2006-2007 Undergraduate Calendar

The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2006-2007 academic year, including the Summer Semester 2006, the Fall Semester 2006 and the Winter Semester 2007.

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 2006

The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2006-2007 academic year, including the Summer Semester 2006, the Fall Semester 2006 and the Winter Semester 2007.

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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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. This is achieved by requiring each student to take a minimum of 1.50 credits (usually 3 courses) in each of the above areas. The courses to be taken in semesters 4 to 6 may be selected to allow a broad study of the sciences.

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 (usually 30 courses) as outlined in the Total Course Requirements for all students in the General Science Program.

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

Semester 2

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

One of:

MATH*2080	[0.50]	Elements of Calculus II
STAT*2040	[0.50]	Statistics I

One of:

PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*2040	[0.50]	Fundamental Electronics and Sensors

0.50 electives

Semester 3

0.50 credits in biological science

0.50 credits in chemistry
0.50 credits in physics
0.50 credits in mathematical science
0.50 electives

Semester 4 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'.

*refer to B.Sc. Program Requirements: Regulation 1, Entry Credits and Regulation 3, 1000 Level Credits

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

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

One of:

CIS*1200	[0.50]	Introduction to Computing
STAT*2040	[0.50]	Statistics I
STAT*2100	[0.50]	Introductory Probability and Statistics

0.50 credits in biological science
0.50 credits in chemistry
0.50 credits in physics
0.50 electives

Semester 4 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'.

*refer to B.Sc. Program Requirements: Regulation 3, 1000 Level Credits

Total Course Requirements for all Students in the General Science Program

Total of 15.00 credits (usually 30 courses) as follows:

1. The Science core - a minimum of 1.50 credits (usually 3 courses) beyond the 4U or OAC level, in each of biological science, chemistry, mathematical science, physics (Refer to "Regulation 3, 1000 Level Credits") - minimum of 6.00 (usually 12 courses)
2. Additional acceptable science credits* - selected from biological science, chemistry, computing and information science, mathematics, statistics, physics, geology or other science courses - 6.00 credits (usually 12 courses)
3. Arts and social science credits - 2.00 credits (usually 4 courses)
4. Additional acceptable credits (these may include one of BIOL*1020, CHEM*1060, PHYS*1020) - 1.00 credits (usually 2 courses)

*at least 2.00 credits (usually 4 courses) of the additional science courses must be 3000 or 4000 level

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
5.00 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*3150	[0.50]	Principles of Farm 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: Nutrition, Breeding and Genetics, and Physiology. 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.

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

Breeding & Genetics [0.50] Required

ANSC*4050	[0.50]	Biotechnology in Animal Science
MBG*3090	[0.50]	Applied Animal Breeding
MBG*4030	[0.50]	Animal Breeding Methods

Physiology [0.50] Required

ANSC*4090	[0.50]	Applied Animal Behaviour
ANSC*4100	[0.50]	Environmental Management and Animal Productivity
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:

AGR*2360	[0.50]	Challenges & Opportunities in Animal Production
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

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
0.50 electives

Fall Semester

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

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*3070 [0.50] Bacterial Genetics
- 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*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

Summer Semester

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

Semester 6 - Fall

MICR*3230 [0.50] Immunology I
One of:
- MBG*3070 [0.50] Bacterial Genetics
- 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

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*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

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

Semester 5 - Winter

BIOC*3560 [0.50] Structure and Function in Biochemistry
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

Semester 6 - Fall

CHEM*3750 [0.50] Organic Chemistry II
MICR*3230 [0.50] Immunology I
One of:
- MBG*3070 [0.50] Bacterial Genetics
- 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

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*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
0.50 electives or restricted 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

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
1.00 Chemistry, Biochemistry or Molecular Biology and Genetics courses at the 3000 or 4000 level ***
0.75 electives or restricted electives *

Semester 8

CHEM*4740 [0.50] Topics in Bio-Organic Chemistry
One of: **
CHEM*4630 [0.50] Bioinorganic Chemistry
CHEM*4720 [0.50] Organic Reactivity
0.50 Chemistry, Biochemistry or Molecular Biology and Genetics course at the 3000 or 4000 level ***
1.00 electives or restricted electives *

* restricted electives required include:

BIOL*2210 [0.50] Introductory Cell Biology
One of:
MICR*2020 [0.50] Microbial Interactions and Associations
MICR*2030 [0.50] Microbial Growth

** CHEM*4630 and CHEM*4720 are offered in alternating winter semesters and both courses are required.

*** the allowable Chemistry, Biochemistry and Molecular Biology and Genetics courses at the 3000 and 4000 level are:

BIOC*4520 [0.50] Metabolic Processes
BIOC*4540 [0.50] Enzymology
BIOC*4550 [0.50] Biochemistry and Structure of Macromolecules
BIOC*4570 [0.50] Applied Biochemistry
BIOC*4580 [0.50] Membrane Biochemistry
CHEM*3440 [0.50] Analytical Chemistry III: Analytical Instrumentation
CHEM*4900 [0.75] Chemistry and Biochemistry Research Project I
CHEM*4910 [0.75] Chemistry and Biochemistry Research Project II
MBG*3350 [0.75] Laboratory Methods in Molecular Biology I
MBG*4080 [0.50] Molecular Genetics
TOX*4590 [0.50] Biochemical Toxicology

Biological Science (BIOS)

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. 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

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 and Toxicology

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:

MICR*3230	[0.50]	Immunology I
NUTR*4200	[0.50]	Nutrition and Immune Function

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

2.00 electives or restricted electives*

Restricted Electives

1. 1 anatomy course from BIOM*3010, HK*3401/2, ZOO*2090 must be completed.
2. A minimum of 1.00 and to a maximum of 2.00 in research experience may be met either by:
   i. completing both HK*4410 and HK*4420
   ii. completing HK*4410 and either HK*4230 or BIOM*4500
   iii. completing both HK*4230 and BIOM*4500
   iv. 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)
   v. equivalent course from another department with the permission of the Faculty Advisor
3. A total of 2.00 credits in Arts and Social Science courses including:
   i. 0.50 credits in philosophy and ethics from PHIL*2030, PHIL*2070, PHIL*2100, PHIL*2120, PHIL*2180
   ii. 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 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
BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2480	[0.50]	Analytical Chemistry I
TOX*2000	[0.50]	Principles of Toxicology

0.50 electives*

Semester 4

CHEM*2700	[0.50]	Organic Chemistry I
MBG*2000	[0.50]	Introductory Genetics

NUTR*3210 [0.50] Fundamentals of Nutrition
STAT*2050 [0.50] Statistics II
0.50 electives*

Semester 5

BIOM*3030 [0.75] Biomedical Histology
BIOM*3100 [0.50] Mammalian Physiology I
MBG*2020 [0.50] Introductory Molecular Biology
TOX*3300 [0.50] Analytical Toxicology
0.50 electives*

Semester 6

BIOC*3560 [0.50] Structure and Function in Biochemistry
BIOM*3090 [0.50] Principles of Pharmacology and Toxicology
BIOM*3110 [0.50] Mammalian Physiology II
BIOM*3120 [0.25] Laboratory Exercises in Mammalian Physiology
PATH*3610 [0.50] Principles of Disease
0.50 electives*

Semester 7

BIOM*4090 [0.50] Pharmacology
MBG*3350 [0.75] Laboratory Methods in Molecular Biology I
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
0.50 electives*

*a minimum of 1.50 must be taken in the College of Arts or the College of Social and Applied Human Sciences

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 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 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

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

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

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

Semester 6 - Fall

BIOM*3030 [0.75] Biomedical Histology
BIOM*3100 [0.50] Mammalian Physiology I
NUTR*4510 [0.50] Toxicology, Nutrition and Food
TOX*3300 [0.50] Analytical Toxicology
0.50 electives

Semester 7 - Winter

BIOM*3090 [0.50] Principles of Pharmacology and Toxicology
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
0.50 electives

Semester 8 - Fall

BIOM*4090 [0.50] Pharmacology
MBG*3350 [0.75] Laboratory Methods in Molecular Biology I
TOX*4000 [0.50] Medical Toxicology
TOX*4590 [0.50] Biochemical Toxicology
0.50 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] Experimental Basis of 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
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

Semester 4 - Summer

BIOC*2580 [0.50] Introductory Biochemistry
MATH*2170 [0.50] Differential Equations I
PHYS*2260 [0.50] Experimental Basis of 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

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

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

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*4350 [0.50] Processing Plant Technology

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 Social and Applied Human Sciences

Minor (Honours Program)

A minimum of 5.00 credits is required.

AGEC*2220 [0.50] Financial Accounting
AGEC*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] 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*3870 [0.50] Symmetry and Spectroscopy
CHEM*4880 [0.50] Topics in Advanced Physical Chemistry
0.50 Arts or Social Science electives

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
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
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

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
0.50 Arts or Social Science electives

Fall Semester

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

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
0.50 electives

Summer Semester

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

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
0.50 electives

Semester 7 - Winter**

PHYS*4040 [0.50] Quantum Mechanics II
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
1.00 electives

Summer Semester

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

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

One of:

MATH*2150	[0.50]	Applied Matrix Algebra
MATH*2160	[0.50]	Linear Algebra I

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

3.00 Chemistry or Biochemistry**

1.50 electives*

*selection of electives is subject to the following rules:

1. at least 1.00 credits in the program must be in the Arts & Social Sciences
2. PHYS*2040 or PHYS*2260
3. students who lack a background in computer science must select one of their electives from CIS*1200 or CIS*1500 to be taken by the end of their second year
4. approval of the chair of the Department of Chemistry and Biochemistry must be obtained for the selection of courses not specifically recommended
5. 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 Departmental 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:

1. Some of these courses may have to be taken in Semester 6.
2. 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
CHEM*2480	[0.50]	Analytical Chemistry I

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

One of:

MATH*2150	[0.50]	Applied Matrix Algebra
MATH*2160	[0.50]	Linear Algebra I

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*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

Semester 6 - Summer

CHEM*3750 [0.50] Organic Chemistry II
One of:
PHYS*2260 [0.50] Experimental Basis of Quantum Physics
0.50 electives*
1.50 electives* or restricted electives**

Fall Semester

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

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 rules:

1. At least 1.00 credits in the program must be in the Arts & Social Sciences.
2. PHYS*2040 or PHYS*2260
3. Students who lack a background in computer science must select one of their electives from CIS*1200 or CIS*1500 to be taken by the end of their second year.

** 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
One of:
MATH*2150 [0.50] Applied Matrix Algebra
MATH*2160 [0.50] Linear Algebra I
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] Experimental Basis of 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 rules:

1. At least 1.00 credits in the program must be in the Arts & Social Sciences.
2. PHYS*2040 or PHYS*2260
3. Students who lack a background in computer science must select one of their electives from CIS*1200 or CIS*1500 to be taken by the end of their second year.

** 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
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
One of:
MATH*2130 [0.50] Numerical Methods
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. Recommended work terms are shown below:

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. A five year option with four work terms is also available. Please see the department's co-op faculty advisor for details.

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

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

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
(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

Semester 6 - Summer

CIS*3490 [0.50] The Analysis and Design of Computer Algorithms
One of:
MATH*2130 [0.50] Numerical Methods
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 - 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

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
(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

Semester 6 - Summer

CIS*3490 [0.50] The Analysis and Design of Computer Algorithms
One of:
MATH*2130 [0.50] Numerical Methods
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

Fall Semester

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

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

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
MATH*1200 [0.50] Calculus I
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
GEOG*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
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. 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
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
BIOL*3120 [0.50] Community 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
1.00 electives

Semester 6

One of:
MBG*3000 [0.50] Population Genetics
ZOO*3300 [0.50] Evolution
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*3200 [0.50] Comparative Animal Physiology I
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 I
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*3110 [0.50] Natural History of Insects
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
PBIO*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
PBIO*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

CHEM*2480	[0.50]	Analytical Chemistry I
BIOC*2580	[0.50]	Introductory Biochemistry
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*		

Stream A

Semester 3 - Fall

CHEM*2480	[0.50]	Analytical Chemistry I
BIOC*2580	[0.50]	Introductory Biochemistry
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

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

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

Fall Semester

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

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
1.00 electives		

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
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

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

Winter Semester

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

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

(ENVB*4420 senior thesis topic to be arranged with faculty advisor)

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*4250	[0.50]	Nursery Production
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
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 Resource Analysis

[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, 2.00 of which must be at the 4000 level. 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
1.00 electives (CIS*2500 recommended if not taken earlier)

Semester 5

MATH*3100 [0.50] Differential Equations II
MATH*3200 [0.50] Real Analysis
One of:
- MATH*3130 [0.50] Algebraic Structures
- 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

Semester 6

MATH*3260 [0.50] Complex Analysis
0.50 credits from a 3000 level statistics
0.50 credits from a 3000 or 4000 level mathematics
1.00 electives

Semester 7

0.50 credits from a 4000 level mathematics***
1.50 electives
One of:
- MATH*3130 [0.50] Algebraic Structures
- MATH*3240 [0.50] Operations Research

Semester 8

1.00 credits from a 4000 level mathematics***

1.50 electives

*students may be exempted from CIS*1500 in Semester 1 upon taking a computer science assessment of computing skills. If exempted from CIS*1500, you are advised to take CIS*2500 in the first semester.

**a student selecting STAT*3100 should take STAT*3110 in semester 6

***a mathematics major must include 2.00 or more credits at the 4000 level in mathematics (which may include STAT*4340) and must include at least 6.00 at the 3000 or 4000 level from the program committee approved list of science electives

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
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3230	[0.50]	Immunology I

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics

0.50 electives

Semester 6

BIOL*3050	[0.50]	Mycology I
MICR*3110	[0.50]	Techniques in Microbiology
MICR*3260	[0.50]	Microbial Adaptation and Development

1.00 electives

Semester 7

MICR*4120	[0.50]	Virology

2.00 electives or restricted electives which can include MICR*4310.

Semester 8

MICR*4290	[0.50]	Microbial Ecology

2.00 electives or restricted electives which can include MICR*4320

Restricted Electives

Of the 8.00 elective credits throughout the program, at least 2.00 must be from the Arts and Social Sciences. For the Major program, 1.50 must be selected from the list below and at least 2.50 must be from the list of approved science electives. (See exception for students taking a minor in an Arts or Social Science subject.) Students in the major program should ensure that at least 1.00 of the electives are 4000 level science courses.

BIOL*4050	[0.50]	Mycology II
BIOC*4540	[0.50]	Enzymology
BIOC*4580	[0.50]	Membrane Biochemistry
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*3220	[0.50]	Plant Microbiology
MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4230	[0.50]	Immunology II
MICR*4240	[0.50]	Topics in Microbiology
MICR*4270	[0.50]	Microbial Design
MICR*4310	[1.00]	Research Project I
MICR*4320	[1.00]	Research Project II
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 5.00 credits:

2.00 credits including:

BIOC*3560	[0.50]	Structure and Function in Biochemistry
MICR*2020	[0.50]	Microbial Interactions and Associations
MICR*2030	[0.50]	Microbial Growth
MICR*3110	[0.50]	Techniques in Microbiology

2.00 credits from:

BIOL*3050	[0.50]	Mycology I
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
MBG*2020	[0.50]	Introductory Molecular Biology
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*4140	[0.50]	Soil Microbiology and Biotechnology
MICR*4180	[0.50]	Microbial Processes in Environmental Management

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics

1.00 credits from:

BIOL*4050	[0.50]	Mycology II
MCB*4080	[0.50]	Applied Microbiology and Biochemistry
MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4120	[0.50]	Virology
MICR*4230	[0.50]	Immunology II
MICR*4270	[0.50]	Microbial Design
MICR*4290	[0.50]	Microbial Ecology
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
PHYS*1080	[0.50]	Physics for Life Sciences
COOP*1100	[0.00]	Introduction to Co-operative Education

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

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
MICR*3120 [0.50] Systematic Bacteriology
MICR*3230 [0.50] Immunology I
One of:
MBG*3070 [0.50] Bacterial Genetics
MBG*3080 [0.50] Bacterial Genetics
0.50 electives

Semester 6 - Winter

BIOL*3050 [0.50] Mycology I
MICR*3110 [0.50] Techniques in Microbiology
MICR*3260 [0.50] Microbial Adaptation and Development
1.00 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

MICR*4290 [0.50] Microbial Ecology
2.00 electives or restricted electives which can include MICR*4310

Summer Semester

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

Semester 8 - Fall

MICR*4120 [0.50] Virology
2.00 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
PHYS*1080 [0.50] Physics for Life Sciences
COOP*1100 [0.00] Introduction to Co-operative Education
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

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

Semester 5 - Winter

BIOL*3050 [0.50] Mycology I
BIOC*3560 [0.50] Structure and Function in Biochemistry
MICR*3110 [0.50] Techniques in Microbiology
1.00 electives

Summer Semester

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

Semester 6 - Fall

MICR*3120 [0.50] Systematic Bacteriology
MICR*3230 [0.50] Immunology I
One of:
MBG*3070 [0.50] Bacterial Genetics
MBG*3080 [0.50] Bacterial Genetics
1.00 electives

Semester 7 - Winter

MICR*3260 [0.50] Microbial Adaptation and Development
MICR*4290 [0.50] Microbial Ecology
1.50 electives or restricted electives which can include MICR*4310

Summer Semester

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

Semester 8 - Fall

MICR*4120 [0.50] Virology
2.00 electives or restricted electives which can include MICR*4320

Restricted Electives

Of the 8.00 elective credits throughout the program, at least 2.00 must be from the Arts and Social Sciences. For the Major program, 1.50 must be selected from the list below and at least 2.50 must be from the list of approved science electives. (See exception for students taking a minor in an Arts or Social Science subject.) Students in the major program should ensure that at least 1.00 of the electives are 4000 level science courses.

BIOL*4050 [0.50] Mycology II
BIOC*4540 [0.50] Enzymology
BIOC*4580 [0.50] Membrane Biochemistry
FOOD*3230 [0.75] Food Microbiology
FOOD*3260 [0.50] Industrial Microbiology
MCB*4080 [0.50] Applied Microbiology and Biochemistry
MICR*3220 [0.50] Plant Microbiology
MICR*4010 [0.50] Pathogenic Bacteriology
MICR*4230 [0.50] Immunology II
MICR*4240 [0.50] Topics in Microbiology
MICR*4270 [0.50] Microbial Design
MICR*4310 [1.00] Research Project I
MICR*4320 [1.00] Research Project II
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 departmental 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
One of:
PHYS*1000 [0.50] An Introduction to Mechanics
PHYS*1070 [0.50] Introductory Physics for Life Sciences
One of:
MATH*1080 [0.50] Elements of Calculus I
MATH*1200 [0.50] Calculus I
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
One of:
CIS*1200 [0.50] Introduction to Computing
CIS*1500 [0.50] Introduction to Programming
One of:
PHYS*1010 [0.50] Introductory Electricity and Magnetism
PHYS*1080 [0.50] Physics for Life Sciences
0.50 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
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

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.

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*4290	[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*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*4160	[0.50]	Plant Breeding
MBG*4200	[0.50]	Transmission Genetics
MBG*4240	[0.50]	Applied Molecular Genetics
MBG*4270	[0.50]	DNA Replication, Recombination and Repair
MCB*4010	[0.50]	Advanced Cell Biology
MCB*4050	[0.50]	Protein and Nucleic Acid Structure
MICR*4120	[0.50]	Virology

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics

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*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*4160	[0.50]	Plant Breeding
MBG*4200	[0.50]	Transmission Genetics
MBG*4240	[0.50]	Applied Molecular Genetics
MBG*4270	[0.50]	DNA Replication, Recombination and Repair
MCB*4010	[0.50]	Advanced Cell Biology
MCB*4050	[0.50]	Protein and Nucleic Acid Structure
MICR*4120	[0.50]	Virology

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics

One of:

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

Neuroscience (NEUR)

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

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 and Toxicology
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 and Toxicology
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:

HK*4410 [0.50] Research Concepts
HK*4420 [0.50] Research Modules
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

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
  (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]	Experimental Basis of 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

Semester 4 - Summer

MATH*2170 [0.50] Differential Equations I
PHYS*2260 [0.50] Experimental Basis of 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
BOT*2100 [0.50] Life Strategies of Plants
BIOC*2580 [0.50] Introductory Biochemistry
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*4600 [0.75] Plant Environment Interaction and Stress Physiology
   - 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 I
   - CROP*3300 [0.50] Grain Crops
   - CROP*3310 [0.50] Protein and Oilseed Crops
   - CROP*3330 [0.50] Forage Crops: Science and Technology
   - CROP*4240 [0.50] Weed Science
   - ENVB*2030 [0.50] Current Issues in Forest Science
   - ENVB*3210 [0.50] Plant Pathology
   - ENVB*4000 [0.50] Plant Disease Management
   - 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

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

PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant-Microbe Interactions
PBIO*4300	[1.00]	Research Opportunities in Plant Biotechnology I

1.00 electives or restricted electives

Semester 8

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

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
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*4120	[0.50]	Virology
MICR*4230	[0.50]	Immunology II
PBIO*3110	[0.50]	Crop Physiology
PBIO*4310	[1.00]	Research Opportunities in Plant Biotechnology II
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] Experimental Basis of 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
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

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
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 and will include:

BIOL*1030 [0.50] Biology I
BIOL*1040 [0.50] Biology II
4.00 additional credits in Zoology (ZOO*) courses at the 2000 level or higher