

2007-2008 Undergraduate Calendar

The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2007-2008 academic year, including the Summer Semester 2007, the Fall Semester 2007 and the Winter Semester 2008.

For your convenience the Undergraduate Calendar is available in PDF format.

If you wish to link to the Undergraduate Calendar please refer to the [Linking Guidelines](#).

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Disclaimer

University of Guelph 2007

The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2007-2008 academic year, including the Summer Semester 2007, the Fall Semester 2007 and the Winter Semester 2008.

The University reserves the right to change without notice any information contained in this calendar, including any rule or regulation pertaining to the standards for admission to, the requirements for the continuation of study in, and the requirements for the granting of degrees or diplomas in any or all of its programs. The publication of information in this calendar does not bind the University to the provision of courses, programs, schedules of studies, or facilities as listed herein.

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Introduction

Collection, Use and Disclosure of Personal Information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90f31_e.htm. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes. Certain personal information is disclosed to external agencies, including the Ontario Universities Application Centre, the Ministry of Training, Colleges and Universities, and Statistics Canada, for statistical and planning purposes, and is disclosed to other individuals or organizations in accordance with the Office of Registrarial Services Departmental Policy on the Release of Student Information. For details on the use and disclosure of this information call the Office of Registrarial Services at the University at (519) 824-4120 or see <http://www.uoguelph.ca/registrar/registrar/index.cfm?index>.

Statistics Canada - Notification of Disclosure

For further information, please see Statistics Canada's web site at <http://www.statcan.ca> and Section XIV Statistics Canada.

Address for University Communication

Depending on the nature and timing of the communication, the University may use one of these addresses to communicate with students. Students are, therefore, responsible for checking all of the following on a regular basis:

Email Address

The University issued email address is considered an official means of communication with the student and will be used for correspondence from the University. Students are responsible for monitoring their University-issued email account regularly. See Section I--Statement of Students' Academic Responsibilities for more information.

Home Address

Students are responsible for maintaining a current mailing address with the University. Address changes can be made, in writing, through Undergraduate Program Services.

Name Changes

The University of Guelph is committed to the integrity of its student records, therefore, each student is required to provide either on application for admission or on personal data forms required for registration, his/her complete, legal name. Any requests to change a name, by means of alteration, deletion, substitution or addition, must be accompanied by appropriate supporting documentation.

Student Confidentiality and Release of Student Information Policy Excerpt

The University undertakes to protect the privacy of each student and the confidentiality of his or her record. To this end the University shall refuse to disclose personal information to any person other than the individual to whom the information relates where disclosure would constitute an unjustified invasion of the personal privacy of that person or of any other individual. All members of the University community must respect the confidential nature of the student information which they acquire in the course of their work.

Complete policy at <http://www.uoguelph.ca/policies>.

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Bachelor of Science (B.Sc.)

The University of Guelph offers general and honours programs leading to the B.Sc. degree. The general program consists of a minimum of 15.00 credits (usually 30 semester courses) involving normally 6 semesters of study. The requirements for the honours program is a minimum of 20.00 credits (usually 40 semester courses) which may be obtained over 8 semesters of study. Some majors may require more than 20.00 credits.

The Three Semester System

Most of the B.Sc. programs operate on the three semester system. In this system each of the Fall, Winter and Summer semesters is of 12 weeks duration. Two semesters are equivalent to 1 academic year at a university on the traditional system. In the three semester system, students may vary their rate of progress towards graduation. However, since many science courses must be taken in a certain sequence and not all courses are offered each semester, most science students are required to proceed from semester to semester in restricted patterns. Furthermore, the advanced courses of the honours programs are offered only in the regular fall and winter semesters.

Additional information may be obtained from Admissions Services, Office of Registrarial Services. The three-semester system and the pass-by-course method of advancement allow considerable flexibility of program arrangement. In addition, a variety of program contents is available which the student may modify to meet individual requirements.

Transfer from One B.Sc. Program to Another

On entrance to the B.Sc. program, the student may elect to follow an intended area of specialization or to postpone this decision until a later semester. The choice of a particular program of study may be most effectively made at the end of Semester 3 or 4. Judicious selection of courses in each and every semester will allow the easiest transfer between programs without incurring the need for additional semesters of study. The program counsellor of the particular college from which it is anticipated that the majority of science courses will be taken should be consulted for advice.

Program Information

General Program Requirements

The general B.Sc. degree requires the successful completion of 15.00 required credits. Normally 2.50 credits (usually 5 courses) are taken in each semester so that the degree may be completed in 6 semesters. The general science program is designed to give a broad general training in biological science, chemistry, physics and mathematical science.

Honours Program Requirements

In order to graduate in the honours program, students must fulfill all program requirements for the program and have achieved a 60%, or higher, cumulative average over all course attempts. Normally 2.50 credits (usually 5 courses) are taken in each semester so that the degree may be completed in generally 8 semesters. The following types of honours programs are offered:

Honours Major Programs

Major in a subject

Major in a subject (with a minor)

Honours Major

These programs permit a student to study science in greater depth than is permitted by the general program. The student is required to take a minimum of 1.00 credits (usually 2 courses) in each of biological science, chemistry, physics and mathematical science. In each of semesters 3 to 8, students select science credits so that the total program provides a broad science training with concentration in an area of physical science or biological science.

A major normally consists of certain prescribed courses (minimum of 8.00 credits) and a number of elective courses to complete the requirements for the degree. The composition of science courses selected must contain a sufficient number (minimum of 6.00 credits) of 3000 and 4000 level courses including a grouping (minimum of 2.00 credits) particularly at the 4000 level. A major program may be studied in conjunction with a minor in an area of science, humanities or social science.

Honours Minor

A minor is a group of courses which provides for exposure to and mastery of the fundamental principles of a subject. A minor consists of a minimum of 5.00 credits (normally 10 courses). It may also require certain other courses from other areas to be taken along with the specified courses of the minor. A minor is taken in conjunction with a major.

Students should seek advice from the program counsellor of either the College of Biological Science or the College of Physical and Engineering Science dependent upon their primary area(s) of interest. Refer to B.Sc. Program Requirements: Regulation 6. Double-Counting of Credits.

B.Sc. Program Requirements

Regulations 1, 2, 3 and 4 apply to all B.Sc. students.

1. Entry Credits

In general, the 4U or OAC credit or its equivalent is required in a subject area to allow entrance to the initial university course. Students who lack this requirement can remedy the deficiency by successful completion of:

BIOL*1020 for students lacking biology
CHEM*1060 for students lacking chemistry
PHYS*1020 for students lacking physics

Not more than one of the above will be allowed for credit toward the B.Sc. degree.

2. Basic Science Core

In each of the first 2 semesters B.Sc. students must take one (1) of the specified courses in each of biology, chemistry, physics and mathematical science, and 1 other course which is normally an Arts or Social Science elective.

3. 1000 Level Credits

No B.Sc. program may include more than 7.00 credits at the 1000 level.

4. 3000 and 4000 Level Credits

There is a requirement for a minimum of 6.00 science credits at the 3000- and 4000-levels with a minimum of 2.00 credits at the 4000 level.

5. Science Credits

A minimum of 16.00 science credits (usually 32 courses) is required for the honours major program. The inclusion of a minor in a non-science area involves the reduction to 14.00 science credits (usually 28 courses) with the approval of the program counsellors. Acceptable science courses in the following programs means "acceptable to the B.Sc. Program Committee". Lists of acceptable courses are available in the offices of the faculty advisors and the program counsellors and on the world wide web at the following address: http://www.bsc.uoguelph.ca/Approved_electives.shtml.

6. Double-Counting of Credits

A maximum of 2.00 credits required in a major program may be applied to meet the requirements of a minor program.

7. Continuation of Study

Students are advised to consult the regulations for continuation of study outlined in detail in Section VIII--Undergraduate Degree Regulations & Procedures.

Doctor of Veterinary Medicine

Students in the B.Sc. program who intend to apply for admission to the Doctor of Veterinary Medicine program should register for the Major Biological Science or Major Physical Science program, or the major of their choice. Prospective candidates for the D.V.M. program should consult the admission requirements for the program. Students may obtain assistance in selecting a program that will meet the requirements for the Doctor of Veterinary Program and for continuation in biological or physical science programs by consulting the appropriate Program Counsellor.

General Program (BSCG)

Continuation of Study

Students are advised to consult the regulations for continuation of study within the program which are outlined in detail in Section VIII--Undergraduate Degree Regulations & Procedures.

Conditions for Graduation

In order to qualify for graduation from the general program the student is required to attain a passing grade in a minimum of 15.00 required credits as outlined in the Total Course Requirements for all students in the General Science Program.

Total Course Requirements for all Students in the General Science Program

Total of 15.00 credits as follows:

- 4.00 credits from the first year science core - 1.00 credits beyond the 4U or OAC level in each of biological science, chemistry, mathematical science, physics. Note: A maximum of 7.00 credits at the 1000 level may be used towards the degree requirements.
- An additional 0.50 credits from at least 3 of the following subject areas: biological science, biochemistry/chemistry, mathematical science, physics.
- 6.50 additional credits selected from the list of approved sciences electives for the B.Sc. degree program of which 2.50 credits must be at the 3000 or 4000 level. Note: One of: BIOL*1020, CHEM*1060, PHYS*1020 may be counted towards the degree requirements, counting as 0.50 credits in science.
- 2.00 credits - arts and/or social science electives approved for the B.Sc. degree program.
- 1.00 credits in electives.

Recommended Schedule for Students in Biological Science Areas

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I

MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

CIS*1000	[0.50]	Introduction to Computer Applications
CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
STAT*2040	[0.50]	Statistics I
MATH*2080	[0.50]	Elements of Calculus II

0.50 Arts or Social Science electives

Semester 3 to 6

A minimum of 2.50 credits in each semester, including at least 2.00 acceptable science credits per semester. For details consult 'Total Course Requirements'.

Recommended Schedule for Students in Physical Science Areas

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 Arts or Social Science electives

Semester 3 to 6

A minimum of 2.50 credits in each semester, including 2.00 acceptable science courses per semester. For details consult 'Total Course Requirements'.

Honours Programs (BSCH)

Honours Program Majors

The following honours majors are available:

Biological Sciences:

- 20.00 credits - Animal Biology
- 20.25 credits - Biochemistry
- 20.00 credits - Biological Science
- 20.00 credits - Bio-Medical Science
- 20.00 credits - Human Kinetics
- 20.00 credits - Marine and Freshwater Biology
- 20.00 credits - Microbiology
- 20.00 credits - Molecular Biology & Genetics
- 20.00 credits - Nutritional and Nutraceutical Sciences
- 20.00 credits - Plant Biology
- 20.00 credits - Plant Biotechnology
- 20.00 credits - Wild Life Biology
- 20.00 credits - Zoology

Physical Sciences:

- 20.00 credits - Biological Chemistry
- 21.25 credits - Biophysics
- 21.75 credits - Chemical Physics
- 20.25 credits - Chemistry
- 20.00 credits - Physical Science
- 21.25 credits - Physics
- 21.25 credits - Theoretical Physics

Environmental Sciences:

- 20.25 credits - Biomedical Toxicology
- 20.00 credits - Earth Surface Science*
- 20.00 credits - Ecology*
- 20.00 credits - Environmental Biology*
- 20.00 credits - Environmental Toxicology

*also see B.SC.(ENV.)

Computing Science, Mathematics, Statistics

20.00 credits - Computing & Information Science

20.00 credits - Mathematics

20.00 credits - Statistics

Additional Disciplines:

20.00 credits - Food Science

20.00 credits - Psychology

Co-operative Educational Programs:

20.00 credits - Applied Mathematics and Statistics

20.25 credits - Biochemistry

20.25 credits - Biomedical Toxicology

21.25 credits - Biophysics

21.25 credits - Chemical Physics

20.25 credits - Chemistry

20.00 credits - Computing & Information Science

20.00 credits - Environmental Toxicology

20.00 credits - Food Science

20.00 credits - Microbiology

21.25 credits - Physics

Honours Program Minors

Minors are available in the following science areas with the particular credit requirements being given (additional minors are available from the College of Arts and the College of Social and Applied Human Sciences). A minor may include additional prerequisites - consult with the appropriate faculty advisor.

Biological Sciences:

- 5.00 credits - Biology
- 5.00 credits - Biochemistry
- 5.00 credits - Biotechnology
- 5.00 credits - Functional Foods and Nutraceuticals
- 5.25 credits - Microbiology
- 5.00 credits - Molecular Biology and Genetics
- 5.00 credits - Neuroscience
- 5.00 credits - Nutritional Sciences
- 5.00 credits - Plant Biology
- 5.00 credits - Plant Biotechnology
- 5.00 credits - Zoology

Physical Sciences:

- 5.00 credits - Chemistry
- 5.00 credits - Physics

Environmental Sciences:

- 5.00 credits - Ecology
- 5.00 credits - Forest Science
- 5.00 credits - Geographic Info. Sys. (G.I.S.) and Environmental Analysis
- 5.00 credits - Geology

Mathematical Sciences:

- 5.25 credits - Computing & Information Science
- 5.00 credits - Mathematical Science
- 5.00 credits - Mathematics
- 5.00 credits - Statistics

Additional Disciplines:

- 5.00 credits - Business Administration
- 5.00 credits - Food Science
- 5.00 credits - Psychology

Continuation of Study

Students are advised to consult the regulations for continuation of study within the program which are outlined in detail in Section VII--Undergraduate Degree Regulations & Procedures.

Conditions for Graduation

Schedules 1 and 2

In order to qualify for graduation from the honours program, the student must fulfill all program requirements and have achieved 60%, or higher, cumulative average in all course attempts.

Note: A student registered in an honours program who has successfully completed all required courses and the specified total number of credits for the program but does not have a cumulative average of 60%, or higher, may apply to graduate from the general program.

Co-operative Education Program

Admission to the Co-operative Education program may be granted on entry to the University or by application normally before the conclusion of Semester 2. Application forms can be obtained from the appropriate faculty co-op advisor. In-course students will need to complete successfully an interview in the appropriate department. Students must

be either a Canadian Citizen or Permanent Resident. A cumulative average of 70% is required in courses taken in Semesters 1 and 2 to permit continuation in the program.

Conditions for Graduation from the B.Sc. Co-operative Education Program

Conditions for graduation are the same as the corresponding regular B.Sc. program. In addition, all work reports and work performance evaluations must have a grade of satisfactory or better.

Animal Biology (ABIO)

Department of Animal and Poultry Science, Ontario Agricultural College

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

CIS*1000	[0.50]	Introduction to Computer Applications
CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming

0.50 Arts or Social Science electives

Semester 3

AGR*2350	[0.50]	Animal Production Systems and Industry
BIOC*2580	[0.50]	Introductory Biochemistry
BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics

0.50 Arts or Social Science electives

Semester 4

ANSC*2340	[0.50]	Structure of Farm Animals
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

Semester 5

ANSC*3080	[0.50]	Agricultural Animal Physiology
ANSC*3120	[0.50]	Introduction to Animal Nutrition

1.50 electives or restricted electives

Semester 6

ANSC*3210	[0.50]	Principles of Animal Care and Welfare
ANSC*3300	[0.50]	Animal Reproduction
MBG*3060	[0.50]	Quantitative Genetics

1.00 electives or restricted electives

Semester 7

2.50 electives or restricted electives

Semester 8

2.50 electives or restricted electives

Restricted Electives

Students must complete 2.00 credits from Arts or Social Science courses.

0.50 credits is required from each of the following: Animal Nutrition, Animal Breeding & Genetics, and Animal Physiology & Behaviour. Students are encouraged to consult with the Faculty Advisor for help in tailoring their selection to meet personal and career interests.

Note: Students are required to complete 16.00 credits in science of which a minimum of 6.00 credits must be at the 3000, 4000 level and at least 2.00 credits of these must be 4000 level.

Animal Breeding & Genetics [0.50] Required

ANSC*4020	[0.50]	Genetics of Companion Animals
ANSC*4050	[0.50]	Biotechnology in Animal Science
MBG*3090	[0.50]	Applied Animal Genetics
MBG*4030	[0.50]	Animal Breeding Methods

Animal Nutrition [0.50] Required

ANSC*3170	[0.50]	Nutrition of Fish and Crustacea
ANSC*3180	[0.50]	Wildlife Nutrition

ANSC*4260	[0.50]	Beef Cattle Nutrition
ANSC*4270	[0.50]	Dairy Cattle Nutrition
ANSC*4280	[0.50]	Poultry Nutrition
ANSC*4290	[0.50]	Swine Nutrition
ANSC*4550	[0.50]	Horse Nutrition
ANSC*4560	[0.50]	Pet Nutrition
Animal Physiology & Behaviour [0.50] Required		
ANSC*4090	[0.50]	Applied Animal Behaviour
ANSC*4100	[0.50]	Applied Environmental Physiology and Animal Housing
ANSC*4130	[0.50]	Reproductive Management and Technology
ANSC*4350	[0.50]	Experiments in Animal Biology
ANSC*4470	[0.50]	Animal Metabolism
ANSC*4490	[0.50]	Applied Endocrinology
An additional 3.00 credits must be obtained by selecting courses from the above lists and from the following:		
ANSC*2360	[0.50]	Challenges and Opportunities in Animal Production
ANSC*3050	[0.50]	Aquaculture: Advanced Issues
ANSC*4610	[0.50]	Critical Analysis in Animal Science
ANSC*4650	[0.50]	Immune Mechanisms of Animals
ANSC*4700	[0.50]	Research in Animal Biology I
ANSC*4710	[0.50]	Research in Animal Biology II
BIOC*3560	[0.50]	Structure and Function in Biochemistry
MICR*3230	[0.50]	Immunology I
MICR*4230	[0.50]	Immunology II
PATH*3610	[0.50]	Principles of Disease
POPM*3240	[0.50]	Epidemiology
POPM*4230	[0.50]	Animal Health

Applied Mathematics and Statistics (Co-op) (APMS:C)

Department of Mathematics and Statistics, College of Physical and Engineering Science

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required to complete this program which includes 4.50 credits in Mathematics, 2.50 credits in Statistics, 2.50 credits in Mathematics or Statistics at the 3000 level, and an additional 2.00 credits in Mathematics or Statistics at the 4000 level, 1.00 credits in Computing and Information Science, and 1.00 credits in Arts or Social Sciences courses.

Semester 1 - Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
CIS*2500	[0.50]	Intermediate Programming
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

Summer Semester

No study semester or work term.

Semester 3 - Fall

MATH*2000	[0.50]	Set Theory
MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Note: Suggested course sequences are available in the departmental brochure. Please consult with the departmental advisor.

Semester 4 - Summer

MATH*2130	[0.50]	Numerical Methods
MATH*2170	[0.50]	Differential Equations I
STAT*2050	[0.50]	Statistics II

0.50 Arts or Social Science electives

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

1.00 credits in Mathematics or Statistics at the 3000 level or above
1.50 electives

Summer Semester

COOP*3000 [0.00] Co-op Work Term III

Semester 6 - Fall

STAT*3100 [0.50] Introductory Mathematical Statistics I
STAT*3240 [0.50] Applied Regression Analysis

At least 1.00 credits from:

MATH*3100 [0.50] Differential Equations II
MATH*3200 [0.50] Real Analysis
MATH*3240 [0.50] Operations Research

0.50 electives

Semester 7 - Winter

STAT*3110 [0.50] Introductory Mathematical Statistics II
1.50 credits in Mathematics or Statistics at the 3000 level or above
0.50 electives

Summer Semester

COOP*4000 [0.00] Co-op Work Term IV

Semester 8 - Fall

2.00 credits in Mathematics or Statistics at the 4000 level
0.50 electives

Electives must include:

1.00 credits in Arts and Social Science courses
2.50 credits in Mathematics or Statistics at the 3000 level
2.00 credits in Mathematics or Statistics at the 4000 level

Biochemistry (BIOC)**Department of Molecular and Cellular Biology, College of Biological Science****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. The major will require the completion of at least 20.25 credits as indicated below:

Semester 1

BIOL*1030 [0.50] Biology I
CHEM*1040 [0.50] General Chemistry I
MATH*1200 [0.50] Calculus I
PHYS*1000 [0.50] An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II
CHEM*1050 [0.50] General Chemistry II
CIS*1500 [0.50] Introduction to Programming
MATH*1210 [0.50] Calculus II
PHYS*1010 [0.50] Introductory Electricity and Magnetism

Semester 3

BIOC*2580 [0.50] Introductory Biochemistry
CHEM*2060 [0.50] Structure and Bonding
CHEM*2480 [0.50] Analytical Chemistry I
CHEM*2880 [0.50] Physical Chemistry
MBG*2000 [0.50] Introductory Genetics

Semester 4

BIOC*3560 [0.50] Structure and Function in Biochemistry
BIOL*2210 [0.50] Introductory Cell Biology
CHEM*2700 [0.50] Organic Chemistry I
MBG*2020 [0.50] Introductory Molecular Biology

0.50 electives

Semester 5

BIOC*3570 [0.50] Analytical Biochemistry
CHEM*3750 [0.50] Organic Chemistry II
MICR*2030 [0.50] Microbial Growth
STAT*2040 [0.50] Statistics I

0.50 electives

Semester 6

MBG*3350 [0.75] Laboratory Methods in Molecular Biology I
PHYS*2030 [0.50] Biophysics of Excitable Cells

1.50 electives

Semester 7

BIOC*4520 [0.50] Metabolic Processes
MCB*4080 [0.50] Applied Microbiology and Biochemistry

MICR*3230 [0.50] Immunology I

One of:

MBG*3080 [0.50] Bacterial Genetics
MBG*4080 [0.50] Molecular Genetics

0.50 electives

Semester 8

BIOC*4540 [0.50] Enzymology
BIOC*4580 [0.50] Membrane Biochemistry

1.50 electives

Electives

Selection of electives for the program is subject to the following rules:

1. At least 1.00 credits must be in the Arts and Social Sciences.
2. One of: MCB*4050, TOX*4590.
3. One of: BIOM*3100, MICR*3330, MICR*4230, PBIO*3110, PBIO*4750.

Minor (Honours Program)

A minor in Biochemistry consists of at least 5.00 course credits. The following courses are required:

BIOC*3560 [0.50] Structure and Function in Biochemistry
BIOC*3570 [0.50] Analytical Biochemistry
BIOC*4540 [0.50] Enzymology
CHEM*2480 [0.50] Analytical Chemistry I
CHEM*2700 [0.50] Organic Chemistry I

One of:

MBG*2020 [0.50] Introductory Molecular Biology
MICR*2030 [0.50] Microbial Growth

In addition, at least 2.00 credits must be chosen from the following courses, with at least 1.00 credits from the first four courses listed:

BIOC*4520 [0.50] Metabolic Processes
BIOC*4580 [0.50] Membrane Biochemistry
MBG*3350 [0.75] Laboratory Methods in Molecular Biology I
MCB*4080 [0.50] Applied Microbiology and Biochemistry
MICR*3230 [0.50] Immunology I
TOX*4590 [0.50] Biochemical Toxicology

Biochemistry (Co-op) (BIOC:C)**Department of Molecular and Cellular Biology, College of Biological Science**

Two Streams are available. Stream A is different from Stream B in that Stream A has a double work term following academic semester 5. The course content of semesters 1-4 is the same as that listed above for the regular Honours Program Major. Students in the Co-op program must also take COOP*1100 in the second academic semester. The total program requirements, including the selection of electives are also the same.

Students will be expected to undertake their work terms after semester 3 and completion of course CHEM*2480. Since certain courses must be taken in a different semester from usual, consult your Faculty Co-op Advisor for assistance with course selection.

To graduate from the Co-op program a minimum of 4 successfully completed work terms is normally required.

Stream A**Semester 1 - Fall**

BIOL*1030 [0.50] Biology I
CHEM*1040 [0.50] General Chemistry I
MATH*1200 [0.50] Calculus I
PHYS*1000 [0.50] An Introduction to Mechanics

0.50 Arts or Social Science electives

Semester 2 - Winter

BIOL*1040 [0.50] Biology II
CHEM*1050 [0.50] General Chemistry II
CIS*1500 [0.50] Introduction to Programming
COOP*1100 [0.00] Introduction to Co-operative Education
MATH*1210 [0.50] Calculus II
PHYS*1010 [0.50] Introductory Electricity and Magnetism

Summer Semester

No academic semester or work term

Semester 3 - Fall

BIOC*2580 [0.50] Introductory Biochemistry
CHEM*2060 [0.50] Structure and Bonding
CHEM*2480 [0.50] Analytical Chemistry I
CHEM*2880 [0.50] Physical Chemistry
MBG*2000 [0.50] Introductory Genetics

Winter Semester

COOP*1000 [0.00] Co-op Work Term I

Semester 4 - Summer

BIOC*3570 [0.50] Analytical Biochemistry

CHEM*2700	[0.50]	Organic Chemistry I
MBG*2020	[0.50]	Introductory Molecular Biology
STAT*2040	[0.50]	Statistics I

0.50 electives

Semester 5 - Fall

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*3750	[0.50]	Organic Chemistry II
MICR*2030	[0.50]	Microbial Growth

0.50 electives

Winter Semester

COOP*2000	[0.00]	Co-op Work Term II
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Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

MICR*3230	[0.50]	Immunology I
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One of:

MBG*3080	[0.50]	Bacterial Genetics
MBG*4080	[0.50]	Molecular Genetics

1.50 electives

Semester 7 - Winter

BIOC*4540	[0.50]	Enzymology
BIOC*4580	[0.50]	Membrane Biochemistry
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
PHYS*2030	[0.50]	Biophysics of Excitable Cells

0.50 electives

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV
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Semester 8 - Fall

BIOC*4520	[0.50]	Metabolic Processes
MCB*4080	[0.50]	Applied Microbiology and Biochemistry

1.50 electives

Electives

Selection of electives for the program is subject to the following rules:

1. At least 1.00 credits must be in the Arts and Social Sciences.
2. One of: MCB*4050, TOX*4590.
3. One of: BIOM*3100, MICR*3330, MICR*4230, PBIO*3110, PBIO*4750.

Stream B**Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
CIS*1500	[0.50]	Introduction to Programming
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

Summer Semester

No academic semester or work term

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2060	[0.50]	Structure and Bonding
CHEM*2480	[0.50]	Analytical Chemistry I
CHEM*2880	[0.50]	Physical Chemistry
MBG*2000	[0.50]	Introductory Genetics

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

BIOC*3570	[0.50]	Analytical Biochemistry
CHEM*2700	[0.50]	Organic Chemistry I
MBG*2020	[0.50]	Introductory Molecular Biology
STAT*2040	[0.50]	Statistics I

0.50 elective

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

BIOC*3560	[0.50]	Structure and Function in Biochemistry
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BIOL*2210	[0.50]	Introductory Cell Biology
MICR*2030	[0.50]	Microbial Growth
PHYS*2030	[0.50]	Biophysics of Excitable Cells

0.50 electives

Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

CHEM*3750	[0.50]	Organic Chemistry II
MICR*3230	[0.50]	Immunology I

One of:

MBG*3080	[0.50]	Bacterial Genetics
MBG*4080	[0.50]	Molecular Genetics

1.00 electives

Semester 7 - Winter

BIOC*4540	[0.50]	Enzymology
BIOC*4580	[0.50]	Membrane Biochemistry
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I

1.00 electives

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV
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Semester 8 - Fall

BIOC*4520	[0.50]	Metabolic Processes
MCB*4080	[0.50]	Applied Microbiology and Biochemistry

1.50 electives

Electives

Selection of electives for the program is subject to the following rules:

1. At least 1.00 credits must be in the Arts and Social Sciences.
2. One of: MCB*4050, TOX*4590.
3. One of: BIOM*3100, MICR*3330, MICR*4230, PBIO*3110, PBIO*4750.

Biological Chemistry (BCHM)**Department of Chemistry, College of Physical and Engineering Science****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major will require the completion of 20.00 credits as indicated below:

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 Arts or Social Science electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2060	[0.50]	Structure and Bonding
CHEM*2400	[0.75]	Analytical Chemistry I
MBG*2000	[0.50]	Introductory Genetics
STAT*2040	[0.50]	Statistics I

Semester 4

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
MBG*2020	[0.50]	Introductory Molecular Biology

0.50 electives or restricted electives *

Semester 5

BIOC*3570	[0.50]	Analytical Biochemistry
CHEM*2880	[0.50]	Physical Chemistry
CHEM*3640	[0.50]	Chemistry of the Elements I
CHEM*3750	[0.50]	Organic Chemistry II

0.50 electives or restricted electives *

Semester 6

BIOC*3560	[0.50]	Structure and Function in Biochemistry
CHEM*3650	[0.50]	Chemistry of the Elements II

CHEM*3760 [0.50] Organic Chemistry III

One of: **

CHEM*4630 [0.50] Bioinorganic Chemistry

CHEM*4720 [0.50] Organic Reactivity

0.50 electives or restricted electives *

Semester 7

CHEM*4730 [0.50] Synthetic Organic Chemistry

CHEM*4740 [0.50] Topics in Bio-Organic Chemistry

0.50 Chemistry, Biochemistry or Molecular Biology and Genetics courses at the 3000 or 4000 level ***

0.75 electives or restricted electives *

Semester 8

One of:

CHEM*4630 [0.50] Bioinorganic Chemistry

CHEM*4720 [0.50] Organic Reactivity

1.00 Chemistry, Biochemistry or Molecular Biology and Genetics course at the 3000 or 4000 level ***

1.00 electives or restricted electives *

Selection of restricted electives are subject to the following:

1. * BIOL*2210 must be taken.
2. * MICR*2020 or MICR*2030 must be taken.
3. ** Note: CHEM*4630 and CHEM*4720 are offered in alternating winter semesters and both courses are required.
4. *** 1.50 credits are to be selected from the following list of allowable courses at the 3000 and 4000 level:

BIOC*4520 [0.50] Metabolic Processes

BIOC*4540 [0.50] Enzymology

BIOC*4580 [0.50] Membrane Biochemistry

CHEM*3440 [0.50] Analytical Chemistry III: Analytical Instrumentation

CHEM*4900 [0.75] Chemistry Research Project I

CHEM*4910 [0.75] Chemistry Research Project II

MBG*3350 [0.75] Laboratory Methods in Molecular Biology I

MBG*4080 [0.50] Molecular Genetics

MCB*4050 [0.50] Protein and Nucleic Acid Structure

MCB*4080 [0.50] Applied Microbiology and Biochemistry

TOX*4590 [0.50] Biochemical Toxicology

Biological Science (BIOS)**College of Biological Science****Major (Honours Program)**

Students may enter this major in Semester I or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major will require the completion of 20.00 credits as indicated below:

1. First year Core - 4.00 credits
 - 1.00 - Biology BIOL*1030 BIOL*1040
 - 1.00 - Chemistry CHEM*1040 CHEM*1050
 - 1.00 - Physics (PHYS*1070, PHYS*1080) or (PHYS*1000, PHYS*1010)
 - 0.50 - Mathematics MATH*1080 or MATH*1200
 - 0.50 - Mathematical Science CIS*1000, CIS*1200, MATH*1210, MATH*2080,
2. Subject Area Core - 8.00 credits
 - 0.50 - BIOL*2210
 - 0.50 - BIOC*2580
 - 0.50 - MBG*2000
 - 0.50 - STAT*2040
 - 0.50 - from one of BIOL*2060, BIOL*3110, BOT*2050
 - 0.50 - minimum from one of BIOM*3100, BOT*3310, HK*3940, ZOO*3200
 - 5.00 - biological science courses of which 4.00 must be at the 3000 or 4000 level*
3. Science Electives - 4.00 credits
 - 1.00 - biological science courses
 - 3.00 - from science offerings on the list of Approved Courses of which at least 2.00 must be at the 3000 or 4000 level*
4. Arts and Social Science Electives - 2.00 credits
 - 2.00 - arts or social science courses from the list of Approved Courses
5. Free Electives - 2.00 credits

*the program must include at total of 6.00 science credits at the 3000 or 4000 level, 2.00 must be at the 4000 level

Recommended Schedule of Studies**Semester 1**

BIOL*1030 [0.50] Biology I

CHEM*1040 [0.50] General Chemistry I

One of:

MATH*1080 [0.50] Elements of Calculus I

MATH*1200 [0.50] Calculus I

One of:

PHYS*1000 [0.50] An Introduction to Mechanics

PHYS*1070 [0.50] Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II

CHEM*1050 [0.50] General Chemistry II

0.50 Mathematical science from:

CIS*1000 [0.50] Introduction to Computer Applications

CIS*1200 [0.50] Introduction to Computing

MATH*1210 [0.50] Calculus II

MATH*2080 [0.50] Elements of Calculus II

One of:

PHYS*1010 [0.50] Introductory Electricity and Magnetism

PHYS*1080 [0.50] Physics for Life Sciences

0.50 Arts or Social Science electives

Semester 3

MBG*2000 [0.50] Introductory Genetics

0.50 Ecology from:

BIOL*2060 [0.50] Ecology

BIOL*3110 [0.50] Population Ecology

BOT*2050 [0.50] Plant Ecology

One of:

BIOC*2580 [0.50] Introductory Biochemistry

BIOL*2210 [0.50] Introductory Cell Biology

1.00 electives

Semester 4

STAT*2040 [0.50] Statistics I

One of:

BIOC*2580 [0.50] Introductory Biochemistry

BIOL*2210 [0.50] Introductory Cell Biology

1.50 electives

Semester 5

One course in Physiology from:

BIOM*3100 [0.50] Mammalian Physiology I

BOT*3310 [0.50] Plant Growth and Development

HK*3940 [1.25] Human Physiology

ZOO*3200 [0.50] Comparative Animal Physiology I

2.00 electives (1.25 electives if HK*3940 is selected)

Semester 6 to 8

2.50 in each semester including 2.00 science credits per semester

Note: 6.00 in biological science must be taken in Semesters 6 through 8 of which 4.00 must be at the 3000 or 4000 level. In the total 6.00 of 3000 and 4000 level science courses, 2.00 must be at the 4000 level.

Biology (BIOL)**College of Biological Science****Minor (Honours Program)**

A minor in Biology shall include the following courses:

BIOL*1030 [0.50] Biology I

BIOL*1040 [0.50] Biology II

BIOL*2060 [0.50] Ecology

BIOL*2210 [0.50] Introductory Cell Biology

MBG*2000 [0.50] Introductory Genetics

and 2.50 of which 1.50 must be at the 3000 or 4000 level, from courses offered by the Human Health and Nutritional Sciences, Integrative Biology and Molecular and Cellular Biology. This minor is intended for students registered in majors in B.Sc. Physical Sciences and the B.A. degree programs.

Bio-Medical Science (BIOM)**Department of Biomedical Sciences and Department of Human Health and Nutritional Sciences**

This joint program of the Department of Human Health and Nutritional Sciences and the Department of Biomedical Sciences focuses on the maintenance and promotion of human and animal health through the study of function (biochemistry and physiology), structure (anatomy and histology), and the basic medical sciences (epidemiology and pharmacology). It will permit graduates from this B.Sc. program to contribute to society in the area of health maintenance. The program is a good preparation for students intending to develop professional or research careers in the medical and biological sciences. Through the use of electives, students may structure a program emphasizing either nutritional sciences or principles of health and disease prevention. For more information on recommended electives contact the Faculty Advisor of the major.

Students who are admitted into the Biomedical Science major from high school must meet additional requirements to continue in the major beyond first year. Continuation is based on the cumulative average in the first two full-time semesters (5.00 credits), including the seven core courses as prescribed by the Schedule of Studies (see below). Students with a minimum of 75% average will be guaranteed continuation in this major. For students with a 70-74.9% average, continuation will be competitive based on available spaces. Students with an average below 70% will be changed to the Biological Science major. Students may subsequently change to another B.Sc. major of their choice.

B.Sc. students who were not admitted into the Biomedical Science major from high school and wish to declare the specialization at the end of the first year must apply directly to the Department of Biomedical Sciences by the last day of classes in the winter semester and meet the additional requirements specified above.

B.Sc. students beyond first year who wish to declare the specialization must apply directly to the Department of Biomedical Sciences by the last day of classes in the winter semester. Admission to the major will be based on the cumulative average in the previous two full-time semesters (5.00 credits). Acceptance will be competitive based on available spaces. Students with an average below 70% will not be considered for admission to the major.

All decisions will be made at the end of June.

Students who are lacking in the fundamentals of word processing, spread sheet use and data management should arrange to complete CIS*1000 as early in their program as possible.

This program is designed to partially meet the current requirements for an entry into medical schools in Ontario (a student interested in meeting these requirements should check the present admission requirements for the medical schools); as well as entry into the DVM program of the Ontario Veterinary College.

Live animals and/or animal tissues are used for teaching purposes in some courses in the Bio-Medical Science Major. This must be accepted by students admitted to the program. All animals are protected under the Animals for Research Act of Ontario (1980), the Guidelines for the Care and Use of Experimental Animals (Canadian Council on Animal Care), and the Animal Care Policies of the University of Guelph.

Major (Honours Program)

A minimum of 20.00 credits is required.

Note: Students are required to complete 16.00 credits in science of which a minimum of 2.00 credits must be at the 4000 level.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives or restricted electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

1.00 electives or restricted electives

Semester 3 (see admission statement above)

BIOC*2580	[0.50]	Introductory Biochemistry
BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

Semester 4

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition

1.00 electives or restricted electives

Semester 5

POPM*3240	[0.50]	Epidemiology
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One of:

BIOM*3100	[0.50]	Mammalian Physiology I
HK*3940	[1.25]	Human Physiology

If BIOM*3100 is selected, then BIOM*3110 and BIOM*3120 must be taken in Semester 6.

Electives or restricted electives (to a maximum of 2.75 total credits).

Semester 6

BIOM*3040	[0.50]	Medical Embryology
BIOM*3090	[0.50]	Principles of Pharmacology

Electives or restricted electives to a maximum of 2.75 total credits.

Note: As part of the electives or restricted electives students must select BIOM*3110 and BIOM*3120 in Semester 6 if BIOM*3100 was selected in Semester 5.

Semester 7

One of:

BIOM*3030	[0.75]	Biomedical Histology
ZOO*3000	[0.50]	Comparative Histology

Electives or restricted electives to a maximum of 2.75 total credits.

Semester 8

PATH*3610	[0.50]	Principles of Disease
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2.00 electives or restricted electives*

Restricted Electives

- 1 anatomy course from BIOM*3010, HK*3401/2, ZOO*2090 must be completed.
- One of:

MICR*3230	[0.50]	Immunology I
NUTR*4200	[0.50]	Nutrition and Immune Function
- A minimum of 1.00 and to a maximum of 2.00 in research experience may be met either by:
 - completing both HK*4410 and HK*4420
 - completing HK*4410 and either HK*4230 or BIOM*4500
 - completing both HK*4230 and BIOM*4500
 - completing one of the 1.00 credits in research courses in either the Department of Human Health and Nutritional Sciences (HK*4360 or HK*4371/2) or in the Department of Biomedical Sciences (BIOM*4510 or BIOM*4521/2)
 - equivalent course from another department with the permission of the Faculty Advisor
- A total of 2.00 credits in Arts and Social Science courses including:
 - 0.50 credits in philosophy and ethics from PHIL*2030, PHIL*2070, PHIL*2100, PHIL*2120, PHIL*2180
 - 0.50 credits in either psychology (PSYC*XXXX) or sociology (SOC*XXXX)

Biomedical Toxicology (BTOX)

Interdisciplinary Program, Department of Biomedical Sciences, Ontario Veterinary College

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2480	[0.50]	Analytical Chemistry I
MBG*2000	[0.50]	Introductory Genetics
TOX*2000	[0.50]	Principles of Toxicology

0.50 Arts or Social Science electives

Semester 4

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2700	[0.50]	Organic Chemistry I
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
STAT*2050	[0.50]	Statistics II

Semester 5

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BIOM*3100	[0.50]	Mammalian Physiology I
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
TOX*3300	[0.50]	Analytical Toxicology

0.25 electives

Semester 6

BIOM*3090	[0.50]	Principles of Pharmacology
BIOM*3110	[0.50]	Mammalian Physiology II

BIOM*3120	[0.25]	Laboratory Exercises in Mammalian Physiology
PATH*3610	[0.50]	Principles of Disease

0.75 electives

Semester 7

BIOM*3030	[0.75]	Biomedical Histology
BIOM*4090	[0.50]	Pharmacology
NUTR*4510	[0.50]	Toxicology, Nutrition and Food
TOX*4000	[0.50]	Medical Toxicology
TOX*4590	[0.50]	Biochemical Toxicology

Semester 8

STAT*3510	[0.50]	Environmental Risk Assessment
TOX*4100	[0.50]	Toxicological Pathology
TOX*4200	[0.50]	Topics in Toxicology

0.75 electives

Biomedical Toxicology (Co-op) (BTOX:C)

Interdisciplinary Program, Department of Biomedical Sciences, Ontario Veterinary College

Major (Honours Program)

A 70% average in courses completed in semesters 1 and 2 is normally required for admission to semester 3 of this program. An optional fourth co-op work term is available.

Semester 1 - Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2480	[0.50]	Analytical Chemistry I
MBG*2000	[0.50]	Introductory Genetics
TOX*2000	[0.50]	Principles of Toxicology

0.50 Arts or Social Science electives

Winter

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2700	[0.50]	Organic Chemistry I
PATH*3610	[0.50]	Principles of Disease
STAT*2050	[0.50]	Statistics II

0.50 electives

Fall

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
STAT*3510	[0.50]	Environmental Risk Assessment

0.50 electives

Summer

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

BIOM*3100	[0.50]	Mammalian Physiology I
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
NUTR*4510	[0.50]	Toxicology, Nutrition and Food
TOX*3300	[0.50]	Analytical Toxicology

0.25 electives

Semester 7 - Winter

BIOM*3090	[0.50]	Principles of Pharmacology
BIOM*3110	[0.50]	Mammalian Physiology II
BIOM*3120	[0.25]	Laboratory Exercises in Mammalian Physiology
TOX*4100	[0.50]	Toxicological Pathology
TOX*4200	[0.50]	Topics in Toxicology

0.25 electives

Semester 8 - Fall

BIOM*3030	[0.75]	Biomedical Histology
BIOM*4090	[0.50]	Pharmacology
TOX*4000	[0.50]	Medical Toxicology
TOX*4590	[0.50]	Biochemical Toxicology

0.25 electives

Biophysics (BIOP)

Department of Physics, College of Physical and Engineering Science

Major (Honours Program)

The program emphasizes the physics of biological systems. It provides an excellent background for careers in the expanding interdisciplinary research laboratories of Government and Industry. Completion of the program at an appropriate level will qualify a student to pursue post-graduate studies in biophysics and certain areas of physics.

Since some of the required courses are not offered every semester, students entering the Major in Biophysics should plan their program in consultation with the Department of Physics Departmental Advisor.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major requires the completion of 21.25 credits as indicated below:

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming

One of (MATH*1200 recommended):

MATH*1080	[0.50]	Elements of Calculus I
MATH*1200	[0.50]	Calculus I

One of (PHYS*1000 recommended):

PHYS*1000	[0.50]	An Introduction to Mechanics
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II

1 physics course from the following list (PHYS*1010 recommended):

PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

One of (MATH*1210 recommended):

MATH*1210	[0.50]	Calculus II
MATH*2080	[0.50]	Elements of Calculus II

0.50 Arts or Social Science electives

Semester 3

MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

One of:

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics

Semester 4

MATH*2170	[0.50]	Differential Equations I
PHYS*2030	[0.50]	Biophysics of Excitable Cells
PHYS*2260	[0.50]	Quantum Physics
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II

Semester 5

BIOC*2580	[0.50]	Introductory Biochemistry
MATH*3100	[0.50]	Differential Equations II
PHYS*3100	[0.75]	Electronics
PHYS*3230	[0.50]	Quantum Mechanics I
PHYS*3240	[0.50]	Statistical Physics I

Semester 6

BIOC*3560	[0.50]	Structure and Function in Biochemistry
PHYS*3220	[0.50]	Waves and Optics
PHYS*3510	[0.50]	Intermediate Laboratory
PHYS*4040	[0.50]	Quantum Mechanics II
PHYS*4540	[0.50]	Molecular Biophysics

Semester 7

MCB*4050	[0.50]	Protein and Nucleic Acid Structure
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PHYS*4240	[0.50]	Statistical Physics II
PHYS*4560	[0.50]	Biophysical Methods

One of:

PHYS*4120	[0.50]	Atomic and Molecular Physics
0.50 electives		

One of:

PHYS*4500	[0.50]	Advanced Physics Laboratory
0.50 electives		

Note: At least one of PHYS*4120 in semester 7 or PHYS*4150 in semester 8 must be taken.

Semester 8

BIOC*4580	[0.50]	Membrane Biochemistry
PHYS*4510	[0.50]	Advanced Physics Project

One of:

PHYS*4150	[0.50]	Solid State Physics
0.50 electives		

0.50 Arts or Social Science electives

0.50 electives

Note: At least one of PHYS*4120 in semester 7 or PHYS*4150 in semester 8 must be taken.

Note: PHYS*4510 will be projects in biophysics, some of which may be in biological areas outside the Department of Physics.

Biophysics (Co-op) (BIOP:C)

Department of Physics, College of Physical and Engineering Science

Major (Honours Program)

Since some of the required courses are not offered every semester, students entering the Major in Biophysics (Co-op) should plan their program in consultation with the Department of Physics Faculty Advisor.

To graduate from the Co-op program a minimum of 4 successfully completed work terms is normally required.

This major requires the completion of 21.25 credits as indicated below:

Semester 1 - Fall

The program for the first semester is the same as the Major in Biophysics (regular) program.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education

1 physics course from the following list (PHYS*1010 recommended):

PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

One of:

CIS*2500	[0.50]	Intermediate Programming
0.50 Arts or Social Science electives		

One of:

MATH*1210	[0.50]	Calculus II
MATH*2080	[0.50]	Elements of Calculus II

Semester 3 - Fall

MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

One of:

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

BIOC*2580	[0.50]	Introductory Biochemistry
MATH*2170	[0.50]	Differential Equations I
PHYS*2260	[0.50]	Quantum Physics
PHYS*3240	[0.50]	Statistical Physics I

0.50 Arts or Social Science electives*

*1.00 must be taken as Arts or Social Science electives in this Major

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

BIOC*3560	[0.50]	Structure and Function in Biochemistry
PHYS*2030	[0.50]	Biophysics of Excitable Cells
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II
PHYS*3220	[0.50]	Waves and Optics

Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

MATH*3100	[0.50]	Differential Equations II
PHYS*3100	[0.75]	Electronics
PHYS*3230	[0.50]	Quantum Mechanics I
1.00 electives		

Semester 7 - Winter

BIOC*4580	[0.50]	Membrane Biochemistry
PHYS*3510	[0.50]	Intermediate Laboratory
PHYS*4040	[0.50]	Quantum Mechanics II
PHYS*4540	[0.50]	Molecular Biophysics
0.50 electives		

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV
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Semester 8 - Fall

MCB*4050	[0.50]	Protein and Nucleic Acid Structure
PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4240	[0.50]	Statistical Physics II
PHYS*4560	[0.50]	Biophysical Methods

One of:

PHYS*4500	[0.50]	Advanced Physics Laboratory
0.50 electives		

Biotechnology (BIOT)

Department of Molecular and Cellular Biology, College of Biological Science

Minor (Honours Program)

A minimum of 5.00 credits is required.

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2020	[0.50]	Microbial Interactions and Associations
MICR*2030	[0.50]	Microbial Growth

One of:

ENGG*2660	[0.50]	Biological Engineering Systems I
ENGG*3830	[0.50]	Bio-Process Engineering
FOOD*2620	[0.50]	Food Engineering Principles

Two of:

ECON*1050	[0.50]	Introductory Microeconomics
ECON*1100	[0.50]	Introductory Macroeconomics
ECON*2100	[0.50]	Economic Growth and Environmental Quality
ECON*2310	[0.50]	Intermediate Microeconomics
ECON*2410	[0.50]	Intermediate Macroeconomics
MCS*1000	[0.50]	Introductory Marketing

Three of:

ANSC*2200	[0.50]	Principles of Aquaculture
ANSC*4050	[0.50]	Biotechnology in Animal Science
FOOD*3260	[0.50]	Industrial Microbiology
MBG*4240	[0.50]	Applied Molecular Genetics
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*3230	[0.50]	Immunology I
MICR*4180	[0.50]	Microbial Processes in Environmental Management
PBIO*3750	[0.50]	Plant Tissue Culture

Business Administration (BADM)

Department of Economics, College of Management and Economics

Minor (Honours Program)

A minimum of 5.00 credits is required.

BUS*2220	[0.50]	Financial Accounting
BUS*2230	[0.50]	Management Accounting
ECON*1050	[0.50]	Introductory Microeconomics
ECON*1100	[0.50]	Introductory Macroeconomics
ECON*2310	[0.50]	Intermediate Microeconomics
ECON*2410	[0.50]	Intermediate Macroeconomics
ECON*3560	[0.50]	Theory of Finance
MCS*3040	[0.50]	Business and Consumer Law

One of:

AGEC*3310	[0.50]	Operations Management
HTM*4390	[0.50]	Individuals and Groups in Organizations

One of:

AGEC*4370	[0.50]	Food & Agri Marketing Management
MCS*1000	[0.50]	Introductory Marketing

Students wishing to acquire further depth in Business Administration should consider taking electives from the areas of study listed under Management Economics in the B.A. degree.

Chemical Physics (CHPY)

Administered by the Office of the Dean, College of Physical and Engineering Science on behalf of the Department of Chemistry and the Department of Physics

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum of 21.75 credits is required.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics
CIS*1500	[0.50]	Introduction to Programming

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 Arts or Social Science electives

Semester 3

CHEM*2060	[0.50]	Structure and Bonding
MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

Semester 4

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2480	[0.50]	Analytical Chemistry I
MATH*2170	[0.50]	Differential Equations I
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II

Semester 5

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*3860	[0.50]	Quantum Chemistry
PHYS*3100	[0.75]	Electronics
PHYS*3230	[0.50]	Quantum Mechanics I
PHYS*3240	[0.50]	Statistical Physics I

Semester 6

CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
PHYS*3220	[0.50]	Waves and Optics
PHYS*4040	[0.50]	Quantum Mechanics II

One of:

CHEM*2700	[0.50]	Organic Chemistry I
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0.50 Arts or Social Science electives

One of:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
CHEM*4880	[0.50]	Topics in Advanced Physical Chemistry

Semester 7

CHEM*3440	[0.50]	Analytical Chemistry III: Analytical Instrumentation
IPS*4001	[0.75]	Chemical Physics Research Project
MATH*3100	[0.50]	Differential Equations II
PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4240	[0.50]	Statistical Physics II

Semester 8

IPS*4002	[0.75]	Chemical Physics Research Project
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One of:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
CHEM*4880	[0.50]	Topics in Advanced Physical Chemistry

1.50 electives

Chemical Physics (Co-op) (CHPY:C)

Administered by the Office of the Dean, College of Physical and Engineering Science on behalf of the Department of Chemistry and the Department of Physics

Major (Honours Program)

A minimum of 21.25 credits is required.

Semester 1 - Fall

The program for the first semester is the same as for the Major in Chemical Physics (regular) program.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

One of:

CIS*2500	[0.50]	Intermediate Programming
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0.50 Arts or Social Science electives

Semester 3 - Fall

CHEM*2060	[0.50]	Structure and Bonding
MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2480	[0.50]	Analytical Chemistry I
MATH*2170	[0.50]	Differential Equations I
PHYS*3240	[0.50]	Statistical Physics I

One of:

CHEM*2700	[0.50]	Organic Chemistry I
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0.50 Arts or Social Science electives

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II
PHYS*3220	[0.50]	Waves and Optics

One of:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
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0.50 electives

Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*3440	[0.50]	Analytical Chemistry III: Analytical Instrumentation
CHEM*3860	[0.50]	Quantum Chemistry
PHYS*3230	[0.50]	Quantum Mechanics I

One of:

CHEM*3640	[0.50]	Chemistry of the Elements I
CHEM*3750	[0.50]	Organic Chemistry II

0.50 electives

Semester 7 - Winter**

PHYS*4040	[0.50]	Quantum Mechanics II
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One of:

CHEM*3760	[0.50]	Organic Chemistry III
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0.50 electives

One of:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
CHEM*4880	[0.50]	Topics in Advanced Physical Chemistry

0.50 Arts or Social Science electives

0.50 electives

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV
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Semester 8 - Fall**

MATH*3100	[0.50]	Differential Equations II
PHYS*3100	[0.75]	Electronics
PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4240	[0.50]	Statistical Physics II

0.50 electives

** A minimum of 2.00 credits in science courses at the 4000 level is required for graduation.

Chemistry (CHEM)

Department of Chemistry, College of Physical and Engineering Science

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. The major will require the completion of 20.25 credits as indicated below:

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2060	[0.50]	Structure and Bonding
CHEM*2400	[0.75]	Analytical Chemistry I
MATH*2150	[0.50]	Applied Matrix Algebra

0.50 electives*

Semester 4

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
MATH*2170	[0.50]	Differential Equations I

0.50 electives*

Semester 5

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*3640	[0.50]	Chemistry of the Elements I
CHEM*3750	[0.50]	Organic Chemistry II
CHEM*3860	[0.50]	Quantum Chemistry

0.50 electives*

Semester 6

CHEM*3650	[0.50]	Chemistry of the Elements II
CHEM*3760	[0.50]	Organic Chemistry III

1.50 electives* or restricted electives**

Semester 7 and 8

CHEM*3440	[0.50]	Analytical Chemistry III: Analytical Instrumentation
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3.00 Chemistry or Biochemistry**

1.50 electives*

*selection of electives is subject to the following:

- At least 1.00 credits must be in the Arts & Social Sciences.
- PHYS*2040 or PHYS*2260
- Approval of the Faculty Advisor must be obtained for the selection of courses not listed as restrictive electives.
- Options for an "Area of Focus" or a minor are available. Subject areas include Biochemistry, Computing and Information Science, Earth Sciences, Environmental Sciences, Mathematical Sciences, and Physics. Please consult with your Faculty Advisor for more detail.

**3.00 credits from the 3000/4000 level as follows:

- 1.50 comprising of (CHEM*3870 or CHEM*4880), (CHEM*4620 or CHEM*4630), (CHEM*4720 or CHEM*4730)
- 1.50 chosen from CHEM*3870, CHEM*4010, CHEM*4400, BIOC*4520, BIOC*4540, BIOC*4550, BIOC*4570, BIOC*4580, CHEM*4620, CHEM*4630, CHEM*4720, CHEM*4730, CHEM*4740, CHEM*4880, CHEM*4900, CHEM*4910, TOX*4590

Note:

- Some of these courses may have to be taken in Semester 6.
- Some of these courses are offered only in alternate years, and some have additional prerequisites for which the student must plan ahead, with the assistance of the faculty advisor.

Minor (Honours Program)

A minor in Chemistry consists of at least 5.00 credits from the core course list and 2.50 from Chemistry at the 2000 level or above including 1.00 from the Restricted Electives list that follows:

Core Courses

CHEM*2060	[0.50]	Structure and Bonding
CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2700	[0.50]	Organic Chemistry I

One of:

CHEM*2400	[0.75]	Analytical Chemistry I
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CHEM*2480	[0.50]	Analytical Chemistry I
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One of:

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*2880	[0.50]	Physical Chemistry

Restricted Electives - 1.00 credits from the following courses:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
CHEM*4010	[0.50]	Chemistry and Industry
CHEM*4400	[0.50]	Advanced Topics in Analytical Chemistry
CHEM*4620	[0.50]	Advanced Topics in Inorganic Chemistry
CHEM*4630	[0.50]	Bioinorganic Chemistry
CHEM*4720	[0.50]	Organic Reactivity
CHEM*4730	[0.50]	Synthetic Organic Chemistry
CHEM*4880	[0.50]	Topics in Advanced Physical Chemistry

Chemistry (Co-op) (CHEM:C)

Department of Chemistry, College of Physical and Engineering Science

Major (Honours Program)

The major will require the completion of 20.25 credits as indicated below.

The course content of semesters 1 to 3 is the same as listed in the regular Honours Program Major.

To graduate from the Co-op program a minimum of 4 successfully completed work terms is normally required. These can be taken as four single work terms (Stream A), or as a double work term between two single work terms (Stream B).

Stream A: single work term option

Semester 1 - Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 electives

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2060	[0.50]	Structure and Bonding
CHEM*2400	[0.75]	Analytical Chemistry I
MATH*2150	[0.50]	Applied Matrix Algebra

0.50 electives*

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
MATH*2170	[0.50]	Differential Equations I

0.50 electives*

Semester 5 - Fall

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*3440	[0.50]	Analytical Chemistry III: Analytical Instrumentation
CHEM*3640	[0.50]	Chemistry of the Elements I
CHEM*3860	[0.50]	Quantum Chemistry

0.50 electives*

Winter Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 6 - Summer

CHEM*3750	[0.50]	Organic Chemistry II
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One of:

PHYS*2260	[0.50]	Quantum Physics
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0.50 electives*

1.50 electives* or restricted electives**

Fall Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 7 - Winter

CHEM*3650	[0.50]	Chemistry of the Elements II
CHEM*3760	[0.50]	Organic Chemistry III

1.50 electives* or restricted electives**

Summer Semester

COOP*4000 [0.00] Co-op Work Term IV

Semester 8 - Fall

2.50 electives* or restricted electives**

* selection of electives is subject to the following:

1. At least 1.00 credits must be in the Arts & Social Sciences.
2. PHYS*2040 or PHYS*2260
3. Approval of the Faculty Advisor must be obtained for the selection of courses not listed as restrictive electives.
4. Options for an "Area of Focus" or a minor are available. Subject areas include Biochemistry, Computing and Information Science, Earth Sciences, Environmental Sciences, Mathematical Sciences, and Physics. Please consult with your Faculty Advisor for more detail.

** 3.00 credits from the 3000/4000 level as follows:

1. 1.50 comprising of (CHEM*3870 or CHEM*4880), (CHEM*4620 or CHEM*4630), (CHEM*4720 or CHEM*4730)
2. 1.50 chosen from CHEM*3870, CHEM*4010, CHEM*4400, BIOC*4520, BIOC*4540, BIOC*4550, BIOC*4570, BIOC*4580, CHEM*4620, CHEM*4630, CHEM*4720, CHEM*4730, CHEM*4740, CHEM*4880, CHEM*4900, CHEM*4910, TOX*4590

Note:

Some of these courses are offered only in alternate years, and some have additional prerequisites for which the student must plan ahead, with the assistance of the faculty advisor.

Stream B: double work term option**Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 electives

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2060	[0.50]	Structure and Bonding
CHEM*2400	[0.75]	Analytical Chemistry I
MATH*2150	[0.50]	Applied Matrix Algebra

0.50 electives*

Winter Semester

COOP*1000 [0.00] Co-op Work Term I

Semester 4 - Summer

CHEM*2070	[0.50]	Structure and Spectroscopy
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3430	[0.50]	Analytical Chemistry II: Instrumental Analysis
MATH*2170	[0.50]	Differential Equations I

0.50 electives*

Semester 5 - Fall

CHEM*2820	[0.50]	Thermodynamics and Kinetics
CHEM*3640	[0.50]	Chemistry of the Elements I
CHEM*3750	[0.50]	Organic Chemistry II
CHEM*3860	[0.50]	Quantum Chemistry

0.50 electives*

Semester 6 - Winter

CHEM*3650	[0.50]	Chemistry of the Elements II
CHEM*3760	[0.50]	Organic Chemistry III

One of:

PHYS*2260 [0.50] Quantum Physics

0.50 electives*

1.00 electives* or restricted electives**

Summer Semester

COOP*2000 [0.00] Co-op Work Term II

Fall Semester

COOP*3000 [0.00] Co-op Work Term III

Semester 7 - Winter

2.50 electives* or restricted electives**

Summer Semester

COOP*4000 [0.00] Co-op Work Term IV

Semester 8 - Fall

CHEM*3440 [0.50] Analytical Chemistry III: Analytical Instrumentation

2.00 electives* or restricted electives**

* selection of electives is subject to the following:

1. At least 1.00 credits must be in the Arts & Social Sciences.
2. PHYS*2040 or PHYS*2260
3. Approval of the Faculty Advisor must be obtained for the selection of courses not listed as restrictive electives.
4. Options for an "Area of Focus" or a minor are available. Subject areas include Biochemistry, Computing and Information Science, Earth Sciences, Environmental Sciences, Mathematical Sciences, and Physics. Please consult with your Faculty Advisor for more detail.

** 3.00 credits from the 3000/4000 level as follows:

1. 1.50 comprising of (CHEM*3870 or CHEM*4880), (CHEM*4620 or CHEM*4630), (CHEM*4720 or CHEM*4730)
2. 1.50 chosen from CHEM*3870, CHEM*4010, CHEM*4400, BIOC*4520, BIOC*4540, BIOC*4550, BIOC*4570, BIOC*4580, CHEM*4620, CHEM*4630, CHEM*4720, CHEM*4730, CHEM*4740, CHEM*4880, CHEM*4900, CHEM*4910, TOX*4590

Note:

Some of these courses are offered only in alternate years, and some have additional prerequisites for which the student must plan ahead, with the assistance of the faculty advisor.

Computing and Information Science (CIS)**Department of Computing and Information Science, College of Physical and Engineering Science**

The B.Sc. Programs in Computing and Information Science (CIS) provide a solid foundation in software design and computer applications, especially in the physical and biological sciences. The Major offers substantial computing experience, as well as an understanding of both fundamental principles and modern applications. The minor provides sufficient software experience to enable significant contribution to many areas of application.

Computing and Information Science Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. The Major requires 12.0 credits in computing, mathematics and statistics, of which 2.5 credits are CIS electives. Other electives must include at least 1.50 in science courses with at least 0.50 at the 3000 level or above. At least 1.00 credits must be in the Arts of Social Sciences, and 0.50 remaining credits in the introductory science sequence (see note in semester 2)

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

CIS*1910	[0.50]	Discrete Structures in Computing I
CIS*2500	[0.50]	Intermediate Programming
MATH*1210	[0.50]	Calculus II

Two of (only one of PHYS*1010 or PHYS*1130 may be selected): *

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1130	[0.50]	Physics with Applications

*Note: A third course from this list must be taken before graduation.

Semester 3

CIS*2030	[0.50]	Structure and Application of Microcomputers
CIS*2430	[0.50]	Object Oriented Programming
CIS*2520	[0.50]	Data Structures
CIS*2910	[0.50]	Discrete Structures in Computing II
MATH*2150	[0.50]	Applied Matrix Algebra

Semester 4

CIS*2750	[0.75]	Software Systems Development and Integration
CIS*3110	[0.50]	Operating Systems
STAT*2040	[0.50]	Statistics I

0.75 electives

Semester 5

CIS*2460	[0.50]	Modelling of Computer Systems
CIS*3530	[0.50]	Data Base Systems and Concepts
CIS*3750	[0.75]	System Analysis and Design in Applications

One of:

MATH*3240	[0.50]	Operations Research
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0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken.

0.25 elective

Semester 6

CIS*3490	[0.50]	The Analysis and Design of Computer Algorithms
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One of:

MATH*2130	[0.50]	Numerical Methods
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0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken.

1.00 CIS electives at the 3000 level or above (CIS*3200 [0.75]recommended)

0.50 electives

Semester 7

0.50 CIS electives at 3000 level or above

1.00 4000 level CIS credits

1.00 electives

Semester 8

1.00 CIS credits at the 4000 level

1.50 electives

The minor program requires at least 5.25 credits, including:

Minor (Honours Program)

CIS*1500	[0.50]	Introduction to Programming
CIS*1910	[0.50]	Discrete Structures in Computing I
CIS*2430	[0.50]	Object Oriented Programming
CIS*2500	[0.50]	Intermediate Programming
CIS*2520	[0.50]	Data Structures
CIS*2750	[0.75]	Software Systems Development and Integration
CIS*2910	[0.50]	Discrete Structures in Computing II
CIS*3530	[0.50]	Data Base Systems and Concepts

1.00 additional credits from CIS or STAT courses at the 2000 level or above

Computing and Information Science (Co-op) (CIS:C)**Department of Computing and Information Science, College of Physical and Engineering Science**

The 4 year Honours Program Major in Computing and Information Science is also available as a Co-operative Education Program. Three co-op work terms are required. A five year option with four work terms is also available. Please see the department's co-op faculty advisor for details.

COOP*1100 must be completed in the 2nd academic semester (winter of year 1). Students may apply for these options at the time of University admission or completion of semester 2.

Conditions for graduation are the same as the corresponding regular B.Sc. program. In addition, all work reports must have a grade of satisfactory or better.

Electives must include at least 1.50 at the 3000 level or above. At least 1.00 credits must be in the Arts or Social Sciences, and 0.50 remaining credit in the introductory science sequence (see note in semester 2).

The recommended schedule of studies for Co-Op Stream A (4-year)**is as follows:****Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

CIS*1910	[0.50]	Discrete Structures in Computing I
CIS*2500	[0.50]	Intermediate Programming
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II

Two of (only one of PHYS*1010 or PHYS*1130 may be selected): *

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1130	[0.50]	Physics with Applications

*Note: A third course from this list must be taken before graduation.

Semester 3- Summer

CIS*2030	[0.50]	Structure and Application of Microcomputers
CIS*2430	[0.50]	Object Oriented Programming
CIS*2520	[0.50]	Data Structures
CIS*2910	[0.50]	Discrete Structures in Computing II
MATH*2150	[0.50]	Applied Matrix Algebra

Fall Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Winter

CIS*2750	[0.75]	Software Systems Development and Integration
CIS*3110	[0.50]	Operating Systems
STAT*2040	[0.50]	Statistics I

0.75 electives

Summer Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Fall

CIS*2460	[0.50]	Modelling of Computer Systems
CIS*3530	[0.50]	Data Base Systems and Concepts
CIS*3750	[0.75]	System Analysis and Design in Applications

One of:

MATH*3240	[0.50]	Operations Research
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(Note: requires co-requisite of MATH*2200)

0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken.

0.25 elective

Winter Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Summer

CIS*3490	[0.50]	The Analysis and Design of Computer Algorithms
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One of:

MATH*2130	[0.50]	Numerical Methods
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0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken.

1.00 CIS electives at the 3000 level or above (CIS*3760 recommended)

0.50 electives

Semester 7 - Fall

0.50 CIS electives at 3000 level or above

1.00 electives

1.00 credits in CIS at the 4000 level

Semester 8 - Winter

1.50 electives

1.00 credits in CIS at the 4000 level

The recommended schedule of studies for Co-Op Stream B(5-year) is as follows:**Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Semester 2 - Winter

CIS*1910	[0.50]	Discrete Structures in Computing I
CIS*2500	[0.50]	Intermediate Programming
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II

Two of (only one of PHYS*1010 or PHYS*1130 may be selected): *

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1130	[0.50]	Physics with Applications

*Note: A third course from this list must be taken before graduation.

Summer Semester Off**Semester 3 - Fall**

CIS*2030	[0.50]	Structure and Application of Microcomputers
CIS*2430	[0.50]	Object Oriented Programming
CIS*2520	[0.50]	Data Structures
CIS*2910	[0.50]	Discrete Structures in Computing II
MATH*2150	[0.50]	Applied Matrix Algebra

Semester 4 - Winter

CIS*2750	[0.75]	Software Systems Development and Integration
CIS*3110	[0.50]	Operating Systems
STAT*2040	[0.50]	Statistics I

Note: STAT*2100 (F) is an acceptable replacement for STAT*2040.

0.25 elective

Summer Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 5 - Fall

CIS*2460	[0.50]	Modelling of Computer Systems
CIS*3530	[0.50]	Data Base Systems and Concepts
CIS*3750	[0.75]	System Analysis and Design in Applications

0.25 elective

One of:

MATH*3240	[0.50]	Operations Research
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(Note: requires co-requisite of MATH*2200).

0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken. CIS*3210 should be taken here to enable subsequent courses in distributed systems.

Winter Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 6 - Summer

CIS*3490	[0.50]	The Analysis and Design of Computer Algorithms
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One of:

MATH*2130	[0.50]	Numerical Methods
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0.50 electives

Note: MATH*2130 in Semester 6 or MATH*3240 in Semester 5 must be taken.

1.00 CIS electives at the 3000 level or above (CIS*3760 recommended)

0.50 electives

Fall Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 7 - Winter

0.50 CIS electives at 3000 level or above

1.00 electives

1.00 credits in CIS at the 4000 level

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV
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Semester 8 - Fall

1.50 electives

1.00 credits in CIS at the 4000 level

Earth Surface Science (ESS)

Department of Geography, College of Social and Applied Human Sciences

Department of Land Resource Science, Ontario Agricultural College

This program combines elements of Geomorphology, Geology and Meteorology and focuses on the study of processes and properties of the abiotic component of the environment.

Graduates of the program should meet the knowledge requirements for eligibility to apply for membership as Environmental Geoscientists in the Association of Professional Geoscientists of Ontario (APGO), allowing for use of the designation P. Geo.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. Students planning to enter the program are advised to consult advisors in either of the two departments. Students needing program approval should contact the B.Sc. Advisors in the Department of Geography.

Major (Honours Program)**Semester 1**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
GEOL*1050	[0.50]	Geology and the Environment
PHYS*1080	[0.50]	Physics for Life Sciences

0.50 Mathematics course from:

MATH*1080	[0.50]	Elements of Calculus I
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MATH*1200	[0.50]	Calculus I
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Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1130	[0.50]	Physics with Applications
GEOL*1300	[0.50]	Introduction to the Biophysical Environment

0.50 Arts or Social Science electives

Semester 3 and 4

GEOG*2000	[0.50]	Geomorphology
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOL*2020	[0.50]	Stratigraphy
GEOL*2200	[0.50]	Glacial Geology
MET*2030	[0.50]	Meteorology and Climatology
SOIL*2010	[0.50]	Soil Science

0.50 Mathematics/Computer Science from:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
MATH*1210	[0.50]	Calculus II
MATH*2080	[0.50]	Elements of Calculus II

One of:

GEOG*2460	[0.50]	Analysis in Geography
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

0.50 electives

Semester 5 and 6

GEOG*3000	[0.50]	Fluvial Processes
GEOG*3610	[0.50]	Environmental Hydrology
GEOL*2110	[0.50]	Earth Material Science
GEOL*3190	[0.50]	Environmental Water Chemistry

1.50 from List A

1.50 electives

Semester 7 and 8

GEOG*4150	[0.50]	Sedimentary Processes
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1.50 from List A

3.00 electives

List A

GEOG*3620	[0.50]	Desert Environments
GEOG*4250	[0.50]	Coastal Processes
GEOG*4690	[1.00]	Geography Field Research
GEOL*3060	[0.50]	Groundwater
GEOL*3090	[0.50]	Applied Structural Geology
GEOL*3250	[0.50]	Field Methods in Geosciences
GEOL*4090	[0.50]	Sedimentology
GEOL*4130	[0.50]	Clay and Humic Chemistry
MET*3050	[0.50]	Microclimatology

Other Requirements

1. At least 1.50 credits from List A must be at the 4000 level.
2. At least 2.50 electives must be acceptable science courses.
3. At least 6.00 of all science credits must be 3000 or 4000 level, of which at least 2.00 must be at the 4000 level.

Ecology (ECOL)

Department of Integrative Biology, College of Biological Science

The program provides a solid foundation in the principles of ecology, and further training in both pure and applied aspects of ecology. After the fourth semester, the student may choose to enter one (1) of three (3) areas of emphasis, or to design a course package that meets his/her own specific ecological interests (General Ecology). The program offers preparation for careers in conservation, resource management, ecological consulting, or nature interpretation; or for graduate training and research in fundamental ecology and evolutionary biology. This major qualifies students for post-graduate work in the environmental sciences, and provides a sound science background for students wishing to pursue careers in teaching, government service or the private sector.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

CIS*1200	[0.50]	Introduction to Computing
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CIS*1500 [0.50] Introduction to Programming
0.50 Arts or Social Science electives

Semester 3

BIOL*2210 [0.50] Introductory Cell Biology
STAT*2040 [0.50] Statistics I
One of:
GEOG*1300 [0.50] Introduction to the Biophysical Environment
GEOL*1050 [0.50] Geology and the Environment

1.00 electives

Semester 4

BIOC*2580 [0.50] Introductory Biochemistry
BIOL*3110 [0.50] Population Ecology
MBG*2000 [0.50] Introductory Genetics

One of:

BIOL*2250 [0.50] Biostatistics and the Life Sciences
STAT*2050 [0.50] Statistics II

0.50 electives

Semester 5

BIOL*3010 [0.50] Laboratory and Field Work in Ecology

One of:

BOT*2100 [0.50] Life Strategies of Plants
ZOO*3200 [0.50] Comparative Animal Physiology I

One of:

ZOO*2070 [0.50] Invertebrate Zoology I
ZOO*2090 [0.50] Vertebrate Structure and Function

One of:

MBG*3000 [0.50] Population Genetics
ZOO*3300 [0.50] Evolution

0.50 electives

Semester 6

BIOL*3120 [0.50] Community Ecology

2.00 electives

Semester 7

BIOL*4110 [0.75] Ecological Methods

1.75 electives

Semester 8

BIOL*4120 [0.50] Evolutionary Ecology

2.00 electives

Areas of Emphasis**General Ecology (GECO)**

A minimum of 3.00 credits from the area-of-emphasis-specific credits, plus 1.50 additional science credits. Of the 4.50 credits, at least 3.50 must be at the 3000 or 4000 level.

Experimental Ecology (EECO)

ZOO*4070 [0.50] Animal Behaviour
ZOO*4170 [0.50] Experimental Comparative Animal Physiology

0.75 credits from:

IBIO*4500 [0.75] Research in Integrative Biology I
ZOO*4410 [0.75] Field Ecology
ZOO*4600 [0.75] Tropical Ecology
ZOO*4610 [0.75] Arctic Ecology
ZOO*4700 [0.50] Field Biology
ZOO*4710 [0.25] Field Biology
ZOO*4800 [0.50] Field Biology
ZOO*4810 [0.25] Field Biology

One of the following not already successfully completed in Semester 6:

MBG*3000 [0.50] Population Genetics
ZOO*3300 [0.50] Evolution

1.75 additional science credits, at least 1.50 of which are at the 3000 or 4000 level

Interpretive Ecology (IE)

ENVB*3000 [0.50] Nature Interpretation
ZOO*4070 [0.50] Animal Behaviour

0.75 credits from:

ZOO*4410 [0.75] Field Ecology
ZOO*4600 [0.75] Tropical Ecology
ZOO*4610 [0.75] Arctic Ecology
ZOO*4700 [0.50] Field Biology
ZOO*4710 [0.25] Field Biology
ZOO*4800 [0.50] Field Biology
ZOO*4810 [0.25] Field Biology

At least 0.75 additional science credits at the 3000 or 4000 level

One of:

BIOL*3050 [0.50] Mycology
BOT*3710 [0.50] Classification and Morphology of Seed Plants

One of:

ZOO*4020 [0.50] Ichthyology
ZOO*4090 [0.50] Ornithology
ZOO*4280 [0.50] Mammalogy
ZOO*4430 [0.50] Herpetology

One of:

BIOL*3450 [0.50] Introduction to Aquatic Environments
ENVB*3090 [0.50] Insect Diversity and Biology

Recommended:

CHEM*3360 [0.50] Environmental Chemistry and Toxicology
ENVB*3040 [0.50] Natural Chemicals in the Environment
ENVB*4040 [0.50] Behaviour of Insects
MICR*4140 [0.50] Soil Microbiology and Biotechnology

Resource Conservation (RC)

AGEC*2700 [0.50] Survey of Natural Resource Economics
BIOL*3130 [0.50] Conservation Biology
ECON*1050 [0.50] Introductory Microeconomics
ZOO*4050 [0.50] Natural Resources Policy

2.50 additional science credits, at least 1.50 of which are at the 3000 or 4000 level

Recommended:

BIOL*4060 [0.50] Restoration Ecology
BIOL*4150 [0.50] Wildlife Conservation and Management
ECON*2100 [0.50] Economic Growth and Environmental Quality
ENVB*2030 [0.50] Current Issues in Forest Science
ENVB*4780 [0.50] Forest Ecology
ENVS*3320 [0.50] Principles of Landscape Ecology

Minor (Honours Program)

A minimum of 5.00 credits is required to completed the minor, which must include:

BIOL*3010 [0.50] Laboratory and Field Work in Ecology
BIOL*3110 [0.50] Population Ecology
BIOL*3120 [0.50] Community Ecology
BIOL*4110 [0.75] Ecological Methods
BIOL*4120 [0.50] Evolutionary Ecology

One of:

MBG*3000 [0.50] Population Genetics
ZOO*3300 [0.50] Evolution

One of:

BOT*2100 [0.50] Life Strategies of Plants
ZOO*2090 [0.50] Vertebrate Structure and Function

One of:

GEOG*1220 [0.50] Human Impact on the Environment
GEOG*1300 [0.50] Introduction to the Biophysical Environment
GEOL*1050 [0.50] Geology and the Environment

0.75 credits chosen in consultation with the faculty advisor

Environmental Biology (ENVB)**Department of Environmental Biology, Ontario Agricultural College**

The honours B.Sc. program in Environmental Biology combines a broad education in the life sciences with a more specialized understanding of the biological consequences of interactions between humans and the environment. This major prepares students for post-graduate work in environmental biology and related life sciences and provides a strong foundation for students wishing to pursue careers in teaching, government service or the private sector.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major requires the completion of 20.00 credits. A minimum of 16.00 of these 20.00 must be science credits. Of these 16.00 science credits, a minimum of 6.00 must be at the 3000 - and 4000-levels with a minimum of 2.00 credits at the 4000-level.

Semester 1

BIOL*1030 [0.50] Biology I
CHEM*1040 [0.50] General Chemistry I
MATH*1080 [0.50] Elements of Calculus I
PHYS*1070 [0.50] Introductory Physics for Life Sciences

0.50 Arts or Social Science elective

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II
CHEM*1050 [0.50] General Chemistry II
PHYS*1080 [0.50] Physics for Life Sciences

One of:

CIS*1200 [0.50] Introduction to Computing
CIS*1500 [0.50] Introduction to Programming
MATH*2080 [0.50] Elements of Calculus II

STAT*2040 [0.50] Statistics I

0.50 Arts or Social Science elective

Semester 3

BIOC*2580 [0.50] Introductory Biochemistry

STAT*2040 [0.50] Statistics I (if not taken in semester 2)

TOX*2000 [0.50] Principles of Toxicology

1.00 electives or restricted electives chosen from lists A, B, C and/or D (or 1.50 if STAT*2040 was taken in semester 2)

Semester 4

BIOL*3110 [0.50] Population Ecology

ENVB*2100 [0.50] Problem-Solving in Environmental Biology

MBG*2000 [0.50] Introductory Genetics

1.00 electives or restricted electives chosen from lists A, B, C and/or D

Semester 5

2.50 electives or restricted electives chosen from lists A, B, C and/or D (at least 1.00 restricted electives must be selected, including at least one ENVB course)

Semester 6

ENVB*3330 [0.50] Ecosystem Processes and Applications

ZOO*3300 [0.50] Evolution

1.50 electives or restricted electives chosen from lists A, B, C and/or D

Semester 7

Students contemplating graduate studies are encouraged to take ENVB*4420 and/or ENVB*4800 in semesters 7 or 8.

2.50 electives or restricted electives chosen from lists A, B, C and/or D

Semester 8

2.50 electives or restricted electives chosen from lists A, B, C and/or D

Restricted Electives

Select 4.50 credits from the following lists of restricted electives during Semesters 3-8. At least 1.00 of these credits must be from ENVB courses.

Students should note that some restricted electives (marked by asterisks **) require other restricted electives as prerequisites. Students should consult the most recent undergraduate calendar for specific requirements.

List A - Environment & Agriculture

Minimum of 1.00 credits from the following list:

CROP*2110 [0.50] Crop Ecology

CROP*2280 [0.50] Crops in Land Reclamation

ENVB*2010 [0.50] Food Production and the Environment

ENVB*2040 [0.50] Plant Health and the Environment

ENVB*3040 [0.50] Natural Chemicals in the Environment

ENVB*3210 [0.50] Plant Pathology

ENVB*4040 [0.50] Behaviour of Insects **

ENVB*4100 [0.50] Applied Entomology **

ENVB*4130 [0.50] Chemical Ecology: Principles & Practice **

MICR*3220 [0.50] Plant Microbiology

MICR*4140 [0.50] Soil Microbiology and Biotechnology

P BIO*4750 [0.50] Genetic Engineering of Plants **

SOIL*3000 [0.50] Environmental Issues in Agriculture and Landscape Management

List B - Impacts of Pollution on Living Organisms

Minimum of 1.00 credits from the following list:

BIOL*3450 [0.50] Introduction to Aquatic Environments

ENVB*3010 [0.50] Climate Change Biology

ENVB*3030 [0.50] Pesticides and the Environment

ENVB*4240 [0.50] Biological Activity of Pesticides

ENVB*4550 [0.50] Ecotoxicological Risk Characterization **

GEOG*3020 [0.50] Global Environmental Change

MBG*4270 [0.50] DNA Replication, Recombination and Repair **

MICR*4180 [0.50] Microbial Processes in Environmental Management

P BIO*4530 [0.50] Environmental Pollution Stresses on Plants **

TOX*3360 [0.50] Environmental Chemistry and Toxicology

ZOO*4350 [0.50] Biology of Polluted Waters **

ZOO*4610 [0.75] Arctic Ecology

List C - Conservation of Biodiversity & Natural Resources

Minimum of 1.00 credits from the following list:

BIOL*3130 [0.50] Conservation Biology

BIOL*4060 [0.50] Restoration Ecology **

BIOL*4150 [0.50] Wildlife Conservation and Management

ENVB*2030 [0.50] Current Issues in Forest Science

ENVB*3090 [0.50] Insect Diversity and Biology

ENVB*3250 [0.50] Forest Health and Disease

ENVB*3300 [0.50] Applied Ecology and Environment **

ENVB*4020 [0.50] Water Quality and Environmental Management **

ENVB*4220 [0.50] Biology of Aquatic Insects **

ENVB*4260 [0.50] Field Entomology **

ENVB*4270 [0.50] Insect Biosystematics **

ENVB*4780 [0.50] Forest Ecology **

ENVS*4220 [0.50] Environmental Impact Assessment **

SOIL*2120 [0.50] Introduction to Environmental Stewardship

SOIL*3050 [0.50] Land Utilization **

SOIL*3080 [0.50] Soil and Water Conservation **

SOIL*3100 [0.50] Resource Planning Techniques **

ZOO*4050 [0.50] Natural Resources Policy

ZOO*4110 [0.50] Principles of Fish and Wild Life Management

ZOO*4600 [0.75] Tropical Ecology

List D - Supporting Courses

ENVB*4420 [0.50] Problems in Environmental Biology

ENVB*4800 [0.50] Topics in Applied Biology

The following restricted elective courses are required as prerequisites for some courses in lists A, B and C:

BIOL*3120 [0.50] Community Ecology

BOT*2100 [0.50] Life Strategies of Plants

MBG*2020 [0.50] Introductory Molecular Biology

SOIL*2010 [0.50] Soil Science

Environmental Toxicology (ETOX)**Interdisciplinary Program, Department of Environmental Biology, Ontario Agricultural College****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1

BIOL*1030 [0.50] Biology I

CHEM*1040 [0.50] General Chemistry I

MATH*1080 [0.50] Elements of Calculus I

PHYS*1070 [0.50] Introductory Physics for Life Sciences

0.50 electives*

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II

CHEM*1050 [0.50] General Chemistry II

PHYS*1080 [0.50] Physics for Life Sciences

STAT*2040 [0.50] Statistics I

0.50 electives*

Semester 3

BIOC*2580 [0.50] Introductory Biochemistry

CHEM*2480 [0.50] Analytical Chemistry I

MBG*2000 [0.50] Introductory Genetics

TOX*2000 [0.50] Principles of Toxicology

0.50 electives*

Semester 4

BIOL*2060 [0.50] Ecology

CHEM*2700 [0.50] Organic Chemistry I

MBG*2020 [0.50] Introductory Molecular Biology

STAT*2050 [0.50] Statistics II

0.50 electives*

Semester 5

BOT*2100 [0.50] Life Strategies of Plants

BIOC*3560 [0.50] Structure and Function in Biochemistry

TOX*3300 [0.50] Analytical Toxicology

ZOO*3200 [0.50] Comparative Animal Physiology I

0.50 electives*

Semester 6

ENVB*3030 [0.50] Pesticides and the Environment

SOIL*2010 [0.50] Soil Science

TOX*3360 [0.50] Environmental Chemistry and Toxicology

ZOO*4170 [0.50] Experimental Comparative Animal Physiology

0.50 electives*

Semester 7

BIOL*3450 [0.50] Introduction to Aquatic Environments

MBG*3350 [0.75] Laboratory Methods in Molecular Biology I

MICR*4180 [0.50] Microbial Processes in Environmental Management

ZOO*4350 [0.50] Biology of Polluted Waters

0.25 electives*

Semester 8

PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants
STAT*3510	[0.50]	Environmental Risk Assessment
TOX*4200	[0.50]	Topics in Toxicology
TOX*4550	[0.50]	Ecotoxicological Risk Characterization

0.50 electives*

* a minimum of 1.50 credits must be from the College of Arts and/or the College of Social and Applied Human Sciences

Environmental Toxicology (Co-op) (ETOX:C)

Interdisciplinary Program, Department of Environmental Biology, Ontario Agricultural College

Major (Honours Program)

A 70% average in the science courses of semesters 1 and 2 is normally required for admission to semester 3 of this program. An optional fourth co-op work term is available.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives*

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 electives*

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2480	[0.50]	Analytical Chemistry I
MBG*2000	[0.50]	Introductory Genetics
TOX*2000	[0.50]	Principles of Toxicology

0.50 electives*

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

CHEM*2700	[0.50]	Organic Chemistry I
SOIL*2010	[0.50]	Soil Science
STAT*2050	[0.50]	Statistics II
TOX*3360	[0.50]	Environmental Chemistry and Toxicology

0.50 electives*

Semester 5 - Fall

BIOL*2060	[0.50]	Ecology
BIOL*3450	[0.50]	Introduction to Aquatic Environments
TOX*3300	[0.50]	Analytical Toxicology
ZOO*3200	[0.50]	Comparative Animal Physiology I

0.50 electives*

Semester 6 - Winter

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BOT*2100	[0.50]	Life Strategies of Plants
BIOC*3560	[0.50]	Structure and Function in Biochemistry
ENVB*3030	[0.50]	Pesticides and the Environment
MBG*2020	[0.50]	Introductory Molecular Biology
ZOO*4170	[0.50]	Experimental Comparative Animal Physiology

Summer Semester

COOP*2000	[0.00]	Co-op Work Term II
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Fall Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 7 - Winter

PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants
STAT*3510	[0.50]	Environmental Risk Assessment
TOX*4200	[0.50]	Topics in Toxicology
TOX*4550	[0.50]	Ecotoxicological Risk Characterization

0.50 electives*

Semester 8 - Fall

MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*4180	[0.50]	Microbial Processes in Environmental Management
ZOO*4350	[0.50]	Biology of Polluted Waters

0.75 electives*

* a minimum of 1.50 credits must be from the College of Arts and/or the College of Social and Applied Human Sciences

Food Science (FOOD)

Department of Food Science, Ontario Agricultural College

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1 - Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Note: CIS*1200, rather than an Arts or Social Science credit is recommended for those needing to improve their computer skills.

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*2080	[0.50]	Elements of Calculus II
PHYS*1080	[0.50]	Physics for Life Sciences

0.50 Arts or Social Science electives

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2880	[0.50]	Physical Chemistry
FOOD*2150	[0.50]	Introduction to Nutritional and Food Science
STAT*2040	[0.50]	Statistics I

0.50 electives

Semester 4 - Winter

FOOD*2100	[0.50]	Communication in Food Science I
FOOD*2620	[0.50]	Food Engineering Principles
MICR*2030	[0.50]	Microbial Growth
NUTR*3210	[0.50]	Fundamentals of Nutrition

0.50 electives

Semester 5 - Fall

FOOD*3010	[0.50]	Food Chemistry
FOOD*3160	[0.75]	Food Processing I
FOOD*3230	[0.75]	Food Microbiology

0.50 electives

Semester 6 - Winter

FOOD*3020	[0.50]	Food Chemistry Laboratory
FOOD*3170	[0.50]	Food Processing II

1.50 electives

Semester 7 - Fall

FOOD*3260	[0.50]	Industrial Microbiology
FOOD*3700	[0.50]	Sensory Evaluation of Foods
FOOD*4120	[0.75]	Food Analysis

0.75 electives

Semester 8 - Winter

FOOD*4100	[0.25]	Communication in Food Science II
FOOD*4700	[0.50]	Food Product Development

1.75 electives

Notes:

1. ENGL*1200 is recommended for those students needing to improve their English grammar.
2. FOOD*2150 could be replaced by FOOD*2010 with permission of department advisor.
3. Of the 6.50 electives credits:
 - At least 2.00 must be Arts or Social Sciences.
 - At least 2.00 must be from list of Restricted Electives.
 - At least 0.5 must be from additional science electives.

Restricted Electives:

FOOD*4010	[0.50]	Food Plant Sanitation and Quality Control
FOOD*4070	[0.50]	Food Packaging
FOOD*4090	[0.50]	Functional Foods and Nutraceuticals
FOOD*4110	[0.50]	Meat and Poultry Processing
FOOD*4140	[0.25]	Communication in Food Science III
FOOD*4220	[0.25]	Topics in Food Science
FOOD*4230	[0.25]	Research in Food Science I
FOOD*4240	[0.25]	Research in Food Science II

FOOD*4400	[0.50]	Dairy Processing
FOOD*4520	[0.50]	Cereal Technology
MCS*3010	[0.50]	Quality Management
POPM*4040	[0.50]	Epidemiology of Food-borne Diseases

Credit Summary (20.00 total credits)

4.00 - 1st year science required

9.50 - Required in semesters 3-8

2.00 - Restricted electives

2.00 - Arts or Social Science electives

0.50 - Additional Science electives

2.00 - Free electives

Minor (Honours Program)

The Minor in Food Science consists of 5.00 credits as follows:

BIOC*2580	[0.50]	Introductory Biochemistry
FOOD*3010	[0.50]	Food Chemistry
FOOD*3230	[0.75]	Food Microbiology
MICR*2030	[0.50]	Microbial Growth

One of:

FOOD*2010	[0.50]	Principles of Food Science
FOOD*2150	[0.50]	Introduction to Nutritional and Food Science
NUTR*2150	[0.50]	Introduction to Nutritional and Food Sciences

One of:

FOOD*2410	[0.50]	Introduction to Food Processing
FOOD*3160	[0.75]	Food Processing I

Restricted Electives

Choose from the following list to bring the total to a minimum of 5.00 credits for the Minor:

FOOD*2620	[0.50]	Food Engineering Principles
FOOD*3170	[0.50]	Food Processing II
FOOD*3260	[0.50]	Industrial Microbiology
FOOD*3700	[0.50]	Sensory Evaluation of Foods
FOOD*4010	[0.50]	Food Plant Sanitation and Quality Control
FOOD*4070	[0.50]	Food Packaging
FOOD*4090	[0.50]	Functional Foods and Nutraceuticals
FOOD*4110	[0.50]	Meat and Poultry Processing
FOOD*4120	[0.75]	Food Analysis
FOOD*4400	[0.50]	Dairy Processing
FOOD*4520	[0.50]	Cereal Technology
FOOD*4700	[0.50]	Food Product Development
NUTR*3210	[0.50]	Fundamentals of Nutrition
POPM*4040	[0.50]	Epidemiology of Food-borne Diseases

Food Science (Co-op) (FOOD:C)**Department of Food Science, Ontario Agricultural College****Major (Honours Program)****Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Note: CIS*1200, rather than an Arts or Social Science credit is recommended for those needing to improve their computer skills.

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*2080	[0.50]	Elements of Calculus II
PHYS*1080	[0.50]	Physics for Life Sciences

0.50 Arts or Social Science electives

Summer Semester

Off

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
CHEM*2880	[0.50]	Physical Chemistry
COOP*1100	[0.00]	Introduction to Co-operative Education
FOOD*2150	[0.50]	Introduction to Nutritional and Food Science
STAT*2040	[0.50]	Statistics I

0.50 electives

Semester 4 - Winter

FOOD*2100	[0.50]	Communication in Food Science I
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FOOD*2620	[0.50]	Food Engineering Principles
MICR*2030	[0.50]	Microbial Growth
NUTR*3210	[0.50]	Fundamentals of Nutrition

0.50 electives

Summer Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 5 - Fall

FOOD*3010	[0.50]	Food Chemistry
FOOD*3160	[0.75]	Food Processing I
FOOD*3230	[0.75]	Food Microbiology

0.50 electives

Semester 6 - Winter

FOOD*3020	[0.50]	Food Chemistry Laboratory
FOOD*3170	[0.50]	Food Processing II

1.50 electives

Summer Semester

Optional

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Winter Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 7 - Fall

FOOD*3260	[0.50]	Industrial Microbiology
FOOD*3700	[0.50]	Sensory Evaluation of Foods
FOOD*4120	[0.75]	Food Analysis

0.75 electives

Semester 8 - Winter

FOOD*4100	[0.25]	Communication in Food Science II
FOOD*4700	[0.50]	Food Product Development

1.75 electives

Notes:

See Notes and Credit Summary in Food Science Major.

Forest Science (FORS)**Department of Environmental Biology, Ontario Agricultural College****Minor (Honours Program)**

A minor in Forest Science consists of 5.00 credits from the following courses:

BOT*2050	[0.50]	Plant Ecology
ENVB*2030	[0.50]	Current Issues in Forest Science
ENVB*4420	[0.50]	Problems in Environmental Biology
ENVB*4780	[0.50]	Forest Ecology
HORT*3260	[0.50]	Woody Plants

Three of:

ENVB*3090	[0.50]	Insect Diversity and Biology
GEOG*3110	[0.50]	Biotic and Natural Resources
HORT*3340	[0.50]	Culture of Plants
HORT*3350	[0.50]	Woody Plant Production and Culture
PBIO*4100	[0.50]	Soil Plant Relationships
PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants

Two of:*

AGEC*2700	[0.50]	Survey of Natural Resource Economics
ENVB*3000	[0.50]	Nature Interpretation
GEOG*3210	[0.50]	Management of the Biophysical Environment
SOIL*3100	[0.50]	Resource Planning Techniques
ZOO*4050	[0.50]	Natural Resources Policy
ZOO*4410	[0.75]	Field Ecology

* Resource Management majors may substitute SOIL*4110 for ZOO*4410

Functional Foods and Nutraceuticals (FFAN)**Department of Human Health and Nutritional Sciences, College of Biological Science****Department of Food Science, Ontario Agricultural College.****Minor (Honours Program)**

A minor in Functional Foods and Nutraceuticals consists of 5.00 credits.

BIOC*2580	[0.50]	Introductory Biochemistry
ECON*1050	[0.50]	Introductory Microeconomics
NUTR*3210	[0.50]	Fundamentals of Nutrition
TOX*2000	[0.50]	Principles of Toxicology

One of:

FOOD*2010	[0.50]	Principles of Food Science
FOOD*2150	[0.50]	Introduction to Nutritional and Food Science
NUTR*2150	[0.50]	Introduction to Nutritional and Food Sciences

One of:

FOOD*4090	[0.50]	Functional Foods and Nutraceuticals
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NUTR*4090 [0.50] Functional Foods and Nutraceuticals

2.00 Restricted Electives*

*restricted electives should be chosen in consultation with the Nutritional and Nutraceutical Sciences faculty advisor. Any 3000 and 4000 level courses from the following subject areas are eligible as restricted electives: Nutrition**, Food Science**, Biomedical Sciences**, Toxicology, Population Medicine, Animal Science, Plant Biology, Human Kinetics**, and Pathology.

**students in these majors must select restricted electives outside of the major

Geographic Information Systems (GIS) and Environmental Analysis

Department of Geography, College of Social and Applied Human Sciences

Minor (Honours Program)

A minimum of 5.00 credits is required from:

GEOG*1300	[0.50]	Introduction to the Biophysical Environment
GEOG*2420	[0.50]	Aerial-photo Interpretation
GEOG*2480	[0.50]	Mapping and GIS
GEOG*3210	[0.50]	Management of the Biophysical Environment
GEOG*3420	[0.50]	Remote Sensing of the Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis
GEOG*4480	[0.50]	Applied Geographic Information Systems

One of:

GEOG*2000	[0.50]	Geomorphology
GEOG*2110	[0.50]	Climate and the Biophysical Environment

One of:

GEOG*3110	[0.50]	Biotic and Natural Resources
GEOG*3610	[0.50]	Environmental Hydrology
GEOG*3620	[0.50]	Desert Environments

And one of:

GEOG*4110	[0.50]	Environmental Systems Analysis
GEOG*4210	[0.50]	Environmental Governance

[Note: GEOG*3110 or GEOG*3610 is required as prerequisite for GEOG*4110]

Geology (GEOL)

Department of Land Resource Science, Ontario Agricultural College

Minor (Honours Program)

A minor will consist of at least 5.00 credits in Geology. The following 7 courses are mandatory:

GEOL*1050	[0.50]	Geology and the Environment
GEOL*2020	[0.50]	Stratigraphy
GEOL*2110	[0.50]	Earth Material Science
GEOL*2150	0.75	Glacial Geology
GEOL*3090	[0.50]	Applied Structural Geology
GEOL*3120	[0.50]	Paleontology
GEOL*4090	[0.50]	Sedimentology

The remaining credits can be chosen from Geology or the Geomorphology offerings in Geography in the calendar and must be 2000 level or above.

Human Kinetics (HK)

Department of Human Health and Nutritional Sciences, College of Biological Science

Human Kinetics is concerned with understanding capacities for, and limits of, human movement at different ages and with the role of physical activity in human health. Through the use of electives, students may structure a program emphasizing biomechanics and ergonomics, human population biology or nutrition, exercise and metabolism.

If lacking the fundamentals of word processing, spread sheet use and data management, the student should select CIS*1200 as early in the program as possible.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum of 20.00 credits is required.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives or restricted electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

1.00 electives or restricted electives

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics

1.00 electives or restricted electives

Semester 4

HK*2270	[0.50]	Principles of Human Biomechanics
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
ZOO*2100	[0.50]	Developmental Biology

0.50 electives or restricted electives

Semester 5

HK*3401	[0.75]	Human Anatomy
HK*3600	[0.75]	Applied Human Biology
HK*3940	[1.25]	Human Physiology

Semester 6

BIOC*3560	[0.50]	Structure and Function in Biochemistry
HK*3402	[0.75]	Human Anatomy
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

Semester 7

If desired, electives or restricted electives up to a maximum of 2.75 total credits.

Semester 8

If desired, electives or restricted electives up to a maximum of 2.75 total credits.

Note: Students are required to complete 16.00 credits in acceptable science courses.

Restricted Electives

Students must complete 2.00 credits from Arts or Social Science courses with the recommendation that 0.50 of the 2.00 credits be in philosophy. A minimum of 2.00 credits of restricted electives is required. They are to be selected from HK*3100, HK*4XXX, NUTR*4090, NUTR*4210.

Marine and Freshwater Biology (MFB)

Department of Integrative Biology, College of Biological Science

The Major in Marine and Freshwater Biology provides a broad ecological perspective on aquatic environments based on the physical as well as the biological sciences. This major prepares students for post-graduate work in the aquatic sciences, and provides a sound science background for students wishing to pursue careers in teaching, government service or the private sector.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives*

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives*

Semester 3

ZOO*2070	[0.50]	Invertebrate Zoology I
ZOO*2090	[0.50]	Vertebrate Structure and Function
ZOO*2100	[0.50]	Developmental Biology

1.00 electives**

Semester 4

BIOL*2210	[0.50]	Introductory Cell Biology
BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
ZOO*2080	[0.50]	Invertebrate Zoology II

0.50 electives**

Semester 5

BIOL*3110	[0.50]	Population Ecology
BIOL*3450	[0.50]	Introduction to Aquatic Environments
ZOO*3200	[0.50]	Comparative Animal Physiology I
ZOO*3300	[0.50]	Evolution

0.50 electives**

Semester 6

BIOL*3120	[0.50]	Community Ecology
ZOO*3210	[0.50]	Comparative Animal Physiology II

1.50 electives**, ***

Semester 7

ZOO*4350	[0.50]	Biology of Polluted Waters
ZOO*4570	[0.50]	Marine Ecological Processes

1.50 electives**

Semester 8

IBIO*4010	[0.50]	Adaptational Physiology
ZOO*4330	[0.50]	Environmental Biology of Fishes

1.50 electives**

* CIS*1200 is recommended for those needing to improve their computer skills

** suggested electives list available from the faculty advisors

*** BIOL*2250 is strongly recommended if independent research project courses are anticipated in semesters 7 and/or 8

Electives - must include:

1. A minimum of 0.75 credits from:

BIOL*4110	[0.75]	Ecological Methods
IBIO*4500	[0.75]	Research in Integrative Biology I
IBIO*4510	[0.75]	Research in Integrative Biology II
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4540	[0.50]	Marine and Freshwater Research
ZOO*4600	[0.75]	Tropical Ecology
ZOO*4610	[0.75]	Arctic Ecology
ZOO*4700	[0.50]	Field Biology
ZOO*4710	[0.25]	Field Biology
ZOO*4800	[0.50]	Field Biology
ZOO*4810	[0.25]	Field Biology

2. Other field or research courses with approval of faculty advisor.

3. At least 1.00 Arts and/or Social Science electives.

Mathematical Science (MSCI)**Department of Mathematics & Statistics, College of Physical and Engineering Science****Minor (Honours Program)**

This requires 1.00 calculus credits and 4.00 other credits chosen from mathematics, statistics, and computing and information science. For these 4.00 credits students will choose at least 0.50 from each discipline. At least 1.00 credits must be at the 3000 level or above. This minor cannot be combined with a major in Mathematics, Statistics, or Computing and Information Science.

Mathematics (MATH)**Department of Mathematics and Statistics, College of Physical and Engineering Science****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required to complete the Major which includes at least 10.00 credits in Mathematics & Statistics. This major must include at least 6.00 credits at the 3000 or 4000 level from the approved list of science electives of which at least 2.00 credits must be at the 4000 level (and may include STAT*4340). At least 1.00 credits in Arts and Social Science must be completed.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 electives (CIS*2500 recommended)

Semester 3

MATH*2000	[0.50]	Set Theory
MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives

Semester 4

MATH*2130	[0.50]	Numerical Methods
MATH*2170	[0.50]	Differential Equations I
MATH*2210	[0.50]	Advanced Calculus II

One of:

MATH*3160	[0.50]	Linear Algebra II
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0.50 electives

0.50 electives

Semester 5

MATH*3100	[0.50]	Differential Equations II
MATH*3200	[0.50]	Real Analysis

One of:

MATH*3130	[0.50]	Abstract Algebra
MATH*3240	[0.50]	Operations Research

One of:*

STAT*3100	[0.50]	Introductory Mathematical Statistics I
STAT*3240	[0.50]	Applied Regression Analysis

0.50 electives

Note: Students who wish to take STAT*4340 in semester 8 should take STAT*3100 in semester 5, STAT*3110 in semester 6 and STAT*3240 in semester 5 or 7.

Semester 6

MATH*3260	[0.50]	Complex Analysis
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One of:

MATH*3160	[0.50]	Linear Algebra II (if not taken in Sem. 4)
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0.50 electives

1.50 electives

Semester 7

0.50 credits from a 4000 level mathematics

1.50 electives**

One of:

MATH*3130	[0.50]	Abstract Algebra
MATH*3240	[0.50]	Operations Research

Semester 8

1.00 credits from a 4000 level mathematics **

1.50 electives

*A student selecting STAT*3100 should take STAT*3110 in semester 6.

**Students are reminded that the major requires 2.00 credits (four courses) at the 4000 level in Mathematics.

Minor (Honours Program)

A total of 5.00 credits is required to complete the Minor, including:

2.50 credits from:

(MATH*1080 or MATH*1200)

(MATH*1210 or MATH*2080)

MATH*2000 [0.50] Set Theory

(MATH*2150 or MATH*2160)

MATH*2200 [0.50] Advanced Calculus I

0.50 Statistics (STAT*) credits at the 2000 level or above.

2.00 additional Mathematics credits at the 2000 level or above, including 1.50 credits at the 3000 or 4000 level.

Microbiology (MICR)**Department of Molecular and Cellular Biology, College of Biological Science**

Microbiology programs are designed to give students a good understanding of microorganisms, including diversity, ecology, physiology, molecular genetics, current approaches in bacterial genomics/proteomics, and microbial associations with animal hosts and the environments. Such knowledge will provide the basis for further work with microbes in medicine, agricultural industries (including biotechnology, pharmaceuticals, food and beverage) and the environment (surveillance and bioremediation).

Students can take the B.Sc. program with a Major or a Minor in Microbiology, or combine the minor with another major. Students should plan their programs in consultation with the microbiology faculty advisor. As course offerings may change during the program, students are strongly encouraged to review their plans at least once a year with their advisors, and to check the departmental website for program news.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One mathematics/computer course from:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
MATH*2080	[0.50]	Elements of Calculus II

0.50 electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
MICR*2020	[0.50]	Microbial Interactions and Associations
STAT*2040	[0.50]	Statistics I

0.50 electives

Semester 4

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth

1.00 electives

Semester 5

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*3080	[0.50]	Bacterial Genetics
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3230	[0.50]	Immunology I
MICR*3330	[0.50]	World of Viruses

Semester 6

BIOL*3050	[0.50]	Mycology
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*3260	[0.50]	Microbial Adaptation and Development

0.75 electives

Semester 7

2.50 electives or restricted electives which can include MICR*4310

Semester 8

2.50 electives or restricted electives which can include MICR*4320

Elective and Restricted Elective Credits

2.00 elective credits must be from the Arts and Social Sciences.

2.50 restricted elective credits of which 1.00 credit must be at the 4000 level.

A minimum of 6.00 science credits must be at the 3000/4000 level of which at least 2.00 credits must be at the 4000 level (including the 1.00 restricted elective credit).

Restricted Electives

BIOC*4540	[0.50]	Enzymology
BIOC*4580	[0.50]	Membrane Biochemistry
BIOL*4050	[0.50]	Advanced Eukaryotic Microbiology
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
FOOD*4400	[0.50]	Dairy Processing
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*3220	[0.50]	Plant Microbiology
MICR*3270	[0.50]	Microbial Cell Biology
MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4230	[0.50]	Immunology II
MICR*4240	[0.50]	Topics in Microbiology
MICR*4280	[0.50]	Microbial Ecology
MICR*4310	[1.00]	Research Project I
MICR*4320	[1.00]	Research Project II
MICR*4330	[0.50]	Molecular Virology
MICR*4430	[0.50]	Medical Virology

One of:

MICR*4140	[0.50]	Soil Microbiology and Biotechnology
MICR*4180	[0.50]	Microbial Processes in Environmental Management

Minor (Honours Program)

The minor in Microbiology consists of the following 5.25 credits:

2.25 credits including:

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*2020	[0.50]	Microbial Interactions and Associations
MICR*2030	[0.50]	Microbial Growth

2.00 credits from:

BIOL*3050	[0.50]	Mycology
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
MBG*2020	[0.50]	Introductory Molecular Biology
MBG*3080	[0.50]	Bacterial Genetics
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3220	[0.50]	Plant Microbiology
MICR*3230	[0.50]	Immunology I
MICR*3260	[0.50]	Microbial Adaptation and Development
MICR*3270	[0.50]	Microbial Cell Biology
MICR*3330	[0.50]	World of Viruses
MICR*4140	[0.50]	Soil Microbiology and Biotechnology
MICR*4180	[0.50]	Microbial Processes in Environmental Management

1.00 credits from:

BIOL*4050	[0.50]	Advanced Eukaryotic Microbiology
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4230	[0.50]	Immunology II
MICR*4280	[0.50]	Microbial Ecology
MICR*4330	[0.50]	Molecular Virology
MICR*4430	[0.50]	Medical Virology

Microbiology (Co-op) (MICR:C)

Department of Molecular and Cellular Biology, College of Biological Science

Students in the Major in Microbiology program may take the Co-op option. Students do not begin their first work term until they have completed semester 3 and courses BIOL*1030, BIOL*1040 and MICR*2030. Students in the co-op program must also complete COOP*1100 in the second academic semester. At least 3 work terms (COOP*1000, COOP*2000, COOP*3000) are required in the co-op program, and the course requirements are the same as shown for the major program. Some courses must be taken during a different semester than usual, and Co-op students may require an additional semester to meet all the program requirements. Students should plan their programs in consultation with the faculty advisor.

Stream A

Semester 1 - Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives

Students who are admitted to the Co-op Program but deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
PHYS*1080	[0.50]	Physics for Life Sciences

One mathematics/computer course from:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
MATH*2080	[0.50]	Elements of Calculus II

0.50 electives

Summer Semester

No academic semester or work term

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
MICR*2020	[0.50]	Microbial Interactions and Associations
MICR*2030	[0.50]	Microbial Growth

0.50 electives

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2020	[0.50]	Introductory Molecular Biology
STAT*2040	[0.50]	Statistics I

1.00 electives

Semester 5 - Fall

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*3080	[0.50]	Bacterial Genetics
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3230	[0.50]	Immunology I
MICR*3330	[0.50]	World of Viruses

Semester 6 - Winter

BIOL*3050	[0.50]	Mycology
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*3260	[0.50]	Microbial Adaptation and Development

0.75 electives

Summer - Semester

COOP*2000	[0.00]	Co-op Work Term II
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Fall Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 7 - Winter

2.50 electives or restricted electives which can include MICR*4310

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV (optional)
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Semester 8 - Fall

2.50 electives or restricted electives which can include MICR*4320

Stream B**Semester 1 - Fall**

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives

Students who are admitted to the Co-op Program but deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
PHYS*1080	[0.50]	Physics for Life Sciences

One mathematics/computer course from:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
MATH*2080	[0.50]	Elements of Calculus II

0.50 electives

Summer Semester

No academic semester or work term

Semester 3 - Fall

BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
MICR*2020	[0.50]	Microbial Interactions and Associations
MICR*2030	[0.50]	Microbial Growth

0.50 electives

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2020	[0.50]	Introductory Molecular Biology
STAT*2040	[0.50]	Statistics I

1.00 electives

Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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Semester 5 - Winter

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BIOL*3050	[0.50]	Mycology
MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*3330	[0.50]	World of Viruses

0.25 electives

Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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Semester 6 - Fall

MICR*3120	[0.50]	Systematic Bacteriology
MICR*3230	[0.50]	Immunology I
MBG*3080	[0.50]	Bacterial Genetics

1.00 electives

Semester 7 - Winter

MICR*3260	[0.50]	Microbial Adaptation and Development
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2.00 electives or restricted electives which can include MICR*4310

Summer Semester

COOP*4000	[0.00]	Co-op Work Term IV (optional)
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Semester 8 - Fall

2.50 electives or restricted electives which can include MICR*4320

Elective and Restricted Elective Credits

2.00 elective credits must be from the Arts and Social Sciences.

2.50 restricted elective credits of which 1.00 credit must be at the 4000 level.

A minimum of 6.00 science credits must be at the 3000/4000 level of which at least 2.00 credits must be at the 4000 level (including the 1.00 restricted elective credit).

Restricted Electives

BIOC*4540	[0.50]	Enzymology
BIOC*4580	[0.50]	Membrane Biochemistry
BIOL*4050	[0.50]	Advanced Eukaryotic Microbiology
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
FOOD*4400	[0.50]	Dairy Processing
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*3220	[0.50]	Plant Microbiology
MICR*3270	[0.50]	Microbial Cell Biology
MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4230	[0.50]	Immunology II
MICR*4240	[0.50]	Topics in Microbiology
MICR*4280	[0.50]	Microbial Ecology
MICR*4310	[1.00]	Research Project I
MICR*4320	[1.00]	Research Project II
MICR*4330	[0.50]	Molecular Virology
MICR*4430	[0.50]	Medical Virology

One of:

MICR*4140	[0.50]	Soil Microbiology and Biotechnology
MICR*4180	[0.50]	Microbial Processes in Environmental Management

Molecular Biology and Genetics (MBG)**Department of Molecular and Cellular Biology, College of Biological Science**

The B.Sc. program with a Major in Molecular Biology and Genetics is a broadly based program in genetics including related areas of cell and molecular biology. In consultation with the Faculty Advisor, students can choose a general program or can focus their courses in areas such as molecular biology, cell biology, developmental biology, genetics, or agricultural genetics. The program qualifies students for postgraduate training in cell or molecular biology and genetics including clinical genetics and genetic counselling, and provides an excellent background for careers in biotechnology, toxicology, agriculture and medical research. Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Major (Honours Program)

A total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming

0.50 Arts or Social Science electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

Semester 4

MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
STAT*2050	[0.50]	Statistics II

1.00 electives or restricted electives

Semester 5

MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
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1.75 electives or restricted electives

Semester 6

2.50 electives or restricted electives

Semester 7*

MBG*4500 [1.00] Research Project in Molecular Biology and Genetics I

1.50 electives or restricted electives

Semester 8*

MBG*4510 [1.00] Research Project in Molecular Biology and Genetics II

1.50 electives or restricted electives

*instead of the 2 semester sequence of MBG*4500 / MBG*4510 students may choose to take MBG*4600 and 1.50 subject area electives

Note: Students are reminded that AT LEAST 2.00 credits must be at the 4000 level in order to complete the major.

Arts and Social Science Electives - 2.00 credits

Restricted Electives

1. Ecology Elective - 0.50 credits

BIOL*2060	[0.50]	Ecology
BIOL*3110	[0.50]	Population Ecology
BOT*2050	[0.50]	Plant Ecology
MICR*4280	[0.50]	Microbial Ecology

2. Arts and Social Science Electives - 2.00 credits

3. Physiology Elective - 0.50 credits

BIOM*3100	[0.50]	Mammalian Physiology I
BOT*3310	[0.50]	Plant Growth and Development
HK*3940	[1.25]	Human Physiology
ZOO*3200	[0.50]	Comparative Animal Physiology I

4. Subject Area Electives - 3.00 credits (4.50 if MBG*4600 is taken instead of MBG*4500 and MBG*4510)

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BIOL*3300	[0.50]	Applied Bioinformatics
MBG*3000	[0.50]	Population Genetics
MBG*3050	[0.50]	Human Genetics
MBG*3060	[0.50]	Quantitative Genetics
MBG*3080	[0.50]	Bacterial Genetics
MBG*3200	[0.50]	Genetics: Our Uncertain Heritage
MBG*3360	[0.75]	Laboratory Methods in Molecular Biology II
MBG*3600	[0.25]	Introduction to Genomics
MBG*4030	[0.50]	Animal Breeding Methods
MBG*4080	[0.50]	Molecular Genetics
MBG*4110	[0.50]	Advanced Concepts in Genetics
MBG*4160	[0.50]	Plant Breeding
MBG*4240	[0.50]	Applied Molecular Genetics
MBG*4270	[0.50]	DNA Replication, Recombination and Repair
MBG*4300	[0.50]	Plant Molecular Genetics
MCB*4010	[0.50]	Advanced Cell Biology
MCB*4050	[0.50]	Protein and Nucleic Acid Structure
MICR*3330	[0.50]	World of Viruses
MICR*4330	[0.50]	Molecular Virology

One of:

MBG*4040	[0.50]	Genetics and Molecular Biology of Development
MBG*4070	[0.50]	Genetics and Molecular Biology of Development

Minor (Honours Program)

A minor in Molecular Biology and Genetics requires 5.00 credits in Molecular Biology and Genetics chosen in consultation with the faculty advisor, and will include:

MBG*2000	[0.50]	Introductory Genetics
MBG*2020	[0.50]	Introductory Molecular Biology

4.00 credits from:

BIOC*3560	[0.50]	Structure and Function in Biochemistry
BIOL*3300	[0.50]	Applied Bioinformatics
MBG*3000	[0.50]	Population Genetics
MBG*3050	[0.50]	Human Genetics
MBG*3060	[0.50]	Quantitative Genetics
MBG*3080	[0.50]	Bacterial Genetics
MBG*3200	[0.50]	Genetics: Our Uncertain Heritage
MBG*3600	[0.25]	Introduction to Genomics
MBG*4030	[0.50]	Animal Breeding Methods
MBG*4080	[0.50]	Molecular Genetics
MBG*4110	[0.50]	Advanced Concepts in Genetics
MBG*4160	[0.50]	Plant Breeding
MBG*4240	[0.50]	Applied Molecular Genetics
MBG*4270	[0.50]	DNA Replication, Recombination and Repair
MBG*4300	[0.50]	Plant Molecular Genetics
MCB*4010	[0.50]	Advanced Cell Biology
MCB*4050	[0.50]	Protein and Nucleic Acid Structure
MICR*3330	[0.50]	World of Viruses

MICR*4330	[0.50]	Molecular Virology
One of:		
MBG*4040	[0.50]	Genetics and Molecular Biology of Development
MBG*4070	[0.50]	Genetics and Molecular Biology of Development

Neuroscience (NEUR)**Office of the Associate Dean, B.Sc. Program****Minor (Honours Program)**

A minor in Neuroscience shall include a minimum of 5.00 credits including:

BIOM*3000	[0.50]	Mammalian Neuroanatomy
CIS*1500	[0.50]	Introduction to Programming
PHYS*2030	[0.50]	Biophysics of Excitable Cells
PSYC*2410	[0.50]	Behavioural Neuroscience I
ZOO*2100	[0.50]	Developmental Biology
and at least 0.50 from:		
BIOM*3100	[0.50]	Mammalian Physiology I
HK*3940	[1.25]	Human Physiology
ZOO*3200	[0.50]	Comparative Animal Physiology I
and 1.00 from an independent study project in the neurosciences, selected from a combination of:		
BIOM*4510	[1.00]	Research in Biomedical Sciences II
BIOM*4521/2	[1.00]	Research in Biomedical Sciences II
HK*4230	[0.50]	Advanced Study in Human Biology and Nutritional Sciences
HK*4360	[1.00]	Research in Human Biology and Nutritional Sciences
HK*4371/2	[1.00]	Research in Human Biology and Nutritional Sciences II
IBIO*4500	[0.75]	Research in Integrative Biology I
and 1.00 from:		
BIOM*3090	[0.50]	Principles of Pharmacology
HK*3100	[0.50]	Neuromuscular Physiology
NUTR*3210	[0.50]	Fundamentals of Nutrition
PATH*3610	[0.50]	Principles of Disease
PSYC*2390	[0.50]	Principles of Sensation and Perception
PSYC*3030	[0.50]	Neurochemical Basis of Behaviour
PSYC*3040	[0.50]	Current Issues in Neuropsychology
PSYC*3410	[0.50]	Behavioural Neuroscience II
ZOO*4470	[0.50]	Comparative Endocrinology

Nutritional and Nutraceutical Sciences (NANS)**Department of Human Health and Nutritional Sciences, College of Biological Science**

The Nutritional and Nutraceutical Sciences major is concerned with understanding the contribution of food, beverage and nutritional supplement consumption to growth, development of optimal biological function, maintenance of health, and treatment of disease.

If lacking the fundamentals of word processing, spread sheet use and data management, the student should select CIS*1200 as early in the program as possible.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required, including 2.00 credits from Arts and Social Sciences courses.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 electives or restricted electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

1.00 electives or restricted electives

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics

1.00 electives

Semester 4

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

Semester 5

HK*3940	[1.25]	Human Physiology
NUTR*3330	[0.50]	Micronutrients, Phytochemicals and Health
NUTR*3390	[0.50]	Applied Nutritional and Nutraceutical Sciences I

0.25 or 0.50 electives or restricted electives

Semester 6

BIOM*3090	[0.50]	Principles of Pharmacology
NUTR*4090	[0.50]	Functional Foods and Nutraceuticals
NUTR*4330	[0.50]	Applied Nutritional and Nutraceutical Sciences II
PATH*3610	[0.50]	Principles of Disease

0.50 electives or restricted electives

Semester 7

NUTR*4210	[0.50]	Nutrition, Exercise and Energy Metabolism
NUTR*4510	[0.50]	Toxicology, Nutrition and Food

1.50 electives or restricted electives

Semester 8

2.50 electives or restricted electives

Restricted Electives

Students must complete 2.00 credits from Arts and Social Sciences courses and 1.00 credits from among the following:

BIOM*4420	[0.50]	Research Modules
HK*4230	[0.50]	Advanced Study in Human Biology and Nutritional Sciences
HK*4360	[1.00]	Research in Human Biology and Nutritional Sciences
HK*4371/2	[1.00]	Research in Human Biology and Nutritional Sciences II
HK*4410	[0.50]	Research Concepts
HK*4460	[0.50]	Regulation of Human Metabolism
NUTR*4200	[0.50]	Nutrition and Immune Function
NUTR*4320	[0.50]	Nutrition and Metabolic Control of Disease
NUTR*4360	[0.50]	Current Issues in Nutrigenomics

Nutritional Sciences (NSCI)**Department of Human Health and Nutritional Sciences, College of Biological Science****Minor (Honours Program)**

A minor in Nutritional Sciences requires 5.00 credits as follows:

BIOC*2580	[0.50]	Introductory Biochemistry
NUTR*2150	[0.50]	Introduction to Nutritional and Food Sciences
NUTR*3210	[0.50]	Fundamentals of Nutrition
NUTR*3330	[0.50]	Micronutrients, Phytochemicals and Health
STAT*2040	[0.50]	Statistics I

At least 0.50 credits from:

BIOM*3100	[0.50]	Mammalian Physiology I
HK*3940	[1.25]	Human Physiology
ZOO*3200	[0.50]	Comparative Animal Physiology I

and 2.00 credits from:

ANSC*3170	[0.50]	Nutrition of Fish and Crustacea
ANSC*3180	[0.50]	Wildlife Nutrition
ANSC*4160	[0.25]	Beef Cattle Nutrition
ANSC*4170	[0.25]	Dairy Cattle Nutrition
ANSC*4180	[0.25]	Poultry Nutrition
ANSC*4190	[0.25]	Swine Nutrition
ANSC*4500	[0.25]	Horse Nutrition
ANSC*4510	[0.25]	Pet Nutrition
HK*4230	[0.50]	Advanced Study in Human Biology and Nutritional Sciences

HK*4360	[1.00]	Research in Human Biology and Nutritional Sciences
HK*4371/2	[1.00]	Research in Human Biology and Nutritional Sciences II

NUTR*3390	[0.50]	Applied Nutritional and Nutraceutical Sciences I
NUTR*4090	[0.50]	Functional Foods and Nutraceuticals
NUTR*4200	[0.50]	Nutrition and Immune Function
NUTR*4210	[0.50]	Nutrition, Exercise and Energy Metabolism
NUTR*4320	[0.50]	Nutrition and Metabolic Control of Disease
NUTR*4360	[0.50]	Current Issues in Nutrigenomics
NUTR*4510	[0.50]	Toxicology, Nutrition and Food

Physical Science (PSCI)**College of Physical and Engineering Science****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major will require the completion of 20.00 credits as indicated below:

1. Basic Science Core - 4.00 credits

1.00 - Biology (BIOL*1030, BIOL*1040)

1.00 - Chemistry (CHEM*1040, CHEM*1050)

1.00 - Physics [(PHYS*1000, PHYS*1010) or (PHYS*1070, PHYS*1080) or (PHYS*1080, PHYS*1130)]

1.00 - Mathematical Science [(MATH*1080, MATH*2080) or (MATH*1200, MATH*1210)]

2. Subject Area Core - 8.00 credits

0.50 (STAT*2040 or STAT*2100)

0.50 (CIS*1200 or CIS*1500)

7.00 physical science credits, including at least 4.00 credits at the 3000 or 4000 level of which 2.00 credits must be at the 4000 level.

3. Science Electives - 4.00 credits

4.00 science credits from the List of Approved Science Electives for B.Sc. Students*

4. Arts and Social Science Electives - 2.00

2.00 acceptable Arts or Social Science credits selected from the List of Approved B.Sc. Electives*

5. Free Electives - 2.00 credits

Note: the program must include a total of 6.00 science credits at the 3000 or 4000 level. Of these, at least 2.00 credits must be physical science at the 4000 level.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I

One of:

PHYS*1000	[0.50]	An Introduction to Mechanics
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

MATH*1080	[0.50]	Elements of Calculus I
MATH*1200	[0.50]	Calculus I

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II

One of:

PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

One of:

MATH*1210	[0.50]	Calculus II
MATH*2080	[0.50]	Elements of Calculus II

0.50 Arts or Social Science electives

Semester 3

1.50 science electives from the approved list of acceptable B.Sc. science electives*
0.50 electives

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming

OR

STAT*2040	[0.50]	Statistics I
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Semester 4

1.50 science electives from the approved list of B.Sc. science electives*
0.50 electives

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming

(if a statistics course is chosen in Semester 3)

OR

STAT*2040	[0.50]	Statistics I
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(if a computing course is chosen in Semester 3)

Semester 5 to 8

Total of 2.50 credits per semester including at least 2.00 science electives.

Sufficient courses at the 3000 or 4000 level must be selected in Semesters 5 through 8 to total 6.00 credits in science at the 3000 or 4000 level with at least 2.00 physical science at the 4000 level.

*approved course lists are available in the Dean's Office, College of Physical and Engineering Science and on the world wide web at http://www.cpes.uoguelph.ca/BSc/approved_electives.htm

Honours Physical Science (With a Minor)

The requirements and schedules are the same as for Honours Physical Science. Available Minor subjects are listed at the beginning of the B.Sc. Program section under the heading Honours Program Minors.

Physics (PHYS)**Department of Physics, College of Physical and Engineering Science**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. Since some of the required courses are not offered every semester, students entering the Major in Honours Physics should plan their program in consultation with the Department of Physics Faculty Advisor.

Major (Honours Program)

This major requires the completion of 21.25 credits. At least 1.00 of these credits must be obtained from the completion of Arts and/or Social Science courses.

Semester 1*

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2*

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

0.50 Arts or Social Science electives

* students who have taken physics courses other than PHYS*1000 in Semester 1 and PHYS*1010 in Semester 2, may proceed to semester 3 with the permission of the Department of Physics

Semester 3

MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

One of:

STAT*2040 [0.50] Statistics I

0.50 Arts electives

0.50 Social Science electives

Semester 4

MATH*2170	[0.50]	Differential Equations I
PHYS*2260	[0.50]	Quantum Physics
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II

One of:

STAT*2040 [0.50] Statistics I

STAT*2120 [0.50] Probability and Statistics for Engineers

0.50 electives

Semester 5

MATH*3100	[0.50]	Differential Equations II
PHYS*3100	[0.75]	Electronics
PHYS*3230	[0.50]	Quantum Mechanics I
PHYS*3240	[0.50]	Statistical Physics I

One of:

MATH*2000 [0.50] Set Theory

0.50 electives

Semester 6

PHYS*3220	[0.50]	Waves and Optics
PHYS*3400	[0.50]	Advanced Mechanics
PHYS*3510	[0.50]	Intermediate Laboratory
PHYS*4040	[0.50]	Quantum Mechanics II

One of:

MATH*3170 [0.50] Partial Differential Equations and Special Functions

MATH*3260 [0.50] Complex Analysis

0.50 electives

Semester 7+

PHYS*4180	[0.50]	Advanced Electromagnetic Theory
PHYS*4500	[0.50]	Advanced Physics Laboratory

One of:

PHYS*4240 [0.50] Statistical Physics II

0.50 electives

1.00 electives **

Semester 8+

PHYS*4510 [0.50] Advanced Physics Project

2.00 electives **

+ students going on to graduate school in physics should take PHYS*4120, PHYS*4130, PHYS*4150, PHYS*4240

** For the electives chosen in Sem 7 and 8, at least 1.50 credits must be from lists A and B below. At least 1.00 credits must be from list A. Substitutions of courses in list B by other 3000 or 4000 level courses must be approved by the Physics Faculty Advisor.

List A

PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4130	[0.50]	Subatomic Physics
PHYS*4150	[0.50]	Solid State Physics

List B

GEOL*3060	[0.50]	Groundwater
PHYS*4540	[0.50]	Molecular Biophysics
PHYS*4560	[0.50]	Biophysical Methods
PHYS*4910	[0.50]	Advanced Topics in Physics I
PHYS*4920	[0.50]	Advanced Topics in Physics II
PHYS*4930	[0.50]	Advanced Topics in Physics III
POLS*3370	[0.50]	Environmental Policy Formation and Administration
REXT*3100	[0.50]	Teaching and Learning in Non-Formal Education
SOIL*3600	[0.50]	Remote Sensing
STAT*3240	[0.50]	Applied Regression Analysis
STAT*3510	[0.50]	Environmental Risk Assessment

Minor (Honours Program)

A minor in Physics requires 5.00 credits in physics courses including at least 1.00 at the 3000 or 4000 level.

The following four courses, with a weight of 0.75 each, are required:

PHYS*2440	[0.75]	Mechanics I
PHYS*2450	[0.75]	Mechanics II
PHYS*2460	[0.75]	Electricity and Magnetism I
PHYS*2470	[0.75]	Electricity and Magnetism II

The following courses are strongly recommended:

PHYS*1000	[0.50]	An Introduction to Mechanics
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

Physics (Co-op) (PHYS:C)**Department of Physics, College of Physical and Engineering Science**

Since some of the required courses are not offered every semester, students entering the Major in Physics (Co-op) should plan their program in consultation with the Department of Physics Faculty Advisor. To graduate from the Co-op program a minimum of 4 successfully completed work terms (COOP*1000, COOP*2000, COOP*3000, COOP*4000) is normally required.

Major (Honours Program)

This major requires the completion of 21.25 credits.

Semester 1 - Fall

The program for the first semester is the same as the Major in Physics (regular) program.

Semester 2 - Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism

One of:

CIS*2500 [0.50] Intermediate Programming

0.50 Arts or Social Science electives*

Semester 3 - Fall

MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
PHYS*2440	[0.75]	Mechanics I
PHYS*2460	[0.75]	Electricity and Magnetism I

One of:

MATH*2000 [0.50] Set Theory

STAT*2040 [0.50] Statistics I

0.50 Arts or Social Science electives*

Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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Semester 4 - Summer

MATH*2170	[0.50]	Differential Equations I
PHYS*2260	[0.50]	Quantum Physics
PHYS*3240	[0.50]	Statistical Physics I

One of:

CIS*2520 [0.50] Data Structures

0.50 electives*

0.50 electives*

Fall Semester

COOP*2000 [0.00] Co-op Work Term II

Semester 5 - Winter

PHYS*2450 [0.75] Mechanics II

PHYS*2470 [0.75] Electricity and Magnetism II

PHYS*3220 [0.50] Waves and Optics

One of:

STAT*2040 [0.50] Statistics I

STAT*2120 [0.50] Probability and Statistics for Engineers

MATH*3260 [0.50] Complex Analysis

0.50 electives

0.50 electives

Summer Semester

COOP*3000 [0.00] Co-op Work Term III

Semester 6 - Fall +

MATH*3100 [0.50] Differential Equations II

PHYS*3100 [0.75] Electronics

PHYS*3230 [0.50] Quantum Mechanics I

1.00 electives **

Semester 7 - Winter +

PHYS*3400 [0.50] Advanced Mechanics

PHYS*3510 [0.50] Intermediate Laboratory

PHYS*4040 [0.50] Quantum Mechanics II

One of:

MATH*3170 [0.50] Partial Differential Equations and Special Functions

0.50 electives**

0.50 electives**

Summer Semester

COOP*4000 [0.00] Co-op Work Term IV

Semester 8 - Fall +

PHYS*4180 [0.50] Advanced Electromagnetic Theory

PHYS*4240 or 0.50 electives

PHYS*4500 [0.50] Advanced Physics Laboratory

1.00 electives**

* 1.00 must be taken as Arts or Social Science electives in this Major

+ and ** refer to the notes in the Major in Physics program

Plant Biology (PBIO)**Department of Integrative Biology, College of Biological Science****Department of Environmental Biology, Ontario Agricultural College****Department of Plant Agriculture, Ontario Agricultural College****Major (Honours Program)**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1

BIOL*1030 [0.50] Biology I

CHEM*1040 [0.50] General Chemistry I

MATH*1080 [0.50] Elements of Calculus I

PHYS*1070 [0.50] Introductory Physics for Life Sciences

0.50 Arts or Social Science electives *

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II

CHEM*1050 [0.50] General Chemistry II

PHYS*1080 [0.50] Physics for Life Sciences

One of:

CIS*1200 [0.50] Introduction to Computing

CIS*1500 [0.50] Introduction to Programming

MATH*2080 [0.50] Elements of Calculus II

0.50 Arts or Social Science electives*

Semester 3

AGR*2470 [0.50] Introduction to Plant Agriculture

BIOC*2580 [0.50] Introductory Biochemistry

BOT*2100 [0.50] Life Strategies of Plants

MBG*2000 [0.50] Introductory Genetics

One of:

0.50 electives

0.50 Arts and Social Science electives

Semester 4

BIOL*2210 [0.50] Introductory Cell Biology

BOT*3310 [0.50] Plant Growth and Development

ENVB*2040 [0.50] Plant Health and the Environment

MBG*2020 [0.50] Introductory Molecular Biology

One of:

0.50 electives

0.50 Arts and Social Science electives

Semester 5

BOT*3410 [0.50] Plant Anatomy

STAT*2040 [0.50] Statistics I

0.50 Arts or Social Science electives

1.00 electives **

Semester 6

BOT*3710 [0.50] Classification and Morphology of Seed Plants

2.00 electives **

Semester 7

2.50 electives **

Semester 8

BOT*4380 [0.50] Metabolism in the Whole Life of Plants

2.00 electives **

* it is recommended that 0.50 Arts or Social Science electives be chosen from:

ECON*1100 [0.50] Introductory Macroeconomics

ENGL*1200 [0.50] Reading the Contemporary World

GEOG*1220 [0.50] Human Impact on the Environment

HIST*1250 [0.50] Science and Society Since 1500

PHIL*1000 [0.50] Introductory Philosophy: Major Texts

POLS*1400 [0.50] Issues in Canadian Politics

PSYC*1100 [0.50] Principles of Behaviour

Electives**

1. One of:

BIOL*2060 [0.50] Ecology

BOT*2050 [0.50] Plant Ecology

CROP*2110 [0.50] Crop Ecology

2. A minimum of 2.50 credits must be from the following list of preferred electives:

BIOL*3300 [0.50] Applied Bioinformatics

MBG*4300 [0.50] Plant Molecular Genetics

PBIO*3110 [0.50] Crop Physiology

PBIO*3750 [0.50] Plant Tissue Culture

PBIO*4000 [0.50] Molecular and Cellular Aspects of Plant-Microbe Interactions

PBIO*4100 [0.50] Soil Plant Relationships

PBIO*4150 [0.50] Molecular and Cellular Aspects of Plant Development

PBIO*4530 [0.50] Environmental Pollution Stresses on Plants

PBIO*4750 [0.50] Genetic Engineering of Plants

3. A minimum of 3.00 credits must be from the following list:

BIOL*3050 [0.50] Mycology

CROP*3300 [0.50] Grain Crops

CROP*3310 [0.50] Protein and Oilseed Crops

CROP*4240 [0.50] Weed Science

ENVB*2030 [0.50] Current Issues in Forest Science

ENVB*3210 [0.50] Plant Pathology

ENVB*4070 [0.50] Biological and Cultural Control of Plant Diseases

ENVB*4420 [0.50] Problems in Environmental Biology

ENVB*4780 [0.50] Forest Ecology

HORT*3010 [0.50] Annual, Perennial and Indoor Plants - Identification and Use

HORT*3230 [0.50] Plant Propagation

HORT*3260 [0.50] Woody Plants

HORT*3340 [0.50] Culture of Plants

HORT*4300 [0.50] Postharvest Physiology

HORT*4420 [0.50] Fruit Crops

IBIO*4500 [0.75] Research in Integrative Biology I

IBIO*4510 [0.75] Research in Integrative Biology II

MBG*3000 [0.50] Population Genetics

MBG*3100 [0.50] Plant Genetics

MBG*4160 [0.50] Plant Breeding

MICR*3220 [0.50] Plant Microbiology

4. 1.50 Arts and Social Science electives

5. A minimum of 6.00 science credits must be completed at the 3000 and 4000 levels with a minimum 2.00 credits at the 4000 level.

Minor (Honours Program)

A minor in Plant Biology requires 5.00 credits in the Plant Biology program chosen in consultation with the faculty advisor. The courses will include:

BOT*3310	[0.50]	Plant Growth and Development
BOT*4380	[0.50]	Metabolism in the Whole Life of Plants
ENVB*2040	[0.50]	Plant Health and the Environment

One of:

AGR*2470	[0.50]	Introduction to Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants

One of:

BOT*3410	[0.50]	Plant Anatomy
BOT*3710	[0.50]	Classification and Morphology of Seed Plants

One of:

BIOL*2060	[0.50]	Ecology
BOT*2050	[0.50]	Plant Ecology
CROP*2110	[0.50]	Crop Ecology

2.00 credits from list of preferred electives in PBIO Major

Plant Biotechnology (PBTC)

Department of Molecular and Cellular Biology, College of Biological Sciences

Department of Environmental Biology, Ontario Agricultural College

Department of Plant Agriculture, Ontario Agricultural College

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming

0.50 Arts or Social Science electives

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics

One of:

AGR*2470	[0.50]	Introduction to Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants

0.50 electives or restricted electives

Semester 4

BOT*3310	[0.50]	Plant Growth and Development
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

Semester 5

MBG*3100	[0.50]	Plant Genetics
PBIO*3750	[0.50]	Plant Tissue Culture

1.50 electives or restricted electives

Semester 6

MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MBG*4300	[0.50]	Plant Molecular Genetics

One of:

PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development
PBIO*4750	[0.50]	Genetic Engineering of Plants

0.75 electives or restricted electives

Semester 7

MBG*4500	[1.00]	Research Project in Molecular Biology and Genetics I
PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant-Microbe Interactions

1.00 electives or restricted electives

Semester 8

BOT*4380	[0.50]	Metabolism in the Whole Life of Plants
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One of:

PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development
PBIO*4750	[0.50]	Genetic Engineering of Plants

1.50 electives or restricted electives

Restricted Electives

List A

A minimum of 2.00 credits must be taken from the following list:

BIOL*3300	[0.50]	Applied Bioinformatics
BOT*3410	[0.50]	Plant Anatomy
MBG*3200	[0.50]	Genetics: Our Uncertain Heritage
MBG*3600	[0.25]	Introduction to Genomics
MBG*4510	[1.00]	Research Project in Molecular Biology and Genetics II
MCB*4010	[0.50]	Advanced Cell Biology
MCB*4050	[0.50]	Protein and Nucleic Acid Structure
MICR*3220	[0.50]	Plant Microbiology
MICR*3230	[0.50]	Immunology I
MICR*3330	[0.50]	World of Viruses
MICR*4230	[0.50]	Immunology II
PBIO*3110	[0.50]	Crop Physiology
PBIO*4600	[0.50]	Plant Environment Interaction and Stress

Note: Students are strongly recommended to take PBIO*4310.

List B

A minimum of 1.00 credits must be taken from the following list:

CROP*2110	[0.50]	Crop Ecology
CROP*3300	[0.50]	Grain Crops
CROP*3310	[0.50]	Protein and Oilseed Crops
ENVB*3210	[0.50]	Plant Pathology
HORT*3230	[0.50]	Plant Propagation
HORT*4300	[0.50]	Postharvest Physiology
HORT*4420	[0.50]	Fruit Crops
MBG*4160	[0.50]	Plant Breeding

Minor (Honours Program)

A minor in Plant Biotechnology requires 5.00 credits in the Plant Biotechnology Program chosen in consultation with the Faculty Advisor. The courses include:

MBG*2020	[0.50]	Introductory Molecular Biology
PBIO*3750	[0.50]	Plant Tissue Culture
PBIO*4750	[0.50]	Genetic Engineering of Plants

One of:

AGR*2470	[0.50]	Introduction to Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants

1.50 credits from Restricted Electives List A (listed under Major above)

0.50 credits from Restricted Electives List B (listed under Major above)

1.00 credits from the following courses:

BOT*3310	[0.50]	Plant Growth and Development
BOT*4380	[0.50]	Metabolism in the Whole Life of Plants
MBG*3100	[0.50]	Plant Genetics
MBG*4300	[0.50]	Plant Molecular Genetics
PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant-Microbe Interactions
PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development

Psychology (PSYC)

Department of Psychology, College of Social and Applied Human Sciences

The B.Sc. Major in Psychology offers an opportunity for students to develop interests within learning, perception, cognition, and physiological psychology from a sound base in physical and biological sciences. Students primarily interested in other areas within psychology should consult the schedule of studies for the Bachelor of Arts program. Psychology courses in the above focuses may also be studied via the B.A. program.

Note on Honours Courses

Courses marked (H) are designed for students in a psychology honours program, the Information Systems and Human Behaviour program, the Developmental Psychology Minor program, the Educational Psychology Minor program, the Organizational Behaviour Minor program, the Social Psychology program, the Cognitive Neuropsychology Minor program, or Human Resources Management major of the Bachelor of Commerce program. Students in other programs wishing to take these courses must obtain the permission of the instructors concerned. Unless otherwise specified, all other courses may be taken by general, honours, and students from other programs, providing the prerequisites are met. **Courses designated with (H) are Honours level courses requiring for registration a cumulative average of at least 70% in all course attempts in Psychology, or registration in either the HRM Major or ISHB Major.**

Major (Honours Program)

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

One of: *

PSYC*1100 [0.50] Principles of Behaviour
 PSYC*1200 [0.50] Dynamics of Behaviour

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II
 CHEM*1050 [0.50] General Chemistry II
 PHYS*1080 [0.50] Physics for Life Sciences

One of:

CIS*1200 [0.50] Introduction to Computing
 CIS*1500 [0.50] Introduction to Programming

One of: *

PSYC*1100 [0.50] Principles of Behaviour
 PSYC*1200 [0.50] Dynamics of Behaviour

Semester 3

One of:

PSYC*2330 [0.50] Principles of Learning
 PSYC*2410 [0.50] Behavioural Neuroscience I

One of:

PSYC*2390 [0.50] Principles of Sensation and Perception
 PSYC*2650 [0.50] Cognitive Psychology

One of:

PSYC*2010 [0.50] Quantification in Psychology
 STAT*2040 [0.50] Statistics I

1.00 electives **

Semester 4

PSYC*2360 [0.50] Introductory Research Methods
 PSYC*3320 [0.50] Statistical Principles in Psychological Research

0.50 Psychology core (PSYC*2330, PSYC*2390, PSYC*2410, PSYC*2650)

0.50 electives**

One of:

PSYC*2310 [0.50] Introduction to Social Psychology
 PSYC*2450 [0.50] Introduction to Developmental Psychology
 PSYC*2740 [0.50] Personality

Semester 5

PSYC*3370 [0.50] Experimental Design and Analysis

2.00 electives **

Semester 6

PSYC*3250 [0.50] Psychological Measurement
 PSYC*3380 [0.50] Non-experimental Research Methods

1.50 electives **

Semester 7***

2.50 electives **

Semester 8***

2.50 electives**

* PSYC*1100 should be completed prior to semester 3, PSYC*1200 prior to semester 4

** Electives in semester 3-8 must satisfy the following requirements:

- i. 1.00 arts and/or non-psychology social science credits
- ii. 4 credits at the 3000 level
- iii. 2 credits at the 4000 level
- iv. 3.5 Psychology B.Sc. elective credits from List A
- v. 3.5 Non-psychology B.Sc. elective credits (suitable course prefixes are provided in List B)

*** students planning to enter a graduate program in Psychology are advised to complete PSYC*4870 and PSYC*4880 in Semesters 7 and 8, respectively. Note that PSYC*4370 or PSYC*4900 must be completed prior to or concurrently with either PSYC*4870 or PSYC*4880

Note: The selection of electives should take into consideration the prerequisites for preferred advanced courses. With the permission of the Psychology Department PRIOR to course selection, up to 2 non-psychology credits can be used towards the psychology credits if such courses enhance the student's psychology program.

List A Psychology B.Sc. Electives

PSYC*3030 [0.50] Neurochemical Basis of Behaviour
 PSYC*3040 [0.50] Current Issues in Neuropsychology
 PSYC*3100 [0.50] Evolutionary Psychology
 PSYC*3220 [0.50] Ergonomics: the Scientific Study of People-System Relationships
 PSYC*3330 [0.50] Memory
 PSYC*3340 [0.50] Psycholinguistics
 PSYC*3410 [0.50] Behavioural Neuroscience II
 PSYC*3430 [0.50] Topics in Animal Learning and Cognition
 PSYC*3850 [0.50] Intellectual Disabilities

PSYC*4370 [0.50] History of Psychology
 PSYC*4600 [0.50] Cognitive Neuroscience
 PSYC*4750 [0.50] Motivation
 PSYC*4870 [0.50] Honours Thesis I
 PSYC*4880 [1.00] Honours Thesis II
 PSYC*4900 [0.50] Psychology Seminar

List B

List of Approved Science Electives Courses for B.Sc. students, excluding psychology: Courses with the following prefixes are examples of particularly suitable science electives for students in this program: BIOL; BIOM; CIS; ENGG; ENVB; HK; MATH; STAT; ZOO; ENVB.

Minor (Honours Program)

A minor in Psychology requires 5.00 psychology credits as follows:

PSYC*1100 [0.50] Principles of Behaviour
 PSYC*1200 [0.50] Dynamics of Behaviour
 PSYC*2360 [0.50] Introductory Research Methods

2.00 credits from 2000 level psychology core courses selected as follows:

a. 1.50 credits from:

PSYC*2330 [0.50] Principles of Learning
 PSYC*2390 [0.50] Principles of Sensation and Perception
 PSYC*2410 [0.50] Behavioural Neuroscience I
 PSYC*2650 [0.50] Cognitive Psychology

b. 0.50 credits from:

PSYC*2310 [0.50] Introduction to Social Psychology
 PSYC*2450 [0.50] Introduction to Developmental Psychology
 PSYC*2740 [0.50] Personality

1.00 credits from courses in List A

One of:

PSYC*2010 [0.50] Quantification in Psychology
 STAT*2040 [0.50] Statistics I

Statistics (STAT)**Department of Mathematics and Statistics, College of Physical and Engineering Science**

Students in this program will acquire the ability to use modern statistical methods in a variety of applications, the theoretical understanding necessary to develop statistical methods to meet new needs and a solid preparation for further study. As well, since statistical computing is a fundamental tool for the application and development of modern statistical methods, students will develop skills in computer applications programming using such high-level languages as SAS and S-PLUS.

Students may enter this major in any semester. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required to complete the major. Required 1000 level courses are listed under Semester 1 and Semester 2 of the recommended Schedule of Studies for Major. At least 8.00 credits in Statistics and Mathematics are required at the 2000 level or above, as follows: MATH*2130, MATH*2150, MATH*2160, MATH*2200, STAT*2040, STAT*2050, STAT*3100, STAT*3110, STAT*3210, STAT*3240, STAT*3320. Five other courses (2.50 credits) in Statistics at the 3000 or 4000 level, of which at least four (2.00 credits) must be at the 4000 level. One other course (0.50 credits) in Mathematics or Statistics at the 2000 level or above.

Recommended Schedule of Studies for Major (Honours Program)**Semester 1**

BIOL*1030 [0.50] Biology I
 CHEM*1040 [0.50] General Chemistry I
 CIS*1500 [0.50] Introduction to Programming
 MATH*1200 [0.50] Calculus I
 PHYS*1000 [0.50] An Introduction to Mechanics

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040 [0.50] Biology II
 CHEM*1050 [0.50] General Chemistry II
 MATH*1210 [0.50] Calculus II
 PHYS*1010 [0.50] Introductory Electricity and Magnetism

0.50 Arts or Social Science electives*

Semester 3

MATH*2200 [0.50] Advanced Calculus I
 STAT*2040 [0.50] Statistics I

One of:

MATH*2150 [0.50] Applied Matrix Algebra
 MATH*2160 [0.50] Linear Algebra I

0.50 Arts or Social Science electives

0.50 electives**

Semester 4

MATH*2130	[0.50]	Numerical Methods
STAT*2050	[0.50]	Statistics II

1.50 electives**

Semester 5

STAT*3100	[0.50]	Introductory Mathematical Statistics I
STAT*3240	[0.50]	Applied Regression Analysis
STAT*3320	[0.50]	Sampling Theory with Applications

1.00 electives**

Semester 6

STAT*3110	[0.50]	Introductory Mathematical Statistics II
STAT*3210	[0.50]	Experimental Design

1.50 electives**

Semester 7

2.50 electives**

Semester 8

2.50 electives**

*The recommended Arts or Social Science elective can be postponed to a future semester if the student wishes to take STAT*2040 in Semester 2.

** Electives must satisfy the following requirements:

1. Electives must include at least 2.50 credits in Statistics at the 3000 or 4000 level, and an additional 0.50 credits in Statistics or Mathematics at the 2000 level or above.
2. At least 2.00 credits in Statistics must be at the 4000 level.
3. Electives plus core courses must include at least 6.00 credits at the 3000 or 4000 level from the B.Sc. Program Committee approved list of science electives.
4. At least 1.00 credits in Arts or Social Science must be completed.

Minor (Honours Program)

A total of 5.00 credits in Statistics and Mathematics are required, including:

MATH*1200	[0.50]	Calculus I
MATH*1210	[0.50]	Calculus II
STAT*2040	[0.50]	Statistics I
STAT*2050	[0.50]	Statistics II
STAT*3100	[0.50]	Introductory Mathematical Statistics I
STAT*3110	[0.50]	Introductory Mathematical Statistics II
STAT*3240	[0.50]	Applied Regression Analysis

One of:

MATH*2150	[0.50]	Applied Matrix Algebra
MATH*2160	[0.50]	Linear Algebra I

0.50 additional credits in Statistics

0.50 additional credits in Statistics or Mathematics

Theoretical Physics (THPY)**Department of Physics, College of Physical and Engineering Science**

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. Since some of the required courses are not offered every semester, students entering the Major in Theoretical Physics should plan their program in consultation with the Faculty Advisor.

Major (Honours Program)

This major requires the completion of 21.25 credits. At least 1.00 of these credits must be obtained from the completion of Arts and/or Social Science courses.

Semester 1 to 3

The program for the first three semesters is the same as the Major in Physics program.

Semester 4

MATH*2170	[0.50]	Differential Equations I
PHYS*2260	[0.50]	Quantum Physics
PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II

One of:*

MATH*2210	[0.50]	Advanced Calculus II
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0.50 electives

Semester 5

MATH*3100	[0.50]	Differential Equations II
PHYS*3100	[0.75]	Electronics
PHYS*3230	[0.50]	Quantum Mechanics I
PHYS*3240	[0.50]	Statistical Physics I

One of:

MATH*2000	[0.50]	Set Theory
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0.50 electives

Semester 6

MATH*3260	[0.50]	Complex Analysis
PHYS*3220	[0.50]	Waves and Optics
PHYS*3400	[0.50]	Advanced Mechanics

PHYS*3510	[0.50]	Intermediate Laboratory
PHYS*4040	[0.50]	Quantum Mechanics II

Semester 7

PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4180	[0.50]	Advanced Electromagnetic Theory
PHYS*4240	[0.50]	Statistical Physics II

One 3000 or 4000 level mathematics course or 0.50 electives

One of:

PHYS*4500	[0.50]	Advanced Physics Laboratory
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0.50 electives

Semester 8

PHYS*4130	[0.50]	Subatomic Physics
PHYS*4150	[0.50]	Solid State Physics
PHYS*4510	[0.50]	Advanced Physics Project

One 3000 or 4000 level mathematics course

0.50 electives

*those not taking MATH*2210 in Semester 4 must consult the Department of Physics Departmental Advisor

Wild Life Biology (WLB)**Department of Integrative Biology, College of Biological Science**

The Major in Wild Life Biology provides exposure to the ecological principles upon which the scientific management of wild life is based. This major prepares students for post-graduate work in ecology and management of wild life and provides a sound science background for students wishing to pursue careers in teaching, government service or the private sector.

Major (Honours Program)

Students may enter this major in semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives *

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives *

Semester 3

BIOC*2580	[0.50]	Introductory Biochemistry
ZOO*2070	[0.50]	Invertebrate Zoology I
ZOO*2090	[0.50]	Vertebrate Structure and Function
ZOO*2100	[0.50]	Developmental Biology

0.50 electives **

Semester 4

BIOL*2210	[0.50]	Introductory Cell Biology
MBG*2000	[0.50]	Introductory Genetics
NUTR*3210	[0.50]	Fundamentals of Nutrition
ZOO*2080	[0.50]	Invertebrate Zoology II

0.50 electives **

Semester 5

BIOL*3010	[0.50]	Laboratory and Field Work in Ecology
BIOL*3110	[0.50]	Population Ecology
BOT*2050	[0.50]	Plant Ecology
ZOO*3200	[0.50]	Comparative Animal Physiology I
ZOO*3300	[0.50]	Evolution

Semester 6

ANSC*3180	[0.50]	Wildlife Nutrition
BIOL*3120	[0.50]	Community Ecology
ZOO*3210	[0.50]	Comparative Animal Physiology II

1.00 electives **, ***

Semester 7 ****

BIOL*4110	[0.75]	Ecological Methods
ZOO*4070	[0.50]	Animal Behaviour

1.25 electives **

Semester 8

BIOL*4150 [0.50] Wildlife Conservation and Management

2.00 electives **

* CIS*1200 is recommended for those needing to improve their computer skills

** suggested electives list available from faculty advisors

*** BIOL*2250 is strongly recommended if independent research project courses are anticipated in semester 7 and/or 8

**** a minimum of 0.75 credits from these courses may be taken as an alternative to BIOL*4110 in semester 7:

IBIO*4500	[0.75]	Research in Integrative Biology I
IBIO*4510	[0.75]	Research in Integrative Biology II
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4600	[0.75]	Tropical Ecology
ZOO*4610	[0.75]	Arctic Ecology
ZOO*4700	[0.50]	Field Biology
ZOO*4710	[0.25]	Field Biology
ZOO*4800	[0.50]	Field Biology
ZOO*4810	[0.25]	Field Biology

Other field or research courses with approval of faculty advisor.

Electives must include:

1. A minimum of 1.00 credits from:

ZOO*4090	[0.50]	Ornithology
ZOO*4280	[0.50]	Mammalogy
ZOO*4430	[0.50]	Herpetology

2. At least 1.00 Arts and/or Social Science electives.

Zoology (ZOO)**Department of Integrative Biology, College of Biological Science**

The Major in Zoology offers a broad education in the life sciences while providing a more specialized understanding of the structure, function and ecology of animals. This major qualifies students for post-graduate work in zoology and other life sciences and provides a sound science background for students wishing to pursue careers in teaching, government service or the private sector.

Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A minimum total of 20.00 credits is required to complete the major.

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
MATH*1080	[0.50]	Elements of Calculus I
PHYS*1070	[0.50]	Introductory Physics for Life Sciences

0.50 Arts or Social Science electives *

Students who are admitted deficient in one OAC/4U course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The first-year science core in that subject should be completed by Semester 3.

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

0.50 Arts or Social Science electives *

Semester 3

ZOO*2070	[0.50]	Invertebrate Zoology I
ZOO*2090	[0.50]	Vertebrate Structure and Function
ZOO*2100	[0.50]	Developmental Biology

1.00 electives **

Semester 4

BIOL*2210	[0.50]	Introductory Cell Biology
BIOC*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
ZOO*2080	[0.50]	Invertebrate Zoology II

0.50 electives **

Semester 5

BIOL*3110	[0.50]	Population Ecology
ZOO*3200	[0.50]	Comparative Animal Physiology I
ZOO*3300	[0.50]	Evolution

1.00 electives **

Semester 6

BIOL*3120	[0.50]	Community Ecology
ZOO*3210	[0.50]	Comparative Animal Physiology II

1.50 electives **, ***

Semester 7

ZOO*3000 [0.50] Comparative Histology

ZOO*4070 [0.50] Animal Behaviour

1.50 electives **

Semester 8

2.50 electives **

* CIS*1200 is recommended for those needing to improve their computer skills

** suggested electives list available from the faculty advisors

*** BIOL*2250 is strongly recommended if independent research project courses are anticipated in semesters 7 and/or 8

Electives must include:

1. A minimum of 0.50 credits from:

IBIO*4500	[0.75]	Research in Integrative Biology I
IBIO*4510	[0.75]	Research in Integrative Biology II
ZOO*4170	[0.50]	Experimental Comparative Animal Physiology
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4600	[0.75]	Tropical Ecology
ZOO*4610	[0.75]	Arctic Ecology
ZOO*4700	[0.50]	Field Biology
ZOO*4710	[0.25]	Field Biology
ZOO*4800	[0.50]	Field Biology
ZOO*4810	[0.25]	Field Biology

Other field or research courses with approval of faculty advisor.

2. At least 1.00 Arts or Social Science electives.

3. This major must contain at least 6.00 science credits at the 3000 or 4000 level, which must include at least 2.00 at the 4000 level. The restricted elective in point number 1 above counts as part of this 3000 or 4000 level requirement.

Note: The Major in Zoology is a flexible program which allows students in consultation with faculty advisors, to design a program to meet their own needs and interests. For example, students may wish to concentrate in Evolutionary Physiology, Quantitative Zoology, or Systematic Zoology for which lists of electives are available from faculty advisors.

Minor (Honours Program)

Students in programs other than Zoology, Wildlife Biology, Marine and Freshwater Biology and Ecology who have a strong interest in Zoology may choose to take a minor in Zoology.

A minor in Zoology requires a minimum of 5.00 credits, 4.00 of which must be from the following list:

BIOL*3110	[0.50]	Population Ecology
BIOL*3120	[0.50]	Community Ecology
ZOO*2070	[0.50]	Invertebrate Zoology I
ZOO*2080	[0.50]	Invertebrate Zoology II
ZOO*2090	[0.50]	Vertebrate Structure and Function
ZOO*2100	[0.50]	Developmental Biology
ZOO*3000	[0.50]	Comparative Histology
ZOO*3200	[0.50]	Comparative Animal Physiology I
ZOO*3210	[0.50]	Comparative Animal Physiology II
ZOO*3300	[0.50]	Evolution
ZOO*4070	[0.50]	Animal Behaviour
ZOO*4090	[0.50]	Ornithology
ZOO*4280	[0.50]	Mammalogy
ZOO*4330	[0.50]	Environmental Biology of Fishes
ZOO*4430	[0.50]	Herpetology

The remaining 1.00 credit may also come from this list or from outside this list, in consultation with a faculty advisor.