

# Biological Sciences

The biology programs at Bishop's University provide a broad foundation in the field of biology, preparing its students for numerous options. These include graduate and professional studies in medicine, dentistry, veterinary medicine, the allied health sciences, forestry, wildlife biology, microbiology, biotechnology, and many other applied areas. A degree in biology also prepares the student for direct employment in the biotechnology sector, environmental biology, or the allied health fields.

The Department of Biological Sciences is well equipped for study and student research in general biology, physiology, molecular biology and ecology. In house facilities include aquatic and terrestrial animal rooms, a greenhouse, walk-in-growth chambers, laminar flow hoods, incubators, centrifuges, research microscopes, autoclaves, and computers for data analysis, graphing and simulation studies. Students are given first-hand experience in the use of these facilities and are encouraged in every way possible to develop their capacities for independent work in biology.

Biology's best attribute is its teachers. The faculty at Bishop's is dedicated to undergraduate student teaching. Students who come to BU are treated as individuals, not numbers, and will be exposed to numerous hands-on lab situations. At Bishop's you won't just be shown how to do something, you will be expected to become proficient yourself, gaining practical experience often lacking in other biology programs.

Bishop's University is located near a variety of habitats including bogs, lakes, rivers, mountains, marshes, hardwood forests and meadows, most of which are in easy reach from the campus and are accessible for field trips. This means you could be hiking one lab and canoeing the next. The rural setting of Bishop's combines the features of a biological field station with those of a well-equipped biology department, providing exceptional opportunities for field study and research in ecology and environmental biology. Those students interested in molecular biology and physiology will benefit from the proximity of the Université de Sherbrooke, and its academic hospitals and School of Pharmacology. This French-language university provides an active nucleus of researchers in physiology, immunology, nuclear medicine, and microbiology. An ongoing collaboration between the Université de Sherbrooke and Bishop's provides our students with access to these researchers and their laboratories.

The Biology B.Sc. programs are designed on a foundation of prerequisite courses at the collegial level in biology, chemistry, mathematics, and physics. These are followed by a set of core courses that lead to one of four concentrations: Health Science, Molecular Biology, Environmental Biology, Diversity Form and Function. The Biology B.A. program is designed for students lacking a background in the sciences and allows them to study those in either Health Science or Environmental Biology.

## **B.Sc. Programs, Major/Honours:**

The B.Sc. programs are designed for those students wishing to graduate with a Bachelor of Science degree which requires a strong grounding in the core sciences (math, physics, and chemistry). Students graduating from these programs will be well prepared to continue on to graduate (M.Sc. or Ph.D.) or professional school (i.e. medicine or physiotherapy) programs.

### **Concentration "Health Science"**

This program is designed specifically for students interested in graduating from BU and then proceeding on to a second degree in the applied health fields (i.e. medicine, dentistry, physiotherapy, or athletic therapy).

### **Concentration "Molecular Biology"**

Students interested in seeking immediate employment or future graduate training in the field of biotechnology or molecular biology should strongly consider this program.

### **Concentration “Environmental Biology”**

This program is designed for those students interested in general ecology, human-animal interactions, biodiversity, and conservation biology.

### **Concentration “Diversity, Form and Function”**

This program is ideal for students interested in biodiversity, veterinary science, taxonomy, zoology, botany, animal science, and conservation biology.

### **Entrance Requirements**

Students are considered for entry into programs offered by the Division of Natural Sciences and Mathematics after completion of a Québec Collegial Diploma (DEC), grade 12 in other provinces or the U.S.A., or the equivalent level of education from other international origins. Students applying from a Québec CEGEP will normally be admitted to a three-year program of at least 93 credits. All other students seeking a first Bachelor’s degree will normally be admitted to a four-year program of at least 123-credits. A student’s total credit requirement depends on the program and the type of degree chosen. However, all Bishop’s students must complete the 3-credit, English Writing Proficiency examination (EWP) included in the total credit requirement.

### **Entrance Requirements for Quebec Students**

To enter any of the B.Sc. Programs, a student must normally have a Quebec collegial diploma (D.E.C.) in science, or the equivalent, including General Biology, General Chemistry, Solutions Chemistry, Differential Calculus, Integral Calculus, Mechanics and/or Electricity and Magnetism. Students having these prerequisites can normally complete their undergraduate program at Bishop’s in three years.

CEGEP Chemistry 202-BFA-05 and 202-BFB-05 (organic chemistry) are also recommended as preparation for Bishop’s biology programs, but students may enter without these courses, or with Chemistry 202 only, according to the following requirements:

- (i) Students with CEGEP Chemistry 202-BFA-05 and Chemistry 202-BFB-05 are exempt from Biology155a/Chemistry 105a but must replace this course with one science option.
- (ii) Students who obtained a grade of 85% or higher in CEGEP Chemistry 202-BFA-05, are exempt from Biology155a/Chemistry 105a but must replace this course with one science option.
- (iii) Students who obtained less than 85% in CEGEP Chemistry 202-BFA-05 and students lacking CEGEP Chemistry 202-BFA-05 must include Biology155a or Chemistry 105a in their program.

### **Entrance Requirements for Non-Quebec Students**

Upon completion of grade 12 in other provinces or the United States, or of the equivalent level of secondary education elsewhere, students enter a four-year degree program at Bishop’s. In the biology B.Sc. programs, students must register in their first year for the following required Quebec-collegial-equivalent science courses: Biology/Biology Laboratory 191a; Chemistry 191a/081a, 192b/082b; Mathematics 198a/088a, 199b/089a; Physics 193a/083a, 194b/084b. In the biology B.A. program, students must register in their first year for Biology/Biology Laboratory 191a. In all biology programs, students must also register in their first year for English Language 116, or another English course, and for one course (three lecture credits) in English, Classical Studies, History, Philosophy, Religion, or Liberal Arts. In the Biology B.Sc. programs, students must register for a final course (three lecture credits) in any discipline.

Regardless of what level the student is entering, all students wishing to graduate from the Biology B.Sc. program must complete the Biology core requirements and the appropriate concentration core courses. Also, the students must select the appropriate number of concentration options, 2-3 science options, and appropriate number of free electives. Details for these course selections for each of these

criteria may be found below. In addition, all students entering the U0 year must complete the appropriate courses listed under the “U0 Courses for Non-Quebec B.Sc. Biology Students”.

The lists of classes below do not include co-requisite labs. For a student to complete the requirements of their program they must complete both the course and its associated co-requisite lab.

### **U0 Courses for Non-Quebec B.Sc. Biology Students:**

#### **Total Credits 30**

Checklist of required courses for non-Quebec students registered in a B.Sc. program.

- BIO191 Introductory Biology
- CHE191 General Chemistry I
- CHE192 General Chemistry II
- PHY193 General Physics I for Life Sciences I
- PHY194 General Physics II for Life Sciences II
- MAT198 Calculus I for Life Sciences
- MAT199 Calculus II for Life Sciences
- ELA116 Effective Writing (or other ENG)
- HUM (CLA, ENG, HIS, REL, PHI or Lib. Arts)
- Free Option (One 3 Credit Course from any Division)

### **Biology Core: required by all Biology B.Sc. students:**

#### **Total Credits 21**

- BIO110 Introductory Cellular and Molecular Biology
- BIO115 Diversity of Life 1
- BIO116 Diversity of Life 2
- BIO118 Genetics
- BIO226 Animal Physiology 1
- PHY101 Statistical Methods
- CHE105 Organic Chemistry

Students must also choose the specified selection of courses for their desired concentration. See below for details.

### **B.Sc. “Health Science” Concentration**

Concentration Courses: required courses for the Health Science concentration: Total Credits 18 credits

- BIO133 Human Anatomy
- BIO215 Metabolism
- BIO228 Animal Physiology 2
- BIO352 Microbiology
- PSY101 Introduction to Psychology I
- PBI288 Brain and Behavior 1

Concentration Options: all Health science students must take 7 courses from the following list of options. A minimum of 4 of the 7 courses must be from BIO/BCH/CHE: Total Credits 21

- BIO252 Bioethics
- BIO291 Planning and Analysis of Biological Experiments
- BIO310 Advanced Cell
- BIO349 Medical and Veterinary Entomology
- BIO328 Advanced Physiology
- BIO359 Human Genetics
- BIO360 Molecular Genetics
- BIO117 General Ecology
- BIO212 Evolution

BIO220 History of biology  
BIO365 Developmental Biology  
BIO379 Clinical Neuropsychology  
BIO380 Psychopharmacology  
BCH191 Nutrition  
BCH336 Immunology  
BCH338 Environmental Biochemistry and Toxicology  
CHE106 Organic Chemistry II:  
PBI275 Health Psychology I  
PBI276 Health Psychology II  
PBI327 Psychology of Nutrition  
PSY203 Sports Psychology: Performance Enhancement  
PSY213 Research Methods  
PMA260 Psychological Statistics  
PSY328 Occupational Health Psychology

Science Courses: all health science majors must complete  
2 science options: Total Credits 6

Science option 1 (One 3-Credit Course from the Division of Science)

Science option 2 (One 3-Credit Course from the Division of Science)

Free Electives: all Biology Majors must complete 8 free electives from any division  
of their choice: Total Credits 24

### **Honours**

Honours students complete the same as above but instead of 8 free electives should choose only 5. They must however complete the following three courses and maintain a) a minimum of 75% in all 200- and 300-level Biology courses with an overall (i.e. U2 and U3 combined) maximum permitted exemption of four credits representing no more than two courses, and b) a minimum of 75% in BIO462a/b and BIO463a/b.

BIO272 Scientific Writing for Life Science

BIO462 Honours thesis 1

BIO463 Honours thesis 2

### **B.Sc. “Molecular Biology” Concentration**

Concentration Courses: required courses for the Molecular Biology concentration: Total Credits 21

CHE106 Organic Chemistry II

BIO215 Metabolism

BIO310 Advanced Cell

BIO360 Molecular Genetics

BIO365 Developmental Biology

BCH211 Biochemistry I: Proteins

BCH336 Immunology

Concentration Options: all Molecular Biology students must take 7 courses from the following list of options: Total Credits 21

BIO117 General Ecology

BIO220 History of Biology

BIO228 Animal Physiology 2

BIO252 Bioethics

BIO291 Planning and Analysis of Biological Experiments

BIO314 Biotech

BIO345 Plant Physiology  
BIO352 Microbiology  
BIO359 Human Genetics  
BIO379 Clinical Neuropsychology  
BIO380 Psychopharmacology  
BCH191 Nutrition  
BCH212 Biochemistry II: Lipids and Biomembranes  
BCH338 Environmental Biochemistry and Toxicology

Science Courses: all Molecular Biology majors must complete 1 science options: Total Credits 3  
Science option (One 3 Credit Course from the Division of Science)

Free Electives: all Biology Majors must complete 8 free electives from any division of their choice:  
Total credits 24

### **Honours**

Honours students complete the same as above but instead of 8 free electives should choose only 5. They must however complete the following three courses and maintain a) a minimum of 75% in all 200- and 300-level Biology courses with an overall (i.e. U2 and U3 combined) maximum permitted exemption of four credits representing no more than two courses, and b) a minimum of 75% in BIO462a/b and BIO463a/b.

BIO272 Scientific Writing for Life Science  
BIO462 Honours thesis 1  
BIO463 Honours thesis 2

### **B.Sc. “Environmental Biology” Concentration**

Concentration Courses: required courses for the Environmental Science concentration: Total Credits 18

BIO117 General Ecology  
BIO212 Evolution  
BIO217 Advanced Ecology  
BIO221 Biogeography  
CHE133 Environmental Chemistry  
ESG127 Introduction to Physical Geography

Concentration Options: all Environmental Science students must take 7 courses from the following list of options. A minimum of 4 of which must be from BIO/BCH: Total Credits 21

BIO215 Metabolism  
BIO230 Freshwater Biology  
BIO257 Vascular Plant Systematics  
BIO291 Planning and Analysis of Biological Experiments  
BIO349 Medical and Veterinary Entomology  
BIO352 Microbiology  
BIO358 Animal Behavior  
BIO345 Plant Physiology  
BCH338 Environmental Biochemistry and Toxicology  
ESG269 The Earths Crust  
ESG226 Oceans I  
ESG227 Oceans II  
ESG250 Geomorphology  
ESG251 Soils and Vegetation  
ESG265 The Atmosphere and Weather  
ESG361 Glacial Environments

Free Electives: all Biology Majors must complete 8 free electives from any division of their choice:  
Total Credits 24

Science Courses: all Environmental Biology majors students must complete 2 science options: Total Credits 6

Science option 1 (One 3 Credit Course from the Division of Science)

Science option 2 (One 3 Credit Course from the Division of Science)

### **Honours**

Honours students complete the same as above but instead of 8 free electives should choose only 4. They must however complete the following four courses and maintain a) a minimum of 75% in all 200- and 300-level Biology courses with an overall (i.e. U2 and U3 combined) maximum permitted exemption of four credits representing no more than two courses, and b) a minimum of 75% in BIO462a/b and BIO463a/b.

BIO272 Scientific Writing for Life Science

BIO291 Planning and Analysis of Biological Experiments

BIO462 Honours thesis 1

BIO463 Honours thesis 2

### **B.Sc. “Diversity, Form and Function” Concentration**

Concentration Courses: required courses for the Diversity, Form & Function concentration: Total Credits 18

BIO117 General Ecology

BIO212 Evolution

BIO228 Animal Physiology 2

BIO248 Invertebrate Zoology

BIO257 Vascular Plants Systematics

BIO270 Vertebrate Zoology

Optional Courses: the student would also have to take 7 courses from the following list of options.

Total Credits 21

BIO133 Vertebrate Anatomy

BIO215 Metabolism

BIO291 Planning and Analysis of Biological Experiments

BIO310 Advanced Cell

BIO328 Advanced Physiology

BIO330 Ornithology

BIO345 Plant Physiology

BIO349 Medical and Veterinary Entomology

BIO350 Invertebrate Physiology

BIO352 Microbiology

BIO353 Parasitology

BIO354 Insect Biodiversity

BIO358 Animal Behavior

BIO367 Ichthyology

PBI288 Brain and Behavior 1

Free Electives: all Biology Majors must complete 8 free electives from any division of their choice: Total credits 24

Science Courses: all Diversity, Form and Function students must complete 2 science options: Total Credits 6

Science option 1 (One 3 Credit Course from the Division of Science)

Science option 2 (One 3 Credit Course from the Division of Science)

## **Honours**

Honours students complete the same as above but instead of 8 free electives should choose only 4. They must however complete the following four courses and maintain a) a minimum of 75% in all 200- and 300-level Biology courses with an overall (i.e. U2 and U3 combined) maximum permitted exemption of four credits representing no more than two courses, and b) a minimum of 75% in BIO462a/b and BIO463a/b.

- BIO272 Scientific Writing for Life Science
- BIO291 Planning and Analysis of Biological Experiments
- BIO462 Honours thesis 1
- BIO463 Honours thesis 2

## **BA Programs:**

Students entering Bishop's University from outside Quebec must enroll in the 4-year (120 credits) program, which includes the following U0 academic year. Students entering from the Quebec Cegep system do not take the U0 year and instead should start their 90 credits program with the Biology Core courses.

The lists of classes below do not include co-requisite labs. For a student to complete the requirements of their program they must complete both the course and its associated co-requisite lab.

## **U0 Courses for all Non-Quebec B.A. Biology Students.**

### **Total Credits 30**

#### **Courses for non-Quebec students registered in a B.A. Biology program.**

- BIO191 Introductory Biology
- ELA116 Effective Writing (or other ENG)
- HUM Humanities (CLA, ENG, HIS, REL, PHI or Lib. Arts)
- 7 Free Options

Biology Core: required by all Biology BA students: Total Credits 15

- BIO110 Introductory Cellular and Molecular Biology
- BIO115 Diversity of Life 1
- BIO116 Diversity of Life 2
- BIO118 Genetics
- PHY101 Statistical Methods

## **BA "Health Science" Concentration**

All students in this program must take the following 2 courses. Total Credits 6.

- BIO226 Animal Physiology 1
- BIO228 Animal Physiology 2

**Students must also take 6 or more courses from the following list.** Total Credits 18.

- BIO133 Human Anatomy
- BIO212 Evolution
- BIO252 Bioethics
- BIO279 Neuropsychology
- BIO280 Psychopharmacology
- BIO352 Microbiology
- BIO328 Advanced Physiology
- BIO349 Medical and Veterinary Entomology
- EXS127 Intro to Exercise Physiology
- BCH191 Nutrition
- PBI327 Psychology of Nutrition

PBI275 Health Psychology I  
PBI276 Health Psychology II  
PBI288 Brain and Behavior 1  
PSY101 Introduction to Psychology I

Free Options: Students must also choose 17 lecture courses from any division. Total Credits 51

### **BA “Environmental Biology” Concentration**

All students in this program must take the following 2 courses. Total 6 credits.

BIO117 General Ecology  
BIO212 Evolution

Students must also take 6 or more courses from the following list, a minimum of 4 of which must be from Biology: Total Credits 18.

BIO221 Biogeography  
BIO230 Freshwater Biology  
BIO248 Invertebrate Zoology  
BIO257 Vascular Plants Systematics  
BIO270 Vertebrate Zoology  
BIO349 Medical and Veterinary Entomology  
BIO352 Microbiology  
BIO358 Animal Behavior  
BIO367 Ichthyology  
BCH338 Environmental Biochemistry and Toxicology  
ESG127: Introduction to Physical Geography  
ESG226 Oceans I  
ESG227 Oceans II  
ESG250 Geomorphology  
ESG251 Soils and Vegetation  
ESG265 The Atmosphere and Weather  
ESG269 The Earth’s Crust  
ESG361 Glacial Environments

Free Options: Students must also choose 17 lecture courses from any division. Total Credits 51

### **Biology Minor**

The Biology minor consists of eight introductory courses in different specializations in biology, five of which are prescribed, and three are open. It is intended to allow students with a major in another field to obtain a perspective on modern biology.

BIO110 Introductory Cellular and Molecular Biology  
BIO115 Diversity of Life 1  
BIO116 Diversity of Life 2  
BIO117 General Ecology  
BIO118 Genetics

Students must also complete three other Biology courses totaling 9 lecture credits.

Total 24 credits

Note: Only lecture credits are indicated. Any associated laboratories will increase the number of required credits.

### **Pre-Medical Studies Program**

The pre-med program is intended for those students who wish to apply to medical school directly after graduating from Bishop’s. This program is not exclusive to Biology but is administered by the department. The pre-med program may be taken by any student at Bishop’s; however, it can only be taken as a second concentration and may not be taken on its own. Therefore, students must complete

the following list of courses as part of, or in addition to, those requirements necessary to meet the student's primary major/concentration.

### **93 Credit Program:**

Pre-Med Required Science courses: Total 27 Credits. The following courses must be taken in order to meet the requirements of the concentration.

BCH211 Biochemistry I: Proteins  
BCH275 Biochemistry III: Metabolism  
BIO110 Introductory Cellular and Molecular Biology  
BIO226 Animal Physiology I  
BIO228 Animal Physiology II  
CHE105 Organic Chemistry  
CHE106 Organic Chemistry II  
PHY101 Statistical Methods  
PSY101 Introduction to Psychology

Pre-Med Required Non-Science Courses: Total 15 Credits. Students must take the following number of electives from the list below in order to meet the requirements of the concentration.

At least 2 Second Language Courses.  
At least 2 Courses in English Literature.  
At least 1 Course from the Social Sciences.

### **123-credit program:**

Students enrolled in the 123-credit program must take the same courses listed above, plus they must complete the standard list of U0 courses required for BSc students from outside Quebec.

BIO191 Introductory Biology  
CHE191 General Chemistry  
CHE192 General Chemistry II  
PHY193 General Physics I for Life Sciences I  
PHY194 General Physics II for Life Sciences II  
MAT198 Calculus I for Life Sciences  
MAT199 Calculus II for Life Sciences  
ELA116 Effective Writing (or other ENG)  
HUM (CLA, ENG, HIS, REL, PHI or Lib. Arts)  
Free Option (One 3 Credit Course from any Division)

### **COURSES:**

PLEASE NOTE: The following list of courses represents those courses which are normally offered by the Department of Biological Sciences. However, some courses alternate and thus are only available every second year. The schedule of such courses is indicated below the course description. Some courses that are not required in Biology programs are not offered on a regular basis. Such courses are indicated with an asterisk (\*).

Biology 107 Birds and Behaviour 4-6-6

This course represents an examination of the biology of birds, with emphasis on their behaviour, including singing, territoriality, mate choice, parental care, flocking and migration. Research results on these topics will be used to illustrate fundamental principles of ecology and evolution. Course format will be a mixture of lectures, student-led seminars, laboratory work and field trips. No previous scientific education or knowledge of birds is assumed.

*Note: This course cannot be taken for credit by students in Biology or Biochemistry.*

*Professor Yezerinac*

Biology 110a Introductory Cellular and Molecular Biology 3-3-0

The structure, organization, and molecular genetics of cells; the structure and function of cell organelles; genetic replication and expression; gene mutation; regulation of the cell cycle.

*Prerequisite: BIO 191, collegial Biology, or equivalent*

*Professor Yezerinac*

Biology 113a Field Biology I (only offered in the spring semester) 4-5-30

An intensive, three-week long course in which participants study a wide range of habitats to gain familiarity with plants and animals in the field and to learn methods of field study. Physical aspects of the environment relating to the biota are studied, as well as the plants and animals and their interactions with one another and their environment. Living organisms are brought to the laboratory for further study. Instruction is given five full days per week during a three-week period. Areas of instruction: Mosses and Lichens; Terrestrial Mammals; Insects.

*Prerequisite: collegial Biology or equivalent*

*Offered in odd-numbered years.*

*Staff*

Biology 114a Field Biology II (only offered in the spring semester) 4-5-30

A course similar to Biology 113a, except that other topics are covered: Forest Ecology, Aquatic Invertebrates; Animal Behavior.

*Prerequisite: collegial Biology or equivalent*

*Offered in even-numbered years*

*Staff*

Biology 115a Diversity of Life I 3-3-0

This course offers a thorough exploration of one branch of the tree of life, that occupied by multicellular animals. The course complements Diversity of Life II, a winter-term course with a focus on prokaryotic and non-animal eukaryotic life. The material in both courses is organized according to a modern phylogenetic framework. In this course students will learn about phylogenetic hypotheses and evidence, and they will study how classifications are created, tested, and, where necessary, rejected. Focusing on animals, we will discuss many of the morphological and physiological adaptations that have arisen. The evolutionary implications of some features, such as bilateral symmetry and the notochord, will be discussed more thoroughly. Recent advances as well as current contentious issues in animal classification will also be examined.

*Prerequisite: collegial Biology or equivalent; Co-requisite: Biology Lab 115a*

*Professor Savage*

Biology Lab 115a Diversity of Life I Laboratory 1-0-3

The classification, identification, morphology and biology of the animals considered in Biology 115a.

*Prerequisite: collegial Biology or equivalent; Co-requisite: Biology 115a*

*Professor Yezerinac*

Biology 116b Diversity of Life II 3-3-0

Like its companion course Biology 115a, this course explores the tree of life, but from a less animal-centric view. We study the prokaryotes at the root of the tree, responsible for more than half of the earth's biomass. Next, we examine the branch that contains all fungi (and lichens). The various protists and those algae that are not related to green plants form other branches, which we will also explore. Finally, we study in more detail the largest group of eukaryotes by biomass, the green plants. The material in this course (and in Biology 115a) is organized according to a modern phylogenetic framework. The focus will be on diversity, function and ecological importance. In the case of the green plants, we look at the reasons for the tremendous ecological success of this form of life. We examine photosynthesis, transport, reproduction and life cycles, and evolution, empathizing ecological relevance.

*Co-requisite: Biology Lab 116b*

*Professor van Hulst*

Biology Lab 116b Diversity of Life II Laboratory 1-0-3

A series of experiments and exercises to complement Biology 116b.

*Co-requisite: Biology 116b*

*Professor Yezerinac*

Biology 117a General Ecology 3-3-0

An introduction to modern ecology: environmental patterns, patterns in the distribution of plants and animals, evolution and adaptation, ecosystem function, plant and animal populations, species interactions, community organization, applied ecology.

*Prerequisite: collegial biology or equivalent; Co-requisite: Biology Lab 117a*

*Professor van Hulst*

Biology Lab 117a General Ecology Laboratory 1-0-3

Experiments and exercises in General Ecology.

*Prerequisite: collegial biology or equivalent; Co-requisite: Biology 117a*

*Professor King*

Biology 118b Genetics 3-3-0

An introduction to the study of biologically inherited traits from three perspectives. (i) Mendelian Genetics: the rules of genetic transmission and heredity. (ii) Molecular Genetics: the biochemical and chromosomal basis of heredity. (iii) Population & Evolutionary Genetics: the variation in genes amongst individuals and populations, heritability, and changes in genes over time.

*Prerequisite: Biology 110a; Co-requisite: Biology Lab 118b*

*Professor Yezerinac*

Biology Lab 118b Genetics Laboratory 1-0-3

Experiments in genetics designed to complement topics discussed in Biology 118b.

*Prerequisite: Biology 110a; Co-requisite: Biology 118b*

*Professor Yezerinac*

Biology 131\* The Human Body in Health and Disease 3-3-0

An introduction to human anatomy and physiology. This course will employ problem-based learning, virtual experiments, and traditional lectures to explain the relationship between the structure of the human body and its functions. These concepts will then be applied to the study of representative human diseases. This course is designed for students with minimal biology backgrounds, including arts students, teachers, coaches, and home-care workers. Students will acquire a working knowledge of human biology and the ability to communicate this knowledge to others.

*Prerequisites: Secondary school Biology and/or Chemistry recommended.*

*Note: This course cannot be taken for credit by students in Biology or Biochemistry.*

*Professor Hull*

Biology 133 Human Anatomy 3-3-0

The anatomy of all of the major body systems will be discussed in the context of human health and disease. This course is designed for students interested in the biomedical sciences or health education. Students will develop their understanding of human anatomy and will acquire the ability to communicate scientific concepts to their patients or students.

*Prerequisite or Corequisite: BIO 191 or collegial Biology.*

*Corequisite: BIL 133. This course cannot be taken for credit by anyone who already has credit for BIO131 or BIO132.*

Biology Lab 133 Human Anatomy Lab 1-0-3

This course will give students a solid grounding in vertebrate anatomy through dissections and preserved material. Dissection material will include either in part or whole, several mammalian species including sheep, cat, cow, and pig. Material will focus on the recognition and development of the major organs and systems such as the skeletal, muscle, nervous, reproductive, excretory, and digestive systems. Although general mammalian structure will be examined, the relevance of these structures to human anatomy will represent the major focus of the course.

*Corequisite: BIO 133.*

*Professor Richardson*

Biology 138b The Genetics Revolution 3-3-0

This course is designed for non-science majors to examine the impact of recent genetic discoveries on medicine, agriculture and industry. It will begin with a brief introduction to the genetic organization of all living organisms, the structures of animal, plant and bacterial cells, and the molecular technologies used to alter the genomes of these organisms for scientific and industrial purposes. The use of these technologies in the biotech industry to develop new drugs, diagnostic tests, alter agriculturally important plant species, and enhance forensic identification will be explored. As well, the potential benefits and possible problems associated with these technologies to human society as well as ethical questions arising about the use of these new techniques will be discussed.

*This course cannot be taken for credit by students enrolled in programs in Biochemistry, Biology or Chemistry.*

*Staff*

Biology 155a Organic Chemistry for Biologists 3-3-0

An introduction to the chemistry of organic molecules with emphasis on compounds and reactions prevalent in living organisms. Will include an introduction to proteins, lipids, carbohydrates, and nucleic acids.

*Prerequisite: Chemistry 191a, 192b, 081a, and 082b; Corequisite: Biology Lab 155a*

*Not offered in 2006-2007; students should instead register in CHE105a/185a*

*Professor Stroehrer*

Biology Lab 155a Organic Chemistry for Biologists Lab 1-0-3

Extraction, purification, and analysis of different classes of organic molecules. Introduction to different separation techniques including column chromatography, thin layer chromatography, and polyacrylamide gel electrophoresis.

*Prerequisite: Chemistry 191a, 192b, 081a, and 082b; Corequisite: Biology 155a*

*Not offered in 2006-2007; students should instead register in CHE105a/185a*

*Professor Stroehrer*

Biology 191a Introductory Biology 3-3-0

Scientific method, chemistry of life, cell structure, cell metabolism, respiration, photosynthesis, transport systems, origin of life, evolution, genetics, reproduction, taxonomy, diversity of life (including microorganisms, fungi, plants and animals), ecosystems.

BIO 191a is designed for students wishing to major in biology or biochemistry at Bishop's but who lack the appropriate collegial biology course. This course may also be taken for credit by non-biology students as part of their regular program.

*This course cannot be taken for credit by B.Sc. students who are enrolled in a 3-year program, nor can it be taken for credit by anyone who already has credit for Biology 193, Biology 199 or PBI191.*

*Co-requisite: Biology Lab 191a*

*Professor Richardson*

Biology Lab 191a Introductory Biology Laboratory 1-0-3

Experiments and exercises in Introductory Biology. This laboratory course cannot be taken for credit by anyone who already has credit for Bil193 or Bil199.

*Co-requisite: Biology 191a*

*Professor Yezerinac*

Biology 193b Introductory Biology for Education Students 3-3-0

BIO193b has essentially the same course content as BIO191a but is designed for education students to provide them with the necessary biological knowledge for teaching biology in the school system.

*This course cannot be taken for credit by anyone who already has credit for Biology 191, Biology 199 or PBI 191.*

*Prerequisites: Secondary school Biology and/or Chemistry are recommended.*

*Co-requisite: Biology Lab 193b*

*Staff*

Biology Lab 193b Introductory Biology Laboratory  
for Education Students 1-0-3

BIL193b has essentially the same course content as BIL191a but is designed for education students to provide them with the necessary laboratory biological knowledge for teaching biology in the school system.

*This course cannot be taken for credit by anyone who already has credit for BIL191 or BIL199.*

*Co-requisite: Biology 193b*

*Staff*

Biology 212b Evolution 3-3-0

Possibly the greatest single theory in modern science, evolution influences all aspects of biology from wildlife management to modern medicine. This course will examine both the patterns of evolution as well as the mechanism.

*Professor Richardson*

Biology 215b Metabolism 3-3-0

Introduction to the basic metabolic pathways of living cells. These include the central metabolic pathways associated with cellular energy generation, carbohydrate degradation and synthesis, fatty acid degradation and synthesis, lipid metabolism and nitrogen metabolism. Emphasis will be placed on the role and regulation of enzymes associated with these pathways.

*Prerequisite: collegial biology, Biology 155a or Chemistry 105a/185a and Biology 226a.*

*Co-requisite: Biology Lab 215b.*

*Students may not take this course for credit if they have received credit for BCH 275b.*

*Professor Stroehrer*

Biology Lab 215b Metabolism Laboratory 1-0-3

This course introduces the student to research approaches in metabolic enzymology and the study of enzyme kinetics. Environmental factors influencing enzyme activity as well as the effects of different inhibitory molecules will be examined. As well, protein isolation and analysis will be covered.

*Pre-requisite: collegial biology, Biology 155a or Chemistry 105a/185a and Biology 226a*

*Co-requisite: Biology 215b*

*Professor Stroehrer*

Biology 217b Advanced Ecology 3-3-0

A second course in ecology that focuses on understanding relations between animals, plants, and microbes. Topics include: population growth and regulation, variation in space and time, predation (including herbivory and adaptations to avoid being eaten), parasitism and disease, symbiosis and mutualism, life history variation, regulation and manipulation of abundance, disturbance, food webs, colonization, conservation, and population viability analysis.

*Prerequisite: Biology 117a; Co-requisite Biology Lab 217b*

*Professor van Hulst*

Biology Lab 217b Advanced Ecology Laboratory 1-0-3

Laboratory exercises to accompany Advanced Ecology. We will use 10 exercises in conservation biology using the computer application RAMAS EcoLab. These incorporate real-world ecological problems, and will give the student experience in dealing with complex systems, as well as teaching valuable notions in applied ecology.

*Prerequisite: Biology 117a; Co-requisite: Biology 217b*

*Professor van Hulst*

Biology 220\* History of Biology 3-3-0

An outline of biological discovery from early times to the present in relation to social, historical and cultural developments.

*Prerequisites: Biology 110a, Biology 115a, Biology 116b, Biology 117a, Biology 118b*

*Staff*

Biology 221b Biogeography 3-3-0

The main goals of this course are to study spatial patterns of biodiversity and to attempt to reconstruct the origin and the present distribution of both extinct and extant taxa. We start by examining the modern distribution of selected groups of plants and animals, as well as the distribution and limits of the major biomes. We proceed with an overview of the major changes in the earth's climate and topology through geological times, and conclude with the impact of these historical changes on the evolution and the distribution of plants and animals. Techniques in biogeographical analysis will be taught and the students are expected to carry out a group project on the biogeographic history of a specific group of plants or animals. Topics such as extinction, adaptive radiation and island biogeography will also be covered.

*Prerequisites: Biology 115a*

*Pre or Co-requisite: Biology 212*

*Professor Savage*

Biology 224b Animal Physiology I 3-3-0

This course will review the broad subject of cancer development and treatment. In particular it will focus on taking concepts seen in cell biology (Bio110) and applying them to cancer cells. Among the topics reviewed will be: cancer types and staging, mutation rates and environmental contributions to genetic changes, oncogenes and tumor suppressors, cell proliferation/death balance, modification of cancer cells phenotypes and metastases formation, role of the immune system in the prevention of cancer spreading, strategies of cure, and a review of the body's physiological responses to several forms of cancer.

*Prerequisites: BIO 110 Introductory Cell and Molecular Biology and BIO 226 Animal Physiology I*

Biology 226a Animal Physiology I 3-3-0

Basic mechanisms of homeostatic regulation. Topics include: Cell physiology, Nervous system, Muscular system, the Endocrine system, and the Cardiovascular system.

*Prerequisite: Biology 110a; Co-requisite: Biology Lab 226a*

*Students who have received credit for Biology 216a cannot also receive credit for Biology 226a.*

*Professor Hull*

Biology Lab 226a Animal Physiology I Laboratory 1-0-3

Experiments designed to examine the physiological systems discussed in Biology 226a.

*Prerequisite: Biology 110a; Co-requisite: Biology 226a*

*Professor Hull*

Biology 228b Animal Physiology II 3-3-0

Mechanisms of functional operation of animal organisms. Topics include: renal, respiratory, gastrointestinal, and reproductive function.

*Prerequisite: Biology 226a; Co-requisite: Biology Lab 228b*

*Students who have received credit for Biology 344b cannot also receive credit for Biology 228b*

*Professor Hull*

Biology Lab 228b Animal Physiology II Laboratory 1-0-3

Experiments dealing with different aspects of animal physiology. Some experiments will be performed using computer simulations.

*Prerequisite: Biology 226a Co-requisite: Biology 228b.*

*Students who have received credit for Biology Laboratory 344b cannot also receive credit for Biology Lab 228b.*

*Professor Hull*

Biology 230a Freshwater Biology 3-3-0

This course will expose students to the biological importance and diversity of freshwater systems. Class material will look at both the biotic and abiotic components of aquatic systems as well as their interactions.

*Prerequisite or Co-requisite: Biology 115a; Co-requisite: Biology Lab 230a*

*Offered in even-numbered years*

*Professor Richardson*

Biology Lab 230a Freshwater Biology Lab 1-3-0

The lab section will focus on the different techniques necessary for sampling both lentic and lotic systems. Emphasis will be placed on practical first-hand experience using the appropriate equipment in the field. The process of data collection will culminate in the students performing a mini-research project on a local aquatic system of their choice and presenting these data to their peers.

*Prerequisite or Co-requisite: Biology 115a; Biology 117a; Co-requisite: Biology 230a*

*Offered in even-numbered years*

*Professor Richardson*

Biology 248b Invertebrate Zoology 3-3-0

Morphology, physiology, embryology, evolution and classification of invertebrate animals.

*Prerequisite: Biology 115a; Co-requisite: Biology Lab 248b*

*Professor Savage*

Biology Lab 248b Invertebrate Zoology Laboratory 1-0-3

The classification, identification, morphology and biology of the animals considered in Biology 248b.

*Prerequisite: Biology 115a; Co-requisite: Biology 248b*

*Professor Savage*

Biology 252\* Bioethics 3-3-0

Ethical aspects of modern biology, biotechnology, and medicine. Topics to be discussed: Use and abuse of biology, Transgenics and the changing world, Medical science today, Biology and Culture, Sociobiology, Limits to scientific inquiry. The animal rights controversy, cloning controversy, ethical imperatives, environmental issues, and medical ethics will be explored.

*Prerequisite: Biology 110a or permission of instructor*

*Note: This course restricted to Biology, Biochemistry and Chemistry majors.*

*Professor Stroehrer*

Biology 257a Vascular Plant Systematics 3-3-0

Evolution, taxonomy, morphology, and anatomy of the vascular plants.

*Prerequisite: Biology 116b; Co-requisite: Biology Lab 257a*

*Offered in even-numbered years*

*Professor van Hulst*

Biology Lab 257a Vascular Plant Systematics Laboratory 1-3-0

Exercises in identification and classification of vascular plants: use of floras and identification keys, computer keys, and programs for numerical classification; morphology and anatomy of vascular plants.

*Prerequisite: Biology 116b; Co-requisite: Biology 257a*

*Offered in even-numbered years*

*Professor van Hulst*

Biology 270a Vertebrate Zoology 3-3-0

Evolution, classification, morphology, and physiology of the various classes of vertebrates. Particular attention will be placed upon the integumentary, skeletal, muscular, respiratory, digestive, excretory, and reproductive systems.

*Prerequisite: Biology 115a; Co-requisite Biology Lab 270b*

*Offered in odd-numbered years*

*Professor Richardson*

Biology Lab 270a Vertebrate Zoology Laboratory 1-0-3

The lab component will expose students to the diversity of vertebrates around them. Vertebrate diversity and behavior will be studied through a series of field trips, while basic anatomy will be examined in more detail in the lab through dissections and preserved mounts.

*Prerequisite: Biology 115a; Co-requisite: Biology 270b*

*Professor Richardson*

Biology 272a Scientific Writing for the Life Sciences 3-3-0

This course is intended for Honours Biology students and will instruct them in the writing, revision and various forms of presentation of scientific research. Lectures will introduce the scientific method and train students to critically read the scientific literature. Detailed examples of a written paper will then follow with step-by-step instructions. Data analysis, word processing and citation methods will be reviewed. In addition to written manuscripts, poster and oral presentations will be discussed.

*Prerequisite: This course is normally open to U2 or U3 students by permission of departmental chair or instructor.*

*Staff*

Biology 291b Evaluating Scientific Evidence 3-3-0

In science we often have to decide whether data favor one hypothesis or another. This is easy if our evidence excludes all but one hypothesis. In practice we often face a harder task: several hypotheses remain that are compatible with the data, although one may seem the more "likely" one. How do we evaluate which one is more likely in the light of the data, and what exactly does "more likely" mean here? This course examines tools designed to help us in selecting the hypothesis that receives most support from the data: Neyman-Pearson P-values, Fisherian P-values, Bayesian posterior probabilities, confidence intervals, Bayesian credible intervals, and information-based criteria like AIC and BIC. You will learn how to calculate and how to interpret P-values and true measures of evidence, and how to use them in your own research.

*Prerequisite: PHY101a*

*Professor van Hulst*

Biology Lab 291a Planning and Analysis of  
Biological Experiments Laboratory 1-0-3

The laboratory provides hands-on training in setting up experiments and analyzing their results using the open-source statistical language R. This is widely used in both academic and industrial settings, is powerful, and is freely available. It provides many tools for experimental design, data analysis, and graphical presentation.

*Corequisite: BIO291a*

*Dr. Robert van Hulst*

Biology 310b Advanced Cell Biology 3-3-0

Topics in modern cell biology. Examines aspects of eukaryotic cell structure and function. Includes, but not restricted to, areas such as intracellular signaling, cell-cycling and cancer, endocytosis, protein targeting and organelle biogenesis.

*Prerequisite: Biology 110a, Biology 118b*

*Offered in even-numbered years*

*Professor Hull*

Biology 314b Biotechnology 3-3-0

This course will explore the technical approaches used in current research and biotechnology, emphasizing the applications of molecular strategies and processes studied in Biology 360. Both the theoretical and practical aspects of these molecular approaches will be discussed, as well as how these techniques are utilized and how they have changed modern research and medicine.

*Prerequisite: Biology 360a or Biochemistry 370*

*Co-requisite: Biology Lab 314b*

*Professor Stroehrer*

Biology Lab 314b Biotechnology Laboratory 1-0-3

Practical application of several of the techniques introduced in Biology 314.

*Prerequisite: Biology 360a or Biochemistry 370*

*Co-requisite: Biology 314b.*

*Professor Stroehrer*

Biology 320b Programmed Cell Death 3-3-0

Programmed cell death, also called apoptosis, is a normal physiological process that takes place in every type of cell in the animal kingdom. It plays a critical role in embryo development, in selective processes (immune system), in degenerative diseases and in cancer. Since the early 90's, programmed cell death is one of the fastest growing subject of research, with almost 15000 scientific publications in 2004. In this course, we will explore normal and impaired mechanisms involved in cell death, through examples taken in human medicine or in invertebrates' development.

*Prerequisite: Biology 110*

Biology 328b Advanced Physiology 3-3-0

This course will examine how animals adapt to environmental stresses such as extremes of temperature of altitude, hypoxia, water limitation and dietary changes. Short-term (acute), medium-term (acclimatory) and chronic (evolutionary) adaptations will be discussed.

*Pre-requisite: Biology 226a; Pre-or Co-requisite: Biology 228b*

*Offered in odd-numbered years*

*Professor Hull*

Biology 330\* Ornithology 3-3-0

An introduction to the study of birds, including their structure, function, reproduction, evolution and classification. The integration of morphological, physiological, and behavioral adaptations will be emphasized. In addition, topics of particular relevance to birds such as mechanisms of flight, migration, vocal communication, and conservation will be discussed.

*Prerequisite: Biology 115a; Co-requisite: Biology Lab 330*

*Professor Yezerinac*

Biology Lab 330\* Ornithology Laboratory 1-0-3

Study of bird morphology using preserved specimens and museum study skins. Field trips will be used to learn about living birds and their identification.

*Prerequisite: Biology 115a; Co-requisite: Biology 330*

*Professor Yezerinac*

Biology 333a Advanced Exercise Science 3-3-0

This course examines selected topics in Exercise Physiology. Through traditional lectures, directed readings, seminars, and case studies, students will study short-term and long-term adaptations to exercise. We will also examine the scientific principles underlying sports-related topics such as optimizing exercise performance, injuries, and injury repair.

*Prerequisite: Biology 226 or Exercise Science 127*

*Co-requisite: Biology Laboratory 333*

*Note: See Exercise Science 373. Students may not take this course for credit if they have received credit for EXS 373.*

*Professor Hull*

Biology Lab 333 Advanced Exercise Science Laboratory 1-0-3

The labs will introduce students to functional and clinically applied anatomy and physiology. They will experience evaluation and treatments of various musculoskeletal conditions, with an emphasis on sports related injuries. The student will work in both clinical and field settings. Case studies, injury reporting, and injury research will enable the student to learn independently and apply lecture material.

*Co-requisite: Biology 333*

*Note: See Exercise Science 383. Students may not take this course for credit if they have received credit for EXS 383.*

*Professor King*

Biology 345\* Plant Physiology 3-3-0

Nutrition, transport, growth and development in plants; the water relations of plants; mineral nutrition; growth regulators; tropisms; photoperiodism; vernalization and dormancy.

*Prerequisite: Biology 116b*

*Professor van Hulst*

Biology 349a Medical and Veterinary Entomology 3-3-0

As one of the most important group of vectors, insects, ticks and mites are involved in the transmission of numerous viruses, protozoans and bacteria causing diseases such as malaria, the plague, sleeping sickness, scabies, West Nile fever, and Lyme disease. This course will introduce students to some of the basic concepts of entomology but with a focus on the biology and control of those groups causing harm to humans and their domestic animals.

*Prerequisite BIO 115*

Biology 350 Invertebrate Physiology 3-3-0

This course provides an overview of some physiological mechanisms of invertebrates including digestion and nutrition, respiration, excretion, reproduction, circulation, locomotion, and behavior. We will also consider some of the unique strategies used by invertebrates which allow them to thrive in Earth's most extreme and challenging environments: deserts, frozen wastelands, deep ocean floors, hot vents, inside other organisms, and hypersaline lakes.

*Prerequisite: BIO 115.*

Biology 352a Microbiology 3-3-0

An introduction to prokaryotic microorganisms, eukaryotic microorganisms, and viruses; their ecology, growth characteristics, and host interactions. Examination of the environmental roles of microbes as well as their impact on the human world.

*Prerequisite: Biology 110a; Co-requisite: Biology Lab 352a*

*Offered in even-numbered years*

*Professor Stroehler*

Biology Lab 352a Microbiology Laboratory 1-0-3

An introduction to common microbiological techniques used in medical, biological and biochemical research, including techniques in growth, staining and identification of bacteria and viruses. As well, the diversity of physiological and metabolic requirements of bacteria will be examined.

*Prerequisite: Biology 110a; Co-requisite: Biology 352a*

*Offered in even-numbered years*

*Professor Stroehler*

Biology 353 Principles of Parasitism 3-3-0

An overview of parasite biology, with special emphasis on eukaryotic parasite diversity, ecology and host-parasite interactions (biochemistry, immunology, physiology, and pathology). We will also consider population / community ecology and evolutionary implications for parasites and their hosts. The course material is complemented by a lab, BIL 353.

Biology Lab 353 Principles of Parasitism Lab 1-0-3

The taxonomy, morphology, life cycles, and histopathology of commonly occurring protozoan and metazoan parasites of humans and domestic animals. Designed to give the student hands on experience, the laboratory will include the examination of prepared specimens and necropsy (=dissection) of hosts, and experiments exploring the effects of parasites on host physiology.

Biology 354 Insect Biodiversity 3-3-0

With close to a million described species, insects form more than 70% of animal diversity. But in spite of such overwhelming diversity they are poorly known and consequently often excluded from biodiversity studies. The main goal of this course is to teach the students how to collect, preserve and identify insects, especially those found in eastern North America. In addition to using material housed in the Bishop's insect collection, material collected in the field by each student will be prepared in a fashion that will make the specimens museum worthy. Through the collecting and identification process, students will learn about insect taxonomy but they will also learn about where different taxa can be found and what their general ecological requirements are. Once they have completed the course, students should be able to identify most commonly encountered insects at least to the family level and recognize those that are beneficial or potentially harmful.

*Prerequisite: BIO 115*

Biology 358b Animal Behaviour 3-3-0

The study of animal behaviour represents the oldest known form of biological study. Even from our earliest beginnings, humans had an intense interest in understanding how animals behave. This interest is still evident from our almost instinctive need to share our homes with various pets. This course will build on this most basic need to watch and understand animal behaviour, but will do so from a more scientific approach.

*Prerequisite: Biology, 115a, Biology 117a; Co-requisite: Biology Lab 358b*

*Offered in odd-numbered years*

*Professor Richardson*

Biology Lab 358b Animal Behaviour Labs 1-0-3

Using videos and experimental labs, students will further explore many of the concepts and topics discussed in the class.

*Prerequisite: Biology 115a, Biology 117a; Co-requisite: Biology 358b*

*Offered in odd-numbered years*

*Professor Richardson*

Biology 359a Human Genetics 3-3-0

Cytogenetics, biochemical genetics, Mendelian genetics, molecular genetics and quantitative genetics of humans; chromosome mapping; genetics and medicine.

*Prerequisite: Biology 118b*

*Offered in even-numbered years*

*Staff*

Biology 360a Molecular Genetics 3-3-0

The molecular biology of nucleic acids and proteins, including DNA replication, mutation, and recombination; RNA transcription; and protein synthesis. Also covered will be protein/nucleic acid interactions and regulation of gene expression.

*Prerequisite: Biology 118b*

*Students may not take this course for credit if they have received credit for BCH 370a.*

*Professor Stroehrer*

Biology 365b Developmental Biology 3-3-0

Examination of the molecular events involved in the development of vertebrates, invertebrates and plants, emphasizing common strategies used in these three systems. Topics will include establishment of body axes, origin of germ layers, and segmental pattern formation. The role of developmental genes, regulatory gene families, and maternal effect genes will be emphasized. Morphogenesis and early cell differentiation will also be studied.

*Prerequisite: Biology 110a; Biology 118b*

*Offered in even-numbered years*

*Professor Stroehrer*

Biology 367a Ichthyology: The World of Fishes 3-3-0

A survey of fishes of the world. Fish taxa representing freshwater, marine, temperate, tropical and deep sea forms will be examined in terms of their morphology, phylogeny, behavioural ecology and community structure. Adaptations associated with the successful occupation of diverse aquatic habitats within the group as a whole will be discussed. In addition, within-taxa global distribution patterns will be examined in light of current theories regarding plate tectonics and zoogeography.

*Prerequisite: collegial biology, Biology 115a; Co-requisite: Biology Lab 367a*

*Offered in even-numbered years.*

*Professor Richardson*

Biology Lab 367a Ichthyology Laboratory 1-0-3

The identification of fishes, with the use of keys based on the characteristics of major groups. Practical techniques will include the preservation, clearing and staining of whole fishes for skeletal features. Other laboratory exercises will include examinations of fish anatomy, behaviour and development.

*Prerequisite: collegial biology, Biology 115a; Co-requisite: Biology 367a*

*Offered in even-numbered years.*

*Professor Richardson*

Biology 371a Independent Studies in Biology I 3-1-3

This course is not normally offered and is only meant for final-year students who wish to pursue in-depth study of a particular area of biology or who have a special need for a biology course that would otherwise not be available during their final semester of course work. This course can only be done in close collaboration with a faculty advisor from within the Department of Biological Sciences, and may not be used as a supplement to a student's honours project. Requirements for this course will be agreed upon by at least three professors from within the Department of Biological Sciences.

*Pre-requisite: Consent of a member of the Department of Biological Sciences.*

Biology 372b Independent Studies in Biology II 3-1-3

This course represents an additional semester of independent work, either a continuation of or a separate course from Bio 371a, meant for final-year students who wish to pursue in-depth study of a particular area of biology or who have a special need for a biology course that would otherwise not be available during their final semester of course work. This course can only be done in close collaboration with a faculty advisor from within the Department of Biological Sciences, and may not be used as a supplement to a student's honours project. Requirements for this course will be agreed upon by at least three professors from within the Department of Biological Sciences.

*Pre-requisite: Consent of a member of the Department of Biological Sciences.*

Biology 379a Clinical Neuropsychology 3-3-0

Neuropsychology is the study of the relationship between brain structures and behaviour. In this course we will explore the neuroanatomical correlates of both normal and abnormal behaviors in humans. Among the topics to be discussed are the behavioral sequelae of head injury, mood disorders associated with regional trauma and epilepsy, sex differences in cerebral organization, cerebral asymmetries, language and aphasia, and the various disorders of perception. Depending on the interests of the students, special topics include dyslexia, alexithymia, Alzheimer's disease, alcoholism, and schizophrenia.

*Students who have taken PBI279 or BIO279 (Neuropsychology) may not take this course for credit*

*Prerequisite: PBI288b or permission of instructor*

*Professor Drumheller*

Biology 380b Psychopharmacology 3-3-0

This course is designed to introduce students in psychology and the natural sciences to the field of neuropsychology. Emphasis will be placed on the relationships between psychoactive drugs, their mechanisms of action in the nervous system, and human behavior. Following an analysis of the principles of pharmacology and pharmacokinetics, as well as the mechanisms of drug

tolerance and dependence, the cognitive, emotional and behavioral aspects of specific classes of drugs will be examined. These classes of drugs will include sedatives, hypnotics, stimulants, narcotics, psychomimetics, psychedelics, and hallucinogens.

*Students who have taken PBI 280 or BIO280 (Psychopharmacology) may not take this course for credit*

*Prerequisite: PBI288b or permission of the instructor*

*Professor Drumheller*

Biology 462a/b Honours Biological Problems 3-1-6

An introduction to the planning, execution and reporting of biological research. Each student is required to choose a research problem and, in consultation with a departmentally approved supervisor, draw up a formal research proposal of work to be undertaken. The final mark in this course will be based on the research proposal, preliminary research completed on the stated project, and presentation of a poster during the final week of classes. Satisfactory completion of Biology 462 with a minimum mark of 75% will permit enrollment in Biology 463.

*Prerequisite: Permission of course coordinator. (Professor van Hulst)*

*Co-requisite: Biology 272a*

Biology 463a/b Advanced Honours Biological Problems 3-1-6

A continuation of Biology 462, in which the student will complete all research as outlined in the research proposal. The final mark in this course will be based on the quality and amount of research completed, presentation of a departmental seminar during the final week of classes, open to the public, based on research findings, and submission of a final written honours thesis. Enrollment in Biology 463 is conditional upon completing Biology 462 with a minimum mark of 75%.

*Prerequisite: Permission of course coordinator. (Professor van Hulst)*

## **Cognate courses**

Biochemistry 336b (Immunology) is a cognate biology course.