

X—Degree Programs, 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 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 the course requirements for the program and have achieved a 60%, or higher, cumulative average. 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 credit (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.

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.

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.

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 (usually 14 courses) at the 1000 level.

4. 3000 and 4000 Level Credits

There is a requirement for a minimum of 6.00 credits (usually 12 courses) at the 3000- and 4000-levels with a minimum of 2.00 credits (usually 4 courses) 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 departmental advisors and the program counsellors and on the world wide web at the following address: http://www.cpes.uoguelph.ca/BSc/approved_electives.htm.

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](#). A cumulative average of 70% or higher in certain subjects is normally required for students wishing to enter semester 3 of some of the honours major programs.

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 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 pass standing in a minimum of 15.00 acceptable credits (usually 30 courses).

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 the Life Sciences I
0.50 Arts or Social Science elective		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
0.50 elective		
One of:		
MATH*2080	[0.50]	Elements of Calculus II
STAT*2040	[0.50]	Statistics I
One of:		
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
PHYS*2040	[0.50]	Fundamental Electronics and Sensors

Semester 3

0.50 credit in biological science	
0.50 credit in chemistry	
0.50 credit in physics	
0.50 credit in mathematical science	

0.50 elective

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 elective

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 elective

Semester 3

0.50 credit in biological science

0.50 credit in chemistry

0.50 credit in physics

0.50 elective

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1650	[0.50]	Programming I
STAT*2040	[0.50]	Statistics I
STAT*2100	[0.50]	Introductory Probability and Statistics

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 credit (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](#)
- 20.00 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:

- 20.25 credits – [Biochemistry](#)
- 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:

- 20.75 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 departmental advisor.

Biological Sciences:

- 5.00 credits – [Biology](#)
- 5.00 credits – [Biomedical Science](#)
- 5.00 credits – [Biotechnology](#)
- 5.00 credits – [Functional Foods and Nutraceuticals](#)
- 5.00 credits – [Genetics](#)
- 5.00 credits – [Microbiology](#)
- 5.00 credits – [Neuroscience](#)
- 5.00 credits – [Nutritional Sciences](#)
- 5.00 credits – [Plant Biology](#)
- 5.00 credits – [Zoology](#)

Physical Sciences:

- 5.00 credits – [Biochemistry](#)
- 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:

- 5.00 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 20.00 credits (usually 8 semester) honours B.Sc. program, the student must have completed successfully the courses approved for the program.

Note: A student registered in an honours program who has passed 20.00 credits (usually 40 or more course attempts) but who is not eligible to continue in the honours program may be granted the degree 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 departmental 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 the science 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.

X—Degree Programs, Bachelor of Science (B.Sc.)

Animal Biology (ABIO)

Department of Animal and Poultry Science, Ontario Agricultural College.

Faculty Advisor: Dr. J.L. Atkinson, ANNU 249, ext. 53716.

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 the Life Sciences I

0.50 elective or restricted elective

Semester 2

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

0.50 elective or restricted elective

One of:

CIS*1000	[0.50]	Introduction to Computer Applications
CIS*1200	[0.50]	Introduction to Computing
CIS*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Semester 3

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

0.50 elective or restricted elective

Semester 4

ANSC*2340	[0.50]	Structure of Farm Animals
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3190	[0.50]	Fundamentals of Nutrition

1.00 elective or restricted elective

Note: A 3000 level Chemistry is recommended for students considering MCAT examinations.

Semester 5

AGR*2350	[0.50]	Animal Production Systems and Industry
ANSC*3080	[0.50]	Agricultural Animal Physiology
ANSC*3120	[0.50]	Introduction to Animal Nutrition

1.00 electives or restricted electives

Semester 6

ANSC*3150	[0.50]	Principles of Farm Animal Care and Welfare
ANSC*4120	[0.50]	Fundamentals of Animal Reproduction
MBG*3060	[0.50]	Quantitative Genetics

1.00 credit from electives or restricted electives

Semester 7

ANSC*4050	[0.50]	Recombinant DNA in Animal Science
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2.00 electives or restricted electives

Note: AGR*2360 is highly recommended as an elective course in semester 7

Semester 8

ANSC*4470	[0.50]	Animal Metabolism
ANSC*4480	[0.50]	Applied Endocrinology

1.50 electives or restricted electives

Restricted Electives

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

At least 3.00 credits must be obtained from the following list of courses. Students are encouraged to consult with the Faculty Advisor both for help in tailoring their selection to meet personal and career interests and to avoid problems due to differences in the credit weightings and frequency with which specific courses are offered.

AGR*2360	[0.75]	Challenges and Opportunities in Animal Production
ANSC*2200	[0.50]	Principles of Aquaculture
ANSC*4070	[0.50]	Applied Animal Behaviour
ANSC*4080	[0.50]	Environmental Management and Animal Productivity
ANSC*4130	[0.50]	Reproductive Management and Technology
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
ANSC*4610	[0.50]	Critical Analysis in Animal Science
CHEM*3560	[0.50]	Structure and Function in Biochemistry
MBG*3090	[0.50]	Applied Animal Breeding
MBG*4030	[0.50]	Animal Breeding Methods
NUTR*3340	[0.50]	Nutrition of Fish and Crustacea
NUTR*3350	[0.50]	Wildlife Nutrition

Note: At least 16.00 science credits must be completed. A list of acceptable science credits is available from the Faculty Advisor.

X—Degree Programs, Bachelor of Science (B.Sc.)

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

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

Major (Honours Program)

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 credit in Computing and Information Science, and 1.00 credit in Arts or Social Sciences courses.

Semester 1 – Fall

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1650	[0.50]	Programming I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

Semester 2 – Winter

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
CIS*2650	[0.50]	Programming II
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*2100	[0.50]	Introductory Probability and Statistics

0.50 Arts or Social Science elective

Winter Semester

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

Please consult with the departmental advisor.

Semester 4 – Summer

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

0.50 Arts or Social Science elective

0.50 elective

Fall Semester

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

1.00 credit in Mathematics or Statistics at the 3000 level or above

1.50 elective

Summer Semester

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

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

0.50 elective

At least 1.00 credit from:

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

Semester 7 – Winter

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

0.50 elective

Summer Semester

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

2.00 credits in Mathematics or Statistics at the 4000 level

0.50 elective

Electives must include:

1.00 credit 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

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MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MICR*3230	[0.50]	Immunology I
MICR*4260	[0.50]	Microbial Technology
TOX*4590	[0.50]	Biochemical Toxicology

Biochemistry (BIOC)

Department of Chemistry and Biochemistry, College of Physical and Engineering Science.

Major (Honours Program)

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 elective		

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
One of:		
CIS*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Semester 3

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

Semester 4

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

Semester 5

CHEM*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 elective		

Semester 6

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

Semester 7

CHEM*4520	[0.50]	Metabolic Processes
MICR*3230	[0.50]	Immunology I
1.00 electives		
One of:		
MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics
MBG*4080	[0.50]	Molecular Genetics

Semester 8

CHEM*4540	[0.50]	Enzymology
CHEM*4580	[0.50]	Membrane Biochemistry
1.50 electives		

Electives

Selection of electives is subject to the following rules:

- At least 1.00 credits in the program must be in the Arts and Social Sciences.
- One of CHEM*4570 and MICR*4260 must be taken during the program.
- One of CHEM*4550, MBG*4350, TOX*4590 must be taken during the program.
- One of the following courses (0.50 credits) must be taken during the program: 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:

CHEM*2580	[0.50]	Introductory Biochemistry
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3560	[0.50]	Structure and Function in Biochemistry
CHEM*3570	[0.50]	Analytical Biochemistry
CHEM*4540	[0.50]	Enzymology

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:

CHEM*4520	[0.50]	Metabolic Processes
CHEM*4570	[0.50]	Applied Biochemistry
CHEM*4580	[0.50]	Membrane Biochemistry

X—Degree Programs, Bachelor of Science (B.Sc.)

Biochemistry (Co-op) (BIOC:C)

Department of Chemistry and Biochemistry, College of Physical and Engineering 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 Departmental 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 elective		

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*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Summer Semester

No academic semester or work term

Semester 3 – Fall

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

Winter Semester

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

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3570	[0.50]	Analytical Biochemistry
STAT*2040	[0.50]	Statistics I
0.50 elective		

Semester 5 – Fall

CHEM*3560	[0.50]	Structure and Function in Biochemistry
CHEM*3750	[0.50]	Organic Chemistry II
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
0.50 elective		

Winter Semester

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

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

MICR*3230	[0.50]	Immunology I
1.50 elective		

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics
MBG*4080	[0.50]	Molecular Genetics

Semester 7 – Winter

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

Summer Semester

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

CHEM*4520	[0.50]	Metabolic Processes
2.00 electives		

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 elective		

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*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Summer Semester

No academic semester or work term

Semester 3 – Fall

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

Winter Semester

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

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3570	[0.50]	Analytical Biochemistry
STAT*2040	[0.50]	Statistics I

0.50 elective

Fall Semester

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

CHEM*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
PHYS*2030	[0.50]	Biophysics of Excitable Cells
0.50 elective		

Summer Semester

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

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

One of:

MBG*3070	[0.50]	Bacterial Genetics
MBG*3080	[0.50]	Bacterial Genetics
MBG*4080	[0.50]	Molecular Genetics

Semester 7 – Winter

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

Summer Semester

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

CHEM*4520	[0.50]	Metabolic Processes
2.00 electives		

X—Degree Programs, Bachelor of Science (B.Sc.)

Biological Chemistry (BCHM)

Department of Chemistry and Biochemistry, College of Physical and Engineering Science.

Major (Honours Program)

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 elective

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 elective

Semester 3

CHEM*2060 [0.50] Structure and Bonding
 CHEM*2400 [0.75] Analytical Chemistry I
 CHEM*2580 [0.50] Introductory Biochemistry
 MBG*2000 [0.50] Introductory Genetics
 0.50 elective or restricted elective *

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 elective or restricted elective *

Semester 5

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

Semester 6

CHEM*3560 [0.50] Structure and Function in Biochemistry
 CHEM*3650 [0.50] Chemistry of the Elements II
 CHEM*3760 [0.50] Organic Chemistry III
 0.50 elective or restricted elective *

One of: **

CHEM*4630 [0.50] Bioinorganic Chemistry
 CHEM*4720 [0.50] Organic Reactivity

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 elective or restricted elective *

Semester 8

CHEM*4740 [0.50] Topics in Bio–Organic Chemistry
 1.00 Chemistry, Biochemistry or Molecular Biology and Genetics courses at the 3000 or 4000 level ***
 1.00 elective or restricted elective *

One of: **

CHEM*4630 [0.50] Bioinorganic Chemistry
 CHEM*4720 [0.50] Organic Reactivity

* 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:

CHEM*3440 [0.50] Analytical Chemistry III: Analytical Instrumentation
 CHEM*4520 [0.50] Metabolic Processes
 CHEM*4540 [0.50] Enzymology
 CHEM*4550 [0.50] Biochemistry and Structure of Macromolecules
 CHEM*4570 [0.50] Applied Biochemistry
 CHEM*4580 [0.50] Membrane Biochemistry
 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

X—Degree Programs, Bachelor of Science (B.Sc.)

Biological Science (BIOS)

College of Biological Science.

Major (Honours Program)

This major will require the completion of 20.00 credits as indicated below:

1. First year Core – 4.00 credits
 - 1.00 – Biology BIOL*1030BIOL*1040
 - 1.00 – Chemistry CHEM*1040CHEM*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*1200, MATH*2080, STAT*2040
2. Subject Area Core – 8.00 credits
 - 0.50 – BIOL*2210
 - 0.50 – CHEM*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
 0.50 Arts or Social Science elective

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 the Life Sciences I

Semester 2

BIOL*1040 [0.50] Biology II
 CHEM*1050 [0.50] General Chemistry II
 0.50 Mathematical science from:
 CIS*1200 [0.50] Introduction to Computing
 CIS*1500 [0.50] Introduction to Programming
 CIS*1650 [0.50] Programming I
 MATH*1210 [0.50] Calculus II
 MATH*2080 [0.50] Elements of Calculus II
 STAT*2040 [0.50] Statistics I

0.50 Arts or Social Science elective

One of:

PHYS*1010 [0.50] Introductory Electricity and Magnetism
 PHYS*1080 [0.50] Introductory Physics for the Life Sciences II

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

1.00 electives *

One of:

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

Semester 4

STAT*2040 [0.50] Statistics I
 1.50 electives

One of:

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

Semester 5

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

One course in Physiology from:

BIOM*3100 [0.50] Mammalian Physiology I
 BOT*3310 [0.50] Plant Physiology
 HK*3940 [1.25] Human Physiology

ZOO*3200 [0.50] Comparative Animal Physiology I

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.

**X—Degree Programs, Bachelor of Science
(B.Sc.)**

Biology (BIOL)

Dean's Office, 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 [Departments of Botany, Human Biology and Nutritional Sciences, Microbiology, Molecular Biology and Genetics](#) and [Zoology](#). This minor is intended for students registered in majors in B.Sc. Physical Sciences and the B.A. degree programs.

X—Degree Programs, Bachelor of Science (B.Sc.)

Bio–Medical Science (BIOM)

Department of Biomedical Sciences and Department of Human Biology and Nutritional Sciences.

Faculty Advisor: G. Partlow, Ext. 54917, OVC Room 1685.

This joint program of the [Department of Human Biology 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 co-ordinator of the major.

You may declare the Bio–Medical Science major at entrance from high school or during your first year. Acceptance into this major is confirmed at one entry point per year at the end of the Winter semester. To continue from first year, you must obtain a 70% average in 5.00 credits, including the seven core courses as prescribed by the Schedule of Studies (see below).

Students who are in the process of completing a minimum of 9.00 or 14.00 credits may also apply to the major during the winter semester. Admission is competitive based on academic performance and available spaces. To be considered, students must obtain a minimum 70% average in each of the previous two full-time semesters (or equivalent) and the signature of the course coordinator. Meeting these minimum requirements does not guarantee admission to the major. Decisions are made at the end of the Winter semester.

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 by 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 the Life Sciences I

0.50 elective or restricted elective

Semester 2

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

1.00 electives or restricted electives

Semester 3 (see admission statement above)

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*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

CHEM*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

POP*3240 [0.50] Epidemiology
Electives or restricted electives (to a maximum of 3.00 total credits as desired)

One of:

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

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 3.00 total credits as desired)*

Note: As part of the electives or restricted electives (to a maximum of 3.00 total credits as desired) students must select BIOM*3110 and BIOM*3120 in Semester 6 if BIOM*3100 was selected in Semester 5.

Semester 7

1.25 to 1.50 electives or restricted electives*

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

Semester 8

PATH*3610 [0.50] Principles of Disease

2.00 electives or restricted electives*

Restricted Electives

- 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:
 - completing both HK*4410 and HK*4420
 - completing HK*4410 and either HK*4230 or BIOM*4500
 - completing both HK*4230 and BIOM*4500
 - completing one of the 1.00 in research courses in either the [Department of Human Biology and Nutritional Sciences](#) (HK*4360 or HK*4371/2) or in the [Department of Biomedical Sciences](#) (BIOM*4510 or BIOM*4521/2)
 - equivalent course from another department with the permission of the coordinator
3. A total of 2.00 credits in Arts and Social Science courses including:
 - 0.50 credit in philosophy and ethics from PHIL*2030, PHIL*2070, PHIL*2100, PHIL*2120, PHIL*2180
 - 0.50 credit in either psychology (PSYC*XXXX) or sociology (SOC*XXXX)

X—Degree Programs, Bachelor of Science (B.Sc.)

Biomedical Science (BMED)

Department of Biomedical Sciences, Ontario Veterinary College.

Minor (Honours Program)

The minor requires 5.00 credits as listed below.

- a) Physiology – one of the following groups:
- i) Group A
 - BIOM*3100 [0.50] Mammalian Physiology I
 - BIOM*3110 [0.50] Mammalian Physiology II
 - BIOM*3120 [0.25] Laboratory Exercises in Mammalian Physiology
 - ii) Group B
 - HK*3940 [1.25] Human Physiology
 - iii) Group C
 - ZOO*3200 [0.50] Comparative Animal Physiology I
 - ZOO*3210 [0.50] Comparative Animal Physiology II
- b) Anatomy – One of:
- BIOM*3010 [0.50] Laboratory Animal Anatomy
 - ZOO*2090 [0.50] Vertebrate Structure and Function
- Note: students in the Human Kinetics program will be permitted to substitute HK*3401/2 for BIOM*3010 or ZOO*2090
- c) Pharmacology –
- BIOM*3090 [0.50] Principles of Pharmacology and Toxicology
- d) Toxicology – One of:
- ENVB*3030 [0.50] Pesticides and the Environment
 - NUTR*4510 [0.50] Toxicology, Nutrition and Food
 - TOX*2000 [0.50] Principles of Toxicology
 - TOX*4100 [0.50] Toxicological Pathology
 - TOX*4590 [0.50] Biochemical Toxicology
- e) Histology and Cell Biology – One of:
- BIOL*2210 [0.50] Introductory Cell Biology
 - BIOM*3030 [0.75] Biomedical Histology
 - ZOO*3000 [0.50] Comparative Histology
- f) Pathology – One of:
- PATH*3610 [0.50] Principles of Disease
 - PATH*4100 [0.50] Diseases of Aquatic Animals

Electives

To complete the minimum of 5.00 credits, electives may be selected from any area listed above, 3000 or 4000 level courses in biochemistry (CHEM*35XX, CHEM*45XX, CHEM*4630), biomedical sciences, human kinetics, microbiology, molecular biology and genetics, nutrition or from the following list:

- PHYS*2030 [0.50] Biophysics of Excitable Cells
- POPM*3240 [0.50] Epidemiology
- POPM*4040 [0.50] Epidemiology of Food-borne Diseases
- POPM*4230 [0.50] Animal Health
- PSYC*3030 [0.50] Behavioural Aspects of Drug Action
- PSYC*3040 [0.50] Current Issues in Neuropsychology
- PSYC*3410 [0.50] Behavioural Basis of Neuroscience II
- STAT*2040 [0.50] Statistics I
- STAT*2050 [0.50] Statistics II
- ZOO*4170 [0.50] Experimental Comparative Animal Physiology
- ZOO*4470 [0.50] Comparative Endocrinology

X—Degree Programs, Bachelor of Science (B.Sc.)

Biomedical Toxicology (BTOX)

Interdisciplinary Program, Department of Biomedical Sciences, Ontario Veterinary College.

Faculty Advisor: Herman Boermans, Ext. 54984, Department of Biomedical Sciences.

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. Academic counselling is available through the Coordinator of Toxicology Programs or through the [Department of Biomedical Sciences](#).

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 the Life Sciences I
0.50 elective*		

Semester 2

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

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2480	[0.50]	Analytical Chemistry I
CHEM*2580	[0.50]	Introductory Biochemistry
TOX*2000	[0.50]	Principles of Toxicology
0.50 elective*		

Semester 4

CHEM*2700	[0.50]	Organic Chemistry I
MBG*2000	[0.50]	Introductory Genetics
NUTR*3190	[0.50]	Fundamentals of Nutrition
STAT*2050	[0.50]	Statistics II
0.50 elective*		

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 elective*		

Semester 6

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
CHEM*3560	[0.50]	Structure and Function in Biochemistry
NUTR*4510	[0.50]	Toxicology, Nutrition and Food
PATH*3610	[0.50]	Principles of Disease

Semester 7

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 elective*		

Semester 8

NUTR*4510	[0.50]	Toxicology, Nutrition and Food
STAT*3510	[0.50]	Environmental Risk Assessment
TOX*4100	[0.50]	Toxicological Pathology
TOX*4200	[0.50]	Topics in Toxicology
0.50 elective*		

One of the following not taken in Semester 6:

NUTR*4510	[0.50]	Toxicology, Nutrition and Food
0.50 elective		

*a minimum of 1.50 must be taken in the [College of Arts](#) or the [College of Social and Applied Human Sciences](#)

X—Degree Programs, Bachelor of Science (B.Sc.)

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

Interdisciplinary Program, Department of Biomedical Sciences, Ontario Veterinary College.

Faculty Advisor: Herman Boermans, Ext. 54984, Department of Biomedical Sciences.

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. Academic counselling is available through the Coordinator of Toxicology Programs or through the [Department of Biomedical Sciences](#).

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 the Life Sciences I
0.50 elective*		

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]	Introductory Physics for the Life Sciences II
STAT*2040	[0.50]	Statistics I
0.50 elective*		

Stream A

Fall Semester 3: CHEM*2480, CHEM*2580, MBG*2000, TOX*2000, 0.50 elective

Winter: COOP*1000

Summer Semester 4: BIOL*2210, CHEM*2700, PATH*3610, STAT*2050, 0.50 elective

Fall: COOP*2000

Winter Semester 5: CHEM*3560, MBG*2020, NUTR*3190, STAT*3510, 0.50 elective

Summer: COOP*3000

Fall Semester 6: BIOM*3030, BIOM*3100, TOX*3300, 1.00 elective

Winter Semester 7: NUTR*4510*, BIOM*3090, BIOM*3110, BIOM*3120, TOX*4100, TOX*4200

Fall Semester 8: BIOM*4090, MBG*3350, TOX*4000, TOX*4590, 0.50 elective

*if NUTR*4510 is not offered in this academic year, an alternative 4000 level course must be selected with the approval of the academic counsellor

Stream B

Summer Semester 3: BIOL*2210, CHEM*2480, CHEM*2580, STAT*2050, 0.50 elective

Fall: COOP*1000

Winter Semester 4: CHEM*2700, CHEM*3560, MBG*2000, NUTR*3190, 0.50 elective

Summer: COOP*2000

Fall Semester 5: BIOM*3100, TOX*2000, TOX*3300, 1.00 elective

Winter Semester 6: BIOM*3090, BIOM*3110, BIOM*3120*, MBG*2020, NUTR*4510**

Summer: COOP*3000, PATH*3610

Fall Semester 7: BIOM*3030, BIOM*4090, MBG*3350, TOX*4000, TOX*4590

Winter Semester 8: STAT*3510, TOX*4100, TOX*4200, 1.00 elective

**if NUTR*4510 is not available in Semester 6, it must be taken in Semester 8

X—Degree Programs, Bachelor of Science (B.Sc.)

Biophysics (BIOP)

Department of Physics, College of Physical and Engineering Science.

Major (Honours Program)

A grade of 70% in the physics and biology courses of semesters 1 and 2 is normally required for admission to semester 3 of this 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.

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

One of:

CIS*1500 [0.50] Introduction to Programming
CIS*1650 [0.50] Programming I

Note: Students who have had no prior programming experience should take CIS*1500, and if they are planning to take further CIS courses should consult their Program Counsellor.

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 the Life Sciences I
PHYS*1110 [0.50] Introductory Physics with Applications I

Semester 2

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

0.50 Arts or Social Science elective

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

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

One of (MATH*1210 recommended):

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

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

CHEM*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

CHEM*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

CHEM*4570 [0.50] Applied Biochemistry
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 elective

One of:

PHYS*4500 [0.50] Advanced Physics Laboratory

0.50 elective

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

Semester 8

CHEM*4580 [0.50] Membrane Biochemistry
PHYS*4510 [0.50] Advanced Physics Project
0.50 Arts or Social Science elective
0.50 elective

One of:

PHYS*4150 [0.50] Solid State Physics

0.50 elective

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](#).

X—Degree Programs, Bachelor of Science (B.Sc.)

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 Departmental 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]	Introductory Physics for the Life Sciences II
PHYS*1130	[0.50]	Introductory Physics with Applications II

One of:

CIS*2650	[0.50]	Programming II
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0.50 Arts or Social Science elective

One of:

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

Semester 3 – Fall

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

One of:

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

Winter Semester

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

CHEM*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 elective*

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

Fall Semester

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

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

Summer Semester

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

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

1.00 elective

Semester 7 – Winter

CHEM*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 elective

Summer Semester

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

CHEM*4570	[0.50]	Applied Biochemistry
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
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0.50 elective

X—Degree Programs, Bachelor of Science (B.Sc.)

Biotechnology (BIOT)

Department of Microbiology, College of Biological Science.

Minor (Honours Program)

CHEM*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:		
COST*1000	[0.50]	Introduction to Marketing Management
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
Three of:		
ANSC*2200	[0.50]	Principles of Aquaculture
ANSC*4050	[0.50]	Recombinant DNA in Animal Science
CHEM*4570	[0.50]	Applied Biochemistry
FOOD*3260	[0.50]	Industrial Microbiology
MBG*4240	[0.50]	Applied Molecular Genetics
MICR*3230	[0.50]	Immunology I
MICR*4180	[0.50]	Microbial Processes in Environmental Management
MICR*4260	[0.50]	Microbial Technology
PBIO*3750	[0.50]	Plant Tissue Culture

**X—Degree Programs, Bachelor of Science
(B.Sc.)**

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
COST*3040	[0.50]	Business and Consumer Law
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

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
COST*1000	[0.50]	Introduction to Marketing Management

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.

X—Degree Programs, Bachelor of Science (B.Sc.)

Chemistry (CHEM)

Department of Chemistry and Biochemistry, College of Physical and Engineering Science.

Major (Honours Program)

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 elective

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 elective

Semester 3

CHEM*2060	[0.50]	Structure and Bonding
CHEM*2400	[0.75]	Analytical Chemistry I
CHEM*2580	[0.50]	Introductory Biochemistry

0.50 elective*

One of:

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

Semester 4

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

0.50 elective*

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 elective*

Semester 6

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

1.50 elective* or restricted elective**

Semester 7 and 8

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

1.50 electives*

*selection of electives is subject to the following rules:

- at least 1.00 credits in the program must be in the Arts & Social Sciences
- PHYS*2040 or PHYS*2260
- students who lack a background in computer science must select one of their electives from CIS*1200, CIS*1500, CIS*1650 to be taken by the end of their second year
- approval of the chair of the [Department of Chemistry and Biochemistry](#) must be obtained for the selection of courses not specifically recommended
- 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 from the 3000/4000 level as follows:

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

Note:

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

Minor (Honours Program)

A minor in Chemistry consists of at least 5.00 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

**X—Degree Programs, Bachelor of Science
(B.Sc.)****Chemistry (Co-op) (CHEM:C)**

Department of Chemistry and Biochemistry, College of Physical and Engineering Science.

Major (Honours Program)

The following plan is recommended. The course content of semesters 1 to 3 is the same as listed above for the regular [Honours Program Major](#). Co-op students 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 immediately after semester 3 and completion of CHEM*2400. Since certain courses must be taken in a different semester from usual, consult your Departmental 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.

Fall: Academic Semester 1

Winter: Academic Semester 2

Summer: No Academic Semester or Work Term

Fall: Academic Semester 3

Winter: COOP*1000

Summer: Academic Semester 4

Fall: Academic Semester 5

Winter: COOP*2000

Summer: Academic Semester 6

Fall: COOP*3000

Winter: Academic Semester 7

Summer: COOP*4000

Fall: Academic Semester 8

X—Degree Programs, Bachelor of Science (B.Sc.)

Chemical Physics (CHPY)

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

Major (Honours Program)

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

One of:

CIS*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Note: Students who have had no prior programming experience should take CIS*1500, and if they are planning to take further CIS courses should consult their Program Counsellor.

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 elective

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

0.50 Arts or Social Science elective

One of:

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

Semester 7

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

Semester 8

IPS*4002	[0.75]	Chemical Physics Research Project
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1.50 elective

One of:

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

X—Degree Programs, Bachelor of Science (B.Sc.)

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 Biochemistry and the Department of Physics.

Major (Honours Program)

A minimum of 21.25 credits is required.

Semester 1

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

Semester 2

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*2650	[0.50]	Programming II
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0.50 Arts or Social Science elective

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

Winter Semester

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

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 elective

Fall Semester

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

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

One of:

CHEM*3870	[0.50]	Symmetry and Spectroscopy
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0.50 elective

Summer Semester

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

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
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0.50 elective in odd numbered years

Semester 7

PHYS*4040	[0.50]	Quantum Mechanics II
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0.50 Arts or Social Science elective

1.00 elective

One of:

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

Summer Semester

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

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 elective

X—Degree Programs, Bachelor of Science (B.Sc.)

Computing and Information Science (CIS)

Department of Computing and Information Science, College of Physical and Engineering Science.

Major (Honours Program)

Note that some of these courses may have to be taken in Semester 6.

A average grade of 70% in CIS*1650, CIS*1900, CIS*2650, MATH*1200 and MATH*1210 in semesters 1 and 2 is normally required but does not guarantee admission to semester 3 of the Computing and Information Science program.

Semester 1

CIS*1650 [0.50] Programming I

MATH*1200 [0.50] Calculus I

Two of (only one of PHYS*1000 or PHYS*1110 may be selected): *

BIOL*1030 [0.50] Biology I

CHEM*1040 [0.50] General Chemistry I

PHYS*1000 [0.50] An Introduction to Mechanics

PHYS*1110 [0.50] Introductory Physics with Applications I

One of:

ENGL*1200 [0.50] Reading the Contemporary World

ENGL*1410 [0.50] Major English Writers

Semester 2

CIS*1900 [0.50] Discrete Structures in Computer Science

CIS*2650 [0.50] Programming II

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] Introductory Physics with Applications II

Semester 3

CIS*2030 [0.50] Structure and Application of Microcomputers

CIS*2420 [0.50] Data Structures

MATH*2150 [0.50] Applied Matrix Algebra

0.50 elective**

One of (STAT*2100 is preferred):

STAT*2040 [0.50] Statistics I

STAT*2100 [0.50] Introductory Probability and Statistics

Note: CIS*2450 is substituted for CIS*2030 in Semester 3 by students in Stream A of the Co-op program.

Semester 4

CIS*2450 [0.50] Software Systems Development and Integration

CIS*3110 [0.50] Operating Systems

1.00 elective**

One of:

MATH*2130 [0.50] Numerical Methods

0.50 elective

Note: MATH*2130 in Semester 4 or MATH*3240 in Semester 5 must be taken.

Semester 5

CIS*3430 [0.50] System Analysis and Design in Applications

CIS*3530 [0.50] Data Base Systems and Concepts

CIS*3650 [0.50] Compilers

0.50 elective**

One of:

MATH*3240 [0.50] Operations Research

0.50 elective

Note: MATH*2130 in Semester 4 or MATH*3240 in Semester 5 must be taken.

Semester 6

CIS*3120 [0.50] Digital Systems

CIS*3200 [0.50] Software Engineering

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

1.00 elective**

Semester 7

CIS*4600 [0.50] Elements of Theory of Computation

0.50 4000 level CIS course

0.50 3000 level or 4000 level CIS course

1.00 elective**

Semester 8

1.00 from a CIS course at the 4000 level

1.50 elective**

*a third must be taken before graduation

**electives must include at least 1.50 in science courses with at least 0.50 at the 3000 level or above and at least 1.00 credit must be in the Arts or Social Sciences, and 1.00 remaining credit in the introductory science sequence (see * semesters 1 and 2)

Minor (Honours Program)

CIS*1650 [0.50] Programming I

CIS*1900 [0.50] Discrete Structures in Computer Science

CIS*2420 [0.50] Data Structures

CIS*2450 [0.50] Software Systems Development and Integration

CIS*2650 [0.50] Programming II

CIS*3110 [0.50] Operating Systems

CIS*3430 [0.50] System Analysis and Design in Applications

STAT*2100 [0.50] Introductory Probability and Statistics

2.00 additional credits from CIS courses at the 2000 level or above

X—Degree Programs, Bachelor of Science (B.Sc.)

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:

Work/Study Semesters

	YR.1	YR.2	YR.3	YR.4
Fall	1	COOP*1000	5	7
Winter	2	4	COOP*3000	8
Summer	3	COOP*2000	6	

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 academic advisor for details.

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

X—Degree Programs, Bachelor of Science (B.Sc.)

Ecology (ECOL)

Department of Botany, College of Biological Science.

Department of Zoology, 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)

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 the Life Sciences I
0.50 Arts or Social Science elective		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
0.50 Arts or Social Science elective		

One of:

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

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2580	[0.50]	Introductory Biochemistry
STAT*2040	[0.50]	Statistics I
0.50 elective		

One of:

GEOG*1300	[0.50]	Introduction to the Biophysical Environment
GEOL*1000	[0.50]	Principles of Geology
GEOL*1100	[0.50]	Principles of Geology

Semester 4

BIOL*3110	[0.50]	Population Ecology
MBG*2000	[0.50]	Introductory Genetics
1.00 elective		

One of:

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

Semester 5

BIOL*3010	[0.50]	Laboratory and Field Work in Ecology
BIOL*3120	[0.50]	Community Ecology
1.00 elective		

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

Semester 6

2.00 electives

One of:

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

Semester 7

BIOL*4110	[0.75]	Ecological Methods
1.75 electives		

Semester 8

BIOL*4120	[0.50]	Evolutionary Ecology
2.00 electives		

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 credit from:		
BOT*4820	[0.75]	Research Opportunities in Botany I

ZOO*4410	[0.75]	Field Ecology
ZOO*4500	[0.75]	Research Problems in Zoology I
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

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

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

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

Interpretive Ecology (IE)

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

0.75 credit 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

0.75 credit chosen in consultation with the Ecology departmental advisor (Dr. J. Klironomos, AXEL 103)

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
GEOL*1100	[0.50]	Principles of Geology

X—Degree Programs, Bachelor of Science (B.Sc.)

Environmental Biology (ENVB)

Department of Environmental Biology, Ontario Agricultural College.

The honours B.Sc. program in Environmental Biology combines a study of the functioning of living organisms with study of the physical environment and the interaction between them. Opportunity is presented to concentrate in one of two areas of emphasis on how the understanding of organisms and their environment relates to [Plant Protection](#) (pest management) or [Environmental Quality](#).

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 the Life Sciences I

One of:

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

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
ENVB*2010	[0.50]	Food Production and the Environment
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II

0.50 Arts or Social Science elective

Semester 3

BIOL*2060	[0.50]	Ecology
BOT*2100	[0.50]	Life Strategies of Plants
CHEM*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics

0.50 elective

Semester 4

ENVB*2040	[0.50]	Biology of Plant Pests
ENVB*2100	[0.50]	Problem-Solving in Environmental Biology
SOIL*2010	[0.50]	Soil Science
STAT*2040	[0.50]	Statistics I

0.50 elective

Areas of Emphasis

Students in [Environmental Biology](#) must select one (1) of the two (2) following areas of emphasis by the end of Semester 4.

Environmental Quality (EQ)

Semester 5

BIOL*3450	[0.50]	Introduction to Aquatic Environments
ENVB*2030	[0.50]	Current Issues in Forest Science
ENVB*3040	[0.50]	Natural Chemicals in the Environment
TOX*2000	[0.50]	Principles of Toxicology

0.50 elective or restricted elective

Semester 6

ENVB*3030	[0.50]	Pesticides and the Environment
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1.50 electives or restricted electives

One of:

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

Semester 7

ENVB*3300	[0.50]	Applied Ecology and Environment
ENVB*4020	[0.50]	Water Quality and Environmental Management
ENVB*4800	[0.50]	Topics in Applied Biology
MICR*4140	[0.50]	Soil Microbiology and Biotechnology

0.50 electives or restricted electives

Semester 8

ENVB*4550	[0.50]	Ecotoxicological Risk Characterization
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2.00 electives or restricted electives

At least 6.00 of the science credits must be 3000 or 4000 level, of which at least 2.00 must be at the 4000 level.

Restricted Electives

A total of 1.50 Arts and Social Science credits are required, 1.00 of which must be from the following:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
PHIL*2070	[0.50]	Philosophy of the Environment
POLS*3370	[0.50]	Environmental Policy Formation and Administration
SOC*2280	[0.50]	Society and Environment

1.00 credit from:

MICR*3220	[0.50]	Plant Microbiology
MICR*4180	[0.50]	Microbial Processes in Environmental Management
SOIL*3050	[0.50]	Land Utilization
SOIL*3080	[0.50]	Soil and Water Conservation

1.00 credit from:

ENVB*4220	[0.50]	Biology of Aquatic Insects
ENVB*4780	[0.50]	Forest Ecology
GEOG*3110	[0.50]	Biotic and Natural Resources

GEOG*4110	[0.50]	Environmental Systems Analysis
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

*at least 6.00 of the science credits must be 3000 or 4000 level, of which at least 2.00 must be at the 4000 level

Plant Protection (PP)

Semester 5

ENVB*2030	[0.50]	Current Issues in Forest Science
ENVB*3210	[0.50]	Plant Pathology
PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants
ZOO*4350	[0.50]	Biology of Polluted Waters

1.00 elective or restricted elective

Semester 6

ENVB*3030	[0.50]	Pesticides and the Environment
ENVB*4100	[0.50]	Applied Entomology

1.00 elective or restricted elective

One of:

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

Semester 7

CROP*4240	[0.50]	Weed Science
ENVB*4800	[0.50]	Topics in Applied Biology

1.50 elective or restricted elective

Semester 8

ENVB*4070	[0.50]	Biological Control: Plant Diseases
ENVB*4240	[0.50]	Biological Activity of Pesticides

1.50 electives or restricted electives

At least 6.00 of the science credits must be 3000 and 4000 level, of which at least 2.00 must be at the 4000 level.

Restricted Electives

A total of 1.50 Arts and Social Science credits are required, 1.00 of which must be from the following:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
PHIL*2070	[0.50]	Philosophy of the Environment
POLS*3370	[0.50]	Environmental Policy Formation and Administration
SOC*2280	[0.50]	Society and Environment

1.00 credit from:

BOT*3200	[0.50]	Mycology
BOT*3710	[0.50]	Classification and Morphology of Seed Plants
ENVB*3090	[0.50]	Insects in Relation to Wildlife

1.00 credit from:

BIOL*3450	[0.50]	Introduction to Aquatic Environments
ENVB*3040	[0.50]	Natural Chemicals in the Environment
ENVB*4020	[0.50]	Water Quality and Environmental Management
ENVB*4040	[0.50]	Behaviour of Insects
MICR*3220	[0.50]	Plant Microbiology
MICR*4140	[0.50]	Soil Microbiology and Biotechnology
PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants
PBIO*4600	[0.75]	Plant Environment Interaction and Stress Physiology

X—Degree Programs, Bachelor of Science (B.Sc.)

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.

Students planning to enter this program should consult counsellors in one of the departments. For program approval, students should contact the B.Sc. counsellor in the [Department of Geography](#).

Major (Honours Program)

Semester 1

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
GEOG*1300	[0.50]	Introduction to the Biophysical Environment
PHYS*1110	[0.50]	Introductory Physics with Applications I

0.50 Mathematics course from:

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

Semester 2

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

0.50 Arts or Social Science elective

One of:

GEOG*1000	[0.50]	Principles of Geology
GEOG*1050	[0.50]	Geology and the Environment

Semester 3 and 4

GEOG*2000	[0.50]	Geomorphology
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*2020	[0.50]	Stratigraphy
GEOG*2150	[0.75]	Glacial Geology
MET*2030	[0.50]	Meteorology and Climatology
SOIL*2010	[0.50]	Soil Science

0.50 Arts or Social Science elective

0.50 elective

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

Semester 5 and 6

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

1.50 from [List A](#)

1.50 electives

Semester 7 and 8

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

3.00 electives

List A

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

Other Requirements

- At least 1.50 credits from [List A](#) must be at the 4000 level.
- At least 2.50 electives must be acceptable science courses.
- 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.

X—Degree Programs, Bachelor of Science (B.Sc.)

Environmental Toxicology (ETOX)

Interdisciplinary Program, Department of Environmental Biology, Ontario Agricultural College.

Faculty Advisor: Herman Boermans, Ext. 54984, Department of Biomedical Sciences.

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. Academic counselling is available through the Coordinator of Toxicology Programs or through the Department of Environmental Biology.

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 the Life Sciences I
0.50 elective*		

Semester 2

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

Semester 3

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

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 elective		

Semester 5

BIOL*3450	[0.50]	Introduction to Aquatic Environments
CHEM*3560	[0.50]	Structure and Function in Biochemistry
TOX*3300	[0.50]	Analytical Toxicology
ZOO*3200	[0.50]	Comparative Animal Physiology I
0.50 elective*		

Semester 6

BOT*2100	[0.50]	Life Strategies of Plants
SOIL*2010	[0.50]	Soil Science
TOX*3360	[0.50]	Environmental Chemistry and Toxicology
ZOO*4170	[0.50]	Experimental Comparative Animal Physiology
0.50 elective*		

Semester 7

ENVB*3030	[0.50]	Pesticides and the Environment
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 elective*		

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 elective*		

* a minimum of 1.50 credits must be from the [College of Arts](#) and/or the [College of Social and Applied Human Sciences](#)

X—Degree Programs, Bachelor of Science (B.Sc.)

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

Interdisciplinary Program, Department of Environmental Biology, Ontario Agricultural College.

Faculty Advisor: Herman Boermans, Ext. 54984, Department of Biomolecular Sciences.

Faculty Advisor: Nigel Bunce, Ext. 53962, Department of Chemistry and Biochemistry.

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. Academic counselling is available through the Coordinator of Toxicology Programs or through the Department of Environmental Biology.

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 the Life Sciences I

0.50 elective*

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]	Introductory Physics for the Life Sciences II
STAT*2040	[0.50]	Statistics I

0.50 elective*

Stream A

Semester 3 – Fall

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

0.50 elective

Winter Semester

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

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

0.50 elective

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 elective

Semester 6 – Winter

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

Summer Semester

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

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

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

0.50 elective

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 elective

Stream B

Semester 3 – Summer

CHEM*2480	[0.50]	Analytical Chemistry I
CHEM*2580	[0.50]	Introductory Biochemistry
SOIL*2010	[0.50]	Soil Science
STAT*2050	[0.50]	Statistics II

0.50 elective

Fall Semester

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

BIOL*2060	[0.50]	Ecology
BIOL*3450	[0.50]	Introduction to Aquatic Environments
MBG*2000	[0.50]	Introductory Genetics
TOX*3360	[0.50]	Environmental Chemistry and Toxicology

0.50 elective

Semester 5 – Summer

BOT*2100	[0.50]	Life Strategies of Plants
CHEM*2700	[0.50]	Organic Chemistry I
CHEM*3570	[0.50]	Analytical Biochemistry

1.00 elective

Semester 6 – Fall

ENVB*3030	[0.50]	Pesticides and the Environment
TOX*2000	[0.50]	Principles of Toxicology
TOX*3300	[0.50]	Analytical Toxicology
ZOO*3200	[0.50]	Comparative Animal Physiology I

0.50 elective

Winter Semester

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

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

MBG*2020	[0.50]	Introductory Molecular Biology
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

0.50 elective

Semester 8 – Winter

PBIO*4530	[0.50]	Environmental Pollution Stresses on Plants
TOX*4200	[0.50]	Topics in Toxicology
TOX*4550	[0.50]	Ecotoxicological Risk Characterization
ZOO*4170	[0.50]	Experimental Comparative Animal Physiology

0.50 elective

X—Degree Programs, Bachelor of Science (B.Sc.)

Food Science (FOOD)

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*1110	[0.50]	Introductory Physics with Applications I

0.50 Arts or Social Science elective

Note: PHYS*1110 and PHYS*1130 could be replaced by PHYS*1000 and PHYS*1010 or PHYS*1070 and PHYS*1080 in Semesters 1 and 2.

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

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*1130	[0.50]	Introductory Physics with Applications II

0.50 Arts or Social Science elective

Note: PHYS*1110 and PHYS*1130 could be replaced by PHYS*1000 and PHYS*1010 or PHYS*1070 and PHYS*1080 in Semesters 1 and 2.

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

Semester 3 – Fall

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

0.50 elective

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 elective

Semester 5 – Fall

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

0.50 elective

Semester 6 – Winter

FOOD*3020	[0.50]	Food Chemistry Laboratory
FOOD*3170	[0.50]	Food Processing II
FOOD*3260	[0.50]	Industrial Microbiology

1.00 elective

Semester 7 – Fall

FOOD*4120	[0.75]	Food Analysis
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1.75 electives

Semester 8 – Winter

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

1.75 electives

Notes:

- ENGL*1200 is recommended for those students needing to improve their English grammar.
- FOOD*2150 could be replaced by FOOD*2010 with permission of department advisor.
- Of the 7.00 elective credits:
 - At least 2.00 must be Arts or Social Sciences.
 - At least 2.00 must be from list of Restricted Electives.
 - At least 1.00 must be from additional science electives.

Restricted Electives:

COST*3010	[0.50]	Quality Management
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*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*4340	[0.50]	Cheese and Fermented Dairy Foods
FOOD*4350	[0.50]	Processing Plant Technology
FOOD*4400	[0.50]	Dairy Processing
FOOD*4520	[0.50]	Cereal Technology
POPM*4040	[0.50]	Epidemiology of Food-borne Diseases

Credit Summary (20.00 total credits)

4.00	– 1st year science required
9.00	– Required in semesters 3–8
2.00	– Restricted electives
2.00	– Arts or Social Science electives
1.00	– Additional Science elective
2.00	– Free elective

Minor (Honours Program)

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

CHEM*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 Sciences
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
FOOD*3170	[0.50]	Food Processing II

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*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*4340	[0.50]	Cheese and Fermented Dairy Foods
FOOD*4350	[0.50]	Processing Plant Technology
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

X—Degree Programs, Bachelor of Science (B.Sc.)

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*1110	[0.50]	Introductory Physics with Applications I

0.50 Arts or Social Science elective

Note: PHYS*1110 and PHYS*1130 could be replaced by PHYS*1000 and PHYS*1010 or PHYS*1070 and PHYS*1080 in Semesters 1 and 2.

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*2080	[0.50]	Elements of Calculus II
PHYS*1130	[0.50]	Introductory Physics with Applications II

0.50 Arts or Social Science elective

Summer Semester

Off

Semester 3 – Fall

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

0.50 elective

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 elective

Summer Semester

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

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

0.50 elective

Semester 6 – Winter

FOOD*3020	[0.50]	Food Chemistry Laboratory
FOOD*3170	[0.50]	Food Processing II
FOOD*3260	[0.50]	Industrial Microbiology

1.00 elective

Summer Semester

Optional

Fall Semester

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

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

FOOD*4120	[0.75]	Food Analysis
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1.75 elective

Semester 8 – Winter

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

1.75 elective

Notes:

See Notes and Credit Summary in Food Science Major.

X—Degree Programs, Bachelor of Science (B.Sc.)

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 departmental advisor)

Three of:

ENVB*3090	[0.50]	Insects in Relation to Wildlife
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

X—Degree Programs, Bachelor of Science (B.Sc.)

Functional Foods and Nutraceuticals (FFAN)

Department of Human Biology 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.

CHEM*2580	[0.50]	Introductory Biochemistry
ECON*2150	[0.50]	Introduction to Business Economics
NUTR*3210	[0.50]	Fundamentals of Nutrition
TOX*2000	[0.50]	Principles of Toxicology

2.00 Restricted Electives*

One of:

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

*restricted electives should be chosen in consultation with the Human Biology and Nutritional Sciences faculty advisors. 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

X—Degree Programs, Bachelor of Science (B.Sc.)

Genetics (GEN)

Department of Molecular Biology and Genetics, College of Biological Science.

Minor (Honours Program)

A minor in 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:		
MBG*3000	[0.50]	Population Genetics
MBG*3050	[0.50]	Human Genetics
MBG*3060	[0.50]	Quantitative Genetics
(MBG*3070 or MBG*3080)		
MBG*3200	[0.50]	Genetics: Our Uncertain Heritage
MBG*4030	[0.50]	Animal Breeding Methods
(MBG*4040 or MBG*4070)		
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 and Environmental Mutagenesis
MBG*4350	[0.50]	Structural Molecular Biology
MBG*4620	[0.50]	Molecular Cytogenetics

X—Degree Programs, Bachelor of Science (B.Sc.)

Geographic Information Systems (GIS) and Environmental Analysis (GIS)

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]	Cartographic Methods
GEOG*3210	[0.50]	Management of the Biophysical Environment
GEOG*3480	[0.50]	Geographic Information Systems
GEOG*4210	[0.50]	Environmental Resource Analysis
GEOG*4480	[0.50]	Applied Geographic Information Systems
SOIL*3600	[0.50]	Remote Sensing

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

**X—Degree Programs, Bachelor of Science
(B.Sc.)**

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.

X—Degree Programs, Bachelor of Science (B.Sc.)

Human Kinetics (HK)

Department of Human Biology and Nutritional Sciences, College of Biological Science.

Faculty Advisor: Dr. B.A. Wilson, ANNU 336B

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 elect CIS*1200 as early in the program as possible.

Major (Honours Program)

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 the Life Sciences I

0.50 elective or restricted elective

Semester 2

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

1.00 elective or restricted elective

Semester 3

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

1.00 elective or restricted elective

Semester 4

CHEM*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
ZOO*2100	[0.50]	Developmental Biology

0.50 elective or restricted elective

Semester 5

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

Semester 6

HK*2270	[0.50]	Principles of Human Biomechanics
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 3.00 total credits.

Semester 8

If desired, electives or restricted electives up to a maximum of 3.00 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*4XXX, NUTR*4020, NUTR*4090, NUTR*4210.

Areas of Emphasis

Students choosing Sports Injury Management must follow the schedule of studies for the area of emphasis.

Sports Injury Management (SIM)

Contact: Dr. B.A. Wilson, ext. 2297.

This is a collaborative effort between the Sheridan College Institute of Technology and Advanced Learning 3-year diploma program in Sports Injury Management and the University of Guelph B.Sc. Human Kinetics major program. Semester 2 B.Sc. students may be selected for admission and concurrent registration over the next four year period to the Human Kinetics major in this area of emphasis and the [Sheridan College Institute of Technology and Advanced Learning Sports Injury Management](#) program. Semester 4 students may be selected for admission into this area of emphasis if space is available. Since space in this area of emphasis is limited, admission is competitive and is based on academic achievement and an interview process. Students will enrol in courses at Guelph for semesters 1 to 6 and at Sheridan for semesters 7 to 10. Upon successful completion, students will earn both a University of Guelph B.Sc. degree and a Sheridan College Institute of Technology and Advanced Learning diploma. A total of 27.25 credits is required.

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2580	[0.50]	Introductory Biochemistry
HK*2020	[0.50]	Human Musculoskeletal Anatomy
MBG*2000	[0.50]	Introductory Genetics
XSHR*1710	[0.25]	Sheridan—Emergency Conditions

0.50 Arts or Social Science elective

Semester 4

HK*2270	[0.50]	Principles of Human Biomechanics
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3210	[0.50]	Fundamentals of Nutrition
STAT*2040	[0.50]	Statistics I
XSHR*1730	[0.50]	Sheridan—Field Practice I (100 hours)

0.50 Arts or Social Science elective

Semester 5

HK*3401	[0.75]	Human Anatomy
HK*3600	[0.75]	Applied Human Biology
HK*3940	[1.25]	Human Physiology
XSHR*2710	[0.50]	Sheridan—Field Practice II (200 hours)

Semester 6

HK*3402	[0.75]	Human Anatomy
HK*4320	[0.75]	Work Physiology
XSHR*2740	[0.50]	Sheridan—Field Practice III (150 hours)

At least 0.50 credit in HK*4XXX courses.

Semester 7

HK*4230	[0.50]	Advanced Study in Human Biology and Nutritional Sciences
XSHR*1720	[0.25]	Sheridan—Lower Quadrant Composite
XSHR*2730	[0.25]	Sheridan—Modalities
XSHR*2750	[1.00]	Sheridan—Field Practice IV (250 hours)
XSHR*2760	[0.25]	Sheridan—Clinical Assessment Rehab. I
XSHR*2800	[0.50]	Sheridan—Human Adaptation to Exercise

Semester 8

XSHR*1740	[0.25]	Sheridan—Protective Equipment
XSHR*2720	[0.25]	Sheridan—Upper Quadrant Composite
XSHR*2780	[0.25]	Sheridan—Sports Injury Clinic I
XSHR*2790	[0.25]	Sheridan—Mechanics of Lower Quadrant
XSHR*2810	[0.50]	Sheridan—Clinical Assessment Rehab. II
XSHR*2860	[0.75]	Sheridan—Field Practice V (200 hours)

Semester 9

HK*4371	[0.50]	Research in Human Biology and Nutritional Sciences II
XSHR*2770	[0.25]	Sheridan—Functional Anatomy of Spine/Head
XSHR*2820	[0.50]	Sheridan—Mechanics of Upper Quadrant
XSHR*2830	[0.50]	Sheridan—Clinical Assessment Rehab. III
XSHR*2870	[0.75]	Sheridan—Field Practice VI
XSHR*2890	[0.25]	Sheridan—Sports Injury Clinic II

Semester 10

HK*4372	[0.50]	Research in Human Biology and Nutritional Sciences II
XSHR*2840	[0.50]	Sheridan—Clinical Administration
XSHR*2850	[0.25]	Sheridan—Manual Therapy
XSHR*2880	[1.50]	Sheridan—Clinical Placement

X—Degree Programs, Bachelor of Science (B.Sc.)

Marine and Freshwater Biology (MFB)

Department of Zoology, 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)

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 the Life Sciences I
0.50 Arts or Social Science elective*		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
STAT*2040	[0.50]	Statistics I
0.50 Arts or Social Science elective*		

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 elective**		

Semester 4

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

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 elective**		

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 elective**		

Semester 8

ZOO*4330	[0.50]	Environmental Biology of Fishes
ZOO*4560	[0.50]	Marine and Freshwater Adaptations
1.50 electives**		

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

** suggested electives list available from the Department of Zoology 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 1.00 credits from:

BIOL*4110	[0.75]	Ecological Methods
BIOL*4200	[0.75]	Biotic Diversity and Ecology of Mangrove Forests
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4490	[0.75]	Teaching in Zoology
ZOO*4500	[0.75]	Research Problems in Zoology I
ZOO*4510	[0.75]	Research Problems in Zoology II
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

Other field or research courses with approval of Dept. of Zoology advisor.

2. At least 1.00 Arts and/or Social Science elective.

**X—Degree Programs, Bachelor of Science
(B.Sc.)****Mathematical Science (MSCI)**

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

Minor (Honours Program)

This requires 1.00 calculus credit 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.

X—Degree Programs, Bachelor of Science (B.Sc.)

MATH*2200 [0.50] Advanced Calculus I

Mathematics (MATH)

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

Students wishing to enter an honours program in mathematics should consult with an advisor in the Department of Mathematics and Statistics. A grade of 70% in the mathematics courses of semester 1 and 2 is normally required for admission to semester 3 of the Major program in Mathematics.

Major (Honours Program)

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 credit in Arts and Social Science must be completed.

Semester 1*

BIOL*1030	[0.50]	Biology I
CHEM*1040	[0.50]	General Chemistry I
CIS*1650	[0.50]	Programming I
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

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 elective (CIS*2650 recommended)

Semester 3

MATH*2000	[0.50]	Set Theory
MATH*2160	[0.50]	Linear Algebra I
MATH*2200	[0.50]	Advanced Calculus I
STAT*2100	[0.50]	Introductory Probability and Statistics

0.50 Arts or Social Science elective

Semester 4

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

1.00 elective (CIS*2650 recommended if not taken earlier)

Semester 5

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

0.50 elective

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

Semester 6

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

Semester 7

0.50 credit 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 credit from a 4000 level mathematics***
1.50 electives

*students may be exempted from CIS*1650 in Semester 1 upon taking a computer science assessment of computing skills. If exempted from CIS*1650, you are advised to take CIS*2650 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 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, which must include:
1.50 credits from 3000 or 4000 level mathematics courses

1.00 credit from:

(MATH*1080 or MATH*1200)

(MATH*1210 or MATH*2080)

2.50 credits from:

MATH*2000	[0.50]	Set Theory
MATH*2130	[0.50]	Numerical Methods
(MATH*2150 or MATH*2160)		
MATH*2170	[0.50]	Differential Equations I

X—Degree Programs, Bachelor of Science (B.Sc.)

Microbiology (MICR)

Department of Microbiology, College of Biological Science.

Microbiology programs are designed to give students a good understanding of microorganisms, including their 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 would normally be admitted to either program in semester 3 but can be admitted in any semester thereafter. For admission to the Major in Microbiology program, students will need a minimum 70% average in science subjects completed at the point of entry to the program.

Major (Honours Program)

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

Semester 1

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

Semester 2

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

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

Semester 3

CHEM*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 elective		

Semester 4

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

Semester 5

CHEM*3560	[0.50]	Structure and Function in Biochemistry
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3230	[0.50]	Immunology I
0.50 elective		

One of:

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

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 elective		

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*4230		

Restricted Electives

Of the 8.00 elective credits throughout the program, at least 2.50 must be from the Arts and Social Sciences. For the Major program, 1.50 must be selected from the list below and at least 2.00 must be from science programs. (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
CHEM*4540	[0.50]	Enzymology
CHEM*4580	[0.50]	Membrane Biochemistry
FOOD*3230	[0.75]	Food Microbiology
FOOD*3260	[0.50]	Industrial Microbiology
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*4260	[0.50]	Microbial Technology
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:

2.50 credits including all of:

CHEM*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
MICR*3260	[0.50]	Microbial Adaptation and Development
MICR*4270	[0.50]	Microbial Design

1.50 credits from:

(MBG*3070 or MBG*3080)

MBG*4080 [0.50] Molecular Genetics

(BOT*3200 or MICR*3100)

MICR*3110	[0.50]	Techniques in Microbiology
MICR*3120	[0.50]	Systematic Bacteriology
MICR*3220	[0.50]	Plant Microbiology
MICR*3230	[0.50]	Immunology I

1.00 credits from:

MICR*4010	[0.50]	Pathogenic Bacteriology
MICR*4120	[0.50]	Virology
MICR*4230	[0.50]	Immunology II
MICR*4260	[0.50]	Microbial Technology
MICR*4290	[0.50]	Microbial Ecology

X—Degree Programs, Bachelor of Science (B.Sc.)

Microbiology (Co-op) (MICR:C)

Department of Microbiology, College of Biological Science.

Major (Honours Program)

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 above for the major programs. 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 microbiology academic advisor and/or Co-op advisor. Two schedules are printed below and detailed course selections are available from the Co-op advisor.

Semester	Stream A	Stream B
F	1	1
W	2	2
S	Off	Off
F	3	3
W	Work 1	Work 1
S	4	4
F	5	Work 2
W	6	5
S	Work 2	Work 3
F	Work 3	6
W	7	7
S	Work 4	Work 4
F	8	8

X—Degree Programs, Bachelor of Science (B.Sc.)

Molecular Biology and Genetics (MBG)

Department of Molecular Biology and Genetics, 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 will normally be admitted to this program in semester 3, but can be admitted at any time thereafter. For admission to this program students should have a minimum 70% average in the science subjects required in semesters 1 and 2.

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

0.50 elective or restricted elective

One of:

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

One of:

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

Semester 2

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

0.50 elective or restricted elective

One of:

CIS*1200 [0.50] Introduction to Computing
CIS*1500 [0.50] Introduction to Programming
CIS*1650 [0.50] Programming I

One of:

PHYS*1010 [0.50] Introductory Electricity and Magnetism
PHYS*1080 [0.50] Introductory Physics for the Life Sciences II

Semester 3

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

0.50 elective or restricted elective

Semester 4

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

1.00 elective or restricted elective

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 in the subject area electives must be at the 4000 level in order to complete the major.

Restricted Electives

1. Ecology Elective – 0.50 credit

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, 0.50 Any Arts or Social Science course from the list of approved electives.

3. Physiology Elective – 0.50 credit

BIOM*3100 [0.50] Mammalian Physiology I
BOT*3310 [0.50] Plant Physiology
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)

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*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 and Environmental Mutagenesis
MBG*4350 [0.50] Structural Molecular Biology
MBG*4620 [0.50] Molecular Cytogenetics

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

5. Science Electives – 0.50 credit

CHEM*3560 [0.50] Structure and Function in Biochemistry
MICR*3230 [0.50] Immunology I
MICR*4120 [0.50] Virology

X—Degree Programs, Bachelor of Science (B.Sc.)

Neuroscience (NEUR)

Department of Human Biology 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 Basis of 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
ZOO*4500	[0.75]	Research Problems in Zoology I

and 1.00 from:

BIOM*3090	[0.50]	Principles of Pharmacology and Toxicology
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]	Behavioural Aspects of Drug Action
PSYC*3040	[0.50]	Current Issues in Neuropsychology
PSYC*3410	[0.50]	Behavioural Basis of Neuroscience II
ZOO*4470	[0.50]	Comparative Endocrinology

Other suitable courses may be substituted for the above with the approval of the departmental advisor for the Department of Human Biology and Nutritional Sciences who is responsible for the administration of this minor.

Students who are interested in this minor must include PSYC*1100 as one of their Arts and Social Science credits and should include CHEM*2580 as part of their program.

X—Degree Programs, Bachelor of Science (B.Sc.)

Nutritional and Nutraceutical Sciences (NANS)

Department of Human Biology and Nutritional Sciences, College of Biological Science.

Coordinator: Dr. B.A. Wilson, ANNU 336B

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 elect CIS*1200 as early in the program as possible.

Major (Honours Program)

A total 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 the Life Sciences I

0.50 elective or restricted elective

Semester 2

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

1.00 elective or restricted elective

Semester 3

BIOL*2210	[0.50]	Introductory Cell Biology
CHEM*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics
NUTR*2150	[0.50]	Introduction to Nutritional and Food Sciences

0.50 elective or restricted elective

Semester 4

CHEM*3560	[0.50]	Structure and Function in Biochemistry
MBG*2020	[0.50]	Introductory Molecular Biology
NUTR*3190	[0.50]	Fundamentals of Nutrition
STAT*2040	[0.50]	Statistics I

0.50 elective or restricted elective

Semester 5

HK*3940	[1.25]	Human Physiology
NUTR*3330	[0.50]	Micronutrients, Phytochemicals and Health

0.75 elective or restricted elective

Semester 6

NUTR*4090	[0.50]	Functional Foods and Nutraceuticals
PATH*3610	[0.50]	Principles of Disease

1.50 electives or restricted electives

Semester 7

NUTR*4330	[0.50]	Applied Nutritional and Nutraceutical Sciences
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2.00 electives or restricted electives

Semester 8

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

Restricted Electives

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

HK*4460	[0.50]	Regulation of Human Metabolism
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 in Disease
NUTR*4510	[0.50]	Toxicology, Nutrition and Food

X—Degree Programs, Bachelor of Science (B.Sc.)

Nutritional Sciences (NSCI)

Department of Human Biology and Nutritional Sciences, College of Biological Science.

Minor (Honours Program)

A minor in Nutritional Sciences requires 5.00 credits as follows:

CHEM*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 credit 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 credit from:		
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*3340	[0.50]	Nutrition of Fish and Crustacea
NUTR*3350	[0.50]	Wildlife Nutrition
NUTR*4020	[0.50]	Nutrition, Growth and Development
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 in Disease
NUTR*4510	[0.50]	Toxicology, Nutrition and Food

X—Degree Programs, Bachelor of Science (B.Sc.)

Physical Science (PSCI)

College of Physical and Engineering Science.

Major (Honours Program)

Distribution Requirements

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*1110, 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 (one of CIS*1200, CIS*1500, CIS*1650)
 - 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
 0.50 Arts or Social Science elective

One of:

PHYS*1000 [0.50] An Introduction to Mechanics
 PHYS*1070 [0.50] Introductory Physics for the Life Sciences I
 PHYS*1110 [0.50] Introductory Physics with Applications I

One of:

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

Semester 2

BIOL*1040 [0.50] Biology II
 CHEM*1050 [0.50] General Chemistry II
 0.50 Arts or Social Science elective

One of:

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

One of:

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

Semester 3

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

0.50 elective

One of:

CIS*1200 [0.50] Introduction to Computing
 CIS*1500 [0.50] Introduction to Programming
 CIS*1650 [0.50] Programming I
 STAT*2040 [0.50] Statistics I
 STAT*2100 [0.50] Introductory Probability and Statistics

Semester 4

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

0.50 elective

One of:

CIS*1200 [0.50] Introduction to Computing
 CIS*1500 [0.50] Introduction to Programming
 CIS*1650 [0.50] Programming I
 STAT*2040 [0.50] Statistics I
 STAT*2100 [0.50] Introductory Probability and Statistics

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](http://www.cpes.uoguelph.ca/BSc/approved_electives.htm) 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](#).

X—Degree Programs, Bachelor of Science (B.Sc.)

Physics (PHYS)

Department of Physics, College of Physical and Engineering Science.

Any student seeking admission into this specialization who does not have at least a 70% average in the physics and mathematics courses of semesters 1 and 2 must consult with the Departmental 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 Departmental 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
MATH*1200	[0.50]	Calculus I
PHYS*1000	[0.50]	An Introduction to Mechanics

One of:

CIS*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Note: Students who have had no prior programming experience should take CIS*1500, and if they are planning to take further CIS courses should consult their Program Counsellor.

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 elective

* 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

STAT*2100 or 0.50 Arts or Social Science elective

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

0.50 elective

Semester 5

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

One of:

MATH*2000	[0.50]	Set Theory
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0.50 elective

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 elective

Semester 7+

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

1.00 elective **

One of:

PHYS*4240	[0.50]	Statistical Physics II
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0.50 elective

Semester 8+

PHYS*4510	[0.50]	Advanced Physics Project
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2.00 electives **

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

** three of the electives chosen in Sem. 7 and 8 must be from the following list, and 2 of the courses must be Physics (PHYS*) courses. Students should consult the Department of Physics Departmental Advisor concerning selection of electives and information about other possible physics courses in Sem. 7 and 8:

ENGG*3410	[0.50]	Systems and Control Theory
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GEOL*3060	[0.50]	Groundwater
PHYS*4120	[0.50]	Atomic and Molecular Physics
PHYS*4130	[0.50]	Subatomic Physics
PHYS*4150	[0.50]	Solid State Physics
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

X—Degree Programs, Bachelor of Science (B.Sc.)

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 Departmental 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*2650	[0.50]	Programming II
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0.50 Arts or Social Science elective*

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
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STAT*2100	[0.50]	Introductory Probability and Statistics
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0.50 Arts or Social Science elective*

Winter Semester

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

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

0.50 elective*

One of:

CIS*2420	[0.50]	Data Structures
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CIS*2450	[0.50]	Software Systems Development and Integration
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0.50 elective*

Fall Semester

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

PHYS*2450	[0.75]	Mechanics II
PHYS*2470	[0.75]	Electricity and Magnetism II
PHYS*3220	[0.50]	Waves and Optics

0.50 elective

One of:

MATH*3170	[0.50]	Partial Differential Equations and Special Functions
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MATH*3260	[0.50]	Complex Analysis
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0.50 elective

Summer Semester

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

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

0.50 elective**

One of:

PHYS*4240	[0.50]	Statistical Physics II
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0.50 elective

Semester 7 – Winter +

PHYS*3400	[0.50]	Advanced Mechanics
PHYS*3510	[0.50]	Intermediate Laboratory
PHYS*4040	[0.50]	Quantum Mechanics II

1.00 elective**

Summer Semester

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

PHYS*4180	[0.50]	Advanced Electromagnetic Theory
PHYS*4240 or 0.50 elective		
PHYS*4500	[0.50]	Advanced Physics Laboratory

1.00 elective**

* 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

X—Degree Programs, Bachelor of Science (B.Sc.)

Plant Biology (PBIO)

Department of Botany, College of Biological Science and Ontario Agricultural College.

Department of Environmental Biology, Ontario Agricultural College.

Department of Plant Agriculture, Ontario Agricultural College.

The Plant Biology Program is administered by the Department of Botany, extension 52730. This is a joint program between the College of Biological Science [Department of Botany and the Ontario Agricultural College (Department of Environmental Biology and Department of Plant Agriculture)].

Coordinator: J. Strommer, Ext. 52759.

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 the Life Sciences I
0.50 Arts or Social Science elective *		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
0.50 Arts or Social Science elective*		

One of:

CIS*1200	[0.50]	Introduction to Computing
CIS*1650	[0.50]	Programming I
MATH*2080	[0.50]	Elements of Calculus II

Semester 3

AGR*2451	[0.50]	Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants
CHEM*2580	[0.50]	Introductory Biochemistry
MBG*2000	[0.50]	Introductory Genetics

One of:

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

Semester 4

AGR*2452	[0.50]	Plant Agriculture
BIOL*2210	[0.50]	Introductory Cell Biology
ENVB*2040	[0.50]	Biology of Plant Pests
MBG*2020	[0.50]	Introductory Molecular Biology

0.50 Arts or Social Science elective

Semester 5

STAT*2040	[0.50]	Statistics I
0.50 Arts or Social Science elective		
1.50 elective **		

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 elective 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
POLS*1400	[0.50]	Public Management and Administration
PSYC*1100	[0.50]	Principles of Behaviour

Electives **

The selection of electives is subject to the following rules:

1. A minimum of 1.50 credits must be from the following list:

BOT*3310	[0.50]	Plant Physiology
BOT*3410	[0.50]	Plant Anatomy
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*4030	[0.50]	Plant Cell Biology
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
2. A minimum of 4.00 must be from the following list:		
BIOL*3050	[0.50]	Mycology I
BOT*2000	[0.50]	Plants, Biology and People
BOT*4820	[0.75]	Research Opportunities in Botany I
BOT*4830	[0.75]	Research Opportunities in Botany II
CROP*2280	[0.50]	Crops in Land Reclamation
CROP*3300	[0.50]	Grain Crops
CROP*3310	[0.50]	Protein and Oilseed Crops
CROP*3320	[0.50]	Pasture and Grazing Management
CROP*3330	[0.50]	Forage Crops: Science and Technology
CROP*4220	[0.50]	Cropping Systems
CROP*4240	[0.50]	Weed Science
CROP*4260	[0.50]	Crop Science Field Trip
CROP*4340	[0.50]	Seminar: Selected Topics in Crop Science
CROP*4350	[0.50]	Crop Science Research Project I
CROP*4360	[0.50]	Crop Science Research Project II
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 Control: 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*3220	[0.50]	Turf Management
HORT*3230	[0.50]	Plant Propagation
HORT*3260	[0.50]	Woody Plants
HORT*3280	[0.50]	Greenhouse Production
HORT*3340	[0.50]	Culture of Plants
HORT*3510	[0.50]	Vegetable Production
HORT*4250	[0.50]	Nursery Production
HORT*4300	[0.50]	Postharvest Physiology
HORT*4380	[0.50]	Tropical and Sub-Tropical Horticultural Crops
HORT*4420	[0.50]	Fruit Crops
HORT*4900	[0.50]	Horticultural Science Research I
HORT*4910	[0.50]	Horticultural Science Research 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
3. From the total of 8.00 in semester 5–8 at least 5.50 from this list or from the approved science elective course list for B.Sc. students must be at the 3000 and 4000 levels and at least 2.00 must be 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:

AGR*2451/2	[1.00]	Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants
BOT*3710	[0.50]	Classification and Morphology of Seed Plants
ENVB*2040	[0.50]	Biology of Plant Pests
1.00 credits from list of preferred electives		
One of:		
BIOL*2060	[0.50]	Ecology
BOT*2050	[0.50]	Plant Ecology
CROP*2110	[0.50]	Crop Ecology

The remaining credits chosen from offerings by the Departments of Botany, Environmental Biology, Plant Agriculture, Crop Science or Horticultural Science.

X—Degree Programs, Bachelor of Science (B.Sc.)

Plant Biotechnology (PBTC)

Department of Botany, College of Biological Sciences.

Department of Environmental Biology, Ontario Agricultural College.

Department of Plant Agriculture, Ontario Agricultural College.

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 the Life Sciences I

0.50 Arts or Social Science elective

Semester 2

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

0.50 Arts or Social Science elective

One of:

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

Semester 3

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

0.50 elective

One of:

AGR*2451	[0.50]	Plant Agriculture
BOT*2000	[0.50]	Plants, Biology and People

Semester 4

MBG*2020	[0.50]	Introductory Molecular Biology
MICR*2030	[0.50]	Microbial Growth
STAT*2040	[0.50]	Statistics I

0.50 elective

One of:

AGR*2452	[0.50]	Plant Agriculture
BOT*2100	[0.50]	Life Strategies of Plants

Semester 5

BOT*3310	[0.50]	Plant Physiology
CIS*2100	[0.50]	Scientific Computing and Applications Development
MBG*3100	[0.50]	Plant Genetics
PBIO*3750	[0.50]	Plant Tissue Culture

0.50 elective

Semester 6

MBG*3350	[0.75]	Laboratory Methods in Molecular Biology I
MBG*4300	[0.50]	Plant Molecular Genetics

0.75 elective

One of:

PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development
PBIO*4750	[0.50]	Genetic Engineering of Plants

Semester 7

PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant–Microbe Interactions
PBIO*4030	[0.50]	Plant Cell Biology
PBIO*4300	[1.00]	Research Opportunities in Plant Biotechnology I

0.50 elective

Semester 8

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

One of:

PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development
PBIO*4750	[0.50]	Genetic Engineering of Plants

Restricted Electives

From a total of 4.25 remaining credits for electives in Semesters 3–8, at least 3.00 credits must be from the following list of Restricted Electives. Students must select 2.00 restricted electives from List A and 1.00 restricted electives from List B.

List A

A minimum of 2.00 credits must be taken from the following list:

BOT*3410	[0.50]	Plant Anatomy
MBG*3200	[0.50]	Genetics: Our Uncertain Heritage
MBG*3600	[0.25]	Introduction to Genomics
MBG*4350	[0.50]	Structural Molecular Biology
MBG*4620	[0.50]	Molecular Cytogenetics
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	[0.75]	Plant Environment Interaction and Stress Physiology

Note: Students are strongly recommended to take PBIO*4310. Permission of the instructor is required.

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*3220	[0.50]	Turf Management
HORT*3230	[0.50]	Plant Propagation
HORT*3280	[0.50]	Greenhouse Production
HORT*3510	[0.50]	Vegetable Production
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 course include:

1.00 credits from Restricted Electives List A (listed under Major above)

0.50 credits from Restricted Electives List B (listed under Major above)

1.50 credits from the following courses:

BOT*3310	[0.50]	Plant Physiology
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*4030	[0.50]	Plant Cell Biology
PBIO*4150	[0.50]	Molecular and Cellular Aspects of Plant Development

One of the following 2 groups of courses:

Group A

BOT*2000	[0.50]	Plants, Biology and People
BOT*2100	[0.50]	Life Strategies of Plants

Group B

AGR*2451/2	[1.00]	Plant Agriculture
PBIO*3750	[0.50]	Plant Tissue Culture
PBIO*4750	[0.50]	Genetic Engineering of Plants

X—Degree Programs, Bachelor of Science (B.Sc.)

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. A cumulative average of at least 70% in all course attempts in Psychology is required for approval to enter semester 4.

Note on Honours Courses

Courses marked (H) in Section XII—Course Descriptions are designed for students in a Honours Psychology program (Honours Program Major or Honours Program Minor in Cognitive Neuropsychology, Developmental Psychology, Educational Psychology, Organizational Behaviour, or Social Psychology), the Information Systems and Human Behaviour program, Career Development Practitioner program (C.D.P.P.), 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. **Courses designated with (H) in Section XII—Course Descriptions are Honours level courses requiring for registration a cumulative average of at least 70% in all course attempts in Psychology.** Courses not designated as (H) are open to all students having the prerequisites. The department also offers an array of elective courses beyond the minimum required by the Honours Psychology program (see Section XII—Course Descriptions).

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 the Life Sciences I

One of: *

PSYC*1100	[0.50]	Principles of Behaviour
PSYC*1200	[0.50]	Dynamics of Behaviour

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
CIS*1500	[0.50]	Introduction to Programming
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II

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 Basis of Neuroscience, I

One of:

PSYC*2390	[0.50]	Principles of Sensation and Perception
PSYC*2650	[0.50]	Introduction to Cognitive Processes

One of:

PSYC*2010	[0.50]	Quantification in Psychology
STAT*2040	[0.50]	Statistics I

1.00 elective **

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 elective**		

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*3371	[0.50]	Research Methods
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2.00 electives **

Semester 6

PSYC*3250	[0.50]	Psychological Measurement
PSYC*3372	[0.50]	Research Methods

1.50 electives **

Across semester 7 and 8 students must complete both PSYC*4370 and PSYC*4900. These courses may be completed concurrently or sequentially (one in semester 7, one in semester 8).

Semester 7

1.00 or 1.50 electives **

One of: ***

PSYC*4870	[0.50]	Honours Thesis I
0.50 at the 3000 or 4000 level from List A or List B		

One of:

PSYC*4370	[0.50]	History of Psychology
PSYC*4900	[0.50]	Psychology Seminar

Semester 8

1.00 or 1.50 elective**

One of: ***

PSYC*4880	[1.00]	Honours Thesis II
1.00 at the 3000 or 4000 level from List A or List B		

One of:

PSYC*4370	[0.50]	History of Psychology
PSYC*4900	[0.50]	Psychology Seminar

* PSYC*1100 should be completed prior to semester 3, PSYC*1200 prior to semester 4

** additional credits in semesters 3–8 must be taken to make up a total of 1.00 Arts and/or non–psychology social science credits, 3.00 credits from List A, 3.00 acceptable non–psychology science course credits; suggestions for particularly suitable electives are given in List B

*** students intending to go on to graduate school should take PSYC*4870 and 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

Learning and Physiological Psychology

PSYC*3030	[0.50]	Behavioural Aspects of Drug Action
PSYC*3040	[0.50]	Current Issues in Neuropsychology
PSYC*3100	[0.50]	Evolutionary Psychology
PSYC*3410	[0.50]	Behavioural Basis of Neuroscience II
PSYC*3430	[0.50]	Topics in Animal Learning and Cognition
PSYC*3850	[0.50]	Intellectual Disabilities
PSYC*4750	[0.50]	Motivation
ZOO*4070	[0.50]	Animal Behaviour

Perception and Cognition

PHYS*2030	[0.50]	Biophysics of Excitable Cells
PSYC*3330	[0.50]	Human Memory
PSYC*3340	[0.50]	Psycholinguistics
PSYC*4400	[0.50]	Cognitive Neuropsychology Seminar

List B

The following courses are particularly suitable science electives for students in this program:

Biology – BIOL*2210	
Chemistry – CHEM*2580	
Environmental Biology – ENVB*4040	
Genetics – MBG*2000, MBG*2020, MBG*3050	
Mathematics – MATH*3510	
Pharmacology – BIOM*3090	
Physiology – BIOM*3000, HK*3940, BIOM*3100, BIOM*3110	
Statistics – STAT*3240, STAT*3320, STAT*4350	
Zoology – BIOL*3120, ZOO*2100, ZOO*3000, ZOO*3200, ZOO*4170, ZOO*4390, ZOO*4410	

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 Basis of Neuroscience, I
PSYC*2650	[0.50]	Introduction to Cognitive Processes

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 PSYC* courses in List A

One of:

PSYC*2010	[0.50]	Quantification in Psychology
STAT*2040	[0.50]	Statistics I

X—Degree Programs, Bachelor of Science (B.Sc.)

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.

Any student seeking admission into this specialization who does not have at least a 70% average in the mathematics courses of semesters one and two should consult with the Departmental Advisor. A total of 20.00 credits is required to complete the major which includes at least 10.00 credits in Statistics and Mathematics, 2.00 of which must be at the 4000 level. At least 1.00 credit in Arts and Social Science must be completed.

Major (Honours Program)

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

One of:

CIS*1500	[0.50]	Introduction to Programming
CIS*1650	[0.50]	Programming I

Note: Students who have had no prior programming experience should take CIS*1500, and if they are planning to take further CIS courses should consult with their departmental advisor.

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 elective

Semester 3

MATH*2200	[0.50]	Advanced Calculus I
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0.50 Arts or Social Science elective

0.50 elective

One of:

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

One of:

STAT*2040	[0.50]	Statistics I
STAT*2100	[0.50]	Introductory Probability and Statistics

Semester 4

MATH*2130	[0.50]	Numerical Methods
MATH*2170	[0.50]	Differential Equations I
MATH*2210	[0.50]	Advanced Calculus II
STAT*2050	[0.50]	Statistics II

0.50 elective

Note: If STAT*2100 was taken in Semester 3, STAT*2050 is recommended but not required.

Semester 5

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

1.50 electives

Semester 6

STAT*3110	[0.50]	Introductory Mathematical Statistics II
STAT*3210	[0.50]	Experimental Design

0.50 3000 or 4000 level Statistics or Mathematics *

1.00 elective

Semester 7

STAT*4080	[0.50]	Data Analysis
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0.50 from a 4000 level Statistics or Mathematics *

1.50 electives

Semester 8

STAT*3320	[0.50]	Sampling Theory with Applications
STAT*4340	[0.50]	Statistical Inference

1.00 from a 3000 or 4000 level Statistics *

0.50 elective

*a Statistics major must include 2.00 or more credits in Statistics at the 4000 level (which may include MATH*4070, MATH*4240) and must include at least 6.00 credits at the 3000 or 4000 level from the B.Sc. Program Committee approved list of science electives

Minor (Honours Program)

A total of 5.00 credits in Statistics and Mathematics is required to complete the Minor, at least 3.00 credits of which are in Statistics and at least 1.50 in Mathematics. The required courses are:

MATH*1200	[0.50]	Calculus I
MATH*1210	[0.50]	Calculus II
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

1 of:

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

1 of:

STAT*2040	[0.50]	Statistics I
STAT*2100	[0.50]	Introductory Probability and Statistics

To complete the minor it is recommended to take courses from:

STAT*3210	[0.50]	Experimental Design
STAT*3320	[0.50]	Sampling Theory with Applications
STAT*4080	[0.50]	Data Analysis
STAT*4350	[0.50]	Applied Multivariate Statistical Methods

Note: Students are strongly urged to take mathematics courses as electives such as:

MATH*2130	[0.50]	Numerical Methods
MATH*2200	[0.50]	Advanced Calculus I
MATH*3240	[0.50]	Operations Research

X—Degree Programs, Bachelor of Science (B.Sc.)

Theoretical Physics (THPY)

Department of Physics, College of Physical and Engineering Science.

Any student seeking admission into this specialization who does not have at least a 70% average in the physics and mathematics courses of semesters 1 and 2 must consult with the Departmental 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 Department of Physics Departmental 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
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0.50 elective

Semester 5

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

One of:

MATH*2000	[0.50]	Set Theory
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0.50 elective

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 elective

One of:

PHYS*4500	[0.50]	Advanced Physics Laboratory
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0.50 elective

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 elective

*those not taking MATH*2210 in Semester 4 must consult the Department of Physics Departmental Advisor

X—Degree Programs, Bachelor of Science (B.Sc.)

Wild Life Biology (WLB)

Department of Zoology, 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)

A minimum total of twenty 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 the Life Sciences I
0.50 Arts or Social Science elective *		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
STAT*2040	[0.50]	Statistics I
0.50 Arts or Social Science elective *		

Semester 3

CHEM*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 elective **		

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 elective **		

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

BIOL*3120	[0.50]	Community Ecology
NUTR*3350	[0.50]	Wildlife Nutrition
ZOO*3210	[0.50]	Comparative Animal Physiology II
1.00 elective **, ***		

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 the Department of Zoology 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:

BIOL*4200	[0.75]	Biotic Diversity and Ecology of Mangrove Forests
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4500	[0.75]	Research Problems in Zoology I
ZOO*4510	[0.75]	Research Problems in Zoology II
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

Electives must include:

- A minimum of 1.00 credit from:

ZOO*4090	[0.50]	Ornithology
ZOO*4280	[0.50]	Mammalogy
ZOO*4430	[0.50]	Herpetology
- At least 1.00 Arts and/or Social Science electives.

X—Degree Programs, Bachelor of Science (B.Sc.)

Zoology (ZOO)

Department of Zoology, 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)

A minimum total of twenty 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 the Life Sciences I
0.50 Arts or Social Science elective *		

Semester 2

BIOL*1040	[0.50]	Biology II
CHEM*1050	[0.50]	General Chemistry II
PHYS*1080	[0.50]	Introductory Physics for the Life Sciences II
STAT*2040	[0.50]	Statistics I
0.50 Arts or Social Science elective *		

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 elective **		

Semester 4

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

Semester 5

BIOL*3110	[0.50]	Population Ecology
ZOO*3200	[0.50]	Comparative Animal Physiology I
ZOO*3300	[0.50]	Evolution
1.00 elective **		

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 Department of Zoology 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:

BIOL*4200	[0.75]	Biotic Diversity and Ecology of Mangrove Forests
ZOO*4170	[0.50]	Experimental Comparative Animal Physiology
ZOO*4300	[0.75]	Marine Biology and Oceanography
ZOO*4410	[0.75]	Field Ecology
ZOO*4500	[0.75]	Research Problems in Zoology I
ZOO*4510	[0.75]	Research Problems in Zoology II
ZOO*4521/2	[1.50]	Research Problems in Zoology III
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. 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 and department 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 departmental 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