courses (24 credits)

3 credits, one of:

EPSC 331	(3)	Field School 2
EPSC 341	(3)	Field School 3

plus 21 credits chosen from the following:

Note: Courses at the 300 or higher level in other departments in the Faculties of Science and Engineering may also be used as complementary credits, with the permission of the Director of undergraduate studies.

EPSC 312	(3)	Spectroscopy of Minerals
EPSC 330	(3)	Earthquakes and Earth Structure
EPSC 334	(3)	Invertebrate Paleontology
EPSC 340	(3)	Earth and Planetary Inference
EPSC 350	(3)	Tectonics
EPSC 423	(3)	Igneous Petrology
EPSC 425	(3)	Sediments to Sequences
EPSC 435	(3)	Applied Geophysics
EPSC 445	(3)	Metamorphic Petrology
EPSC 451	(3)	Hydrothermal Mineral Deposits
EPSC 452	(3)	Mineral Deposits
EPSC 455	(3)	Sedimentary Geology
EPSC 501	(3)	Crystal Chemistry
EPSC 519	(3)	Isotope Geology
EPSC 525	(3)	Subsurface Mapping
EPSC 530	(3)	Volcanology
EPSC 542	(3)	Chemical Oceanography
EPSC 547	(3)	Modelling Geochemical Processes
EPSC 548	(3)	Processes of Igneous Petrology
EPSC 549	(3)	Hydrogeology
EPSC 550	(3)	Selected Topics 1
EPSC 551	(3)	Selected Topics 2
EPSC 552	(3)	Selected Topics 3
EPSC 561	(3)	Ore-forming Processes 1
EPSC 562	(3)	Ore-forming Processes 2
EPSC 570	(3)	Cosmochemistry

13.10.7 Bachelor of Science (B.Sc.) - Major Earth and Planetary Sciences (66 credits)

The program curriculum is designed to provide a rigorous foundation in physical sciences and the flexibility to create an individualized program in preparation for careers in industry, teaching, and research. The program is accepted for professional qualification in most Canadian provinces.

U1 Required Courses (21 credits)

EPSC 203	(3)	Structural Geology
EPSC 210	(3)	Introductory Mineralogy
EPSC 212	(3)	Introductory Petrology
EPSC 220	(3)	Principles of Geochemistry
EPSC 231	(3)	Field School 1
EPSC 312	(3)	Spectroscopy of Minerals
MATH 222	(3)	Calculus 3

U1 Complementary Courses (3 credits)

3 credits, one of:

EPSC 201	(3)	Understanding Planet Earth
EPSC 233	(3)	Earth and Life History

U2 and U3 Required Courses (24 credits)

EPSC 320	(3)	Elementary Earth Physics
EPSC 334	(3)	Invertebrate Paleontology
EPSC 340	(3)	Earth and Planetary Inference
EPSC 350	(3)	Tectonics
EPSC 423	(3)	Igneous Petrology
EPSC 445	(3)	Metamorphic Petrology
EPSC 452	(3)	Mineral Deposits
EPSC 455	(3)	Sedimentary Geology

Complementary Courses (18 credits)

3 credits, one of:

EPSC 331	(3)	Field School 2
EPSC 341	(3)	Field School 3

plus 15 credits (five courses) chosen from the following:

Note: Other courses at the 300-level or higher in Earth and Planetary Sciences and in other departments in the Faculties of Science and Engineering may also be used as complementary credits with the permission of the Director of undergraduate studies.

EPSC 330	(3)	Earthquakes and Earth Structure
EPSC 425	(3)	Sediments to Sequences
EPSC 435	(3)	Applied Geophysics
EPSC 451	(3)	Hydrothermal Mineral Deposits
EPSC 470D1	(3)	Undergraduate Thesis Research

EPSC 470D2	(3)	Undergraduate Thesis Research
EPSC 501	(3)	Crystal Chemistry
EPSC 519	(3)	Isotope Geology
EPSC 530	(3)	Volcanology
EPSC 542	(3)	Chemical Oceanography
EPSC 547	(3)	Modelling Geochemical Processes
EPSC 548	(3)	Processes of Igneous Petrology
EPSC 549	(3)	Hydrogeology
EPSC 550	(3)	Selected Topics 1
EPSC 551	(3)	Selected Topics 2
EPSC 552	(3)	Selected Topics 3
EPSC 561	(3)	Ore-forming Processes 1
EPSC 562	(3)	Ore-forming Processes 2
EPSC 570	(3)	Cosmochemistry
EPSC 580	(3)	Aqueous Geochemistry
EPSC 590	(3)	Applied Geochemistry Seminar

13.10.8 Bachelor of Science (B.Sc.) - Honours Earth and Planetary Sciences (75 credits)

The program curriculum is designed to provide a rigorous foundation in physical sciences and the flexibility to create an individualized program in preparation for careers in industry, teaching, and research. It is intended to provide an excellent preparation for graduate work in the earth sciences. The program is accepted for professional qualification in most Canadian provinces.

Note: Honours students must maintain a CGPA equal to or greater than 3.20.

U1 Required Courses (24 credits)

EPSC 203	(3)	Structural Geology
EPSC 210	(3)	Introductory Mineralogy
EPSC 212	(3)	Introductory Petrology
EPSC 220	(3)	Principles of Geochemistry
EPSC 231	(3)	Field School 1
EPSC 233	(3)	Earth and Life History
EPSC 312	(3)	Spectroscopy of Minerals
MATH 222	(3)	Calculus 3

U2/U3 Required Courses (33 credits)

EPSC 320	(3)	Elementary Earth Physics
EPSC 340	(3)	Earth and Planetary Inference
EPSC 350	(3)	Tectonics
EPSC 423	(3)	Igneous Petrology
EPSC 445	(3)	Metamorphic Petrology
EPSC 452	(3)	Mineral Deposits
EPSC 455	(3)	Sedimentary Geology
EPSC 480D1	(3)	Honours Research Project
EPSC 480D2	(3)	Honours Research Project

MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations

Cpan yCo e(18)

EPSC 548	(3)	Processes of Igneous Petrology
EPSC 549	(3)	Hydrogeology
EPSC 550	(3)	Selected Topics 1
EPSC 551	(3)	Selected Topics 2
EPSC 552	(3)	Selected Topics 3
EPSC 561	(3)	Ore-forming Processes 1
EPSC 562	(3)	Ore-forming Processes 2
EPSC 580	(3)	Aqueous Geochemistry
EPSC 590	(3)	Applied Geochemistry Seminar

13.10.10 Earth and Planetary Sciences (EPSC) Related Programs

13.10.10.1 Joint Major in Physics and Geophysics

For more information, see section 13.29: Physics (PHYS).

13.10.10.2 Earth System Science Interdepartmental Major

This program is offered by the Department of Atmospheric & Oceanic Sciences, Earth & Planetary Sciences, and Geography. Students in the Department of Earth & Planetary Sciences who are interested in this program should contact: Professor Jeffrey McKenzie (jeffrey.mckenzie@mcgill.ca).

For more information, see section 13.11: Earth System Science Interdepartmental Major (ESYS).

13.11 Earth System Science Interdepartmental Major (ESYS)

13.11.1 Location

Program Adviser
Professor Jeffrey McKenzie
Frank Dawson Adams, Room 131C
Email: jeffrey.mckenzie@mcgill.ca
Telephone: 514-398-3833

13.11.2 About Earth System Science Interdepartmental Major

The McGill program in Earth System Science (ESYS) is designed to equip students with the skills and knowledge to address six "Grand Challenges" that are fundamental to our understanding of the way in which the Earth operates. These are:

- Global biogeochemical cycles
- Climate variability and change
- Land use and land cover change
- Energy and resources
- Earth hazards: volcanoes, earthquakes, and hurricanes
- Earth-atmosphere observation, analysis, and prediction

The ESS Major is offered jointly by the Department of Atmospheric and Oceanic Sciences (AOC), the Department of Earth and Planetary Sciences (EPSC), and the Department of Geography (GEOG).

The individual departments, their disciplines, and specific courses offered by them are described in their respective entries in this publication.

13.11.3 Bachelor of Science (B.Sc.) - Major Earth System Science (57 credits)

The Major in Earth System Science (ESYS) is offered jointly by the following departments:

Atmospheric and Oceanic Sciences (AOC)

Earth and Planetary Sciences (EPSC)

Geography (GEOG)

Earth System Science (ESYS) views Earth as a single integrated system that provides a unifying context to examine the interrelationships between all components of the Earth system. The approach concentrates on the nature of linkages among the bi2o4a linkages among the bi2o42 0 0 1 43 chem 1 43 hu

BIOL 434	(3)	Theoretical Ecology
BIOL 441	(3)	Biological Oceanography
BIOL 465	(3)	Conservation Biology
BIOL 540	(3)	Ecology of Species Invasions
BREE 319	(3)	Engineering Mathematics
ECON 347	(3)	Economics of Climate Change
ECON 405	(3)	Natural Resource Economics
EPSC 212	(3)	Introductory Petrology
EPSC 312	(3)	Spectroscopy of Minerals
EPSC 320	(3)	Elementary Earth Physics
EPSC 330	(3)	Earthquakes and Earth Structure
EPSC 331	(3)	Field School 2
EPSC 334	(3)	Invertebrate Paleontology
EPSC 341	(3)	Field School 3
EPSC 350	(3)	Tectonics
EPSC 423	(3)	Igneous Petrology
EPSC 425	(3)	Sediments to Sequences
EPSC 445	(3)	Metamorphic Petrology
EPSC 451	(3)	Hydrothermal Mineral Deposits
EPSC 452	(3)	Mineral Deposits
EPSC 455	(3)	Sedimentary Geology
EPSC 519	(3)	Isotope Geology
EPSC 525	(3)	Subsurface Mapping
EPSC 530	(3)	Volcanology
EPSC 542	(3)	Chemical Oceanography
EPSC 549	(3)	Hydrogeology
EPSC 580	(3)	Aqueous Geochemistry
EPSC 590	(3)	Applied Geochemistry Seminar
GEOG 272	(3)	Earth's Changing Surface
GEOG 305	(3)	Soils and Environment
GEOG 306	(3)	Raster Geo-Information Science
GEOG 307	(3)	Socioeconomic Applications of GIS
GEOG 321	(3)	Climatic Environments
GEOG 322	(3)	Environmental Hydrology
GEOG 350	(3)	Ecological Biogeography
GEOG 351	(3)	Quantitative Methods
GEOG 372	(3)	Running Water Environments
GEOG 380	(3)	Adaptive Environmental Management
GEOG 495	(3)	Field Studies - Physical Geography
GEOG 499	(3)	Subarctic Field Studies
GEOG 505	(3)	Global Biogeochemistry
GEOG 506	(3)	Advanced Geographic Information Science
GEOG 522	(3)	Advanced Environmental Hydrology

GEOG 535	(3)	Remote Sensing and Interpretation
GEOG 536	(3)	Geocryology
GEOG 537	(3)	Advanced Fluvial Geomorphology
GEOG 550	(3)	Historical Ecology Techniques
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 317	(3)	Numerical Analysis
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 323	(3)	Probability
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 423	(3)	Regression and Analysis of Variance
MATH 437	(3)	Mathematical Methods in Biology
MATH 447	(3)	Introduction to Stochastic Processes
MATH 525	(4)	Sampling Theory and Applications
NRSC 540	(3)	Socio-Cultural Issues in Water
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 342	(3)	Majors Electromagnetic Waves
PHYS 432	(3)	Physics of Fluids

13.12 Environment

13.12.1 Location

Downtown Campus
3534 University Street
Montreal, Quebec H3A 2A7
Telephone: 514-398-2827
Fax: 514-398-1643

Macdonald Campus
Rowles House
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue, Quebec H9X 3V9
Telephone: 514-398-7559
Fax: 514-398-7846

13.12.2 About Environment

All courses given by the McGill School of Environment (Subject Code ENVR) are considered as courses taught by the Faculty of Science.

Science students who are interested in studying the environment should refer to the McGill School of Environment section where they will find information concerning the Minor program in Environment, the B.Sc. Major program in Environment and the B.Sc. Honours program in Environment.

13.13 Experimental Medicine (EXMD)

13.13.1 Location

Lady Meredith House, Room 101
1110 Pine Avenue West
Montreal, Quebec H3A 1A3

Telephone: 514-398-3466
Email: experimental.medicine@mcgill.ca
Website: www.medicine.mcgill.ca/expmed

13.13.2 About Experimental Medicine

Experimental Medicine is a Division of the Department of Medicine. There are no B.Sc. programs in Experimental Medicine, but the EXMD courses listed below are considered as courses taught by the Faculty of Science.

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 504	(3)	Biology of Cancer
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
EXMD 509	(3)	Gastrointestinal Physiology and Pathology
EXMD 510	(3)	Bioanalytical Separation Methods
EXMD 511	(3)	Joint Venturing with Industry

13.14 Field Study

For details about the Minor program in Field Study, see Field Studies and Study Abroad > Field Study Minor.

13.15 General Science Minor

13.15.1 Location

Interdisciplinary Program Adviser
Ryan Bouma, Interim Adviser
Email: ryan.bouma@mcgill.ca
Telephone: 514-398-7330

13.15.2 About General Science

The Minor in General Science is only open to students in a B.Sc. Liberal program. Students interested in completing this Minor must consult with the Adviser for this program. See the program description in section 13.15.3: Bachelor of Science (B.Sc.) - Minor General Science (18 credits) for more information.

13.15.3 Bachelor of Science (B.Sc.) - Minor General Science (18 credits)

The Minor General Science is restricted to students in the B.Sc. Liberal program and may be used for the breadth component in this option. Students sho consult their program adviser for their core science component and the Interdisciplinary Programs Adviser when selecting courses for this Minor.

Complementary Courses (18 credits)

Courses are to be chosen according to the following guidelines:

All courses must be offered by the Faculty of Science and must be at or above the 200 level*.

Professors
N.T. Roulet; B.Sc., M.Sc.(Trent), Ph.D.(McM.) (James McGill Professor)
G.W. Wenzel; M.A.(Manit.), Ph.D.(McG.)

Associate Professors
G.L. Chmura; B.S.(Mass.), M.S.(Rhode Is.), Ph.D.(L.S.U.)
O.T. Coomes; B.Sc.(Vic., BC), M.A.(Tor.), Ph.D.(Wisc.)
B. Forest; A.B.(Chic.), M.A., Ph.D.(Calif.-LA)
M.F. Lapointe; B.Sc., M.Sc.(McG.), Ph.D.(Br. Col.)
T.C. Meredith; B.E.S.(Wat.), M.Sc., Dip.Cons.(Lond.), Ph.D.(Camb.)
W.H. Pollard; B.A., M.Sc.(Guelph), Ph.D.(Ott.)
N.A. Ross; B.A., M.A.(Qu.), Ph.D.(McM.)
R. Sengupta; B.Sc.(Bombay), M.Sc.(IIT Mumbai), M.S., Ph.D.(S. Ill.-Carbondale) (joint appt. with McGill School of Environment)
R.E. Sieber; B.Sc.(Mich. St.), M.A.(W. Mich.), Ph.D.(Rutg.) (joint appt. with McGill School of Environment)
I.B. Strachan; B.Sc.(Tor.), M.Sc., Ph.D.(Qu.) (cross appt. with Natural Resource Sciences)
S. Turner; B.Soc.Sci., M.Soc.Sc.(Waikato), Ph.D.(Hull)
J. Unruh; B.A.(Kansas), M.S.(Wisc.), Ph.D.(Ariz.) (on leave Winter 2011 and Fall 2011)

Assistant Professors
L. Berrang Ford; B.Sc.(Guelph), M.Sc.(Oxf.), Ph.D.(Guelph)
S. Breau; B.A.(Moncton), M.A.(Laval), Ph.D.(Calif.-LA)
J. Ford; B.A., M.Sc.(Oxf.), Ph.D.(Guelph)
M. Kalácska; B.Sc., M.Sc., Ph.D.(Alta.)
B. Lehner; Dip. Hydrol.(Freiburg), Ph.D.(Frankfurt)
N. Oswin; B.A. Hons.(Tor.), M.A.(Dal.), Ph.D.(Br. Col.)
N. Ramankutty; B.E.(P.S.G. Coll. of Tech.), M.S.(Ill.), Ph.D.(Wisc.)
J. Rhemtulla; B.Sc.(McG.), M.Sc.(Alta.), Ph.D.(Wisc. Madison)

13.16.5 Bachelor of Science (B.Sc.) - Minor Geography (18 credits)

The Minor Geography is expandable into the B.Sc. Major Geography.

The Minor Geography is designed to provide students in the Faculty of Science with an overview of basic elements of geography at the introductory and advanced level.

This Minor permits no overlap with any other programs.

Required Courses (12 credits)

GEOG 203	(3)	Environmental Systems
GEOG 216	(3)	Geography of the World Economy
GEOG 217	(3)	Cities in the Modern World
GEOG 302	(3)	Environmental Management 1

Complementary Courses (6 credits)

6 credits of Geography courses at the 300 and 400 le

GEOG 272	(3)	Earth's Changing Surface
GEOG 290	(1)	Local Geographical Excursion
GEOG 302	(3)	Environmental Management 1
GEOG 351	(3)	Quantitative Methods

Complementary Courses (36 credits)

3 credits of statistics:

Note: Credit given for statistics courses is subject to certain restrictions. Students in Science should consult the "Course Overlap" information in the "Course Requirements" section for the Faculty of Science.

BIOL 373	(3)	Biometry
GEOG 202	(3)	Statistics and Spatial Analysis
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics
SOCI 350	(3)	Statistics in Social Research

3 credits of GIS techniques:

GEOG 306	(3)	Raster Geo-Information Science
GEOG 308	(3)	Principles of Remote Sensing

12 credits of systematic physical geography

GEOG 305	(3)	Soils and Environment
GEOG 321	(3)	Climatic Environments
GEOG 322	(3)	Environmental Hydrology
GEOG 372	(3)	Running Water Environments
GEOG 470	(3)	Wetlands

3 credits of field courses:

(Field course availability is determined each year in February)

GEOG 495	(3)	Field Studies - Physical Geography
GEOG 496	(3)	Geographical Excursion
GEOG 497	(3)	Ecology of Coastal Waters
GEOG 499	(3)	Subarctic Field Studies

15 credits from approved courses in Geography, or elsewhere in the Faculty of Science, or in the Faculty of Engineering; at least 9 credits of which are to be taken outside Geography. Students may also include any courses that are not already counted towards the GIS techniques or the systematic physical geography requirements. Admission to 500-level courses in Geography requires the instructor's permission. It is not advisable to take more than one 500-level course in a term.

Advising Note: See the Geography website for the list of approved courses in the Faculty of Science. Some courses require the permission of the Department and from the Associate Dean of Science, Student Affairs.

Geography Approved Courses: Major, Honours and Joint Programs

GEOG 404	(3)	Environmental Management 2

GEOG 501	(3)	Modelling Environmental Systems
GEOG 505	(3)	Global Biogeochemistry
GEOG 506	(3)	Advanced Geographic Information Science
GEOG 522	(3)	Advanced Environmental Hydrology
GEOG 523	(3)	Global Ecosystems and Climate
GEOG 535	(3)	Remote Sensing and Interpretation
GEOG 536	(3)	Geocryology
GEOG 537	(3)	Advanced Fluvial Geomorphology
GEOG 550	(3)	Historical Ecology Techniques
GEOG 555	(3)	Ecological Restoration

13.16.9 Ba ts(B.S) - H sG y(66)

The Honours program is designed to vide specialized systematic training in ysical geography In addition to the Faculty requirement that Honours y (66 credG 0 g BT /F1 8.1 Tf 1 0 0 1455.48.52 61sinroducgicya75 -ographic Information Science

3 credits of GIS techniques:

GEOG 306	(3)	Raster Geo-Information Science
GEOG 308	(3)	Principles of Remote Sensing

12 credits of systematic physical geography:

GEOG 305	(3)	Soils and Environment
GEOG 321	(3)	Climatic Environments
GEOG 322	(3)	Environmental Hydrology
GEOG 372	(3)	Running Water Environments
GEOG 470	(3)	Wetlands

3 credits of field courses:

GEOG 495	(3)	Field Studies - Physical Geography

13.16.10.3 Earth System Science Interdepartmental Major

For more information, see section 13.11: Earth System Science Interdepartmental Major (ESYS).

This program is offered by the Department of Atmospheric & Oceanic Sciences, Earth & Planetary Sciences, and Geography.

Students in the Department of Geography interested in this program should contact: Professor Jeffrey McKenzie (jeffrey.mckenzie@mcgill.ca).

13.16.10.4 Bachelor of Arts and Science (B.A. & Sc.) Interfaculty Program in Sustainability, Science and Society

The Interfaculty Program in Sustainability, Science and Society is open only to students in the B.A. & Sc. degree.

Adviser: Prof. Navin Ramankutty
Email: navin.ramankutty@mcgill.ca
Telephone: 514-398-8428

For further information about this program, see Bachelor of Arts and Science > Bachelor of Arts and Science (B.A. & Sc.) - Interfaculty Program in Sustainability, Science and Society (54 credits).

13.17 Immunology Interdepartmental Honours

13.17.1 Location

Montreal General Hospital
Room L11.132-44
1650 Cedar Avenue
Montreal, Quebec H3G 1A4

or

McIntyre Medical Sciences Building, Room 1136
3655 Promenade Sir-William-Osler
Montreal, Quebec H3G 1Y6

13.17.2 About the Immunology Interdepartmental Honours

Three departments offer the Honours program in Immunology: Biochemistry, Microbiology and Immunology, and Physiology, combining elements of each. The program is a demanding one, which will prepare the student for graduate work in immunology.

** Students select either CHEM 203 or CHEM 204.

*** Students select either PHGY 209 or MIMM 211.

BIOC 212*	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 201*	(3)	Cell Biology and Metabolism
CHEM 203**	(3)	Survey of Physical Chemistry
CHEM 204**	(3)	Physical Chemistry/Biological Sciences 1
CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 222	(4)	Introductory Organic Chemistry 2 53.965 649.1 Tm (ysical CheCe944)Tj 1 1 0 1 165.864 601.94 TCe944
MIMM 211***	(3)	Introductory Microbiology
PHGY 209***	(3)	Mammalian Physiology 1

2/ ECo e

13 credits from the following:

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
MIMM 314	(3)	Immunology

3/ ECo e

15 credits from the following:

MIMM 414	(3)	Advanced Immunology
PHGY 419D1	(4.5)	Immunology Research Project
PHGY 419D2	(4.5)	Immunology Research Project
PHGY 513	(3)	Cellular Immunology

Cplan yCo e(27)d

U1 Cplan yCo e

6 credits chosen for U1 complementary courses in the following manner

3 credits selected from:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

plus 3 credits selected from the following:

* Students take CHEM 287 and CHEM 297.

ANAT 214	(3)	Systemic Human Anatomy
		Introductory Molecular 949 1m9 128.824 Tm (ts selected from:5B4949 1m9 128.e 1 0 0 1 70.52 144.544m9

CHEM 297*	(1)	IntroductoryAnalytical Chemistry Laboratory
COMP 202	(3)	Introduction to Computing 1
COMP 203	(3)	Introduction to Computing 2
MATH 204	(3)	Principles of Statistics 2
MIMM 211	(3)	Introductory Microbiology
MIMM 212	(2)	Laboratory in Microbiology
		Mammalian Ph

CHEM 222	(4)	Introductory Organic Chemistry 2
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 503	(3)	Drug Design and Development 1
CHEM 504	(3)	Drug Design and Development 2
EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
MIMM 211	(3)	Introductory Microbiology
MIMM 314	(3)	Immunology
MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis
NSCI 201	(3)	Introduction to Neuroscience 2
NUTR 307	(3)	Human Nutrition
PATH 300	(3)	Human Disease
PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drugs and Disease
PHAR 303	(3)	Principles of Toxicology
PHAR 503	(3)	Drug Design and Development 1
PHAR 504	(3)	Drug Design and Development 2
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 311	(3)	Channels, Synapses & Hormones
		Respiratory

HIST 335	(3)	Science and Medicine in Canada
HIST 350	(3)	Science and the Enlightenment
HIST 381	(3)	Colonial Africa: Health/Disease
HIST 396	(3)	Disease in Africa Since 1960
HIST 424	(3)	Gender, Sexuality & Medicine
HIST 447	(3)	The Natural History of America
HSEL 308	(3)	Issues in Women's Health
HSEL 309	(3)	Women's Reproductive Health
PHIL 237	(3)	Contemporary Moral Issues
PHIL 343	(3)	Biomedical Ethics
PHIL 443	(3)	Topics in Biomedical Ethics
POLI 417	(3)	Health Care in Canada
PSYC 215	(3)	Social Psychology
PSYC 304	(3)	Child Development
PSYC 333	(3)	Personality and Social Psychology
PSYC 412	(3)	Developmental Psychopathology
PSYC 413	(3)	Cognitive Development
PSYC 414	(3)	Social Development
SOCI 225	(3)	Medicine and Health in Modern Society
SOCI 309	(3)	Health and Illness
SOCI 310	(3)	Sociology of Mental Disorder
SOCI 338	(3)	Introduction to Biomedical Knowledge
SOCI 365	(3)	Health and Development
SOCI 390	(3)	Gender and Health
SOCI 422	(3)	Health Care Providers
SOCI 515	(3)	Medicine and Society
SOCI 525	(3)	Health Care Systems in Comparative Perspective
SOCI 538	(3)	Selected Topics in Sociology of Biomedical Knowledge

Epal Te g

At least 3 credits from:

* Students who have already received credit for MATH 324 will NOT receive credit for GEOG 202, MATH 203, PSYC 204, BIOL 373, MATH 204, or PSYC 305.

Credit given for statistics courses is subject to certain restrictions. Students should consult the "Course Overlap" information in the "Course Requirements" section for the Faculty of Science.

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry
COMP 202	(3)	Introduction to Computing 1
COMP 364	(3)	Computer Tools for Life Sciences
COMP 462	(3)	Computational Biology Methods
GEOG 202	(3)	Statistics and Spatial Analysis
MATH 203	(3)	Principles of Statistics 1
MATH 204	(3)	Principles of Statistics 2

EDKP 449	(3)	Exercise Pathophysiology 2
EDKP 485	(3)	Exercise Pathophysiology 1
EDKP 495	(3)	Scientific Principles of Training
EDKP 498	(3)	Sport Psychology
EDKP 542	(3)	Environmental Exercise Physiology
EDKP 553	(3)	Physical Activity Assessments
EDKP 566	(3)	Advanced Biomechanics Theory

13.20 [illegible]

The Desautels Faculty of Management offers four programs for non-Management students open for application to students in the Faculty of Science. Please refer to the Desautels Faculty of Management section of this publication for detailed information about program requirements and applying.

- Finance for Non-Management Students; see Desautels Faculty of Management > Minor Finance (For Non-Management Students) (18 credits)
- Management for Non-Management Students; see Desautels Faculty of Management > Minor Management (For Non-Management Students) (18 credits)
- As of the 2008-09 academic year, the Minor in Management for Science students was retired. Students currently registered in the program should consult with their program adviser and refer to the Calendar for the academic year in which they began the program for guidance about program requirements.
- Marketing for Non-Management Students; see Desautels Faculty of Management > Minor Marketing (For Non-Management Students) (18 credits)
- Operations Management for Non-Management Students; see Desautels Faculty of Management > Minor Operations Management (For Non-Management Students) (18 credits)

Also available to Science students is the Minor Technological Entrepreneurship for Science students; see section 13.35: Technological Entrepreneurship for Science Students. (Please note that this Minor is currently under revision.)

13.21 [illegible]

13.21.1 [illegible]

Burnside Hall, Room 1005
805 Sherbrooke Street West
Montreal, Quebec H3A 2K6

Telephone: 514-398-3800
Fax: 514-398-3899
Website: www.math.mcgill.ca

13.21.2 A[illegible]

Mathematics has evolved to a discipline that is mainly characterized by its method of proof, its concern for a progressive broadening of its concepts, and by the search for mathematical entities and operations that represent aspects of reality. It is a subject that is pursued by many for its own sake, and regarded as part of the mainstream of human culture. Mathematics pervades modern society with an impact which, already immense, is rapidly growing.

The two principal divisions of mathematics are pure mathematics and applied mathematics. The pure mathematician is interested in abstract mathematical structures and in mathematics as an intellectual enterprise. The primary concern may not be with its utilitarian aspects or with the current needs of science and technology, although many problems in pure mathematics have developed from the sciences.

The applied mathematician is more interested in how mathematics can be used to study some aspects of the world. Mathematicians are engaged in the creation, study and application of advanced mathematical methods relevant to scientific problems. Statistical science and methodology today is concerned with phenomena in which there is a background of uncertainty arising from inherent variability and the investigator is obliged to arrive at decisions from limited data. A key tool in statistics is probability.

Some of the fields in which pure mathematicians work are algebra, analysis, geometry, topology, number theory, and foundations. Applied mathematics,

and embraces such diverse fields as communication theory, theory of optimization, theory of games, and numerical analysis.

Mathematics offers many vocational possibilities. Such fields as teaching, computing, applied statistics, and actuarial science offer opportunities for B.Sc. graduates. Opportunities to do original research in pure and applied mathematics are a found in financially or technologically oriented business firms. The Department of Mathematics and Statistics through its various programs attempts to provide courses to suit the diverse interests within mathematics and statistics.

The Honours program demands of the student a talent for abstraction in addition to a high level of competence in the use of mathematical tools. This program is intended for students who plan to work in an area where mathematical innovations may be needed. It is almost essential for students contemplating a career in mathematical research.

The Major program involves the same subjects as the Honours program but is less demanding in terms of abstraction. It is designed primarily for students who will need mathematical tools in their work but whose creative activity will involve applications of mathematics to other areas. Within the framework of the Mathematics Major, various combinations of courses are suggested to meet the needs of different students. These include course suggestions for secondary school teachers, careers in management, and for careers in industry, government, or actuarial sciences.

It is possible for Major students to include a number of Honours courses in their programs. This will be an advantage for those students who plan to use their mathematics in graduate studies.

Students interested in a Mathematics program linked to other disciplines are advised to consider the B.Sc. Liberal program with a core component in Mathematics or Statistics, or our joint programs with Computer Science, Psychology, and Physics.

In planning their programs, students are advised to seriously consider developing some depth in another discipline preferably one for which mathematics has some relevance and use. Mathematics has been closely linked to areas such as computer science, physics, and engineering, but has recently come to play an increasingly important role in fields such as biology, linguistics, management, and psychology. Students should consider completing the requirements for minor programs such as those available in Cognitive Science, Computer Science, and Statistics.

Students considering programs in Mathematics and Statistics should contact the Department to arrange for academic advising.

The student's attention is called to the fact that a B.Com. degree with a Major in Mathematics is available from the Desautels Faculty of Management. In addition, the Schulich School of Music offers the B.Mus. degree with Honours in Theory with Mathematics Option.

13.21.3 [illegible]

Students who want to get practical experience in industry before graduation are encouraged to participate in one of the following internship programs:

- The Internship Year in Science (IYS) is an academic program offered for a duration of 8, 12, or 16 months. It is reflected on the transcript and included in the program name (Bachelor of Science - Internship program). Eligible students usually take this program between their U2 and U3 years.
- The Industrial Practicum (IP) has a duration of 4 months and is usually carried out starting in May. It will appear as a 0-credit, Pass/Fail course on your transcript.

For more information on these programs, consult section 12.1: Industrial Practicum (IP) and Internship Year in Science (IYS)

Note: Students entering a program listed below that has MATH 222 (Calculus 3) as a required course and who have successfully completed a course equivalent to MATH 222 with a grade of C or better may omit MATH 222 (Calculus 3) from the program, but must replace it with 3 credits of elective courses.

13.21.4 [illegible]

Emeritus Professors

V. Seshadri; B.Sc., M.Sc.(Madr.), Ph.D.(Okla.)

George P.H. Styan; M.A., Ph.D.(Col.)

Kwok Kuen Tam; M.A., Ph.D.(Tor.)

John C. Taylor; B.Sc.(Acad.), M.A.(Qu.), Ph.D.(McM.)

Sanjo Zlobec; M.Sc.(Zagreb), Ph.D.(N'western)

Professors

William J. Anderson; B.Eng., Ph.D.(McG.)

Henri Darmon; B.Sc.(McG.), Ph.D.(Harv.), F.R.S.C. (James McGill Professor)

Stephen W. Drury; M.A., Ph.D.(Cant.)

Christian Genest; B.Sp.Sc.(UQAC), M.Sc.(UQAM), Ph.D.(Br.Col)

Eyal Z. Goren; B.A., M.S., Ph.D.(Hebrew)

Pengfei Guan; B.Sc.(Zhejiang), M.Sc., Ph.D.(Princ.) (Canada Research Chair)

Jacques C. Hurtubise; B.Sc.(Montr.), Ph.D.(Oxf.), F.R.S.C.

ofessors

A.B.(Harv), Ph.D.(Wis.)

13.21.5 Bachelor of Science (B.Sc.) - Minor Mathematics (24 credits)

The Minor may be taken in conjunction with any primary program in the Faculty of Science (other than programs in Mathematics). Students should declare their intention to follow the Minor Mathematics at the beginning of the penultimate year and should obtain approval for the selection of courses to fulfill the requirements for the Minor from the Departmental Chief Adviser (or delegate).

It is strongly recommended that students in the Minor program take MATH 323. The remaining credits may be freely chosen from the required and complementary courses for majors and honours students in Mathematics, with the obvious exception of courses that involve duplication of material. Alternatively, up to 6 credits may be allowed for appropriate courses from other departments.

Generally no more than 6 credits overlap are permitted between the Minor and the primary program. However, with an approved choice of substantial courses, the overlap restriction may be relaxed to 9 credits for students whose primary program requires 60 credits or more, and to 12 credits when the primary program requires 72 credits or more. **(3p**

PHYS 559	(3)	Advanced Statistical Mechanics
SOCI 504	(3)	Quantitative Methods 1
SOCI 505	(3)	Quantitative Methods 2

No more than 6 credits may be taken outside the Department of Mathematics and Statistics.

Further credits (if needed) may be freely chosen from the required and complementary courses for majors and honours students in Mathematics, with the obvious exception of courses that involve duplication of material.

13.21.7 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component in Mathematics (45 credits)

Program Prerequisites

Students entering the Core Science Component in Mathematics are normally expected to have completed the courses below or their equivalents. Otherwise, they will be required to make up any deficiencies in these courses over and above the 45 credits required for the program.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Guidelines for Course Selection

The following informal guidelines should be discussed with the student's adviser. Where appropriate, Honours courses may be substituted for equivalent Major courses. Students planning to pursue graduate studies are encouraged to make such substitutions.

Students interested in computer science are advised to choose courses from the following: MATH 317, MATH 318, MATH 327, MATH 328, MATH 335, MATH 340, MATH 407, MATH 417 and to complete the Computer Science Minor

Students interested in probability and statistics are advised to take MATH 204, MATH 324, MATH 407, MATH 423, MATH 447, MATH 523, MATH 525.

Students interested in applied mathematics should take MATH 317, MATH 319, MATH 324, MATH 326, MATH 327, MATH 407, MATH 417.

Students considering a career in secondary school teaching are advised to take MATH 318, MATH 328, MATH 338, MATH 339, MATH 346, MATH 348.

Students interested in careers in business, industry or government are advised to select courses from the following list:

MATH 317, MATH 319, MATH 327, MATH 329, MATH 407, MATH 417, MATH 423, MATH 430, MATH 447, MATH 523, MATH 525.

Required Courses (27 credits)

* Students may select either MATH 249 or MATH 316 but not both.

** Students who have successfully completed a course equivalent to MATH 222 with a grade of C or better may omit MATH 222, but must replace it with 3 credits of elective courses.

MATH 222**	(3)	Calculus 3
MATH 235	(3)	Algebra 1
MATH 236	(3)	Algebra 2
MATH 242	(3)	Analysis 1
MATH 243	(3)	Analysis 2
MATH 249*	(3)	Honours Complex Variables
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 316*	(3)	Complex Variables
MATH 323	(3)	Probability

Complementary Courses (18 credits)

18 credits selected from the following list, with at least 6 credits selected from:

MATH 317	(3)	NumericalAnalysis
MATH 324	(3)	Statistics
MATH 335	(3)	ComputationalAlgebra
MATH 340	(3)	Discrete Structures 2

the remainder of the 18 credits to be selected from:

MATH 204	(3)	Principles of Statistics 2
	thematical Logic	Mathematical Logic

MATH 236	(3)	Algebra 2
MATH 242	(3)	Analysis 1
MATH 243	(3)	Analysis 2
MATH 314	(3)	Advanced Calculus
MATH 323	(3)	Probability
MATH 324	(3)	Statistics
MATH 423	(3)	Regression and Analysis of Variance

Complementary Courses (18 credits)

18 credits selected from the following list, with at least 6 credits selected from:

* Students may tak

13.21.9 Bachelor of Science (B.Sc.) - Major in Mathematics (54 credits)

Program Prerequisites

Students entering the Major program are normally expected to have completed the courses below or their equivalents. Otherwise, they will be required to make up any deficiencies in these courses over and above the 54 credits of required courses.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Guidelines for Course Selection in the Major Program

The following informal guidelines should be discussed with the student's adviser. Where appropriate, Honours courses may be substituted for equivalent Major courses. Students planning to pursue graduate studies are encouraged to make such substitutions.

Students interested in computer science are advised to choose courses from the following: MATH 317, MATH 318, MATH 327, MATH 328, MATH 335, MATH 340, MATH 407, MATH 417 and to complete the Computer Science Minor

Students interested in probability and statistics are advised to take MATH 204, MATH 324, MATH 407, MATH 423, MATH 447, MATH 523, MATH 525.

Students interested in applied mathematics should take MATH 317, MATH 319, MATH 324, MATH 326, MATH 327, MATH 407, MATH 417.

Students considering a career in secondary school teaching are advised to take MATH 318, MATH 328, MATH 338, MATH 339, MATH 346, MATH 348.

Students interested in careers in business, industry or government are advised to select courses from the following list:

MATH 317, MATH 319, MATH 327, MATH 329, MATH 407, MATH 417, MATH 423, MATH 430, MATH 447, MATH 523, MATH 525.

Required Courses (27 credits)

Note: Students who have done well in MATH 235 and MATH 242 should consider entering the Honours stream by registering in MATH 251 and MATH 255 instead of MATH 236 and MATH 243.

* Students may select either MATH 249 or MATH 316 but not both.

** Students who have successfully completed a course equivalent to MATH 222 with a grade of C or better may omit MATH 222, but must replace it with 3 credits of elective courses.

MATH 222**	(3)	Calculus 3
MATH 235	(3)	Algebra 1
MATH 236	(3)	Algebra 2
	nalysis 1	Analysis 1

the remainder of the 21 credits to be selected from:

MATH 204	(3)	Principles of Statistics 2
MATH 318	(3)	Mathematical Logic
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 320	(3)	Differential Geometry
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 327	(3)	Matrix Numerical Analysis
MATH 328	(3)	Computability and Mathematical Linguistics
MATH 329	(3)	Theory of Interest
MATH 338	(3)	History and Philosophy of Mathematics
MATH 339	(3)	Foundations of Mathematics
MATH 346	(3)	Number Theory
MATH 348	(3)	Topics in Geometry
MATH 352	(1)	Problem Seminar
MATH 407	(3)	Dynamic Programming
MATH 410	(3)	Majors Project
MATH 417	(3)	Mathematical Programming
MATH 423	(3)	Regression and Analysis of Variance
MATH 430	(3)	Mathematical Finance
MATH 447	(3)	Introduction to Stochastic Processes
MATH 523	(4)	Generalized Linear Models
MATH 525	(4)	Sampling Theory and Applications

6 additional credits in Mathematics or related disciplines selected in consultation with the Adviser.

13.21.10 Ba ... (B.Sc.) - ... (72 ...)

P... g...

Students entering the Joint Major in Mathematics and Computer Science are normally expected to have completed the courses below or their equivalents. Otherwise, they will be required to make up any deficiencies in these courses over and above the 72 credits of courses in the program specification.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

...Co... (54 ...)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202 but can replace it with an additional Computer Science complementary course.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms

COMP 310	(3)	Operating Systems
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 360	(3)	Algorithm Design Techniques
MATH 222	(3)	Calculus 3
MATH 235	(3)	Algebra 1
MATH 236	(3)	Algebra 2
MATH 242	(3)	Analysis 1
MATH 315	(3)	Ordinary Differential Equations
MATH 317	(3)	Numerical Analysis
MATH 318	(3)	Mathematical Logic
MATH 323	(3)	Probability
MATH 340	(3)	Discrete Structures 2

Complementary Courses (18 credits)

9 credits from the set of courses recommended for a major or honours program in Mathematics.

9 credits selected from Computer Science courses at the 300 level or above (except COMP 364, COMP 396, COMP 400, COMP 431) and ECSE 508.

13.21.11 Bachelor of Science (B.Sc.) - Joint Major in Statistics and Computer Science (72 credits)

This program provides students with a solid training in both computer science and statistics together with the necessary mathematical background. As statistical endeavours involve ever increasing amounts of data, some students may want training in both disciplines.

Program Prerequisites

Students entering the Joint Major in Statistics and Computer Science are normally expected to have completed the courses below or their equivalents. Otherwise they will be required to make up any deficiencies in these courses over and above the 72 credits of required courses.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Required Courses (51 credits)

* Students who have sufficient knowledge in a programming language do not need to take COMP 202 but can replace it with an additional Computer Science complementary course.

** Students take either COMP 350 or MATH 317, but not both.

*** Students take either MATH 223 or MATH 236, but not both.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350**	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques
MATH 222	(3)	Calculus 3
MATH 223***	(3)	Linear Algebra
MATH 235	(3)	Algebra 1

MATH 236***	(3)	Algebra 2
MATH 242	(3)	Analysis 1
MATH 314	(3)	Advanced Calculus

The minimum requirement for entry into the Honours program is that the student has completed with high standing the following courses below or their equivalents. In addition, a student who has not completed the equivalent of MATH 222 must take it in the first term without receiving credits toward the credits required in the Honours program.

Students who transfer to Honours in Mathematics from other programs will have credits for previous courses assigned, as appropriate, by the Department.

To remain in an Honours program and to be awarded the Honours degree, the student must maintain a 3.00 GPA in the required and complementary Mathematics courses of the program, as well as an overall CGPA of 3.00.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Required Courses (48 credits)

* MATH 314 may be substituted for MATH 248 if MATH 222 had to be taken in the Fall.

MATH 235	(3)	Algebra 1
MATH 242	(3)	Analysis 1
MATH 248*	(3)	Honours Advanced Calculus
MATH 251	(3)	Honours Algebra 2
		TH 251

COMP 250*	(3)	Introduction to Computer Science
COMP 252	(3)	Algorithms and Data Structures

no more than 6 credits from the following courses for which no Honours equivalent exists:

MATH 204	(3)	Principles of Statistics 2
MATH 329	(3)	Theory of Interest
MATH 338	(3)	History and Philosophy of Mathematics
MATH 339	(3)	Foundations of Mathematics
MATH 348	(3)	Topics in Geometry
MATH 407	(3)	Dynamic Programming
MATH 437	(3)	Mathematical Methods in Biology

Students may select other courses with the permission of the Department.

Ba

COMP 250*	(3)	Introduction to Computer Science
MATH 235	(3)	Algebra 1
MATH 242	(3)	Analysis 1
MATH 247**	(3)	Honours Applied Linear Algebra
MATH 248	(3)	Honours Advanced Calculus
MATH 251**	(3)	Honours Algebra 2
MATH 255	(3)	Honours Analysis 2
MATH 354	(3)	Honours Analysis 3
MATH 356	(3)	Honours Probability
MATH 357	(3)	Honours Statistics
MATH 470	(3)	Honours Research Project
MATH 523	(4)	Generalized Linear Models
MATH 533	(4)	Honours Regression and Analysis of Variance
MATH 556	(4)	Mathematical Statistics 1
MATH 557	(4)	Mathematical Statistics 2

Complementary Courses (18 credits)

At least 3 credits from:

MATH 355	(3)	Honours Analysis 4
MATH 587	(4)	Advanced Probability Theory 1

The remaining credits selected from:

MATH 325	(3)	Honours Ordinary Differential Equations
MATH 350	(3)	Graph Theory and Combinatorics
MATH 352	(1)	Problem Seminar
MATH 366	(3)	Honours Complex Analysis
MATH 375	(3)	Honours Partial Differential Equations
MATH 380	(3)	Honours Differential Geometry
MATH 387	(3)	Honours Numerical Analysis
MATH 397	(3)	Honours Matrix Numerical Analysis
MATH 480	(3)	Honours Independent Study
MATH 490	(3)	Honours Mathematics of Finance
MATH 524	(4)	Nonparametric Statistics
MATH 525	(4)	Sampling Theory and Applications
MATH 547	(4)	Stochastic Processes
MATH 550	(4)	Combinatorics
MATH 589	(4)	Advanced Probability Theory 2

With at most 3 credits from the following courses for which no Honours equivalent exists:

MATH 204	(3)	Principles of Statistics 2
MATH 407	(3)	Dynamic Programming

13.21.15 Bachelor of Science (B.Sc.) - Honours Mathematics and Computer Science (75 credits)

Students may complete this program with a minimum of 72 credits or a maximum of 75 credits depending on whether or not they are exempt from taking COMP 202.

Program Prerequisites

Students must consult an Honours adviser in both departments. Students entering the Joint Honours in Mathematics and Computer Science are normally expected to have completed the courses below or their equivalents. Otherwise, they will be required to make up any deficiencies in these courses over and above the 72-75 credits of courses in the program.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Required Courses (45 credits)

* Students who have sufficient knowledge in a programming language are not required to take COMP 202.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 252	(3)	Algorithms and Data Structures
COMP 273	(3)	Introduction to Computer Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 310	(3)	Operating Systems
COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 362	(3)	Honours Algorithm Design
MATH 235	(3)	Algebra 1
MATH 242	(3)	Analysis 1
MATH 248	(3)	Honours Advanced Calculus
MATH 251	(3)	Honours Algebra 2
MATH 255	(3)	Honours Analysis 2
MATH 350	(3)	Graph Theory and Combinatorics

Complementary Courses (30 credits)

18 credits in Mathematics, at least 12 credits selected from:

* Students with appropriate background in probability may substitute MATH 587 for MATH 356 and must then also register for MATH 355.

MATH 354	(3)	Honours Analysis 3
MATH 355	(3)	Honours Analysis 4
MATH 356*	(3)	Honours Probability
MATH 370	(3)	Honours Algebra 3
MATH 371	(3)	Honours Algebra 4
MATH 387	(3)	Honours Numerical Analysis

The remaining credits should be selected from honours courses given by the Department of Mathematics and Statistics.

12 credits in Computer Science, selected from Computer Science courses at the 300 level or above excluding COMP 364, COMP 396 and COMP 431. ECSE 508 may also be taken.

13.21.16 Ba ... (B.S...) - H... ...C... (79 ...)

This is a challenging program providing students with a solid training in both computer science and statistics suitable for entry into graduate school in either discipline.

Students may complete this program with a minimum of 76 credits or a maximum of 79 credits depending on whether or not they are exempt from taking COMP 202.

P... R...

Students entering the Joint Honours in Statistics and Computer Science are normally expected to have completed the courses below or their equivalents. Otherwise, they will be required to make up any deficiencies in these courses over and above the 76-79 credits of courses in the program.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

...Co... (49 ...)

* Students who have sufficient knowledge in a programming language are not required to take COMP 202.

** Students take either MATH 251 or MATH 247, but not both.

COMP 202*	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 252	(3)	Algorithms and Data Structures
COMP 273	(3)	Introduction to Computer Systems
Tj 1 0o 273are Systems3eoretical are Systems	(3)	Programming Languages and Paradigms Systems(3)
		Honours Algorithm Design

At least 8 credits selected from:

MATH 523	(4)	Generalized Linear Models
MATH 524	(4)	Nonparametric Statistics
MATH 525	(4)	Sampling Theory and Applications
MATH 556	(4)	Mathematical Statistics 1
MATH 557	(4)	Mathematical Statistics 2

The remaining Mathematics credits selected from:

** MATH 578 and COMP 540 cannot both be taken for program credit.

MATH 350	(3)	Graph Theory and Combinatorics
MATH 352	(1)	Problem Seminar
MATH 354	(3)	Honours Analysis 3
MATH 355	(3)	Honours Analysis 4
MATH 578**	(4)	Numerical Analysis 1

15 credits in Computer Science selected as follows:

At least 6 credits selected from:

COMP 423	(3)	Data Compression
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods
COMP 490	(3)	Introduction to Probabilistic Analysis of Algorithms
COMP 526	(3)	Probabilistic Reasoning and AI
COMP 540**	(3)	Matrix Computations
COMP 547	(4)	Cryptography and Data Security
COMP 552	(4)	Combinatorial Optimization
COMP 564	(3)	Computational Gene Regulation
COMP 566	(3)	Discrete Optimization 1
COMP 567	(3)	Discrete Optimization 2

The remaining Computer Science credits are selected from COMP courses at the 300 level or above excluding COMP 396 and COMP 431.

13.21.17 [illegible]

13.21.17.1 [illegible]

For more information, see section 13.5: Biology (BIOL) > section 13.5.10: Bachelor of Science (B.Sc.) - Major Biology and Mathematics (76 credits).

13.21.17.2 [illegible]

For more information, see section 13.30: Physiology (PHGY) > section 13.30.6: Bachelor of Science (B.Sc.) - Major Physiology and Mathematics (77 credits).

13.21.17.3 [illegible]

For more information, see section 13.29: Physics (PHYS) > section 13.29.13: Bachelor of Science (B.Sc.) - Honours Mathematics and Physics (81 credits).

13.22 [illegible]

13.22.1 [illegible]

Lyman Duf Medical Sciences Building, Room 511
3775 University Street

Professors

Greg Matlashewski; B.Sc.(C'dia), Ph.D.(Ott.)

Robert A. Murgita; B.Sc.(Maine), M.S.(Vermont), Ph.D.(McG.)

Mark A. Wainberg; B.Sc.(McG.), M.Sc., Ph.D.(Col.)

Associate Professors

Albert Berghuis; M.Sc.(The Netherlands), Ph.D.(Br. Col.)

Dalius J. Briedis; B.A., M.D.(Johns H.)

Benoit Cousineau; B.Sc., M.Sc., Ph.D.(Montr.)

Sylvie Fournier; Ph.D.(Montr.)

Matthias. Gotte; Ph.D.(Max Planck)

Hervé Le Moual; Ph.D.(Montr.)

Gregory T. Marczynski; B.Sc., Ph.D.(Ill.)

Martin Olivier; B.Sc.(Montr.), Ph.D.(McG.)

Ciriaco Piccirillo; B.Sc., Ph.D.(McG.)

Donald Sheppard; M.D.(Tor.)

Assistant Professors

Jorg Friz; Ph.D.(Vienna)

Samantha Gruenheid; B.Sc.(Br. Col.), Ph.D.(McG.)

Associate Members

Institute of Parasitology: Florence Dziersinski, Armando Jardim, Paula Ribeiro

Microbiology & Immunology: Lawrence Kleiman

Medicine: Marcel Behr, Ines Colmegna, Andre Dascal, Sabah uo, Affiliated Centre

Centre for Host Resistance
Montreal General Hospital
1650 Cedar Avenue
Montreal, Quebec H3G 1A4
Telephone: 514-398-8038

Director: E. Skamene

13.22.4 Bachelor of Science (B.Sc.) - Major Concentration Microbiology and Immunology (48 credits)

U1 Required Courses (15 credits)

* Students who have taken CHEM 212 in CEGEP are exempt and must replace these credits with an elective course(s).

BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 212*	(4)	Introductory Organic Chemistry 1
MIMM 211	(3)	Introductory Microbiology
MIMM 212	(2)	Laboratory in Microbiology

U1 Complementary Courses (3 credits)

3 credits, select one from:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

U1, U2 or U3 Complementary Courses (3 credits)

3 credits, select one from:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

U2 Required Courses (15 credits)

MIMM 314	(3)	Immunology
MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 386D1	(3)	Laboratory in Microbiology and Immunology
MIMM 386D2	(3)	Laboratory in Microbiology and Immunology

U3 Complementary Courses (6 credits)

6 credits selected from:

MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology
MIMM 465	(3)	Bacterial Pathogenesis

789MIMM 466739.2503739.2503 (3)	(3)	Viral Pathogenesis 2EP 8, b
MIMM 509	(3)	In ammatory Processes

U, 2 U8 Chpn yCo s(6)d

6 credits selected from:

Students may take either ANAT 458 or BIOC 458, but not both.

Students may take either CHEM 203 or CHEM 204, but not both.

** Students who have taken CHEM 212 or CHEM 222 in CEGEP must replace it with another complementary course.

ANAT 261	(4)	Introduction to Dynamic Histology
ANAT 262	(3)	Introductory Molecular and Cell Biology
ANAT 365	(3)	Cellular Traf cking
ANAT 458	(3)	Membranes and Cellular Signaling
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 458	(3)	Membranes and Cellular Signaling
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOT 505	(3)	Selected Topics in Biotechnology
CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1
CHEM 222**	(4)	Introductory Organic Chemistry 2
CHEM 302	(3)	Introductory Organic Chemistry 3
EXMD 504	(3)	Biology of Cancer
		Applied Microbiology 165.uh7.C3

** Students who have taken CHEM 222 in CEGEP are exempt and must replace these credits with an elective course(s).

BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222**	(4)	Introductory Organic Chemistry 2
MIMM 211	(3)	Introductory Microbiology
MIMM 212	(2)	Laboratory in Microbiology

One of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

One of:

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

U1, U2 or U3 Required Course (3 credits)

One of:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

U2 Required Courses (21 credits)

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
MIMM 314	(3)	Immunology
MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 386D1	(3)	Laboratory in Microbiology and Immunology
MIMM 386D2	(3)	Laboratory in Microbiology and Immunology

U3 Required Courses (9 credits)

MIMM 413	(3)	Parasitology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis

Complementary Courses (9 credits)

9 credits selected from:

* Students may select either ANAT 458 or BIOC 458, but not both.

ANAT 261	(4)	Introduction to Dynamic Histology
ANAT 262	(3)	Introductory Molecular and Cell Biology

ANAT 365	(3)	Cellular Trafficking
ANAT 458*	(3)	Membranes and Cellular Signaling
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 458*	(3)	Membranes and Cellular Signaling
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOT 505	(3)	Selected Topics in Biotechnology
CHEM 302	(3)	Introductory Organic Chemistry 3
EXMD 504	(3)	Biology of Cancer
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 414	(3)	Advanced Immunology
MIMM 509	(3)	Inflammatory Processes
PATH 300	(3)	Human Disease
PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drugs and Disease
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

13.22.6 Bachelor of Science (B.Sc.) - Honours Microbiology and Immunology (73 credits)

The Honours program is designed to offer, in addition to the substantial background given by the Major program, a significant research experience in a laboratory within the Department during the U3 year. Students are prepared for this independent research project by following an advanced laboratory course in U2. This program is intended to prepare students for graduate study in microbiology and immunology or related fields, but could also be chosen by students intending to enter medical research after medical school, or intending to enter the job market in a laboratory research environment.

Students intending to apply to Honours must follow the Major program in U1 and U2 and must obtain a CGPA of at least 3.50 at the end of their U2 year. For graduation in Honours, students must pass all required courses with a C or better and achieve a sessional GPA of at least 3.30 in the U3 year.

U1 Required Courses (25 credits)

* Students who have taken CHEM 212 in CEGEP are exempt and must replace these credits with an elective course(s).

** Students who have taken CHEM 222 in CEGEP are exempt and must replace these credits with an elective course(s).

BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222**	(4)	Introductory Organic Chemistry 2
MIMM 211	(3)	Introductory Microbiology
MIMM 212	(2)	Laboratory in Microbiology

One of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

One of:

CHEM 203	(3)	Survey of Physical Chemistry

CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

[illegible] (3 [illegible]

One of:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

[illegible] (21 [illegible]

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
MIMM 314	(3)	Immunology

13.22.7

13.22.7.1

For more information, see section 13.1.7: Immunology Interdepartmental Honours.

This program is offered by the departments of Biochemistry, Microbiology and Immunology, and Physiology.

Students interested in immunology may choose between this Honours program and the Honours program of the Department of Microbiology and Immunolog

Details of this program may also be obtained from Professor Piccirillo in the Department of Microbiology and Immunology, Room L11.132, Montreal General Hospital, Telephone: 514-934-1934 ext. 45135; ciro.piccirillo@mcgill.ca

---

13.23

13.23.1

Strathcona Music Building
555 Sherbrooke Street West
Montreal, Quebec H3A 1E3

Telephone: 514-398-4535
Fax: 514-398-8061
Website: www.mcgill.ca/music

13.23.2

For more information, see Schulich School of Music.

13.23.3

Department of Music Research Chair
Lloyd

beArts coursesAll other Music courses are considered by the F

Complementary Courses (24 credits)

6 credits selected from:

* Students may select one of NSCI 201 or BIOL 306 or PHGY 311.

ANAT 321	(3)	Circuitry of the Human Brain
BIOL 306*	(3)	Neural Basis of Behaviour
NEUR 310	(3)	Cellular Neurobiology
NSCI 201*	(3)	Introduction to Neuroscience 2
PHGY 311*	(3)	Channels, Synapses & Hormones

18 additional credits:

9 credits each from 2 of the 5 areas listed below; 6 credits in each area must be from 400- or 500-level courses.

Neurobiology/Behaviour

BIOL 306	(3)	Neural Basis of Behaviour
BIOL 389	(3)	Laboratory in Neurobiology
BIOL 514	(3)	Neurobiology Learning and Memory
BIOL 530	(3)	Advances in Neuroethology
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 556	(3)	Topics in Systems Neuroscience
PSYC 302	(3)	The Psychology of Pain
PSYC 318	(3)	Behavioural Neuroscience 2
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 522	(3)	Neurochemistry and Behaviour
PSYT 500	(3)	Advances: Neurobiology of Mental Disorders

Molecular/Developmental/Cellular Neurobiology

ANAT 321	(3)	Circuitry of the Human Brain
BIOC 455	(3)	Neurochemistry
BIOL 532	(3)	Developmental Neurobiology Seminar
BIOL 588	(3)	Advances in Molecular/Cellular Neurobiology
NEUR 310	(3)	Cellular Neurobiology
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 451	(3)	Advanced Neurophysiology

Neurophysiology

ANAT 322	(3)	Neuroendocrinology
BIOL 389	(3)	Laboratory in Neurobiology
BIOL 514	(3)	Neurobiology Learning and Memory
BIOL 588	(3)	Advances in Molecular/Cellular Neurobiology
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 451	(3)	Advanced Neurophysiology

PHGY 520	(3)	Ion Channels
PHGY 556	(3)	Topics in Systems Neuroscience
PSYC 427	(3)	Sensorimotor Behaviour

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
MATH 139*	(4)	Calculus 1 with Precalculus
MATH 140*	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 102	(4)	Introductory Physics - Electromagnetism

Required Courses (20 credits)

* Note: If CHEM 212 is taken prior to the start of the program, credits must be replaced with an alternate 3- or 4-credit course in the program, with approval from the Program Adviser.

BIOL 200	(3)	Molecular Biology
CHEM 212*	(4)	Introductory Organic Chemistry 1
NSCI 200	(3)	Introduction to Neuroscience 1
NSCI 201	(3)	Introduction to Neuroscience 2
NSCI 300	(3)	Neuroethics
NSCI 400D1	(.5)	Neuroscience Seminar
NSCI 400D2	(.5)	Neuroscience Seminar
PSYC 311	(3)	Human Cognition and the Brain

Complementary Courses (45 credits)

9 core credits selected as follows:

3 credits from:

BIOL 373	(3)	Biometry
PSYC 305	(3)	Statistics for Experimental Design

3 credits completed by taking the course below or an equivalent in Computer Science.

COMP 202	(3)	Introduction to Computing 1

3 credits from:

BIOL 309	(3)	Mathematical Models in Biology
MATH 222**	(3)	Calculus 3

** Note: Students who have successfully completed an equivalent to MATH 222 at CEGEP or elsewhere, may substitute another 3-credit course for MATH 222.

Streams

15 credits selected from one of the following streams:

A. Cellular/Molecular Stream

15 credits selected as follows:

* Students take either BIOL 201 OR BIOC 212 but not both.

BIOC 212*	(3)	Molecular Mechanisms of Cell Function
BIOC 311	(3)	Metabolic Biochemistry
BIOL 201*	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
MIMM 314	(3)	Immunology
		Channels, Synapses & Hormones

LING 390	(3)	Neuroscience of Language
PSYC 317	(3)	Genes and Behaviour
PSYC 342	(3)	Hormones and Behaviour

[illegible]

(21-23 credits)

3-16 credits from:

BIOL 301	(4)	Cell and Molecular Laboratory

BIOL 530	(3)	Advances in Neuroethology
BIOL 532	(3)	Developmental Neurobiology Seminar
BIOL 588	(3)	Advances in Molecular/Cellular Neurobiology
BMDE 519	(3)	Biomedical Signals and Systems
MATH 437*	(3)	Mathematical Methods in Biology
MIMM 414	(3)	Advanced Immunology
MIMM 509	(3)	Inflammatory Processes
NEUR 550	(3)	Free Radical Biomedicine
PHGY 425	(3)	Analyzing Physiological Systems
PHGY 451	(3)	Advanced Neurophysiology
PHGY 513	(3)	Cellular Immunology
PHGY 520	(3)	Ion Channels
PHGY 556	(3)	Topics in Systems Neuroscience
PHYS 413*	(3)	Physical Basis of Physiology
PSYC 302	(3)	The Psychology of Pain
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 470	(3)	Memory and Brain
PSYC 501	(3)	Auditory Perception
PSYC 502	(3)	Psychoneuroendocrinology
PSYC 522	(3)	Neurochemistry and Behaviour
PSYC 526	(3)	Advances in Visual Perception
PSYC 532	(3)	Cognitive Science
PSYT 500	(3)	Advances: Neurobiology of Mental Disorders
PSYT 505	(3)	Neurobiology of Schizophrenia

* Students may select either MATH 437 OR PHYS 413, but not both.

13.26 [illegible]

13.26.1 [illegible]

School of Dietetics and Human Nutrition
Macdonald-Stewart Building, Room MS2-039
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue, Quebec H9X 3V9

13.26.2 [illegible]

The School of Dietetics and Human Nutrition offers a Minor in Human Nutrition which can be taken by Science students; see Faculty of Agricultural and Environmental Sciences > Bachelor of Science (Nutritional Sciences) - B.Sc.(Nutr.)

NUTR 307 is considered as a course taught by the Faculty of Science and is offered simultaneously on both campuses.

13.27 Pg(P A)H

13.27.1 a

Department of Pathology
Duff Medical Building
3775 University Street
Montreal, Quebec H3A 2B4

13.27.2 AtP g

There are no B.Sc. programs in Pathology, but the course PATH 300 Human Disease is considered as one taught by the Faculty of Science.

13.28 gl (PR

13.28.1 a

McIntyre Medical Building, Room 1325
3655 Promenade Sir William-Osler
Montreal, Quebec H3G 1Y6

Telephone: 514-398-3623
Website: www.medicine.mcgill.ca/pharma

13.28.2 Atgl p

Pharmacology is the science that deals with all aspects of drugs and their interactions with living organisms. Thus, it involves the physical and chemical properties of drugs, their biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and other uses. Since the word drug encompasses all chemical substances that produce an effect on living cells, it is evident that pharmacology is a very extensive subject. Pharmacology is a multidisciplinary science. It has developed its own set of principles and methods to study the mode of the action of drugs, but it has also utilized many techniques and approaches from various disciplines including biochemistry, physiology, anatomy, and molecular biology, as well as others. Pharmacology encompasses a number of different areas such as pharmacogenomics, molecular biology, bioinformatics, neuropharmacology, reproductive pharmacology, endocrine pharmacology, receptor pharmacology, cardiovascular pharmacology, toxicology, developmental pharmacology, autonomic pharmacology, biochemical pharmacology, and therapeutics.

Training in pharmacology is conducted at both the undergraduate and graduate levels. Because of its breadth, students may be attracted to the subject from a variety of viewpoints; this includes those completing a Bachelor's degree in any number of basic science disciplines, such as biology, zoology, chemistry, physics, biochemistry, microbiology, anatomy, and physiology. At the undergraduate level, seven lecture courses are offered. A course involving research projects in pharmacology is also available to provide the student with the opportunity to get first-hand experience in a pharmacology research laboratory. These courses provide students with knowledge concerning the actions of drugs on living systems and insight into approaches to basic pharmacological research.

13.28.3 gl (PRF g

Chair
Hans H. Zingg

Emeritus Professors
Radan Capek; M.D., Ph.D.(Prague)
Brian Collier; B.Sc., Ph.D.(Leeds)
Theodore Sourkes; Ph.D.(Cornell)

Professors
Guillermina Almazan; Ph.D.(McG.)

Associate Members
Yoram Shir; M.D.(Israel), Ph.D.(Johns Hop.)
Laura Stone; Ph.D.(Minn.)
Marc Ware; M.D.(Univ. West Indies, Kingston, Jamaica)
Tak Pan Wong; Ph.D.(McG.)

Adjunct Professors
Bruce Allen; Ph.D.(Br. Col.)
Martin Bruno; Ph.D.(McG.)
Sylvain Chemtob; M.D.(Montr.), Ph.D.(McG.)
Jeffrey Coull; Ph.D. (McG.)
Yves De Koninck; Ph.D.(McG.)
Lorella Garofalo; Ph.D.(McG.)
Jennifer M.A. Laird; Ph.D.(Brist.)
Joseph Mancini; M.Sc., Ph.D.(McG.)
Karen Meerovitch; Ph.D.(McG.)
Thomas Sanderson; Ph.D.(Br. Col.)

13.28.4 Bachelor of Science (B.Sc.) - Minor Pharmacology (24 credits)

The Minor Pharmacology is intended for students registered in a complementary B.Sc. program who are interested in a focused introduction to specialized topics in pharmacology to prepare them for professional schools, graduate education, or entry into jobs in industry or research institutes. Students should declare their intent to enter the Minor in Pharmacology at the beginning of their U2 year. They must consult with, and obtain the approval of, the Coordinator for the Minor Program in the Department of Pharmacology and Therapeutics. (Please contact the coordinator: Dr. Terry Hébert; terence.hebert@mcgill.ca; 514-398-1398).

All courses in the Minor program must be passed with a minimum grade C or better. Generally, no more than 6 credits of overlap are permitted between the Minor and the primary program.

Required Courses (12 credits)

PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drugs and Disease
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2

Complementary Courses (12 credits)

12 credits selected as follows:

3 credits, one of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism

3 credits, one of:

PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

6 credits, chosen from:

* PHAR 504 can be taken with PHAR 503 only

PHAR 303	(3)	Principles of Toxicology
PHAR 503*	(3)	Drug Design and Development 1
PHAR 504*	(3)	Drug Design and Development 2
PHAR 558	(3)	Pharmacology Selected Topics
PHAR 599	(6)	Pharmacology Research Project

13.28.5 Ba[illegible] (B.Sc.) - [illegible] (65 [illegible])

This program incorporates extensive studies in Pharmacology with a strong component of related biomedical sciences, providing a solid preparation for employment opportunities or for entry into graduate or professional training programs. Students must consult an adviser upon entering the program and at the beginning of U2 to verify courses and progress. Additional consultation at regular intervals is encouraged.

U1 [illegible] Co[illegible] (19 [illegible])

BIOL 200	(3)	Molecular Biology
CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 222	(4)	Introductory Organic Chemistry 2
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 212	(1)	Introductory Physiology Laboratory 1
PHGY 213	(1)	Introductory Physiology Laboratory 2

U2 [illegible] Co[illegible] (19 [illegible])

BIOC 311	(3)	Metabolic Biochemistry

BIOL 201	(3)	Cell Biology and Metabolism

3 credits selected from:

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

3 credits selected from:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

6 credits selected from the following upper-level science courses:

Committee approval is required to substitute an upper-level science course not in the list below.

PHAR 599D1 and PHAR 599D2 are taken together

* Note: Students may take either ANAT 458 or BIOC 458.

** Note: Students may take either CHEM 504 or PHAR 504.

ANAT 321	(3)	Circuitry of the Human Brain
ANAT 365	(3)	Cellular Trafficking
ANAT 458*	(3)	Membranes and Cellular Signaling
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 455	(3)	Neurochemistry
BIOC 458*	(3)	Membranes and Cellular Signaling
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 303	(3)	Developmental Biology
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOT 505	(3)	Selected Topics in Biotechnology
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 504**	(3)	Drug Design and Development 2
EXMD 504	(3)	Biology of Cancer
EXMD 511	(3)	Joint Venturing with Industry
MIMM 314	(3)	Immunology
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 414	(3)	Advanced Immunology
NEUR 310	(3)	Cellular Neurobiology
PATH 300	(3)	Human Disease
PHAR 504**	(3)	Drug Design and Development 2
PHAR 599D1	(3)	Pharmacology Research Project

PHAR 599D2	(3)	Pharmacology Research Project
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 314	(3)	Integrative Neuroscience
PHGY 520	(3)	Ion Channels
PSYC 311	(3)	Human Cognition and the Brain

3 credits selected from:

ANAT 212	(3)	Molecular Mechanisms of Cell Function
BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

3 credits selected from:

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

3 credits selected from:

BIOL 373	(3)	Biometry
MATH 203	(3)	Principles of Statistics 1
PSYC 204	(3)	Introduction to Psychological Statistics

9 credits selected from the following upper-level science courses:

Committee approval is required to substitute an upper-level science course not in the list below.

* Note: Students may take either ANAT 458 or BIOC 458.

** Note: Students may take either CHEM 504 or PHAR 504.

ANAT 321	(3)	Circuitry of the Human Brain
ANAT 365	(3)	Cellular Trafficking
ANAT 458*	(3)	Membranes and Cellular Signaling
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 455	(3)	Neurochemistry
BIOC 458*	(3)	Membranes and Cellular Signaling
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 303	(3)	Developmental Biology
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOT 505	(3)	Selected Topics in Biotechnology
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 504**	(3)	Drug Design and Development 2
EXMD 504	(3)	Biology of Cancer
EXMD 511	(3)	Joint Venturing with Industry
MIMM 314	(3)	Immunology
MIMM 387	(3)	Applied Microbiology and Immunology
MIMM 414	(3)	Advanced Immunology
NEUR 310	(3)	Cellular Neurobiology

13.29.3 Internship Year in Science (IYS)

IYS is a pre-graduate work experience program available to eligible students and normally taken between their U2 and U3 years. For more information, see section 12.1 Industrial Practicum (IP) and Internship Year in Science (IYS)

The following programs are also available with an internship component:

- Major in Physics
- Honours in Physics
- Joint Honours Program in Physics and Chemistry
- Joint Honours Program in Physics and Mathematics
- Joint Major Program in Atmospheric Science and Physics
- Joint Major Program in Physics and Computer Science
- Joint Major Program in Physics and Geophysics

13.29.4 [illegible]

Students entering McGill with a Quebec CEGEP profile in Science will normally begin their programs in Physics with courses at the 200 level.

Students without this profile should normally take courses PHYS 131 and PHYS 142 if they have previously taken physics at the high school level and should be taking differential calculus concurrently with PHYS 131 and integral calculus concurrently with PHYS 142. Those students who have not previously taken physics at the high school level and who intend to do programs in the Biological Sciences may instead take courses PHYS 101 and PHYS 102. All students are expected to have reasonable fluency in algebra, geometry, and trigonometry at the high school level. If this is not the case, then MATH 112 should be taken concurrently with PHYS 101. Those for whom this is not necessary are advised to take MATH 139 concurrently with PHYS 101.

13.29.5 Physics (PHYS) Faculty

Chair

C. Gale

Emeritus Professors

Subal Das Gupta; B.A., M.Sc.(Calc.), Ph.D.(McM.) (William C. Macdonald Emeritus Professor of Physics)

Nicholas De Takacsy; B.Sc., M.Sc.(Montr.), Ph.D.(McG.)

Harry C.S. Lam; B.Sc.(McG.), Ph.D.(MIT)

M.P. Langleben; B.Sc., M.Sc., Ph.D.(McG.), F.R.S.C.

Tommy S.K. Mark; B.Sc., M.Sc., Ph.D.(McG.) (William C. Macdonald Emeritus Professor of Physics)

Douglas G. Stairs; B.Sc., M.Sc.(Qu.), Ph.D.(Harv.) (William C. Macdonald Emeritus Professor of Physics)

John O. Strom-Olsen; B.A., M.S., Ph.D.(Cant.)

Martin J. Zuckermann; M.A., D.Phil.(Oxf.), F.R.S.C. (William C. Macdonald Emeritus Professor of Physics)

Post-Retirement Appointments

Z. Altounian; B.Sc., M.Sc.(Cairo), Ph.D.(McM.)

John E. Crawford; B.A., M.A.(Tor.), Ph.D.(McG.)

Robert B. Moore; B.Eng., M.Sc., Ph.D.(McG.)

Popat M. Patel; B.Sc., M.Sc.(Manc.), Ph.D.(Harv.)

Professors

Jean Barrette; B.Sc., M.Sc., Ph.D.(Montr.)

Robert Brandenberger; Dipl., A.M., Ph.D.(Harv.) (Canada Research Chair)

James M. Cline; B.Sc.(Calif.), M.Sc., Ph.D.(Calif. Tech.)

François Corriveau; B.Sc.(Laval), M.Sc.(Br. Col.), Docteur Sc.Nat.(Zurich)

Charles Gale; B.Sc.(Ott.), M.Sc., Ph.D.(McG.) (James McGill Professor)

Professors

Martin Grant; B.Sc.(PEI), M.Sc., Ph.D.(Tor.), F.R.S.C. (James McGill Professor)

Peter Grutter; Dipl., Ph.D.(Basel) (James McGill Professor)

Hong Guo; B.Sc.(Sichuan), M.Sc., Ph.D.(Pitt.), F.R.S.C. (James McGill Professor)

David Hanna; B.Sc.(McG.), M.A., Ph.D.(Harv.) (William C. Macdonald Professor of Physics)

Richard Harris; B.A.(Oxf.), D.Phil.(Sus.)

Victoria Kaspi; B.Sc.(McG.), M.A., Ph.D.(Princ.) (Canada Research Chair) (Lorne Trottier Chair in Astrophysics and Cosmology)

Shaun Lovejoy; B.A.(Cant.), Ph.D.(McG.)

Kenneth J. Ragan; B.Sc.(Alta.), D.Sc.(Geneva) (William C. Macdonald Professor of Physics)

Dominic H. Ryan; B.A., Ph.D.(Trin. Coll.)

Mark Sutton; B.Sc., M.Sc., Ph.D.(Tor.) (Ernest Rutherford Professor of Physics)

Associate Professors

Aashish Clerk; B.Sc.(Tor.), Ph.D.(C'nell) (Canada Research Chair)

Andrew Cumming; B.A.(Camb.), Ph.D.(Calif., Berk.)

Keshav Dasgupta; B.Sc., M.Sc.(Indian IT), Ph.D.(Tata)

Guillaume Gervais, B.Sc.(Sherb.), MSc.(McM.), Ph.D.(North. Uni

Associate Members
M. Chacron (Physiology)
K. Gehring (Biochemistry)
P. Hayden (Computer Science)
M. Mackey (Physiology)
J. Nadeau (Biomedical Engineering)
E. Podgorsak (Radiation Oncology)
D. Rassier (Kinesiology & Physical Education)
D. Ronis (Chemistry)
J. Seuntjens (Medical Physics)
T. Szkopek (Electrical & Computer Engineering)
F. Verhaegen (Oncology & Medical Physics)

Curator (Rutherford Museum and McPherson Collection)
Jean Barrette; B.Sc., M.Sc., Ph.D.(Montr)

13.29.6 Bachelor of Science (B.Sc.) - Minor Physics (18 credits)

The 18-credit Minor permits no overlap with any other programs. It contains no Mathematics courses, although many of the courses in it have Math pre- or corequisites. It will, therefore, be particularly appropriate to students in Mathematics. It is also available to any Science student with the appropriate mathematical background.

Students in certain programs (e.g., the Major Chemistry) will find that there are courses in the Minor that are already part of their program, or that they may not take for credit because of a substantial overlap of material with a course or courses in their program. After consultation with an adviser, such students may complete the Minor by substituting any other physics course(s) from the Major or Honours Physics programs.

Required Course (3 credits)

PHYS 257	(3)	Experimental Methods 1

Complementary Courses (15 credits)

15 credits to be selected as follows:

One of:

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 251	(3)	Honours Classical Mechanics 1

One of:

PHYS 232	(3)	Heat and Waves
PHYS 253	(3)	Thermal Physics

One of:

PHYS 241	(3)	Signal Processing
PHYS 258	(3)	Experimental Methods 2

One of:

PHYS 214	(3)	Introductory Astrophysics
PHYS 224	(3)	Physics of Music
PHYS 260	(3)	Modern Physics and Relativity
PHYS 271	(3)	Introduction to Quantum Physics

One of:

PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 350	(3)	Honours Electricity and Magnetism

13.29.7 Bachelor of Science (B.Sc.) - Minor Electrical Engineering (24 credits)

[Program registration done by Student Affairs Office]

The Minor program does not carry professional recognition. Only students who satisfy the requirements of the Major Physics are eligible for this Minor. Students registered for this option cannot count PHYS 241 toward the requirements of the Major in Physics, and should replace this course by another Physics or Mathematics course. Students who select ECSE 334 in the Minor cannot count PHYS 328 toward the requirements of the Major in Physics, and should replace this course by another Physics or Mathematics course.

Required Courses (12 credits)

ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 303	(3)	Signals and Systems 1
ECSE 330	(3)	Introduction to Electronics

Complementary Courses (12 credits)

3 credits from the following and 9 credits of ECSE courses at the 200, 300, or 400 level subject to approval by the Department of Electrical and Computer Engineering.

ECSE 305	(3)	Probability and Random Signals 1
ECSE 334	(3)	Introduction to Microelectronics

13.29.8 Bachelor of Science (B.Sc.) - Liberal Program - Core Science Component Physics (48 credits)

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
PHYS 131	(4)	Mechanics and Waves

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
MATH 150	(4)	Calculus A
MATH 151	(4)	Calculus B

Required Courses (39 credits)

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 241	(3)	Signal Processing
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 436	(3)	Modern Physics
PHYS 446	(3)	Majors Quantum Physics

Complementary Courses (9 credits)

9 credits selected from:

PHYS 328	(3)	Electronics
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 339	(3)	Measurements Laboratory in General Physics
PHYS 342	(3)	Majors Electromagnetic Waves
PHYS 434	(3)	Optics
PHYS 439	(3)	Majors Laboratory in Modern Physics

13.29.9 Bachelor of Science (B.Sc.) - Major Physics (60 credits)

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

One of:

BIOL 111	(3)	Principles: Organismal Biology

BIOL 112	(3)	Cell and Molecular Biology

MATH 133 and either MATH 140/141 or MATH 150/151.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
MATH 150	(4)	Calculus A
MATH 151	(4)	Calculus B

U1 Required Courses (21 credits)

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 241	(3)	Signal Processing
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2

U2 Required Courses (24 credits)

MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 328	(3)	Electronics
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 339	(3)	Measurements Laboratory in General Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 342	(3)	Majors Electromagnetic Waves

U3 Required Courses (15 credits)

PHYS 434	(3)	Optics
PHYS 436	(3)	Modern Physics
PHYS 439	(3)	Majors Laboratory in Modern Physics
PHYS 446	(3)	Majors Quantum Physics
PHYS 449	(3)	Majors Research Project

It is possible for students to transfer from the Major to the Honours program after the U1 year if they have passed all U1 Required courses and MATH 314 and MATH 315 with a C or better, and obtained a GPA of 3.5 or better in these courses. The written permission of an adviser is required for this change of program.

Note: The missing MATH 249 and PHYS 260 from the U1 Honours Year should be taken in U2.

13.29.10 Bachelor of Science (B.Sc.) - Joint Major Physics and Geophysics (69 credits)

This joint program in Physics and Geophysics provides a firm basis for graduate work in geophysics and related fields as well as a sound preparation for those who wish to embark on a career directly after the B.Sc.

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

One of:

BIOL 111	(3)	Principles: Organismal Biology
BIOL 112	(3)	Cell and Molecular Biology

MATH 133 and either MATH 140/141 or MATH 150/151.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
MATH 150	(4)	Calculus A
MATH 151	(4)	Calculus B

U1 Required Courses (30 credits)

EPSC 203	(3)	Structural Geology
EPSC 210	(3)	Introductory Mineralogy
EPSC 231	(3)	Field School 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2

U2 Required Courses (18 credits)

EPSC 320	(3)	Elementary Earth Physics
EPSC 350	(3)	Tectonics
MATH 315	(3)	Ordinary Differential Equations
MATH 319	(3)	Introduction to Partial Differential Equations
PHYS 339	(3)	Measurements Laboratory in General Physics
PHYS 340	(3)	Majors Electricity and Magnetism

U2 or U3 Required Courses (6 credits)

EPSC 330	(3)	Earthquakes and Earth Structure

EPSC 510	(3)	Geodynamics and Geomagnetism

Complementary Courses (15 credits)

PHYS 331	(3)	Topics in Classical Mechanics
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 342	(3)	Majors Electromagnetic Waves
PHYS 432	(3)	Physics of Fluids
PHYS 446	(3)	Majors Quantum Physics

13.29.11 Bachelor of Science (B.Sc.) - Major Physics and Computer Science (66 credits)

The Major Physics and Computer Science is designed to give motivated students the opportunity to combine the two fields in a way that will distinguish them from the graduates of either field by itself. The two disciplines complement each other, with physics providing an analytic problem-solving outlook and basic understanding of nature, while computer science enhances the ability to create practical and marketable applications, in addition to having its own theoretical interest. Graduates of this program may be able to present themselves as being more immediately useful than a pure physics major, but with more breadth than just a programmer. They will be able to demonstrate their combined expertise in the Special Project course which is the centrepiece of the final year of the program.

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

One of:

Principl4ptics

U2 Required Courses (24 credits)

COMP 206	(3)	Introduction to Software Systems
COMP 251	(3)	Data Structures and Algorithms
COMP 302	(3)	Programming Languages and Paradigms
COMP 350	(3)	Numerical Computing
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 232	(3)	Heat and Waves
PHYS 241	(3)	Signal Processing

U3 Required Courses (21 credits)

COMP 360	(3)	Algorithm Design Techniques
MATH 323	(3)	Probability
PHYS 331	(3)	Topics in Classical Mechanics
PHYS 339	(3)	Measurements Laboratory in General Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 446	(3)	Majors Quantum Physics
PHYS 489	(3)	Special Project

13.29.12 Bachelor of Science (B.Sc.) - Honours Physics (78 credits)

Students entering this program for the first time should have high standing in mathematics and physics. In addition, a student who has not completed the equivalent of MATH 222 must take it in the first term without receiving credit toward the 78 credits required in the Honours program.

A student whose average in the required and complementary courses in any year falls below a GPA of 3.00, or whose grade in any individual required or complementary course falls below a C (unless it is improved to a C or higher in a supplementary examination or by retaking the course), may not register in the Honours program the following year, or graduate with the Honours degree, except with the permission of the Department.

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

One of:

BIOL 111	(3)	Principles: Organismal Biology
BIOL 112	(3)	Cell and Molecular Biology

MATH 133 and either MATH 140/141 or MATH 150/151.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

MATH 150	(4)	Calculus A
MATH 151	(4)	Calculus B

U1 Required Courses (27 credits)

MATH 247	(3)	Honours Applied Linear Algebra
MATH 248	(3)	Honours Advanced Calculus
MATH 249	(3)	Honours Complex Variables
MATH 325	(3)	Honours Ordinary Differential Equations
PHYS 241	(3)	Signal Processing
PHYS 251	(3)	Honours Classical Mechanics 1
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 260	(3)	Modern Physics and Relativity

U2 Required Courses (24 credits)

MATH 375	(3)	Honours Partial Differential Equations
PHYS 253	(3)	Thermal Physics
PHYS 350	(3)	Honours Electricity and Magnetism
PHYS 351	(3)	Honours Classical Mechanics 2
PHYS 357	(3)	Honours Quantum Physics 1
PHYS 359	(3)	Honours Laboratory in Modern Physics 1
PHYS 362	(3)	Statistical Mechanics
PHYS 457	(3)	Honours Quantum Physics 2

U3 Required Courses (6 credits)

PHYS 352	(3)	Honours Electromagnetic Waves
PHYS 551	(3)	Quantum Theory

U3 Complementary Courses (21 credits)

6 credits selected from:

Note: PHYS 459D1 and PHYS 459D2 are taken together

PHYS 459D1	(3)	Honours Research Thesis
PHYS 459D2	(3)	Honours Research Thesis
PHYS 469	(3)	Honours Laboratory in Modern Physics 2
PHYS 479	(3)	Honours Research Project

15 credits selected from the list below (students may substitute one or more courses with a 3-credit course approved by the Department of Physics):

PHYS 432	(3)	Physics of Fluids
PHYS 434	(3)	Optics
PHYS 479	(3)	Honours Research Project
PHYS 514	(3)	General Relativity

PHYS 521	(3)	Astrophysics
PHYS 557	(3)	Nuclear Physics
PHYS 558	(3)	Solid State Physics
PHYS 559	(3)	Advanced Statistical Mechanics
PHYS 562	(3)	Electromagnetic Theory
PHYS 567	(3)	Particle Physics
PHYS 580	(3)	Introduction to String Theory

PHYS 251	(3)	Honours Classical Mechanics 1
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 260	(3)	Modern Physics and Relativity

U2 Required Courses (27 credits)

MATH 242	(3)	Analysis 1
MATH 255	(3)	Honours Analysis 2
MATH 375	(3)	Honours Partial Differential Equations
PHYS 253	(3)	Thermal Physics
PHYS 350	(3)	Honours Electricity and Magnetism
PHYS 351	(3)	Honours Classical Mechanics 2
PHYS 357	(3)	Honours Quantum Physics 1
	(3)	Statistical Mechanics

PHYS 251	(3)	Honours Classical Mechanics 1
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2

U2 Required Courses (24 credits)

CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 365	(2)	Statistical Thermodynamics
COMP 208	(3)	Computers in Engineering
PHYS 350	(3)	Honours Electricity and Magnetism
PHYS 357	(3)	Honours Quantum Physics 1
PHYS 457	(3)	Honours Quantum Physics 2

U3 Required Courses (14 credits)

CHEM 393	(2)	Physical Chemistry Laboratory 2
CHEM 556	(3)	Advanced Quantum Mechanics
CHEM 574	(3)	Introductory Polymer Chemistry
PHYS 352	(3)	Honours Electromagnetic Waves
PHYS 558	(3)	Solid State Physics

U3 Complementary Courses (12 credits)

(with at least 3 credits in Chemistry and 3 credits in Physics)

3 credits selected from:

CHEM 593	(3)	Statistical Mechanics
PHYS 559	(3)	Advanced Statistical Mechanics

9 credits selected from the list below

Note: CHEM 480D1/CHEM 480D2 and CHEM 490D1/CHEM 490D2 are taken together

CHEM 480D1	(1.5)	Research Project 2
CHEM 480D2	(1.5)	Research Project 2
CHEM 490D1	(1.5)	Research Project 3
CHEM 490D2	(1.5)	Research Project 3
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 575	(3)	Chemical Kinetics
CHEM 585	(3)	Colloid Chemistry
MATH 375	(3)	Honours Partial Differential Equations
PHYS 351	(3)	Honours Classical Mechanics 2
PHYS 434	(3)	Optics
PHYS 469	(3)	Honours Laboratory in Modern Physics 2
PHYS 479	(3)	Honours Research Project

13.30.3 Physiology Faculty

Chair
John Orlowski

Emeritus Professors
Thomas M.S. Chang; B.Sc., M.D.,C.M., Ph.D.(McG.), F.R.C.P.(C)
Kresmir Krnjevic; O.C., B.Sc., Ph.D., M.B., Ch.B.(Edin.), F.R.S.C.
Wayne Lapp; M.S.A.(Tor.), Ph.D.(McG.)
Mortimer Levy; B.Sc., M.D.,C.M.(McG.), F.R.C.P.(C) (joint appt. with Medicine)
George Mandl; B.Sc.(C'dia), Ph.D.(McG.)
G. Melvill Jones; B.A., M.A., M.B., B.Ch., M.D.(Cant.)
J. Milic-Emili; M.D.(Milan)
C. Polosa; M.D., Ph.D.

Professors
Monroe W. Cohen; B.Sc., Ph.D.(McG.)
Ellis J. Cooper; B.Eng.(Sir G. Wms.), M.Sc.(Sur.), Ph.D.(McM.)
Kathleen Cullen; B.Sc.(Brown), Ph.D.(Chic.) (William Dawson Scholar)
Leon Glass; B.S.(Brooklyn), Ph.D.(Chic.) (Isadore Rosenfeld Professor of Cardiology)
Phil Gold; C.C., B.Sc., M.Sc., Ph.D., M.D.,C.M.(McG.), F.R.C.P.(C.), F.R.S.C. (joint appt. with Medicine)
David Goltzman; B.Sc., M.D.,C.M.(McG.) (Antoine G. Massabki Professor of Medicine) (joint appt. with Medicine)
John Hanrahan; Ph.D.(B.Col.)
Gergely Lukacs; M.D., Ph.D.(Budapest)
Michael Mackey; B.A., Ph.D.(Wash.) (Joseph Morley Drake Professor of Physiology)
Sheldon Magder; M.D.(Tor.) (joint appt. with Medicine)
Jacapo P. Mortola; M.D.(Milan)
John Orlowski; B.Sc.(McG.), M.Sc., Ph.D.(Qu.) (James McGill Professor)
Premsyl Ponka; M.D., Ph.D.(Prague)
Alvin Shrier; B.Sc.(C'dia), Ph.D.(Dal.) (Hosmer Professor of Physiology)
Douglas G.D. Watt; M.D., Ph.D.(McG.)
John White; B.Sc., M.Sc.(Car.), Ph.D.(Harv.)

Assistant Professors
Maurice Chacron; Ph.D.(Ott.)
Russell Jones; Ph.D.(UT)

Associate Professors
Erik Cook; Ph.D.(Baylor College, Houston)
Riaz Farookhi; B.Sc., M.Sc.(MIT), Ph.D.(Tufts)
Mladen Glavinovic; B.Sc.(Zagreb), M.Sc.(Tor.), Ph.D.(McG.)
Michael Guevara; B.Sc., M.Eng., Ph.D.(McG.)
Pejmun Haghighi; Ph.D.(McG.)
Julio Martinez-Trujillo; Ph.D.(Tübingen)

Associate Professors

Ursula Stochaj; Ph.D.(Cologne)

Ann Wechsler; B.A.(Tor.), M.Sc., Ph.D.(McG.)

Associate Professor (P

Cpm yCo s(12 d)

12 credits selected as follows:

3 credits selected from:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

3 credits selected from:

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry

pl -L tP g)(PCo s

6 credits selected from the Upper-Level Physiology (ULP) course list as follows:

All Physiology courses 400-level and above.

Note:

The 6-credit course PHGY 459D1/D2 equals 3 credits of ULP and 3 credits of electives.

The 9-credit course PHGY 461D1/D2 equals 3 credits of ULP and 6 credits of electives.

ANAT 541	(3)	Cell and Molecular Biology of Aging
BIOL 532	(3)	Developmental Neurobiology Seminar
BMDE 519	(3)	Biomedical Signals and Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis
PHGY 524	(3)	Chronobiology
PSYC 470elopDisorderogenesis	(3)	Memory and Brain

PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 212	(1)	Introductory Physiology Laboratory 1
PHGY 213	(1)	Introductory Physiology Laboratory 2

2/ U3 EpCo s(19)d

BIOC 311	(3)	Metabolic Biochemistry
BIOL 301	(4)	Cell and Molecular Laboratory
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 314	(3)	Integrative Neuroscience

Cpn yCo s(28)d

12-13 credits selected as follows:

3 credits, one of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

3 credits, one of:

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry

3 credits, one of:

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

3-4 credits, one of:

ANAT 214	(3)	Systemic Human Anatomy
ANAT 261	(4)	Introduction to Dynamic Histology

pe tn g)PCo s

9 credits selected from the Upper4)tm0vH5 1 175.10452 42 Tm (Surv)T190.070 1 175.10452 .429 Tm (vel Ph)T201 0 1 1 175.10452 4.429 Tm (ysiologc

EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology
MIMM 465	(3)	Bacterial Pathogenesis
	(3)V	Viral Pathogenesis

EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 504	(3)	Biology of Cancer
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
EXMD 510	(3)	Bioanalytical Separation Methods
NEUR 310	(3)	Cellular Neurobiology
PHAR 503	(3)	Drug Design and Development 1
PHAR 504	(3)	Drug Design and Development 2
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2
PHAR 599	(6)	Pharmacology Research Project
PSYC 302	(3)	The Psychology of Pain
PSYC 311	(3)	Human Cognition and the Brain
PSYC 318	(3)	Behavioural Neuroscience 2
PSYC 342	(3)	Hormones and Behaviour
PSYC 353	(3)	Laboratory in Human Perception
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 470	(3)	Memory and Brain
PSYC 522	(3)	Neurochemistry and Behaviour
PSYC 526	(3)	Advances in Visual Perception
PSYT 500	(3)	Advances: Neurobiology of Mental Disorders

13.30.6 Bachelor of Science (B.Sc.) - Major Physiology and Mathematics (77 credits)

U1 Required Courses (14 credits)

BIOL 200	(3)	Molecular Biology
BIOL 309	(3)	Mathematical Models in Biology
MATH 222	(3)	Calculus 3
PHGY 212	(1)	Introductory Physiology Laboratory 1
PHGY 213	(1)	Introductory Physiology Laboratory 2

One of:

MATH 223	(3)	Linear Algebra
MATH 247	(3)	Honours Applied Linear Algebra

U1 Complementary Courses (15 credits)

3 credits, one of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function

BIOL 201	(3)	Cell Biology and Metabolism

6 credits selected as follows:

* Advising Note: PHGY 201 and PHGY 202 will not be offered in 2011-2012.

PHGY 201*	(3)	Human Physiology: Control Systems
PHGY 202*	(3)	Human Physiology: Body Functions
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

3 credits, one of:

MATH 248	(3)	Honours Advanced Calculus
MATH 314	(3)	Advanced Calculus

3 credits, one of:

MATH 315	(3)	Ordinary Differential Equations
MATH 325	(3)	Honours Ordinary Differential Equations

[illegible] (24 [illegible])

MATH 242	(3)	Analysis 1
MATH 243	(3)	Analysis 2
MATH 323	(3)	Probability
MATH 326	(3)	Nonlinear Dynamics and Chaos
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 314	(3)	Integrative Neuroscience

[illegible] (6 [illegible])

MATH 437	(3)	Mathematical Methods in Biology
PHYS 413	(3)	Physical Basis of Physiology

[illegible] (18 [illegible])

BMDE 519	(3)	Biomedical Signals and Systems
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 324	(3)	Statistics
PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology

13.30.7 [illegible] (B.Sc.) - [illegible] (80 [illegible])

This program provides a firm foundation in physics, mathematics, and physiology. It is appropriate for students interested in applying methods of the physical sciences to problems in physiology and allied biological sciences.

U1 Required Courses (17 credits)

* The corequisite BIOL 200, BIOL 201 is waived for this program.

MATH 222	(3)	Calculus 3
PHGY 212*	(1)	Introductory Physiology Laboratory 1
PHGY 213*	(1)	Introductory Physiology Laboratory 2
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2

U2 Required Courses (21 credits)

MATH 326	(3)	Nonlinear Dynamics and Chaos
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 314	(3)	Integrative Neuroscience
PHYS 328	(3)	Electronics
PHYS 339	(3)	Measurements Laboratory in General Physics

U2 or U3 Required Courses (6 credits)

MATH 437	(3)	Mathematical Methods in Biology
PHYS 413	(3)	Physical Basis of Physiology

U3 Required Courses (21 credits)

BMDE 519	(3)	Biomedical Signals and Systems
PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 446	(3)	Majors Quantum Physics

U1 Complementary Courses (9 credits)

3 credits, one of:

MATH 223	(3)	Linear Algebra
MATH 247	(3)	Honours Applied Linear Algebra

6 credits selected as follows:

* Advising Note: PHGY 201 and PHGY 202 will not be offered in 2011-2012.

** The corequisite BIOL 200, BIOL 201 is waived for this program.

PHGY 201*	(3)	Human Physiology: Control Systems

PHGY 202*	(3)	Human Physiology: Body Functions
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210**	(3)	Mammalian Physiology 2

U2 Complementary Courses (6 credits)

3 credits, one of:

MATH 315	(3)	Ordinary Differential Equations
MATH 325	(3)	Honours Ordinary Differential Equations

3 credits, one of:

MATH 248	(3)	Honours Advanced Calculus
MATH 314	(3)	Advanced Calculus

13.30.8 Bachelor of Science (B.Sc.) - Honours Physiology (75 credits)

All admissions to the Honours program will be in U2, and the student must have a U1 GPA of 3.30, with no less than a B in PHGY 209 and PHGY 210. Admission to U3 requires a U2 CGPA of 3.20 with no less than a B in U2 Ph

PHGY 459D2	(3)	Physiology Seminar
PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology

Complementary Courses (15 credits)

9 credits selected as follows:

3 credits, one of:

BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 201	(3)	Cell Biology and Metabolism

3 credits, one of:

BIOL 309	(3)	Mathematical Models in Biology
BIOL 373	(3)	Biometry

3 credits, one of:

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 204	(3)	Physical Chemistry/Biological Sciences 1

Upper-Level Physiology (ULP) Courses

6 credits selected from the Upper-Level Physiology (ULP) course list as follows:

All Physiology courses 400-level and above.

ANAT 541	(3)	Cell and Molecular Biology of Aging
BIOL 532	(3)	Developmental Neurobiology Seminar
BMDE 519	(3)	Biomedical Signals and Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
EXMD 506	(3)	Advanced Applied Cardiovascular Physiology
EXMD 507	(3)	Advanced Applied Respiratory Physiology
EXMD 508	(3)	Advanced Topics in Respiration
MIMM 413	(3)	Parasitology
MIMM 414	(3)	Advanced Immunology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis
PHGY 524	(3)	Chronobiology
PSYC 470	(3)	Memory and Brain
PSYT 500	(3)	Advances: Neurobiology of Mental Disorders

13.30.9 Physiology (PHGY) Related Programs

13.30.9.1 Interdepartmental Honours Immunology Program

For more information, see section 13.17: Immunology Interdepartmental Honours. This program is offered by the Departments of Biochemistry, Microbiology and Immunology, and Physiology. Students interested in the program should contact Dr. C. Piccirillo, Microbiology and Immunology, ciro.piccirillo@mcgill.ca, 514-398-2872; or Dr. Monroe Cohen, Physiology, monroe.cohen@mcgill.ca, 514-398-4342.

13.31 Psychiatry (PSYT)

13.31.1 Location

1033 Pine Avenue West, Room 105
Montreal, Quebec H3A 1A1
Telephone: 514-398-4176
Website: www.med.mcgill.ca/psychiatry

13.31.2 About Psychiatry

There are no B.Sc. programs in Psychiatry, but the PSYT courses listed below are administered by the Faculty of Science and are open to Arts and Science students and to graduate students.

PSYT 199	FYS: Mental Illness and the Brain
PSYT 301	Issues in Drug Dependence (not offered in 2011-2012)
PSYT 500	Advances: Neurobiology of Mental Disorders
PSYT 502	Brain Evolution and Psychiatry
PSYT 503	Mental Health Services and Policy (not offered in 2011-2012)
PSYT 504	Issues in Forensic Mental Health
PSYT 505	Neurobiology of Schizophrenia
PSYT 515	Advanced Studies in Addiction

13.32 Psychology (PSYC)

13.32.1 Location

Stewart Biology Building, Room W8/1
1205 Dr. Penfield Avenue
Montreal, Quebec H3A 1B1

Telephone: 514-398-6100
Fax: 514-398-4896
Email: info@psych.mcgill.ca
Website: www.psych.mcgill.ca

13.32.2 About Psychology

The Department of Psychology offers programs in both Arts and Science. All B.A. programs in Psychology can be found under Faculty of Arts > Psychology (PSYC).

Psychology is the scientific study of mind and behaviour. It is both a social and a biological science. As a social science, psychology studies social interactions. As a biological science, it regards humans as the product of evolution and so studies them in biological perspective, comparing and contrasting human behaviour with that of other species.

The data of psychology are collected within the psychological laboratory by the use of experimental methods in the study of behaviour, and outside the laboratory by systematic observation of the behaviour of humans and animals. The aim is to formulate general principles of perception, learning, motivation, cognition, and social psychology that are relevant to different aspects of human life. Experimentation, laboratory techniques, observational procedures, measurement, and statistical methods are important tools of the psychologist.

Psychology has many interdisciplinary aspects. The study of psychological problems often involves knowledge drawn from other disciplines such as biology, physiology, linguistics, sociology, philosophy, and mathematics. For this reason, a student with varied interests can frequently find a place for these in psychology.

Psychology is a young science so that explanations of the processes underlying observed phenomena are often theoretical and speculative. The major objectives of psychological study are to reduce the discrepancy between theory and fact and to provide better answers about why humans think and behave as they do.

Although a number of undergraduate courses in Psychology have applied implications, applied training is not the purpose of the undergraduate curriculum. Its purpose is to introduce the student to an understanding of the basic core of psychological knowledge, theory, and method, regardless of questions of practical application.

The B.Sc. or B.A. with a Major or Honours degree in Psychology is not a professional qualification. It does not qualify the individual to carry on professional work in psychology. In the province of Quebec the minimum requirement for membership in the Order of Psychologists, the professional association governing the work of psychologists in the province, is a doctoral degree. All students planning to practice in the province of Quebec will be examined on their proficiency in French before being admitted to the professional association. Undergraduate courses in Psychology may prove of considerable value to students planning careers in professional fields other than psychology. These include but are not restricted to medicine, education, social work, human communication sciences, or business and industry.

Students who are interested in psychology as a career must pursue graduate studies. Persons who hold graduate degrees in Psychology, usually the Ph.D., may find employment in universities, research institutes, hospitals, community agencies, government departments, large corporations, or may act as self-employed consultants. At the graduate level, psychology has many specialized branches including social psychology, physiological psychology, experimental psychology, clinical psychology, child psychology, industrial psychology, community psychology, educational psychology, and others.

Requirements for admission to graduate studies in Psychology vary from one university to another and from one country to another. Nonetheless, both the Honours and Major degrees in Psychology may qualify the student for admission to many graduate schools, provided that sufficiently high grades are obtained and, in some cases, that research experience has been obtained. During the U2 year, undergraduate students are strongly advised to verify the admission requirements of various graduate programs. This is to ensure that sufficient time is available for students to complete all necessary requirements for admission to their preferred graduate programs.

The essential differences between the Honours and the Major program are an emphasis on research methodology courses and practice in the Honours program and that higher academic standards are required of Honours students. Honours students also have an opportunity to work in small groups closely with staff members.

13.32.3 [illegible]

All new students entering the Psychology undergraduate program are required to attend an information meeting prior to registration. Students who have been accepted into a Bachelor of Science program in Psychology must attend one of these meetings. Newly admitted students from CEGEPs should attend the information session on Wednesday, June 15 at 10:00 a.m. in room N2/2 in the Stewart Biology Building. There will be an identical information session on Tuesday, August 30 at 11:00 a.m. in room N2/2 in the Stewart Biology Building for all other students and for CEGEP students who could not attend the earlier meeting. Students accepted into a Bachelor of Arts program must attend a different information meeting. (For details, see Faculty of Arts > Psychology (PSYC).) At this meeting, Paola Carvajal, the Academic Adviser, will explain the requirements of the Department's programs. Incoming students will have an opportunity to ask questions and receive advice on how to plan their courses. After this meeting, students will make appointments for individual advising sessions and fill out their Study Plan form for registration.

Entering students must bring their letter of acceptance and a copy of their collegial transcript(s). They will also need access to this publication and a preliminary Class Schedule before their individual advising session. Students will also find the Psychology Department Handbook helpful. It contains more detailed descriptions of Psychology courses and provides guidelines for how students might pursue particular areas of interest. The handbook is available on the Department website: www.psych.mcgill.ca/ugrad/ugradm.html.

Students entering the Psychology program in January are strongly encouraged to visit the Academic Adviser, Paola Carvajal, in early December to clarify their course selections.

13.32.4 [illegible]

Chair
D. Zuroff

Emeritus Professors
Albert S. Bregman; M.A.(Tor.), Ph.D.(Yale)
Virginia I. Douglas; B.A.(Qu.), M.A., M.S.W., Ph.D.(Mich.)
Wallace E. Lambert; M.A.(Colgate), Ph.D.(N. Carolina), F.R.S.C.
A.A.J. Marley; B.Sc.(Birm.), Ph.D.(Penn.)
Ronald Melzack; M.Sc., Ph.D.(McG.), F.R.S.C. (E.P. Taylor Emeritus Professor of Psychology)

Emeritus Professors

Peter M. Milner; B.Sc.(Leeds), M.Sc., Ph.D.(McG.)

Professors

Frances E. Aboud; B.A.(Tor.), M.A., Ph.D.(McG.)

Mark Baldwin; B.A.(Tor.), M.A., Ph.D.(Wat.)

Irving M. Binik; B.A.(NYU), B.H.L.(Jewish Theological Seminary), M.A., Ph.D.(Penn.)

Blaine Ditto; B.S.(Iowa), Ph.D.(Ind.)

Keith B.J. Franklin; B.A., M.A.(AuT Tm 1 154.914Lod.)NWTj 1 0 0 1 1503.90 658kli2CMk;. Ont), M.A., Ph.D.(McG.)

Assistant Professors

Heungsun Hwang; B.A.(Chung-Ang Univ.), Ph.D.(McG.)

Jelena Ristic; B.A., M.A., Ph.D.(Br. Col.)

Hsiu-Ting Yu; B.S.(Taiwan), M.S., M.A., Ph.D.(Ill.-Urbana-Champaign)

Lecturers

Rhonda Amsel; B.Sc., M.Sc.(McG.)

Paola Carvajal; B.Sc.(C'dia), M.A.(McG.)

Associate Members

Clinical Research Institute of Montreal: Terence J. Coderre

Douglas Hospital: Jorge Armony, Suzanne King, Martin Lepage, Jens Pruessner, Howard Steiger

Montreal Neurological Institute: Lesley Fellows, Marilyn Jones-Gotman, Daniel Guitton, Brenda Milner, Edward Ruthazer, Wayne Sossin, Viviane Sziklas, Robert Zatorre

f 3 0 0 1 70.52 709.84 Tm .)19587t (V2spital.))T 0 1 70.52 5,.m0Za298t Pr

PSYC 211	(3)	Introductory Behavioural Neuroscience
PSYC 212	(3)	Perception
PSYC 213	(3)	Cognition
PSYC 215	(3)	Social Psychology

18-21 credits selected from Psychology courses at the 300 level or above.

13.32.6 Bachelor of Science (B.Sc.) - Liberal Program Core Science Component Psychology (45 credits)

This Core Science Component Psychology requires the completion of 45 credits in Psychology all of which need to be passed with a minimum grade of C. A prerequisite to the program is PSYC 100 or equivalent. Students completing a Liberal Program with a Core Science Component Psychology must also complete at least one breadth component in a second area.

PSYC 341	(3)	The Psychology of Bilingualism
PSYC 342	(3)	Hormones and Behaviour
PSYC 352	(3)	Cognitive Psychology Laboratory
PSYC 353	(3)	Laboratory in Human Perception
PSYC 403	(3)	Modern Psychology in Historical Perspective
PSYC 406	(3)	Psychological Tests
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 413	(3)	Cognitive Development
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 444	(3)	Sleep Mechanisms and Behaviour
PSYC 451	(3)	Human Factors Research and Techniques
PSYC 470	(3)	Memory and Brain
PSYC 501	(3)	Auditory Perception
PSYC 502	(3)	Psychoneuroendocrinology
PSYC 506	(3)	Cognitive Neuroscience of Attention
PSYC 510	(3)	Statistical Analysis of Tests
PSYC 514	(3)	Neurobiology of Learning and Memory
PSYC 522	(3)	Neurochemistry and Behaviour
PSYC 526	(3)	Advances in Visual Perception
PSYC 529	(3)	Music Cognition
PSYC 531	(3)	Structural Equation Models
PSYC 532	(3)	Cognitive Science
PSYC 536	(3)	Correlational Techniques
PSYC 537	(3)	Advanced Seminar in Psychology of Language
PSYC 541	(3)	Multilevel Modelling
PSYC 545	(3)	Topics in Language Acquisition
PSYC 561	(3)	Methods: Developmental Psycholinguistics
PSYC 562	(3)	Measurement of Psychological Processes

B

PSYC 412	(3)	Developmental Psychopathology
PSYC 414	(3)	Social Development
PSYC 416	(3)	Topics in Child Development
PSYC 436	(3)	Human Sexuality and Its Problems
PSYC 471	(3)	Human Motivation
PSYC 473	(3)	Social Cognition and the Self
PSYC 474	(3)	Interpersonal Relationships
PSYC 483	(3)	Seminar in Experimental Psychopathology
PSYC 491D1	(3)	Advanced Study: Behavioural Disorders
PSYC 491D2	(3)	Advanced Study: Behavioural Disorders
PSYC 507	(3)	Emotions, Stress, and Illness
PSYC 509	(3)	Diverse Clinical Populations
PSYC 511	(3)	Infant Competence
PSYC 512	(3)	Advanced Personality Seminar
PSYC 528	(3)	Vulnerability to Depression
PSYC 530	(3)	Applied Topics in Deafness
PSYC 533	(3)	International Health Psychology
PSYC 535	(3)	Advanced Topics in Social Psychology

15 credits in Psychology at the 300 level or above.

6 credits in Psychology at the 400 or 500 level.

13.32.7 Bachelor of Science (B.Sc.) - Major Psychology (54 credits)

Students majoring in Psychology must obtain a minimum grade of C in all 54 credits of the program. A grade lower than C may be made up by taking another equivalent course (if there is one), by successfully repeating the course, or by successfully writing a supplemental examination (if there is one).

Background

It is expected that most students who enter the Major program in Psychology will have taken introductory psychology, biology, and statistics at the collegial level. Recommended CEGEP courses include Psychology 350-101 or 350-102 or equivalent, Biology CEGEP objective 00UK, 00XU or equivalent, Statistics (Mathematics) 201-307 or 201-337 or equivalent. Students must obtain a minimum grade of 75% in their CEGEP statistics course. In the first year those students who have not taken the recommended collegial-level statistics course, or those who have obtained a grade below 75%, must take Psychology PSYC 204. Those who have not taken the recommended collegial-level biology should take BIOL 111 or BIOL 112, and those who have not taken Introductory Psychology in college must take PSYC 100.

U1 Required Courses (12 credits)

Note: PSYC 100 may be taken as a corequisite with these basic courses.

PSYC 211	(3)	Introductory Behavioural Neuroscience
PSYC 212	(3)	Perception
PSYC 213	(3)	Cognition
PSYC 215	(3)	Social Psychology

U1 or U2 Required Course (3 credits)

PSYC 305	(3)	Statistics for Experimental Design

Complementary Courses (39 credits)

List A

6 credits in Psychology from List A (Behavioural Neuroscience, Cognition and Quantitative Methods).

* Advising Notes Regarding PSYC 308 and NSCI 201:

PSYC 308 is not currently offered but can be substituted with the equivalent course NSCI 201.

In all cases, PSYC 308 and NSCI 201 should be considered interchangeable with respect to prerequisite, exclusion, etc., requirements.

Students who have taken PSYC 308 should not take NSCI 201.

NSCI 201*	(3)	Introduction to Neuroscience 2
PSYC 301	(3)	Animal Learning & Theory
PSYC 302	(3)	The Psychology of Pain
PSYC 310	(3)	Intelligence
PSYC 311	(3)	Human Cognition and the Brain
PSYC 315	(3)	Computational Psychology
PSYC 317	(3)	Genes and Behaviour
PSYC 318	(3)	Behavioural Neuroscience 2
PSYC 329	(3)	Introduction to Auditory Cognition
PSYC 340	(3)	Psychology of Language
PSYC 341	(3)	The Psychology of Bilingualism
PSYC 342	(3)	Hormones and Behaviour
PSYC 352	(3)	Cognitive Psychology Laboratory
PSYC 353	(3)	Laboratory in Human Perception
PSYC 403	(3)	Modern Psychology in Historical Perspective
PSYC 406	(3)	Psychological Tests
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 413	(3)	Cognitive Development
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 444	(3)	Sleep Mechanisms and Behaviour
PSYC 451	(3)	Human Factors Research and Techniques
PSYC 470	(3)	Memory and Brain
PSYC 501	(3)	Auditory Perception
PSYC 502	(3)	Psychoneuroendocrinology
PSYC 506	(3)	Cognitive Neuroscience of Attention
PSYC 510	(3)	Statistical Analysis of Tests
PSYC 514	(3)	Neurobiology of Learning and Memory
PSYC 522	(3)	Neurochemistry and Behaviour
PSYC 526	(3)	Advances in Visual Perception
PSYC 529	(3)	Music Cognition
PSYC 531	(3)	Structural Equation Models
	(3)	Cognitive Science

Ba ltt6(B.5) - bl sP ly(60)sl

PSYC 498D2	(4.5)	Senior Honours Research

List A

6 credits in Psychology from List A (Behavioural Neuroscience, Cognition and Quantitative Methods).

* Advising Notes Regarding PSYC 308 and NSCI 201:

PSYC 308 is not currently offered but can be substituted with the equivalent course NSCI 201.

In all cases, PSYC 308 and NSCI 201 should be considered interchangeable with respect to prerequisite, corequisite, etc., requirements.

Students who have taken PSYC 308 should not take NSCI 201.

NSCI 201*	(3)	Introduction to Neuroscience 2
PSYC 301	(3)	Animal Learning & Theory
PSYC 302	(3)	The Psychology of Pain
PSYC 310	(3)	Intelligence
PSYC 311	(3)	Human Cognition and the Brain
PSYC 315	(3)	Computational Psychology
PSYC 317	(3)	Genes and Behaviour
PSYC 318	(3)	Behavioural Neuroscience 2
PSYC 329	(3)	Introduction to Auditory Cognition
PSYC 340	(3)	Psychology of Language
PSYC 341	(3)	The Psychology of Bilingualism
PSYC 342	(3)	Hormones and Behaviour
PSYC 352	(3)	Cognitive Psychology Laboratory
PSYC 353	(3)	Laboratory in Human Perception
PSYC 403	(3)	Modern Psychology in Historical Perspective
PSYC 406	(3)	Psychological Tests
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 413	(3)	Cognitive Development
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 444	(3)	Sleep Mechanisms and Behaviour
PSYC 451	(3)	Human Factors Research and Techniques
PSYC 470	(3)	Memory and Brain
PSYC 501	(3)	Auditory Perception
PSYC 502	(3)	Psychoneuroendocrinology
PSYC 506	(3)	Cognitive Neuroscience of Attention
PSYC 510	(3)	Statistical Analysis of Tests
PSYC 514	(3)	Neurobiology of Learning and Memory
PSYC 522	(3)	Neurochemistry and Behaviour
PSYC 526	(3)	Advances in Visual Perception
PSYC 529	(3)	Music Cognition

PSYC 545	(3)	Topics in Language Acquisition
PSYC 561	(3)	Methods: Developmental Psycholinguistics
PSYC 562	(3)	Measurement of Psychological Processes

List B

6 credits in Psychology from List B (Social, Health and Developmental Psychology)

PSYC 304	(3)	Child Development
PSYC 316	(3)	Psychology of Deafness
PSYC 328	(3)	Health Psychology
PSYC 331	(3)	Inter-Group Relations
PSYC 332	(3)	Introduction to Personality
PSYC 333	(3)	Personality and Social Psychology
PSYC 337	(3)	Introduction: Abnormal Psychology 1
PSYC 338	(3)	Introduction: Abnormal Psychology 2
PSYC 343	(3)	Language Learning in Children
PSYC 351	(3)	Research Methods in Social Psychology
PSYC 408	(3)	Principles of Cognitive Behaviour Therapy
PSYC 409	(3)	Positive Psychology
PSYC 412	(3)	Developmental Psychopathology
PSYC 414	(3)	Social Development
PSYC 416	(3)	Topics in Child Development
PSYC 436	(3)	Human Sexuality and Its Problems
PSYC 471	(3)	Human Motivation
PSYC 473	(3)	Social Cognition and the Self
PSYC 474	(3)	Interpersonal Relationships
PSYC 483	(3)	Seminar in Experimental Psychopathology
PSYC 491D1	(3)	Advanced Study: Behavioural Disorders
PSYC 491D2	(3)	Advanced Study: Behavioural Disorders
PSYC 507	(3)	Emotions, Stress, and Illness
PSYC 509	(3)	Diverse Clinical Populations
PSYC 511	(3)	Infant Competence
PSYC 512	(3)	Advanced Personality Seminar
PSYC 528	(3)	Vulnerability to Depression
PSYC 530	(3)	Applied Topics in Deafness
PSYC 533	(3)	International Health Psychology
PSYC 535	(3)	Advanced Topics in Social Psychology

9 credits at the 300 level or above selected from:

Anatomy and Cell Biology (ANAT), Biochemistry (BIOC), Biology (BIOL), Chemistry (CHEM), Computer Science (COMP), Mathematics (MATH), Physiology (PHGY), Psychiatry (PYST), Psychology (PSYC).

13.32.9 Admission to the Bachelor of Science (B.Sc.) - Honours Psychology

Applications can be obtained from the Undergraduate Office of the Department of Psychology, Room N7/9A, Stewart Biology Building. The applications must be completed and returned to the Undergraduate Office by August 1 for September admission. Candidates will be advised of the Department's decision via email before classes begin in September.

Students should note that awarding of the Honours degree will depend on both cumulative grade point average and a minimum grade of B on PSYC 380D1/380D2 and PSYC 482. First Class Honours is awarded to students who obtain a minimum cumulative grade point average of 3.50, and a minimum program GPA of 3.50 and a minimum grade of A- in the required Honours courses, namely PSYC 380D1/380D2 and PSYC 482. Honours is awarded to students with a minimum cumulative grade point average of 3.00, and a minimum program GPA of 3.00 and a minimum grade of B in the required Honours courses, namely PSYC 380D1/380D2 and PSYC 482. Moreover, the awarding of the Honours degree normally requires completion of two full years of study, U2 and U3, in the Honours program. Students with particularly strong academic records may be admitted for the U3 year only on the basis of their marks and research experience. These students must complete all Honours program requirements.

For more information, see section 13.32.8: Bachelor of Science (B.Sc.) - Honours Psychology (60 credits).

13.33 Redpath Museum (REDM)

13.33.1 Location

Redpath Museum
859 Sherbrooke Street West
Montreal, Quebec H3A 2K6

Telephone: 514-398-4086 ext. 3188
Fax: 514-398-3185
Website: www.mcgill.ca/redpath

Associate Professors

Hans C.E. Larsson; B.Sc.(McG.), Ph.D.(Chic.) (CRC Tier 2 Chair in Macroevolution)

Anthony Ricciardi; B.Sc.(Agr.), M.Sc., Ph.D.(McG.) (joint appt. with McGill School of Environment)

Assistant Professors

Claire de Mazancourt; M.Sc.(École des Mines), DEA, Ph.D.(Paris VI)

Virginie Millien; Maîtrise(Paris VI), DEA, Ph.D.(Montpellier II)

Faculty Lecturer

Linda Cooper; B.A.(C'dia), M.A.(McM.)

Associate Members

Biology: Graham A.C. Bell, Lauren J. Chapman

Earth & Planetary Sciences: Jeanne Paquette

McGill School of Environment: Colin A. Chapman

Adjunct Professors

Robert Holmes

Henry M. Reiswig

Michael Woloch

13.33.4 Bachelor of Science (B.Sc.) - Minor Natural History (24 credits)

The Minor Natural History involves the exploration of the natural w

BIOL 305	(3)	Animal Diversity
BIOL 341	(3)	History of Life
BIOL 350**	(3)	Insect Biology and Control
BIOL 352	(3)	Vertebrate Evolution
BIOL 418	(3)	Freshwater Invertebrate Ecology
BIOL 427	(3)	Herpetology
BIOL 463	(3)	Mammalian Evolution
ENTO 330**	(3)	Insect Biology
ENTO 350**	(3)	Insect Biology and Control
ENTO 440	(3)	Insect Diversity
ENTO 535	(3)	Aquatic Entomology
EPSC 334	(3)	Invertebrate Paleontology
WILD 307	(3)	Natural History of Vertebrates
WILD 350	(3)	Mammalogy
WILD 420	(3)	Ornithology

List B: Botany

* Note: BIOL 205 and BIOL 215 may be applied to either List A or List B.

AEBI 210	(3)	Organisms 1
BIOL 205*	(3)	Biology of Organisms
BIOL 215*	(3)	Introduction to Ecology and Evolution
BIOL 240	(3)	Monteregian Flora
BIOL 355	(3)	Trees: Ecology & Evolution
PLNT 304	(3)	Biology of Fungi
PLNT 353	(3)	Plant Structure and Function
PLNT 358	(3)	Flowering Plant Diversity
PLNT 460	(3)	Plant Ecology

List C: Earth and Environmental Sciences

BIOL 540	(3)	Ecology of Species Invasions
ENVR 200	(3)	The Global Environment
ENVR 202	(3)	The Evolving Earth
EPSC 210	(3)	Introductory Mineralogy
EPSC 233	(3)	Earth and Life History
ESYS 200	(3)	Earth System Processes
ESYS 300	(3)	Investigating the Earth System
GEOG 203	(3)	Environmental Systems
GEOG 272	(3)	Earth's Changing Surface
GEOG 470	(3)	Wetlands
GEOG 550	(3)	Historical Ecology Techniques

List D: Field Studies

* Note: Students may take either of the cross-listed courses NRSC 405 and REDM 405, not both.

Students may also take other field courses with the permission of the Program Adviser.

BIOL 331	(3)	Ecology/Behaviour Field Course
BIOL 334	(3)	Applied Tropical Ecology
BIOL 335	(3)	Marine Mammals
BIOL 573	(3)	Vertebrate Palaeontology Field Course
ENTO 340	(3)	Field Entomology
EPSC 231	(3)	Field School 1
NRSC 405*	(3)	Natural History of East Africa
REDM 405*	(3)	Natural History of East Africa
WILD 475	(3)	Desert Ecology

13.34 [illegible] o Te a h s

13.34.1 [illegible]

Dawson Hall, Room 107
853 Sherbrooke Street West
Montreal, Quebec H3A 2T6

Fax: 514-398-2157
Email: petebarry@mcgill.ca
Website: www.mcgill.ca/scienceforteachers

13.34.2 A [illegible] o Te a h s

The training and certification of school teachers has traditionally been the responsibility of the Faculty of Education and requires the completion of a Bachelor of Education, subject to Ministère de l'Éducation, du Loisir et du Sport (MELS) regulations. The Faculties of Education and of Science have introduced a number of programs for students who wish to combine Science or Mathematics with Education at McGill. These include the Minor in Education for Science Students, and the Concurrent B.Sc. and B.Ed. The traditional Bachelor of Education, Secondary Program, Science and Technology, or Secondary Program, Mathematics is also available within the Faculty of Education; see Faculty of Education > Overview of Programs (Integrated Studies in Education).

The Minor allows Science students to develop or explore an interest in Education without committing themselves to completing a B.Ed. degree. Science students who have taken this Minor will have completed a substantial number of the necessary credits for the B.Ed. degree should they wish to enrol in that program. The Minor also allows the possibility of transferring into the Concurrent B.Sc. and B.Ed. For details, see section 13.34.4: Bachelor of Science (B.Sc.) - Minor Education for Science Students (18 credits).

The Concurrent B.Sc. and B.Ed. is intended as a very rigorous but rewarding alternative to taking the B.Sc. and the B.Ed. in sequence. It is specifically designed to prepare teacher/scientists and is aligned with the requirements of the Ministère de l'Éducation, du Loisir et du Sport. It has been designed to provide students with the opportunity to attain both a B.Sc. degree and a B.Ed. degree at the same time. It is highly structured and closely integrated so as to satisfy the academic requirements of both degrees.

To be admitted, candidates must satisfy the admission requirements of both Faculties. Normally, students will be admitted to both components of the Concurrent B.Sc. and B.Ed. simultaneously. It is possible for students to apply for transfer into this program at any time during their B.Sc. or B.Ed. program. However, because this is a concurrent program, both degrees must be granted at the same convocation. After admission, students should contact one of the coordinators to discuss course selection and scheduling.

Students in the Concurrent B.Sc. and B.Ed. may apply to transfer to either a conventional B.Sc. or a conventional B.Ed. program. To do so, they must submit a Faculty Transfer Application to the appropriate Student Affairs Office. The decision will be based on their grades in the relevant component of the Concurrent program. Students who do transfer to a conventional program may not transfer back to the Concurrent program.

The two components of the Concurrent B.Sc. and B.Ed. are the B.Ed. Secondary Program (120 credits) and one of the B.Sc. programs for teachers (90 cred or 120 credits for students who have not completed the basic sciences). They are combined in such a way that students complete 135 or 165 credits to fulfil all the requirements for graduation for both the B.Ed. and the B.Sc. These combinations are created exceptionally and exclusively for the Concurrent B.Sc. and B.Ed. For more detailed information about the Concurrent program, particularly how some elements are double-counted so as to satisfy the requirements of both the Faculty of Education and the Faculty of Science, see the program website: www.mcgill.ca/scienceforteachers.

Details of the nine different combinations, including an identification of the elements that are double-counted, are found at the links below. Eight combinations for Science have been specifically designed to align with the teachable subject areas in Education. Each incorporates one Major concentration and one Mino Note that Major concentrations are not the same as Major programs. The Mathematics combination includes the Major, not the Major concentration, in Mathematics.

Complementary Courses (15 credits)

9 credits selected from:

One of:

EDEC 233	(3)	First Nations and Inuit Education
EDEC 248	(3)	Multicultural Education
EDEC 249	(3)	Global Education and Social Justice

One of:

EDEC 260	(3)	Philosophical Foundations
EDEC 261	(3)	Philosophy of Catholic Education

One of:

EDEC 247	(3)	Policy Issues in Quebec Education
EDEM 220	(3)	Contemporary Issues in Education

6 credits from the list below:

* Note: Students select either EDES 335 or EDES 353.

EDEC 262	(3)	Media, Technology and Education
EDES 335*	(3)	Teaching Secondary Science 1
EDES 353*	(3)	Teaching Secondary Mathematics 1
EDPE 304	(3)	Measurement and Evaluation
EDPI 309	(3)	Exceptional Students

13.34.5 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Minor Chemistry for Teachers (135 credits)

The Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Minor Chemistry for Teachers is jointly offered by the Faculty of Science and the Faculty of Education. Separately

6 credits of Electives, of which at least 3 credits must be Science Electives; depending on how many credits count tow

Second calculus course, one of:

MATH 141	(4)	Calculus 2
MATH 151	(4)	Calculus B

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses of

EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

Major Concentration Biology - Cell/Molecular (36 credits)

The Major Concentration Biology - Cell/Molecular is a planned sequence of courses designed to permit a degree of specialization in cell/molecular biology

Advising Note: Freshman students should be aware that PHYS 101 and/or PHYS 102 are required for some of the courses in the major and minor concentrations in Biology.

Required Courses

25 credits selected as follows:

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution
BIOL 300	(3)	Molecular Biology of the Gene
BIOL 301	(4)	Cell and Molecular Laboratory
BIOL 303	(3)	Developmental Biology

Complementary Courses

At least 11 credits selected from:

BIOL 306	(3)	Neural Basis of Behaviour
BIOL 313	(3)	Eukaryotic Cell Biology
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOL 370	(3)	Human Genetics Applied
BIOL 373	(3)	Biometry
BIOL 413	(1)	Directed Reading

BIOL 568	(3)	Topics on the Human Genome
BIOL 575	(3)	Human Biochemical Genetics

or other appropriate course at the 300 level or higher with the permission of an adviser.

Minor Chemistry (18 credits)

Required Courses

18 credits selected as follows:

* Note: denotes courses with CEGEP equivalents.

Substitutions for these by more advanced courses may be made at the discretion of the Adviser.

CHEM 203	(3)	Survey of Physical Chemistry

The Major Concentration Biology - Organismal with Minor Chemistry is one of the nine variations of the program and allows students to focus their Science degree in Organismal Biology with a subspecialization in Chemistry.

To fulfill the requirements for graduation for the Concurrent Bachelor of Science and Bachelor of Education, the 135 credits (or 165 credits for students admitted without basic sciences) include the following:

(30 credits of Science Freshman Program (for students admitted without basic sciences))

60 credits of Education Component

69 credits of Science Component consisting of:

- 36 credits of Major Concentration Biology - Organismal

- 18 credits of Minor Chemistry

- 15 credits of Additional Science Courses

6 credits of Electives, of which at least 3 credits must be Science Electives, depending on how many credits count toward both the B.Sc. and the B.Ed. degrees.

For details on the counting of credits toward both degrees (double-counting) visit the program website http://www.mcgill.ca/scienceforteachers/.

B.Sc. Freshman Program

Students who enter Science in U0 will normally be registered in the Science Freshman Program until they complete their first year. They must consult an adviser in the Science Office for Undergraduate Student Advising (SOUSA) to obtain advice and approval of their course selection. Full details are available on the SOUSA website at http://www.mcgill.ca/science/sousa. Academic advising is also available by email. The address is newstudentadvising.science@mcgill.ca.

Students normally complete 30 credits which must include at least seven courses from the list of Approved Freshman Science courses, selected as follows:

[illegible]

Six of the Freshman courses must satisfy one of the following:

Option 1) 2 courses from MATH and 4 courses from BIOL, CHEM or PHYS;

or

Option 2) 3 courses from MATH and 3 courses from BIOL, CHEM or PHYS.

Complementary

The seventh course is chosen from the list of Approved Freshman Science Courses.

Notes:

1. Students who have not studied all of Biology, Chemistry and Physics at the grade 12 level or equivalent are strongly advised to include at least one course in the missing discipline in their Freshman Program.

2. Many students will complete more than seven courses from the Approved Freshman Science Courses list, particularly those who wish to leave several options open for their choice of major.

3. Students entering the Freshman Program must be aware of the department specific requirements when selecting their courses. Detailed advising information is available at http://www.mcgill.ca/science/sousa/bsc/freshman.

4. The maximum number of courses per term, required, complementary and elective, is five.

List of Approved Freshman Science Courses

Select the approved courses according to the instructions above.

Note:

* CHEM 115 (not open to students who are taking or have taken CHEM 110 or CHEM 120)

* CHEM 120 (not open to students who have taken CHEM 115)

BIOL 111	(3)	Principles: Organismal Biology
BIOL 112	(3)	Cell and Molecular Biology
CHEM 110	(4)	General Chemistry 1

ESYS 104	(3)	The Earth System
MATH 133	(3)	Linear Algebra and Geometry
PSYC 100	(3)	Introduction to Psychology

First calculus course, one of:

MATH 139	(4)	Calculus 1 with Precalculus
MATH 140	(3)	Calculus 1
MATH 150	(4)	Calculus A

Second calculus course, one of:

MATH 141	(4)	Calculus 2
MATH 151	(4)	Calculus B

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses offered by departments in the Faculties of Science or Arts. A list of recommended courses is found at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/approved/. Certain courses offered by other faculties may also be taken, but some restrictions apply.

Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

Education Component (60 credits)

60 credits of Education Component consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year.

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education

EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education

Complementary Courses

12 credits selected from:

BIOL 303	(3)	Developmental Biology
BIOL 305	(3)	Animal Diversity
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 307	(3)	Behavioural Ecology/Sociobiology
BIOL 310	(3)	Biodiversity and Ecosystems
BIOL 331	(3)	Ecology/Behaviour Field Course
BIOL 342	(3)	Marine Biology
BIOL 350	(3)	Insect Biology and Control
BIOL 373	(3)	Biometry
BIOL 427	(3)	Herpetology
BIOL 435	(3)	Natural Selection
BIOL 441	(3)	Biological Oceanography
BIOL 465	(3)	Conservation Biology

or other appropriate course at the 300 level or higher with the permission of an adviser.

Minor Chemistry (18 credits)

Required Courses

18 credits selected as follows:

* Note: denotes courses with CEGEP equivalents.

Substitutions for these by more advanced courses may be made at the discretion of the Adviser.

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 212*	(4)	Introductory Organic Chemistry 1
CHEM 222*	(4)	Introductory Organic Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory

Additional Courses (15 credits)

15 credits selected as follows:

12 credits:

BIOL 210	(3)	Perspectives of Science
CHEM 381	(3)	Inorganic Chemistry 2
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3

plus 3 credits, one of:

CHEM 180	(3)	World of Chemistry: Environment
	(3)	World of Chemistry: Food

CHEM 182	(3)	World of Chemistry: Technology
CHEM 183	(3)	World of Chemistry: Drugs

Electives (6 credits)

6 credits, of which at least 3 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

13.34.7 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Physics for Teachers (135 credits)

The Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Biology - Cell/Molecular with Physics for Teachers is jointly offered by the Faculty of Science and the Faculty of Education. Separately, the Bachelor of Science degree requires 90 credits (or 120 credits for students who have not completed the basic sciences) and the Bachelor of Education degree requires 120 credits. In the concurrent program, the requirements for the two degrees are combined in such a way that students complete 135 (or 165 credits) to fulfill all the requirements for graduation for both the B.Sc. and the B.Ed.

Graduates of the B.Ed. degree are recommended by the University to the Quebec Ministère de l'Éducation, du Loisir et du Sport (MELS) for Quebec Teacher Certification. For more information about teacher certification in Quebec, please refer to the Faculty of Education section under "Ov

2. Many students will complete more than ve courses from the Approved Freshman Science Courses list, particularly those who wish to leave several options open for their choice of major

3. Students entering the Freshman Program must be aware of the department speci c requirements when selecting their courses. Detailed advising information is available at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/speci c/.

4. The maximum number of courses per term, required, complementary, and elective, is ve.

Ls

Education Component (60 credits)

60 credits of Education Component, consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education

jCtaBy CE(36)

The Major Concentration Biology - Cell/Molecular is a planned sequence of courses designed to permit a degree of specialization in cell/molecular biology

Advising Note: Freshman students should be aware that PHYS 101 and/or PHYS 102 are required for some of the courses in the major and minor concentrations in Biology.

[illegible]

29 credits selected as follows:

* Students who have already taken CHEM 212 or its equi

One of:

PHYS 232	(3)	Heat and Waves
PHYS 253	(3)	Thermal Physics

One of:

PHYS 241	(3)	Signal Processing
PHYS 258	(3)	Experimental Methods 2

One of:

PHYS 214	(3)	Introductory Astrophysics
PHYS 224	(3)	Physics of Music
PHYS 260	(3)	Modern Physics and Relativity
PHYS 271	(3)	Introduction to Quantum Physics

One of:

PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 350	(3)	Honours Electricity and Magnetism

Additional Courses (15 credits)

BIOL 210	(3)	Perspectives of Science
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus

Electives (6 credits)

6 credits, of which at least 3 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

Ct Ba [illegible] (B.Sc.) [illegible] 15 [illegible]

(30 credits of Science Freshman Program (for students admitted without basic sciences))

First calculus course, one of:

MATH 139	(4)	Calculus 1 with Precalculus
MATH 140	(3)	Calculus 1
MATH 150	(4)	Calculus A

Second calculus course, one of:

MATH 141	(4)	Calculus 2
MATH 151	(4)	Calculus B

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses offered by departments in the Faculties of Science or Arts. A list of recommended courses is found at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/approved/. Certain courses offered by other faculties may also be taken, but some restrictions apply.

Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

Education Component (60 credits)

60 credits of Education Component, consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman Year.

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)

EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

Major Concentration Biology - Organismal (36 credits)

The Major Concentration Biology - Organismal is a planned sequence of courses designed to permit a degree of specialization in organismal biology.

Advising Note: Freshman students should be aware that PHYS 101 and/or PHYS 102 are required for some of the courses in the major and minor concentrations in Biology.

Required Courses

28 credits selected as follows:

* Students who have already taken CHEM 212 or its equivalent will choose another appropriate complementary course, to be approved by the Adviser. Regardless of the substitution, students must take at least 36 credits in this program.

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 206	(3)	Methods in Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution
BIOL 304	(3)	Evolution
BIOL 308	(3)	Ecological Dynamics
CHEM 212*	(4)	Introductory Organic Chemistry 1

Complementary Courses

9 credits selected from:

BIOL 303	(3)	Developmental Biology
BIOL 305	(3)	Animal Diversity
BIOL 306	(3)	Neural Basis of Behaviour
BIOL 307	(3)	Behavioural Ecology/Sociobiology
BIOL 310	(3)	Biodiversity and Ecosystems
BIOL 331	(3)	Ecology/Behaviour Field Course
BIOL 342	(3)	Marine Biology
BIOL 350	(3)	Insect Biology and Control
BIOL 352	(3)	Vertebrate Evolution
BIOL 373	(3)	Biometry
BIOL 427	(3)	Herpetology
BIOL 435	(3)	Natural Selection
BIOL 441	(3)	Biological Oceanography
BIOL 465	(3)	Conservation Biology

or other appropriate course at the 300 level or higher with the permission of an adviser.

Minor Physics (18 credits)

Required Course

3 credits

PHYS 257	(3)	Experimental Methods 1

Complementary Courses

15 credits to be selected as follows:

One of:

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 251	(3)	Honours Classical Mechanics 1

One of:

PHYS 232	(3)	Heat and Waves
PHYS 253	(3)	Thermal Physics

One of:

PHYS 241	(3)	Signal Processing
PHYS 258	(3)	Experimental Methods 2

One of:

PHYS 214	(3)	Introductory Astrophysics
PHYS 224	(3)	Physics of Music

PHYS 260	(3)	Modern Physics and Relativity
PHYS 271	(3)	Introduction to Quantum Physics

One of:

PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 350	(3)	Honours Electricity and Magnetism

Additional Science Courses (15 credits)

BIOL 210	(3)	Perspectives of Science
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus

Electives (5 credits)

5 credits, of which at least 2 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

13.34.9 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Chemistry with Minor Biology for Teachers (135 credits)

The Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Chemistry with Minor Biology for Teachers is jointly offered by the Faculty of Science and the Faculty of Education. Separately, the Bachelor of Science degree requires 90 credits (or 120 credits for students who have not completed the basic sciences) and the Bachelor of Education degree requires 120 credits. In the concurrent program, the requirements for the two degrees are combined in such a way that students complete 135 (or 165 credits) to fulfil all the requirements for graduation for both the B.Sc. and the B.Ed.

Graduates of the B.Ed. degree are recommended by the University to the Quebec Ministère de l'Éducation, du Loisir et du Sport (MELS) for Quebec Teacher Certification. For more information about teacher certification in Quebec, please refer to the Faculty of Education section under "Overview of Faculty Programs", "Undergraduate Education Programs", and "Quebec Teacher Certification".

The Major Concentration Chemistry with Minor Biology is one of the nine variations of the program and allows students to focus their Science degree in Chemistry with a subspecialization in Biology

To fulfil the requirements for graduation for the Concurrent Bachelor of Science and Bachelor of Education, the 135 credits (or 165 credits for students admitted without basic sciences) include the following:

(30 credits of Science Freshman Program (for students admitted without basic sciences))

60 credits of Education Component

69 credits of Science Component consisting of:

- 36 credits of the Major Concentration Chemistry

- 24 credits of the Minor Biology

- 9 credits of Additional Science Courses

6 credits of Electives, of which at least 3 credits must be Science Electives, depending on how many credits count toward both the B.Sc. and the B.Ed. degrees.

For details on the counting of credits toward both degrees (double-counting) visit the program website http://www.mcgill.ca/scienceforteachers/.

B.Sc. Freshman Program

Students who enter Science in U0 will normally be registered i 0 0 19" 0 1 67.52 100.52e rew man

Students normally complete 30 credits which must include at least seven courses from the list of Approved Freshman Science Courses, selected as follows:

[illegible]

Six of the Freshman courses must satisfy one of the following:

Option 1) 2 courses from MATH and 4 courses from - 9rOjnL CH s from the list of

PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses offered by departments in the Faculties of Science or Arts. A list of recommended courses is found at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/approved/. Certain courses offered by other faculties may also be taken, but some restrictions apply.

Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

Education Component (60 credits)

60 credits of Education Component, consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year.

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

Major Concentration Chemistry (36 credits)

The Major Concentration Chemistry is not certified by the Ordre des Chimistes du Québec. Students interested in pursuing a career in Chemistry in Quebec are advised to take an appropriate B.Sc. program in Chemistry

The Major concentration is a planned sequence of courses designed to permit a degree of specialization in this discipline.

Required Courses

18 credits

* Note: Required courses taken at CEGEP or elsewhere that are not credited toward the Concurrent B.Sc. and B.Ed. must be replaced by courses from the Complementary Course List equal to or exceeding their credit value. Regardless of the substitution, students must take at least 36 credits in this program.

CHEM 203	(3)	Survey of Physical Chemistry
CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 222	(4)	Introductory Organic Chemistry 2
CHEM 253	(1)	Introductory Physical Chemistry 1 Laboratory
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297	(1)	Introductory Analytical Chemistry Laboratory

Complementary Courses

18 credits selected from:

CHEM 219	(3)	Introduction to Atmospheric Chemistry
CHEM 263	(1)	Introductory Physical Chemistry 2 Laboratory
CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 307	(3)	Analytical Chemistry of Pollutants
CHEM 334	(3)	Advanced Materials
CHEM 367	(3)	Instrumental Analysis 1
CHEM 381	(3)	Inorganic Chemistry 2
CHEM 382	(3)	Organic Chemistry: Natural Products
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 571	(3)	Polymer Synthesis
CHEM 582	(3)	Supramolecular Chemistry
CHEM 591	(3)	Bioinorganic Chemistry

Minor Biology (24 credits)

Required Courses

15 credits

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution

Complementary Courses

9 credits selected from the Biology Department's course offerings, at the 300 level or above.

Additional Required Courses (9 credits)

BIOL 210	(3)	Perspectives of Science
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3

Electives (6 credits)

6 credits, of which at least 3 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

13.34.10 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Chemistry with Minor Physics for Teachers (135 credits)

The Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Chemistry with Minor Physics for Teachers is jointly offered by the Faculty of Science and the Faculty of Education. Separately, the Bachelor of Science degree requires 90 credits (or 120 credits for students who have not completed the basic sciences) and the Bachelor of Education degree requires 120 credits. In the concurrent program, the requirements for the two degrees are combined in such a way that students complete 135 (or 165 credits) to fulfill all the requirements for graduation for both the B.Sc. and the B.Ed.

Graduates of the B.Ed. degree are recommended by the University to the Quebec Ministère de l'Éducation, du Loisir et du Sport (MELS) for Quebec Teacher Certification. For more information about teacher certification in Quebec, please refer to the Faculty of Education section under "Overview of Faculty Programs", "Undergraduate Education Programs", and "Quebec Teacher Certification".

The Major Concentration Chemistry with Minor Physics is one of the nine variations of the program and allows students to focus their Science degree in Chemistry with a subspecialization in Physics.

To fulfill the requirements for graduation for the Concurrent Bachelor of Science and Bachelor of Education, the 135 credits (or 165 credits for students

Students who enter Science in U0 will normally be registered in the Science Freshman Program until they complete their first year. They must consult an adviser in the Science Office for Undergraduate Student Advising (SOUSA) to obtain advice and approval of their course selection. Full details are available on the SOUSA website at http://www

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

PHYS 102	(4)	Introductory Physics - Electromagnetism
PHYS 142	(4)	Electromagnetism and Optics

Electives

Students wishing to take elective courses may choose them from introductory courses offered by departments in the Faculties of Science or Arts. A list of recommended courses is found at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/approved/. Certain courses offered by other faculties may also be taken, but some restrictions apply.

Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

Education Component (60 credits)

60 credits of Education Component, consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year.

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

Major Concentration Chemistry (36 credits)

The Major Concentration Chemistry is not certi ed by the Ordre des Chimistes du Québec. Students interested in pursuing a career in Chemistry in Quebe are advised to take an appropriate B.Sc. program in Chemistry

The Major concentration is a planned sequence of courses designed to permit a degree of specialization in this discipline.

Required Courses

18 credits selected as follo

CHEM 582	(3)	Supramolecular Chemistry
CHEM 591	(3)	Bioinorganic Chemistry

M i (18)

RCo e

3 credits

PHYS 257	(3)	Experimental Methods 1

Cpn yCo e

15 credits to be selected as follows:

One of:

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 251	(3)	Honours Classical Mechanics 1

One of:

PHYS 232	(3)	Heat and Waves
PHYS 253	(3)	Thermal Physics

One of:

PHYS 241	(3)	Signal Processing
PHYS 258	(3)	Experimental Methods 2

One of:

PHYS 214	(3)	Introductory Astrophysics
PHYS 224	(3)	Physics of Music
PHYS 260	(3)	Modern Physics and Relativity
PHYS 271	(3)	Introduction to Quantum Physics

One of:

PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 350	(3)	Honours Electricity and Magnetism

AddCo e(15)

BIOL 210	(3)	Perspectives of Science
MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus

Electives (6 credits)

6 credits, of which at least 3 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

13.34.11 Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Physics with Minor Biology for Teachers (135 credits)

The Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - Major Concentration Physics with Minor Biology for Teachers is jointly offered by the Faculty of Science and the Faculty of Education. Separately, the Bachelor of Science degree requires 90 credits (or 120 credits for students who have not completed the basic sciences) and the Bachelor of Education degree requires 120 credits. In the concurrent program, the requirements for the two degrees are combined in such a way that students complete 135 (or 165 credits) to fulfill all the requirements for graduation for both the B.Sc. and the B.Ed.

Graduates of the B.Ed. degree are recommended by the University to the Quebec Ministère de l'Éducation, du Loisir et du Sport (MELS) for Quebec Teacher Certification. For more information about teacher certification in Quebec, please refer to the Faculty of Education section under "Overview of Faculty Programs", "Undergraduate Education Programs", and "Quebec Teacher Certification".

The Major Concentration Physics with Minor Biology is one of the nine variations of the program and allows students to focus their Science degree in Physics with a subspecialization in Biology

To fulfill the requirements for graduation for the Concurrent Bachelor of Science and Bachelor of Education, the 135 credits (or 165 credits for students admitted without basic sciences) include the following:

(30 credits of Science Freshman Program (for students admitted without basic sciences))

60 credits of Education Component

69 credits of Science Component consisting of:

- 36 credits of Major Concentration Physics

- 24 credits of Minor Biology

- 9 credits of Additional Science Courses

6 credits of Electives, of which at least 3 credits must be Science Electives, depending on how many credits count toward both the B.Sc. and the B.Ed. degrees.

For details on the counting of credits toward both degrees (double-counting) visit the program website http://www.mcgill.ca/scienceforteachers/.

B.Sc. Freshman Program

Students who enter Science in U0 will normally be registered in the Science Freshman Program until they complete their first year. They must consult an adviser in the Science Office for Undergraduate Student Advising (SOUSA) to obtain advice and approval of their course selection. Full details are available on the SOUSA website at http://www.mcgill.ca/science/sousa. Academic advising is also available by email. The address is newstudentadvising.science@mcgill.ca.

Students normally complete 30 credits which must include at least seven courses from the list of Approved Freshman Science courses, selected as follows.

Mathematics and Science Courses

Six of the Freshman courses must satisfy one of the following:

Option 1) 2 courses from MATH and 4 courses from BIOL, CHEM or PHYS;

or

Option 2) 3 courses from MATH and 3 courses from BIOL, CHEM or PHYS.

Seventh Course

The seventh course is chosen from the list of Approved Freshman Science Courses.

Notes:

1. Students who have not studied all of Biology, Chemistry and Physics at the grade 12 level or equivalent are strongly advised to include at least one course in the missing discipline in their Freshman Program.

2. Many students will complete more than seven courses from the Approved Freshman Science Courses list, particularly those who wish to leave several options open for their choice of major

3. Students entering the Freshman Program must be aware of the department specific requirements when selecting their courses. Detailed advising information is available at http://www.mcgill.ca/science/sousa/newstudents/u0/bsc_freshman/specific/.

4. The maximum number of courses per term, required, complementary and elective, is five.

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

MCDEC ,s 0 0 1 703 0 0 1 165.864 0 CR

30 credits selected as follows:

* Note: Required courses taken at CEGEP or elsewhere that are not credited toward the Concurrent B.Sc. and B.Ed. must be replaced by courses from the Complementary Course List equal to or exceeding their credit value. Regardless of the substitution, students must take at least 36 credits in this program.

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 333	(3)	Thermal and Statistical Physics
PHYS 340	(3)	Majors Electricity and Magnetism
PHYS 446	(3)	Majors Quantum Physics

Complementary Courses

6 credits selected from:

PHYS 214	(3)	Introductory Astrophysics
PHYS 224	(3)	Physics of Music
PHYS 241	(3)	Signal Processing
PHYS 258	(3)	Experimental Methods 2
PHYS 334	(3)	Advanced Materials
PHYS 534	(3)	Nanoscience and Nanotechnology

or any 300- or 400-level course approved by an adviser

Minor Biology (24-25 credits)

24-25 credits for the Minor Biology selected as follows:

15 credits of required courses

9-10 credits of complementary courses

Required Courses

15 credits

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 215	(3)	Introduction to Ecology and Evolution

Complementary Courses

9-10 credits of complementary courses, CHEM 212 and 6 selected from the Biology Department's courses, at the 300 level or above.

* Note: Students who have already taken CHEM 212 or its equivalent will choose another appropriate course, to be approved by the Adviser.

CHEM 212*	(4)	Introductory Organic Chemistry 1

Additional Courses (9 credits)

9 credits selected as follows:

6 credits:

BIOL 210	(3)	Perspectives of Science
MATH 203	(3)	Principles of Statistics 1

plus 3 credits, one additional Physics (PHYS) course appro

1. Students who have not studied all of Biology, Chemistry, and Physics at the grade 12 level or equivalent are strongly advised to include at least one course in the missing discipline in their Freshman Program.

2. Many students will complete more than five courses from the Approved Freshman Science Courses list, particularly those who wish to leave several options open for their choice of major

3. Students entering the Freshman Program must be aware of the department specific requirements when selecting their courses. Detailed advising information is available at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/specific/.

4. The maximum number of courses per term, required, complementary, and elective, is five.

List of Approved Freshman Science Courses

Select the approved courses according to the instructions above.

Note:

* CHEM 115 (not open to students who are taking or have taken CHEM 110 or CHEM 120)

* CHEM 120 (not open to students who have taken CHEM 115)

BIOL 111	(3)	Principles: Organismal Biology
BIOL 112	(3)	Cell and Molecular Biology
CHEM 110	(4)	General Chemistry 1
CHEM 115*	(4)	Accelerated General Chemistry: Giants in Science
CHEM 120*	(4)	General Chemistry 2
COMP 202	(3)	Introduction to Computing 1
ESYS 104	(3)	The Earth System
MATH 133	(3)	Linear Algebra and Geometry
PSYC 100	(3)	Introduction to Psychology

First calculus course, one of:

Calculus 1 with Precalculus

Consult the SOUSA website at http://www.mcgill.ca/science/sousa/continuing_students/bsc/outside/ for more information about taking courses from other faculties.

Education Component (60 credits)

60 credits of Education Component, consisting of:

54 credits of required courses

6 credits of complementary courses

Required Courses

54 credits

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

The English Language Requirement (EDEC 215) must be taken in the Fall semester following the Freshman year

EDEC 201	(1)	First Year Professional Seminar
EDEC 215	(0)	English Language Requirement
EDEC 247*	(3)	Policy Issues in Quebec Education
EDEC 254	(1)	Second Professional Seminar (Secondary)
EDEC 262*	(3)	Media, Technology and Education
EDEC 351	(2)	Third Professional Seminar (Secondary)
EDEC 404	(3)	Fourth Year Professional Seminar (Sec)
EDES 335	(3)	Teaching Secondary Science 1
EDES 350	(3)	Classroom Practices (Secondary)
EDES 435	(3)	Teaching Secondary Science 2
EDFE 200	(2)	First Field Experience (K/Elem & Secondary)
EDFE 254	(3)	Second Field Experience (Secondary)
EDFE 351	(8)	Third Field Experience (Secondary)
EDFE 451	(7)	Fourth Field Experience (Secondary)
EDPE 300*	(3)	Educational Psychology
EDPE 304	(3)	Measurement and Evaluation
EDPI 309*	(3)	Exceptional Students
EDPI 341	(3)	Instruction in Inclusive Schools

Complementary Courses

6 credits selected as follows:

* Note: The courses marked with an asterisk are counted toward both degrees. They will count as "electives" for the B.Sc. degree, although a grade of "C" or better is required.

3 credits, one of the three following courses:

EDEC 233*	(3)	First Nations and Inuit Education
EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations

Additional Courses (15 credits)

15 credits selected as follows:

9 credits

BIOL 210	(3)	Perspectives of Science
CHEM 381	(3)	Inorganic Chemistry 2
MATH 203	(3)	Principles of Statistics 1

plus 3 credits, one of:

CHEM 180	(3)	World of Chemistry: Environment
CHEM 181	(3)	World of Chemistry: Food
CHEM 182	(3)	World of Chemistry: Technology
CHEM 183	(3)	World of Chemistry: Drugs

plus 3 credits, one additional Physics (PHYS) course approved by the Physics Department.

Electives (6 credits)

6 credits, of which at least 3 credits must be Science Electives.

The electives must be chosen in such a way that the credit counts needed for graduation are satisfied.

Concurrent Bachelor of Science (B.Sc.) and Bachelor of Education (B.Ed.) - J

Option 1) 2 courses from MATH and 4 courses from BIOL, CHEM or PHYS;

or

Option 2) 3 courses from MATH and 3 courses from BIOL, CHEM or PHYS.

Complementary

The seventh course is chosen from the list of Approved Freshman Science Courses.

Notes:

1. Students who have not studied all of Biology, Chemistry and Physics at the grade 12 level or equivalent are strongly advised to include at least one course in the missing discipline in their Freshman Program.

2. Many students will complete more than seven courses from the Approved Freshman Science Courses list, particularly those who wish to leave several options open for their choice of major.

3. Students entering the Freshman Program must be aware of the department specific requirements when selecting their courses. Detailed advising information is available at http://www.mcgill.ca/science/sousa/new_students/u0/bsc_freshman/specific/.

4. The maximum number of courses per term, required, complementary and elective, is five.

List of Approved Freshman Science Courses

Select the approved courses according to the instructions above.

Note:

* CHEM 115 (not open to students who are taking or have taken CHEM 110 or CHEM 120)

* CHEM 120 (not open to students who have taken CHEM 115)

BIOL 111	(3)	Principles: Organismal Biology
BIOL 112	(3)	Cell and Molecular Biology
CHEM 110	(4)	General Chemistry 1
CHEM 115*	(4)	Accelerated General Chemistry: Giants in Science
CHEM 120*	(4)	General Chemistry 2
COMP 202	(3)	Introduction to Computing 1
ESYS 104	(3)	The Earth System
MATH 133	(3)	Linear Algebra and Geometry
PSYC 100	(3)	Introduction to Psychology

First calculus course, one of:

MATH 139	(4)	Calculus 1 with Precalculus
MATH 140	(3)	Calculus 1
MATH 150	(4)	Calculus A

Second calculus course, one of:

MATH 141	(4)	Calculus 2
MATH 151	(4)	Calculus B

First physics course, one of:

PHYS 101	(4)	Introductory Physics - Mechanics
PHYS 131	(4)	Mechanics and Waves

Second physics course, one of:

EDEC 248*	(3)	Multicultural Education
EDEC 249*	(3)	Global Education and Social Justice

3 credits, one of the two following courses:

EDEC 260*	(3)	Philosophical Foundations
EDEC 261*	(3)	Philosophy of Catholic Education

M (54)

P g

Students entering the Major program are normally expected to have completed the courses below or their equivalents. Otherwise they will be required to make up any deficiencies in these courses over and above the 54 credits for the program.

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2

Co s

27 credits

Where appropriate, Honours courses may be substituted for equivalent Major courses.

* Students select either MATH 249 or MATH 316 but not both.

MATH 222	(3)	Calculus 3
MATH 235	(3)	Algebra 1
MATH 236	(3)	Algebra 2
MATH 242	(3)	Analysis 1
MATH 243	(3)	Analysis 2
MATH 249*	(3)	Honours Complex Variables
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 316*	(3)	Complex Variables
MATH 323	(3)	Probability

C n y Co s

27 credits selected with the following specifications:

12 credits specifically required of students in the Concurrent B.Sc. and B.Ed. Major Mathematics:

COMP 202	(3)	Introduction to Computing 1
MATH 324	(3)	Statistics
MATH 338	(3)	History and Philosophy of Mathematics
MATH 348	(3)	Topics in Geometry

at least 3 credits from:

MATH 317	(3)	Numerical Analysis
MATH 335	(3)	Computational Algebra

MATH 340	(3)	Discrete Structures 2

12 credits from:

It is highly recommended that students include MATH 318, MATH 328, MATH 339 and MATH 346 in their complementary courses.

MATH 204	(3)	Principles of Statistics 2
MATH 318	(3)	Mathematical Logic
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 320	(3)	Differential Geometry
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 327	(3)	Matrix Numerical Analysis
MATH 328	(3)	Computability and Mathematical Linguistics
MATH 329	(3)	Theory of Interest
MATH 339	(3)	Foundations of Mathematics
MATH 346	(3)	Number Theory
MATH 352	(1)	Problem Seminar
MATH 407	(3)	Dynamic Programming
MATH 410	(3)	Majors Project
MATH 417	(3)	Mathematical Programming
MATH 423	(3)	Regression and Analysis of Variance
MATH 430	(3)	Mathematical Finance
MATH 447	(3)	Introduction to Stochastic Processes
MATH 523	(4)	Generalized Linear Models
MATH 525	(4)	Sampling Theory and Applications

In consultation with an adviser, 3 of the 12 credits may be selected from other MATH courses or related disciplines.

Electives (21 credits)

21 credits of electives, of which at least 18 credits must be Science Electi

Ba lt6(B.5) - M Te gEp ls