ADDENDUM 2005-2006

Faculty of Science

List of new programs and programs for which the requirements were modified this year. For details please see below.

Biology

Honours BSc in Biology

Honours BSc Biology with Biotechnology option

Biopharmaceutical Science

Honours BSc in Biopharmaceutical Science

Environmental Science

Honours BSc in Environmental Science

Mathematics and Statistics

Honours BSc in Mathematics-Science (Co-operative Program)

Honours BSc in Mathematics-Science with concentration in Computer Science

Physical Geography

Honours BSc in Physical Geography

Biology

Honours BSc in Biology

132 cr.

Suggested course stream for full-time students

Compulsory first-year courses:

Fall:

BIO1120	Introduction to Organismal Biology	4
CHM1310	Principles of Chemistry	4
MAT1320	Calculus I	3
PHY1301	Principles of Physics I	3

Winter:

BIO1110	Introduction to Cell Biology	4
CHM1320	Organic Chemistry I	4
ENG1100	Workshop in Essay Writing	3
MAT1323	Calculus and Matrix Algebra	3
PHY1302	Principles of Physics II	3

Compulsory second-year courses:

Fall:

BIO2109	Ecology	4
BIO2127	Introduction to Plant Science: Biodiversity to Biotechnology	5
CHM2120	Organic Chemistry II	3
CHM2132	Physical Chemistry for the Life Sciences	3
MAT2378	Probability and Statistics for the Natural Sciences	3

Winter:

BIO2123	Genetics	4
BIO2125	Animal Form and Function	5
BCH2140	Introduction to Biochemistry	3

Compulsory third-year courses:

Thirty-two credits (minimum) of science electives to be completed by the end of the third year. * 32

* Twenty-five of the 32 credits must be in biology courses at the 3000- and/or 4000-level. A minimum of three credits of laboratory or field work must be included among the 25 credits in biology.

This means either one laboratory course of three credits or two courses with a laboratory or field component.

Exceptionally, some courses offered by the Faculty of science and taught by biology professors, can be considered as biology credits. Consult the Department.

Courses offered by the 'Ontario Universities Program of Field Biology' apply, consult the Department.

Exceptionally, courses PHS3240 and PHA4107, CSI and MIC are recognized as science electives, but cannot count as biology credits.

Twelve credits of non-science electives outside the Faculties of Science, Engineering and Medicine. 12

Students are advised to take three credits of science electives and six credits outside the faculties of science, engineering and medicine before the end of the second year.

NOTE: Some courses are available only in alternate years.

Students should pay close attention to co-requisites and prerequisites when selecting courses that may reflect their interest in biology such as cell and molecular biology, ecology, physiology and plant biology.

Compulsory fourth-year courses:

BIO4000 **	Séminaire%%Seminar	2

Nineteen credits (minimum) from 3000- and/or 4000-level courses in biology. Selection of the courses will be made in consultation with a departmental advisor.	19
Six credits (minimum) of electives, either from science or non-science courses must be completed by the end of the honours year. ** If selected, BIO4004 or BIO4009 must be taken concurrently with BIO4000 during one academic year. BIO 4004 and 4009 have limited enrolments.	6

Honours Research Projects - BIO4004 and BIO4009
All honours research projects must be approved by the Department prior to their initiation. Students are advised to discuss potential research projects with professors before the beginning of the fourth year. Under special circumstances, and with prior approval, a student may be permitted to do a research project outside the department. The student must show that he or she has made a serious effort to find an internal supervisor for an honours project before permission will be given to undertake such a project with a professor outside the department. A departmental professor must co-supervise the project.

Biology

Honours BSc Biology with Biotechnology option

129 cr.

Biotechnology is the utilization of biological processes for commercial purposes. This rapidly expanding and changing high technology area offers many career opportunities in Canada, especially in fields such as fermentation technology, genetic engineering of crop plants and the development of new medically important products. Recent advances in recombinant DNA technology have greatly expanded the possible applications of biotechnology by permitting the genetic engineering of organisms, leading, for example, to bacteria that produce human insulin. Other new techniques such as the production of enzymes and monoclonal antibodies, the development of tissue culture techniques, improved fermentation processes, and novel methods of exploitation of natural products, have found a commercial use. The field of biotechnology requires multidisciplinary teams of biologists, biochemists, chemists, and chemical engineers. The University of Ottawa offers a biotechnology option by drawing on its strength in regular programs.

Suggested course stream for full-time students

Compulsory first-year courses:

Fall:

BIO1120	Introduction to Organismal Biology	4
CHM1310	Principles of Chemistry	4
MAT1320	Calculus I	3
PHY1301	Principles of Physics I	3

Winter:

BIO1110	Introduction to Cell Biology	4
CHM1320	Organic Chemistry I	4
ENG1100	Workshop in Essay Writing	3
MAT1323	Calculus and Matrix Algebra	3
PHY1302	Principles of Physics II	3

Compulsory second-year courses:

Fall:

BIO2109	Ecology	4
BIO2127	Introduction to Plant Science: Biodiversity to Biotechnology	5
CHM2120	Organic Chemistry II	3
CHM2132	Physical Chemistry for the Life Sciences	3
MAT2378	Probability and Statistics for the Natural Sciences	3

Winter:

BIO2123	Genetics	4
BIO2125	Animal Form and Function	5
BCH2140	Introduction to Biochemistry	3

Compulsory third-year courses:

BIO3151	Molecular Biology Laboratory	3
BIO3170	Molecular Biology	3

Nine credits (minimum) of non-science electives, taken outside of the faculties of Science, Engineering and Medicine must be completed by the end of the third year. 9

Students are advised to take three credits of science electives and six credits outside the faculties of Science, Engineering and Medicine before the end of the second year.

Twenty-six credits of science electives which must be completed by the end of the third year. * 26

* At least 19 of the 26 credits must be in biology courses at the 3000 and/or 4000-level, excluding BIO3151 and 3170.

Exceptionally, some courses offered by the Faculty of science and taught by biology professors, can be considered as biology credits. Consult the Department.

Exceptionally, courses PHS3240 and PHA4107, CSI and MIC are recognized as science electives, but cannot count as biology credits.

NOTE: Some courses are available only in alternate year. Students are advised to pay close attention to co-requisites and prerequisites when selecting their courses.

Compulsory fourth-year courses:

BIO4000 **	Séminaire%%Seminar	2
BIO4174	Biotechnology	3

Nine credits from the following courses:

BIO3152	Cell Biology Laboratory	3
BIO4115	Molecular Genetics	3
BIO4129	The Bacterial Cell	3
BIO4144	Plant Biochemistry and Molecular Biology	3
BPS3101	Genomics	3
BPS4101	Human Genome Structure and Function	3
BCH4122	Macromolecules	3

Seven credits in biology at the 3000- and/or 4000-level 7

Six credits (minimum) of electives, either from science or non-science courses must be completed by the end of the honours year. 6

** If selected, BIO4004 or BIO4009 must be taken concurrently with BIO4000 during one academic year. BIO4004 or BIO4009 have limited enrolment.

Honours Research Projects - BIO4004 and BIO4009
All honours research projects must be approved by the department prior to their initiation. Students are advised to discuss potential research projects with professors before the beginning of the fourth year. Under special circumstances, and prior approval, a student may be permitted to do a research project outside the department. The student must show that he or she has made a serious effort to find an internal supervisor for an honours project before permission will be given to undertake such a project with a professor outside the department. A departmental professor must co-supervise the project.

Sequence of Work and Study Terms (modified)

The Co-op program in biology has two sequences. Sequence 1 is for students interested in a field oriented fourth year honours research project. Sequence 2 is for students interested in laboratory-oriented research projects. In sequence 1, students alternate between paid, four-month work terms and study terms. They can work with several different employers, maximizing their exposure to the types of work in their field or they can choose to return to an employer to get more in-depth experience.
With sequence 2, students begin with a twelve month continuous work term with one employer, which allows them to focus on a particular project.

	Summer	Fall	Winter
OPTION 1			
First year		1a	1b
Second year		2a	2b
Third year	T	3a	T
Fourth year	T	4a	3b
Fifth year	T	4b	
OPTION 2			
Fisrt year		1a	1b
Second year		2a	2b
Third year		3a	T
Fourth year	T	T	3b
Fifth year	T	4a	4b

F, W, S: fall, winter or summer session
a: first half of academic year
b: second half of academic year
T: work term

Students can apply for admission to the co-op program during the second year of their program. To do so, they must submit their application to the co-op office.
To be admitted students must meet the following criteria:
- full-time registration in the honours biology program;
- minimum CGPA of 6;
- completion of all requirements up to and including the semester they apply to co-op;
- Canadian citizenship or permanent residency.

Biopharmaceutical Science

Honours BSc in Biopharmaceutical Science — 132 cr.

Suggested course stream for full-time students

Compulsory first-year courses: 34

Fall:

BIO1120	Introduction to Organismal Biology	4
CHM1310	Principles of Chemistry	4
MAT1320	Calculus I	3
PHY1301	Principles of Physics I	3

Three ENG credits at the 1000- or 2000-level

Winter:

BIO1110	Introduction to Cell Biology	4
CHM1320	Organic Chemistry I	4
MAT1323	Calculus and Matrix Algebra	3
PHY1302	Principles of Physics II	3

Three credits non-science electives 3

Compulsory second-year courses: 31

Fall:

BIO2127	Introduction to Plant Science: Biodiversity to Biotechnology	5
CHM2120	Organic Chemistry II	3
CHM2126	Laboratory of Organic Chemistry II	2
CHM2132	Physical Chemistry for the Life Sciences	3
MAT2378	Probability and Statistics for the Natural Sciences	3

Winter:

BCH2140	Introduction to Biochemistry	3
BCH2336	Biochemistry Laboratory I	2
BIO2123	Genetics	4
PHI2396	Bioethics	3

Three credits non-science electives 3

Option: Genomics

Compulsory courses: 31

Fall:

BCH3170 Molecular Biology 3
or
BIO3170 Molecular Biology 3

BCH3356 Molecular Biology Laboratory 3
or BIO3151 in the Winter session

BPS3101 Genomics 3
BPS4000 Séminaire%%Seminar 2
(This course runs from September to April)

Winter:

BCH3120	General Intermediary Metabolism	3
BIO2125	Animal Form and Function	5
BIO3102	Molecular Evolution	3
BIO3151	Molecular Biology Laboratory	3

or BCH3356 in the Fall session

BPS4101	Human Genome Structure and Function	3
BPS4104	Bioinformatics Laboratory	3
PHA4107	Introductory Pharmacology -- Drugs and Living Systems	3

Electives : Genomics Option 27

Fall:

BCH4122	Macromolecules	3
BIO3124	General Microbiology	3
BIO3126	General Microbiology Laboratory	3
BIO3140	Plant Physiology and Biochemistry	3
BIO3147	Developmental Biology	3
BIO3153	Cell Biology	3
BIO3301	Animal Physiology I	3
BIO4174	Biotechnology	3
CHM3120	Intermediate Organic Chemistry	3
CHM4139	Enzyme and Bio-organic Chemistry	3
CSI1303	Introduction to Computing Concepts	4
MIC5124	Immunology	3
MIC5500	Pathogens and the Environment	3
PHS3240	Mammalian Physiology	6
(This course runs from September to April)		

Winter:

BCH3125	Protein Structure and Function	3
BCH4125	Cellular Regulation and Control	3
BIO3152	Cell Biology Laboratory	3
BIO3302	Animal Physiology II	3
BIO4109	Advanced Topics in Animal Development	3
BIO4115	Molecular Genetics	3
BIO4127	Comparative Endocrinology	3
BIO4129	The Bacterial Cell	3
BIO4144	Plant Biochemistry and Molecular Biology	3
BPS4102	Pharmaceuticals: Federal and International Regulations	3
BPS4123	Phytomedicines and Natural Product Drugs	3
BPS4125	Medicinal Chemistry	3
MIC5500	Pathogens and the Environment	3
MIC5224	Pathogenic Bacteriology	3

Option: Medicinal Chemistry

Compulsory courses: 37

Fall:

BCH3170	Molecular Biology	3
or		
BIO3170	Molecular Biology	3

BCH3356	Molecular Biology Laboratory	3
or BIO3151 in the Winter session		

BPS4000	Séminaire%%Seminar	2
(This course runs from September to April)		
CHM2154	Analytical Chemistry	3
CHM3120	Intermediate Organic Chemistry	3
CHM3122	Applications of Spectroscopy in Chemistry	3
CHM3126	Laboratory of Organic Chemistry	3
CHM4116	Advanced Instrumental Analysis Laboratory	3
(This course is offered in the fall and in the winter)		

Winter:

BCH3120	General Intermediary Metabolism	3
BIO3151	Molecular Biology Laboratory	3

or BCH3356 in the Fall session

BPS4125	Medicinal Chemistry	3
CHM2118	Laboratory of Analytical Chemistry	2
CHM2311	Introduction to Structure and Bonding	3
CHM4116	Advanced Instrumental Analysis Laboratory	3
PHA4107	Introductory Pharmacology -- Drugs and Living Systems	3

Electives: Medicinal Chemistry Option 21

Group A 9

CHM4139	Enzyme and Bio-organic Chemistry	3
CHM4141	Computational Chemistry I	3
CHM4325	Advanced Organic Synthesis and Reaction Mechanisms	3
CHM4328	Special Topics in Organic Chemistry	3

Group B 12

BCH3125	Protein Structure and Function	3
BCH4122	Macromolecules	3
BCH4125	Cellular Regulation and Control	3
BIO4115	Molecular Genetics	3
BIO4174	Biotechnology	3
BPS3101	Genomics	3
BPS4129	Advanced Chemical Biology	3
BPS4123	Phytomedicines and Natural Product Drugs	3
BPS4126	Synthetic and Medicinal Chemistry Laboratory	3
CHM2130	*Physical chemistry: Introduction to the molecular properties of matter	3
CHM3125	Polymer and Applied Chemistry	3
CHM3150	Transition Metal Chemistry	3
CHM4315	Advanced Analytical Chemistry	3
CHM4317	Organometallic Chemistry	3
CHM4319	Bio-Inorganic Chemistry	3

CHM ****	Three credits from Group A	3
CSI1303	Introduction to Computing Concepts	4

* Students intending to pursue graduate studies in a chemistry department are strongly encouraged to choose CHM2130 as an option from Group B.

Honours Research Project 9

Genomics: One of the following two options for the honours research project

BPS4006	Projet de recherche%%Honours Project	9

or

BPS4127	Advanced Techniques in Biosciences	3

Additional six credits at the 3000- and/or 4000-level from the list of science electives 6

Medicinal Chemistry: One of the following two options for the honours research project:

BPS4005	Projet de recherche%%Honours Project	8
BPS4903	Séminaire%%Seminar	1

or

BPS4126	Synthetic and Medicinal Chemistry Laboratory	3

And six additional credits from Groups A and B 6

Cooperative Program

BPS4917	Projet de recherche%%Honours Project	5

BPS4903 Séminaire%%Seminar 1

Three additional credits from Groups A and B

Co-operative Program

The co-op program in biopharmaceutical science has two options: medicinal chemistry and genomics. In the medicinal chemistry option, you alternate eight-month paid work terms with eight-month study terms starting in the winter of third year. You can work with two different employers during each of the eight-month work terms, but are encouraged to remain with one. The genomics option is ideal for students who are interested in laboratory-oriented research for their fourth-year projects. You start with three consecutive four-month terms likely all with one employer. This allows you to become involved with complex longer term projects.

	Summer	Fall	Winter
Medicinal Chemistry Option			
First year		1a	1b
Second year		2a	2b
Third year		3a	T
Fourth year	T	4a	3b
Fifth year	T	T	4b
Genomics Option			
Fisrt year		1a	1b
Second year		2a	2b
Third year		3a	T
Fourth year	T	T	3b
Fifth year	T	4a	4b

a: 1st session
b : 2nd session
T: work term

You should apply for admission to co-op in the latter part of your second year of your program. To do so, submit your application to the co-op office before March 1st and satisfy the following requirements:
- full time registration in the honours biopharmaceutical science program;
- minimum CGPA of 6;
- completion of all course requirements up to and including the semester you apply to Co-op;
- Canadian citizenship or permanent residency (proof required with your application).

Environmental Science

Honours BSc in Environmental Science — 129 cr.

Suggested course stream for full-time students

Compulsory courses in first year:

Fall:

BIO1120	Introduction to Organismal Biology	4
CHM1310	Principles of Chemistry	4
ENG1100	Workshop in Essay Writing	3
or		
ENG1112	Technical Report Writing	3

GEO1115	Introduction to Earth Materials	3
MAT1320	Calculus I	3
PHY1301	Principles of Physics I	3

Winter:

BIO1110	Introduction to Cell Biology	4
CHM1320	Organic Chemistry I	4
EVS1101	Introduction to Environmental Science	3
GEG1302	Society and Environment	3
GEO1111	Introduction to Earth Systems	3
MAT1323	Calculus and Matrix Algebra	3
PHY1302	Principles of Physics II	3

Students may complete some of the 1000-level course requirements in their second year.
PHY 1302 can be taken in first or second year of study.

Other compulsory courses:

BIO2109	Ecology	4
BIO3117	Ecosystem Ecology	3
BIO4118	Applied Biostatistics	5
or		
GEO3152	Geological Data Analysis	5
CHM2352	Descriptive Inorganic Chemistry	3
EVS3101	Environmental Issues	3
EVS3120	Environmental Microbiology	3
EVS4000	Séminaire%%Seminar	2
EVS4009	Projet de recherche%%Research Project	9
or		
Nine credits from the Science and Engineering electives		9
EVS4910	Travail sur le terrain en sciences environnementales%%Field Course in Environmental Science	4
GEO2307	Environmental Geology	3
GEO3342	Introduction to Hydrogeology	3
GEG2320	Introduction to Digital Cartography and GIS	3
MAT2378	Probability and Statistics for the Natural Sciences	3

Twenty six credits from A, B, or C 26

A) Conservation and bio-diversity: 26

Compulsory courses:

BIO3115	Conservation Biology	3

One of the following two:

BIO2125	Animal Form and Function	5
or		
BIO2127	Introduction to Plant Science: Biodiversity to Biotechnology	5

One of the following two:

GEO2113	Paleontology	3
or		
GEO2334	Quaternary Geology and Climate Change	3

At least two courses from:

BIO3104	Field Biology I	2
BIO3105	Field Biology II	3
GEG3321	Geographical Approaches to Environmental Issues	3
BIO4136	Freshwater Ecology	5

Between 7-10 (level 2000-4000) credits from the Faculty of Science, the Faculty of Engineering or in the GEG 7-10

B) Global change: 26

Compulsory courses:

GEG2304	Climatology	3
GEG3102	Hydrology	3
GEO2334	Quaternary Geology and Climate Change	3

Nine credits from: 9

GEG3105	Remote Sensing	3
GEG4102	Drainage Basin Processes and Environmental Change	3
GEG4103	Northern Hydrology	3
GEG4120	GIS and Numerical Spatial Analysis	3
GEG4304	Microclimatology	3
GEG4516	Palynologie	3
GEO4332	Permafrost Geomorphology	3

Eight credits (level 2000-4000) from the Faculty of Science, the Faculty of Engineering or GEG 8

C) Environmental Geochemistry and Ecotoxicology: 26

Compulsory courses:

BIO2110	Environmental Physiology	3
BIO4146	Ecotoxicology	3
CHM2116	Laboratory of Environmental Chemistry	2
CHM2120	Organic Chemistry II	3
CHM2154	Analytical Chemistry	3
CHM2313	Environmental Chemistry	3
GEO3382	Geochemistry	3
GEO4342	Groundwater Geochemistry	3

Three credits (level 2000-4000) from the Faculty of Science, the Faculty of Engineering or in GEG 3

Twelve credits from the Humanities and Social Science Electives: 12

ADM1100	Introduction to Business Management	3
ECO1104	Introduction to Microeconomics	3
ECO2110	Microeconomic Analysis of the Public Sector	3
ECO2118	Introduction to the Economics of the Environment	3
ECO2121	Economics of Globalization	3
ENV3101	Legal Context of Environmental Issues	3
FEM2106	Women in Science and Engineering	3
GEG2108	Contested places	3
GEG2305	The Geography of Global Economic Systems	3
GEG2306	Urban Geography	3
GEG3302	Natural Resource Management	3
GEG3313	Planning Methodology	3
GEG4110	Industrial Location and Environment	3

GEG4118	Environmental Impact Assessment	3
GEG4119	Resource Management: Coastal and Shoreline Environments	3
HIS2129	Technology, Society and Environment since 1800	3
LSR2121	Recreation and Environmental Quality	3
LSR3105	Recreation Resources Conservation	3
PHI2396	Bioethics	3
PHI2398	Environmental Ethics	3
PHI3394	Philosophy of Science	3
POL1103	Governance and Society	3
POL2201	Canadian Politics	6
POL4532	Environnement, écologie et politique au Canada	3
SOC2105	Introduction to Social Ecology	3
SOC3105	Environmental Sociology	3

Science and Engineering electives:

BIO3124	General Microbiology	3
BIO3126	General Microbiology Laboratory	3
BIO3914	Biologie des algues et des champignons%%Biology of Algae and Fungi	4
BIO4101	Pesticides and the Environment	3
CHG4303	Hazardous Waste Control	3
CHG4355	Science and Technology of Pulp and Paper	3
CHG4371	Properties and Treatment of Particulate Wastes - Sludges	3
CHG4372	Polymers in the Environment	3
CHG4377	Risk Assessment and Hazard Analysis	3
or		
GEG4118	Environmental Impact Assessment	3
CHG4381	Introduction to Biochemical Engineering	3
CHG4385	Adsorption Separations for Environmental Applications	3
CHM3125	Polymer and Applied Chemistry	3
CHM4315	Advanced Analytical Chemistry	3
CHM4380	Principles of Instrumentation and Measurement	3
CVG2131		
GEG3104	Methods of Geographical Research	3
GEG3107	Geography of Polar Regions	3
GEG3110	Restructuring of Urban and Regional Systems	3
GEG3114	Biogeography	3
GEG3311	Political Geography	3
GEG4100	Glaciology	3
GEG4102	Drainage Basin Processes and Environmental Change	3
GEG4103	Northern Hydrology	3
GEG4105	GIS in Environmental Research	3
GEG4120	GIS and Numerical Spatial Analysis	3
GEG4303	Urbanization and Environment in the Third World	3
GEO4341	Advanced Physical Hydrogeology	3
GEO4342	Groundwater Geochemistry	3
GEO4382	Advanced Geochemistry	3
GEO4354	Quantitative Analysis in Geology	3
MAT3377	Sampling and Surveys	3
MIC5500	Pathogens and the Environment	3

Sequence of Work and Study Terms (modified)

The environmental science program offers a co-op program that provides students with field and workplace experience to complement their academic training. The requirements of the honours co-op degree in environmental sciences include those of the honours BSc in environmental science, plus the completion of four work term courses. Students may select preferably one of the two suggested options, or tailor a more suitable sequence if necessary. Option one includes an arrangement of four-month work terms that alternate with academic terms. The reversal of academic sessions 4A and 4B does not impact on course sequences. Option 2 includes a 12-month work term that can allow students a longer training period with a company or organization, and involvement in longer term projects.

	Summer	Fall	Winter
OPTION 1			
First year		1a	1b
Second year		2a	2b
Third year	T	3a	T
Fourth year	T	4a	3b
Fifth year	T	4b	
OPTION 2			
Fisrt year		1a	1b
Second year		2a	2b
Third year	T	3a	T
Fourth year	T	T	3b
Fifth year		4a	4b

a: first half of academic year
b: second half of academic year
T: work term

If you are already at the University you can apply for admission to co-op at the beginning of the second year of your program. To do so, submit your application to the co-op Office.
To be admitted you must fulfill the following criteria:
- full-time registration in the honours baccalaureate of science program in environmental science;
- minimum CGPA of 6;
- completion of all course requirements up to and including the fall term of second year;
- Canadian citizenship or permanent residency (proof required with your application).

Mathematics and Statistics

Honours BSc in Mathematics-Science (Co-operative Program)

cr.

The requirements of the cooperative program are the same as those of the honours BSc in mathematics-science with the following additional conditions:
- The 9 credits at 2000-level and the 9 credits at 3000-level in the same field of science or engineering other than mathematics must be taken in computer science.
- Students will choose one of the following options:

Option 1 (Modern Applied Mathematics)

Additional compulsory courses:

MAT3130 Introduction to Dynamical Systems

MAT3343	Applied Algebra	3
or		
MAT3344	Discrete Mathematics	3

Option 2 (Probability and Statistics)

Additional compulsory courses:

MAT3172	Foundations of Probability	3
MAT3375	Regression Analysis	3
MAT3376	Analysis of Variance	3
or		
MAT3377	Sampling and Surveys	3

Students must complete four work terms and submit a report on each work term.

Mathematics and Statistics

Honours BSc in Mathematics-Science with concentration in Computer Science

cr.

The requirements of the cooperative program are the same as those of the Honours BSc in mathematics-science and concentration in computer science, with the following additional conditions:
Students will choose one of the following options:

Option 1 (Modern Applied Mathematics)

Additional compulsory courses:

MAT3130	Introduction to Dynamical Systems	3
MAT3343	Applied Algebra	3
or		
MAT3344	Discrete Mathematics	3

Option 2 (Probability and Statistics)

Additional compulsory courses:

MAT3172	Foundations of Probability	3
MAT3375	Regression Analysis	3
MAT3376	Analysis of Variance	3
or		
MAT3377	Sampling and Surveys	3

Students must complete four work terms and submit a report on each work term.

Sequence of Work and Study Terms (modified)

	Summer	Fall	Winter
First year		1a	1b
Second year		2a	2b
Third year	T1	3a	T2
Fourth year	3b	T3	3b ou 4b
Fifth year	T4	4a	4b

a: first half of academic year
b: second half of academic year
T: work term

For a description of the co-operative education program, see CO-OPERATIVE EDUCATION in this calendar. For the general regulations governing co-op programs, refer to the Co-op Students' Handbook available from the central coordinating office (613) 562-5800, ext. 3015. For schedules of courses and work terms, contact the department.
At the end of each work term, students must submit a work term report. This report is due at the beginning of the following term. The report is graded by the department. For the final grade for the course "co-op work term report", both the report and the employer's evaluation are taken into account.

Physical Geography

Honours BSc in Physical Geography — 126 cr.

Suggested course stream for full-time students

Compulsory first-year courses: 36

Fall:

BIO1120	Introduction to Organismal Biology	4
CHM1310	Principles of Chemistry	4
GEG1301	The Physical Environment	3
GEO1115	Introduction to Earth Materials	3
MAT1320	Calculus I	3
PHY1101	Fundamentals of Physics I	3

Winter:

CHM1320	Organic Chemistry I	4
ENG1100	Workshop in Essay Writing	3
or		
ENG1112	Technical Report Writing	3
GEO1111	Introduction to Earth Systems	3
MAT1323	Calculus and Matrix Algebra	3
PHY1102	Fundamentals of Physics II	3

Compulsory second-year (or higher) courses:

GEG2304	Climatology	3
GEG2320	Introduction to Digital Cartography and GIS	3
GEG3102	Hydrology	3
GEG3105	Remote Sensing	3
GEG3306	Quaternary Paleogeography	3
or		
GEO2334	Quaternary Geology and Climate Change	3
GEG4010	Recherche dirigée en géographie physique%%Directed Research in Physical Geography	6
GEG4918	Camp d'automne II%%Field Camp II	3
MAT2378	Probability and Statistics for the Natural Sciences	3
Minimum of 51 credits of electives, as follows:		51

1. Twenty-one credits (minimum) from the following GEG courses: 21

At least nine credits must be GEG 4000-level; GEG 4001 cannot be counted towards this requirement.

GEG3101	Advanced Geomorphology	3
GEG3114	Biogeography	3
GEG3300	Selected Topics in Physical Geography	3
GEG3302	Natural Resource Management	3
GEG3312	Advanced GIS	3
GEG3321	Geographical Approaches to Environmental Issues	3
GEG4001	Étude sur le terrain dans le nord canadien%%Northern Canada Field Research	6
GEG4100	Glaciology	3
GEG4101	Permafrost Geomorphology	3
GEG4102	Drainage Basin Processes and Environmental Change	3
GEG4103	Northern Hydrology	3
GEG4105	GIS in Environmental Research	3
GEG4118	Environmental Impact Assessment	3
GEG4120	GIS and Numerical Spatial Analysis	3
GEG4304	Microclimatology	3
GEG4506	Géomorphologie karstique et environnements pléistocènes	3
GEG4507	Géoarchéologie	3
GEG4508	Climat, environnement et société	3
GEG4509	Les changements climatiques	3
GEG4515	La télédétection appliquée à l'environnement	3
GEG4516	Palynologie	3
GEG4517	L'holocène	3
GEG4916	Séminaire de géographie physique%%Seminar in Physical Geography	3

2. Twelve credits of Earth Sciences electives from: 12

GEO2163	Introduction to Mineralogy	3
GEO2164	Analytical Methods in Mineralogy	3
GEO2165	Stratigraphy and Sedimentation	3
GEO2307	Environmental Geology	3
GEO2321	Structural Geology and Tectonics	3
GEO3152	Geological Data Analysis	5
GEO3163	Igneous Petrology	3
GEO3166	Siliciclastic Sedimentology	3
GEO3167	Mineral Deposits	3
GEO3342	Introduction to Hydrogeology	3

GEO3382	Geochemistry	3
GEO4341	Advanced Physical Hydrogeology	3
GEO4342	Groundwater Geochemistry	3
GEO4354	Quantitative Analysis in Geology	3

3. Human geography electives: 12 credits from GEG courses other than those listed above. **12**

4. Other electives that can be taken to meet the requirement of 51 credits of electives:

BIO2109	Ecology	4
BIO3115	Conservation Biology	3
BIO3117	Ecosystem Ecology	3
CSI1303	Introduction to Computing Concepts	4
EVS1101	Introduction to Environmental Science	3
PHI2398	Environmental Ethics	3

At least nine credits of free electives without a GEG code. 9