Biology

This section presents the requirements for programs in:

- **Bioinformatics B.Sc. Honours**
- **Biology B.Sc. Honours**
- **Biology with Concentration in Biodiversity, Natural History, and Conservation Science B.Sc. Honours**
- **Biology with Concentration in Ecology, Evolution and Behaviour B.Sc. Honours**
- **Biology with Concentration in Health Science B.Sc. Honours**
- **Biology with Concentration in Molecular and Cellular Biology B.Sc. Honours**
- **Biology with Concentration in Physiology B.Sc. Honours**
- **Biology B.Sc. Major**
- **Biology B.Sc.**
- **Biology and Biotechnology B.Sc. Honours**
- **Biology and Earth Sciences B.Sc. Combined Honours**
- **Biology and Physics B.Sc. Combined Honours**
- **Neuroscience and Biology B.Sc. Combined Honours**
- **Biology B.A. Honours**
- **Biology B.A.**
- **Biology B.A. Combined Honours**
- **Biology and Humanities B.Hum. Combined Honours**
- **Minor in Biology**

Program Requirements

Course Categories for Biology Programs

The program descriptions below make use of the following course categories that are defined in the Bachelor of Science Regulations in this Calendar.

- Science Faculty Electives
- Advanced Science Faculty Electives
- Science Continuation
- Science Geography
- Science Psychology
- Approved Courses Outside the Faculties of Science and Engineering and Design
- Free Electives
- Restricted Courses: Students in the Biology B.Sc., Biology B.Sc. Major, and Biology B.Sc. Honours programs (except students in the Biology B.A, Biology B.A. Honours and Biology B.A. Combined Honours programs) may use Technology, Society, Environment courses TSES 3001, TSES 3002, TSES 3500, TSES 4001, TSES 4002, TSES 4003, TSES 4005, TSES 4006, TSES 4007 to fulfill degree requirements, but only as free electives.

Bioinformatics
B.Sc. Honours (20.0 credits)

A. Credits included in the Major CGPA (12.5 credits)		
1. 4.0 credits in:		4.0
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3008 [0.5]	Bioinformatics	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
2. 0.5 credit from:		0.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2303 [0.5]	Microbiology	
BIOL 3102 [0.5]	Mycology	
BIOL 3306 [0.5]	Human Anatomy and Physiology	
3. 3.5 credits from:		3.5
BIOC 2300 [0.5]	Physical Biochemistry	
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
BIOC 3202 [0.5]	Biophysical Techniques and Applications	
BIOC 4008 [0.5]	Computational Systems Biology	
BIOC 4202 [0.5]	Mutagenesis and DNA Repair	
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 4104 [0.5]	Evolutionary Genetics	
BIOL 4106 [0.5]	Advances in Molecular Biology	
4. 1.0 credit in BIOL or BIOC or COMP or MATH or STAT at the 3000-level or higher		1.0
5. 0.5 credit from:		0.5
BIOL 3901 [0.5]	Research Proposal	
BIOL 4901 [0.5]	Directed Special Studies	
or 4000-level BIOL		
6. 3.0 credits in		3.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
COMP 2401 [0.5]	Introduction to Systems Programming	
COMP 2402 [0.5]	Abstract Data Types and Algorithms	
COMP 2404 [0.5]	Introduction to Software Engineering	
COMP 2406 [0.5]	Fundamentals of Web Applications	
B. Credits not included in the Major CGPA (7.5)		
7. 2.0 credits in:		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I Organic Chemistry II	
8. 1.0 credit from:		1.0
PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I Elementary University Physics II	

PHYS 1003 [0.5] & PHYS 1004 [0.5]	Introductory Mechanics and Thermodynamics Introductory Electromagnetism and Wave Motion	
9. 2.0 credits in:		2.0
MATH 1007 [0.5]	Elementary Calculus I	
MATH 1107 [0.5]	Linear Algebra I	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
STAT 2509 [0.5]	Introduction to Statistical Modeling II	
10. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
11. 0.5 credit in free electives.		0.5
Total Credits		**20.0**

Biology
B.Sc. Honours (20.0 credits)

A. Credits included in the Major CGPA (11.5 credits)		
1. 3.0 credits in:		3.0
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
2. 2.0 credits from:		2.0
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit from:		0.5
BIOL 3201 [0.5]	Cell Biology	
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
4. 1.0 credit in BIOL at the 2000-level or higher		1.0
5. 3.5 credits in BIOL or BIOC at the 3000-level or higher		3.5
6. 0.5 credit from		0.5
BIOL 3901 [0.5]	Research Proposal	
BIOL 4901 [0.5]	Directed Special Studies	
or 4000-level BIOL		
7. 1.0 credit in Advanced Science Faculty Electives		1.0
B. Credits not included in the Major CGPA (8.5 credits)		
8. 1.0 credit in		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
9. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
10. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
11. 1.0 credit in Science Faculty Electives		1.0
12. 2.0 credits in Science Continuation (not in BIOL)		2.0
13. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
14. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology with Concentration in Biodiversity, Natural History, and Conservation Science
B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (11.5 credits)		
1. 2.5 credits in:		2.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
2. 2.5 credits in:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit from:		0.5
BIOL 3201 [0.5]	Cell Biology	
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 4207 [0.5]	Advanced Embryology & Developmental Biology	
4. 2.5 credits in:		2.5
BIOL 2903 [0.5]	Natural History and Ecology of Ontario	
BIOL 3602 [0.5]	Conservation Biology	
BIOL 3604 [0.5]	Statistics for Biologists	
BIOL 3609 [0.5]	Evolutionary Concepts	
or BIOL 3611 [0.5]	Evolutionary Ecology	
BIOL 4104 [0.5]	Evolutionary Genetics	
5. 1.5 credit from:		1.5
BIOL 2303 [0.5]	Microbiology	
BIOL 3004 [0.5]	Insect Diversity	
BIOL 3102 [0.5]	Mycology	
BIOL 3202 [0.5]	Principles of Developmental Biology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3601 [0.5]	Ecosystems and Environmental Change	
BIOL 3605 [0.5]	Field Course I	
BIOL 3608 [0.5]	Principles of Biogeography	

BIOL 3801 [0.5]	Plants and Herbivores	
BIOL 3802 [0.5]	Animal Behaviour	
6. 1.5 credits from:		1.5
BIOL 4103 [0.5]	Population Genetics	
BIOL 4203 [0.5]	Evolution of Sex	
BIOL 4207 [0.5]	Advanced Embryology & Developmental Biology	
BIOL 4318 [0.5]	Adaptations to Extreme Environments	
BIOL 4500 [0.5]	The Biology of Birds	
BIOL 4501 [0.5]	The Taxonomy of Birds	
BIOL 4502 [0.5]	Herpetology	
BIOL 4503 [0.5]	Fish Ecology, Conservation and Management	
BIOL 4504 [0.5]	Ecology of Freshwater Invertebrates	
BIOL 4505 [0.5]	Coral Reefs	
BIOL 4506 [0.5]	Cactus Biology	
BIOL 4602 [0.5]	Evolutionary Applications across Disciplines: From Medicine to Conservation	
BIOL 4603 [0.5]	Insect Evolution and Biology	
BIOL 4604 [0.5]	Landscape Ecology	
7. 0.5 credit in:		0.5
BIOL 3901 [0.5]	Research Proposal	
or BIOL 4901 [0.5]	Directed Special Studies	
or BIOL at 4000-level or above		
B. Credits Not Included in the Major CGPA (8.5 credits)		
8. 1.0 credit in:		1.0
CHEM 1001 [0.5]	General Chemistry I	
CHEM 1002 [0.5]	General Chemistry II	
9. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
10. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
11. 1.0 credit in Science Faculty electives		1.0
12. 2.0 credits in Science Continuation courses (not in BIOL)		2.0
Students are encouraged to consider the following courses as options:		
ERTH 2312 [0.5]	Paleontology	
ENSC 3106 [0.5]	Aquatic Science and Management	
13. 2.0 credits in Approved Courses outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
Students are encouraged to consider the following courses as options:		
ENST 2000 [0.5]	Environmental Justice	
ENST 2001 [0.5]	Sustainable Futures: Environmental Challenges and Solutions	
ENST 3022 [0.5]	Environmental and Natural Resources	
INDG 2015 [0.5]	Indigenous Relationalities, Kinships, and Knowledges	
14. 1.0 credit in free electives		1.0
Total Credits		**20.0**

Biology with Concentration in Ecology, Evolution and Behaviour
B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (11.5 credits)		
1. 2.5 credits in:		2.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
2. 2.5 credits in:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit from:		0.5
BIOL 3201 [0.5]	Cell Biology	
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
4. 1.0 credit from:		1.0
BIOL 3609 [0.5]	Evolutionary Concepts	
BIOL 3611 [0.5]	Evolutionary Ecology	
BIOL 3802 [0.5]	Animal Behaviour	
5. 2.0 credits from:		2.0
BIOL 3004 [0.5]	Insect Diversity	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3111 [0.5]	Vertebrate Evolution: Mammals, Reptiles, and Birds	
BIOL 3112 [0.5]	Vertebrate Evolution: Fish and Amphibians	
BIOL 3202 [0.5]	Principles of Developmental Biology	
BIOL 3601 [0.5]	Ecosystems and Environmental Change	
BIOL 3602 [0.5]	Conservation Biology	
BIOL 3604 [0.5]	Statistics for Biologists	
BIOL 3605 [0.5]	Field Course I	
BIOL 3608 [0.5]	Principles of Biogeography	
BIOL 3609 [0.5]	Evolutionary Concepts	
BIOL 3611 [0.5]	Evolutionary Ecology	
BIOL 3612 [0.5]	Computational Methods in Ecology and Evolution	
BIOL 3801 [0.5]	Plants and Herbivores	
BIOL 3802 [0.5]	Animal Behaviour	
BIOL 3804 [0.5]	Social Evolution	
6. 2.0 credits from:		2.0
BIOL 4102 [0.5]	Molecular Ecology	

BIOL 4103 [0.5]	Population Genetics	
BIOL 4104 [0.5]	Evolutionary Genetics	
BIOL 4203 [0.5]	Evolution of Sex	
BIOL 4317 [0.5]	Neuroethology: The Neural Basis of Animal Behaviour	
BIOL 4318 [0.5]	Adaptations to Extreme Environments	
BIOL 4500 [0.5]	The Biology of Birds	
BIOL 4501 [0.5]	The Taxonomy of Birds	
BIOL 4502 [0.5]	Herpetology	
BIOL 4503 [0.5]	Fish Ecology, Conservation and Management	
BIOL 4504 [0.5]	Ecology of Freshwater Invertebrates	
BIOL 4505 [0.5]	Coral Reefs	
BIOL 4506 [0.5]	Cactus Biology	
BIOL 4507 [0.5]	Ecological Parasitology	
BIOL 4602 [0.5]	Evolutionary Applications across Disciplines: From Medicine to Conservation	
BIOL 4604 [0.5]	Landscape Ecology	
BIOL 4802 [0.5]	Advanced Animal Behaviour	
7. 0.5 credit in BIOL at the 2000 level or higher		0.5
8. 0.5 credit from		0.5
BIOL 3901 [0.5]	Research Proposal	
or BIOL 4901 [0.5]	Directed Special Studies	
or 4000-level BIOL		
B. Credits Not Included in the Major CGPA (8.5 credits)		
9. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
10. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
11. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
12. 1.0 credit in Science Faculty Electives		1.0
13. 2.0 credits in Science Continuation courses (not in BIOL)		2.0
14. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
15. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology with Concentration in Health Science B.Sc. Honours (20.0 credits)

A. Credits included in the Major CGPA (11.5 credits)		
1. 2.5 credits in:		2.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.(	Honours Essay and Research Proposal	
or BIOL 4908 [1.(	Honours Research Thesis	
2. 2.0 credits in:		2.0
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2303 [0.5]	Microbiology	
3. 1.0 credit in:		1.0
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 3307 [0.5]	Advanced Human Anatomy and Physiology	
4. 1.0 credit in:		1.0
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
5. 1.0 credit from:		1.0
BIOL 3008 [0.5]	Bioinformatics	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3201 [0.5]	Cell Biology	
BIOL 3202 [0.5]	Principles of Developmental Biology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3501 [0.5]	Biomechanics	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4206 [0.5]	Human Genetics	
BIOL 4207 [0.5]	Advanced Embryology & Developmental Biology	
BIOL 4303 [0.5]	Advances in Microbiology	
BIOL 4318 [0.5]	Adaptations to Extreme Environments	
6. 1.0 credit from:		1.0
BIOC 4009 [0.5]	Biochemistry of Disease	
BIOC 4708 [0.5]	Principles of Toxicology	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4200 [0.5]	Immunology	
BIOL 4202 [0.5]	Mutagenesis and DNA Repair	
BIOL 4306 [0.5]	Animal Neurophysiology	
BIOL 4309 [0.5]	Studies in Human Performance	
BIOL 4319 [0.5]	Studies in Exercise Physiology	
7. 1.0 credit from BIOL or BIOC at the 3000-level or higher		1.0
8. 0.5 credit from:		0.5
BIOL 3901 [0.5]	Research Proposal	
BIOL 4901 [0.5]	Directed Special Studies	
or 4000-level BIOL		
9. 1.0 credit from:		1.0
NEUR 2201 [0.5]	Cellular and Molecular Neuroscience	
NEUR 2202 [0.5]	Neurodevelopment and Plasticity	
NEUR 3204 [0.5]	Neuropharmacology	
PSYC 2301 [0.5]	Introduction to Health Psychology	
10. 0.5 credit from:		0.5
PHIL 2408 [0.5]	Bioethics	
GEOG 3206 [0.5]	Health, Environment, and Society	

ANTH 3310 [0.5]	Studies in Medical Anthropology	
SOCI 3050 [0.5]	Studies in the Sociology of Health	
SOCI 3056 [0.5]	Women and Health	
B. Credits not included in the Major CGPA (8.5 credits)		
11. 2.0 credits from:		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I Organic Chemistry II	
CHEM 2207 [0.5] & CHEM 2208 [0.5]	Introduction to Organic Chemistry I Introduction to Organic Chemistry II	
12. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
13. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
14. 1.0 credit in:		1.0
PSYC 1001 [0.5]	Introduction to Psychology I	
PSYC 1002 [0.5]	Introduction to Psychology II	
15. 1.0 credit in Science Faculty Electives		1.0
16. 1.0 credit in Science Continuation courses (not in BIOL)		1.0
17. 1.0 credit in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		1.0
18. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology with Concentration in Molecular and Cellular Biology
B.Sc. Honours (20.0 credits)

A. Credits included in the Major CGPA (11.5 credits)		
1. 2.5 credits in:		2.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.(	Honours Essay and Research Proposal	
or BIOL 4908 [1.(	Honours Research Thesis	
2. 2.5 credits in:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2303 [0.5]	Microbiology	
3. 0.5 credit from:		0.5
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
4. 1.0 credit in:		1.0
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
5. 1.0 credit in:		1.0
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3201 [0.5]	Cell Biology	
6. 2.0 credits from:		2.0
BIOL 3008 [0.5]	Bioinformatics	
BIOL 3202 [0.5]	Principles of Developmental Biology	
BIOL 4008 [0.5]	Molecular Plant Development	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	
BIOL 4200 [0.5]	Immunology	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4202 [0.5]	Mutagenesis and DNA Repair	
BIOL 4207 [0.5]	Advanced Embryology & Developmental Biology	
BIOL 4303 [0.5]	Advances in Microbiology	
7. 0.5 credit in BIOL or BIOC at the 2000 level or higher		0.5
8. 1.0 credit in BIOL or BIOC at the 3000 level or higher		1.0
9. 0.5 credit from:		0.5
BIOL 3901 [0.5]	Research Proposal	
BIOL 4901 [0.5]	Directed Special Studies	
or 4000-level BIOL		
B. Credits Not Included in the Major CGPA (8.5 credits)		
10. 2.0 credits in:		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I Organic Chemistry II	
11. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
12. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
13. 1.0 credit in Science Faculty Electives		1.0
14. 1.0 credit in Science Continuation courses (not in BIOL)		1.0
15. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
16. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology with Concentration in Physiology
B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (11.5 credits)		
1. 2.5 credits in:		2.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.(	Honours Essay and Research Proposal	
or BIOL 4908 [1.(	Honours Research Thesis	
2. 2.0 credits in:		2.0
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
3. 1.5 credits in:		1.5
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 3307 [0.5]	Advanced Human Anatomy and Physiology	
4. 1.0 credit in:		1.0
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
5. 2.0 credits from:		2.0
BIOC 4203 [0.5]	Secondary Metabolism and Natural Products Biochemistry	
BIOL 3111 [0.5]	Vertebrate Evolution: Mammals, Reptiles, and Birds	
BIOL 3112 [0.5]	Vertebrate Evolution: Fish and Amphibians	
BIOL 3201 [0.5]	Cell Biology	
BIOL 3202 [0.5]	Principles of Developmental Biology	
BIOL 3501 [0.5]	Biomechanics	
BIOL 3802 [0.5]	Animal Behaviour	
BIOL 4008 [0.5]	Molecular Plant Development	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4209 [0.5]	Advanced Plant Physiology	
BIOL 4306 [0.5]	Animal Neurophysiology	
BIOL 4309 [0.5]	Studies in Human Performance	
BIOL 4317 [0.5]	Neuroethology: The Neural Basis of Animal Behaviour	
BIOL 4318 [0.5]	Adaptations to Extreme Environments	
BIOL 4319 [0.5]	Studies in Exercise Physiology	
6. 1.5 credit in BIOL at the 2000-level or higher		1.5
7. 0.5 credit in BIOL or BIOC at the 3000-level or higher		0.5
8. 0.5 credit from:		0.5
BIOL 3901 [0.5]	Research Proposal	
BIOL 4901 [0.5]	Directed Special Studies	
4000-level BIOL		
B. Credits not included in the Major CGPA (8.5 credits)		
9. 2.0 credits from:		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I Organic Chemistry II (or)	
CHEM 2207 [0.5] & CHEM 2208 [0.5]	Introduction to Organic Chemistry I Introduction to Organic Chemistry II	
10. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
11. 1.0 credit from:		1.0
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.	Introductory Electromagnetism and Wave Motion	
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
12. 1.0 credit in Science Faculty electives		1.0
13. 1.0 credit in Science Continuation courses (not in BIOL)		1.0
14. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
15. 1.0 credit in free electives		1.0
Total Credits		**20.0**

Biology
B.Sc. Major (20.0 credits)

A. Credits included in the Major CGPA (9.5 credits)		
1. 1.5 credit in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
2. 2.5 credits from:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
or BIOL 2107 [0.5]	Fundamentals of Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
or BIOL 2201 [0.5	Cell Biology and Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit from:		0.5
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3306 [0.5]	Human Anatomy and Physiology	
4. 3.0 credits in BIOL at the 3000-level or higher		3.0
5. 2.0 credits in Advanced Science Faculty electives		2.0
B. Credits Not Included in the Major CGPA (10.5 credits)		
6. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
7. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
8. 1.0 credit from:		1.0
MATH 1107 [0.5]	Linear Algebra I	

COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
9. 1.0 credit in Science Faculty Electives		1.0
10. 2.0 credits in Advanced Science Faculty Electives		2.0
11. 2.0 credits in Science Continuation courses (not in BIOL)		2.0
12. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
13. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology
B.Sc. (15.0 credits)

Note: some advanced Biology courses with laboratory components will not be available to students enrolling in the B.Sc. program.

A. Credits included in the Major CGPA (6.5 credits)		
1. 1.5 credit in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
2. 2.0 credits from:		2.0
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2107 [0.5]	Fundamentals of Genetics	
BIOL 2201 [0.5]	Cell Biology and Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit in:		0.5
BIOL 3306 [0.5]	Human Anatomy and Physiology	
4. 2.5 credits from BIOL at the 2000-level and 3000-level or higher		2.5
B. Credits Not Included in the Major CGPA (8.5 credits)		
5. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
6. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
7. 1.0 credit from:		1.0
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
8. 2.0 credits in Science Continuation (not in BIOL)		2.0
9. 1.0 credit in Science Faculty Electives		1.0
10. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
11. 1.0 credit in free electives.		1.0
Total Credits		**15.0**

Biology and Biotechnology
B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (13 credits)		
1. 6.5 credits in:		6.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2301 [0.5]	Biotechnology I	
BIOL 2303 [0.5]	Microbiology	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3201 [0.5]	Cell Biology	
BIOL 3301 [0.5]	Biotechnology II	
BIOL 4301 [0.5]	Current Topics in Biotechnology	
2. 1.5 credit in:		1.5
BUSI 2800 [0.5]	Entrepreneurship	
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
3. 4.0 credits from:		4.0
BIOC 2300 [0.5]	Physical Biochemistry	
or CHEM 2103 [0.5]	Physical Chemistry I	
BIOC 3008 [0.5]	Bioinformatics	
BIOC 3103 [0.5]	Practical Biochemistry I	
BIOC 3104 [0.5]	Practical Biochemistry II	
BIOC 3202 [0.5]	Biophysical Techniques and Applications	
BIOL 3004 [0.5]	Insect Diversity	
BIOL 3102 [0.5]	Mycology	
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 3501 [0.5]	Biomechanics	
BIOL 3901 [0.5]	Research Proposal	
CHEM 3700 [0.5]	Industrial Applications of Chemistry	
CHEM 3800 [0.5]	The Chemistry of Environmental Pollutants	
FOOD 3005 [0.5]	Food Microbiology	
BIOC 4001 [0.5]	Methods in Biochemistry	
BIOC 4004 [0.5]	Industrial Biochemistry	
BIOC 4005 [0.5]	Biochemical Regulation	
BIOC 4007 [0.5]	Membrane Biochemistry	
BIOC 4008 [0.5]	Computational Systems Biology	
BIOC 4009 [0.5]	Biochemistry of Disease	
BIOC 4203 [0.5]	Secondary Metabolism and Natural Products Biochemistry	
BIOC 4204 [0.5]	Protein Biotechnology	

BIOC 4708 [0.5]	Principles of Toxicology	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	
BIOL 4200 [0.5]	Immunology	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4202 [0.5]	Mutagenesis and DNA Repair	
BIOL 4206 [0.5]	Human Genetics	
BIOL 4304 [0.5]	Forensic Biology	
BIOL 4901 [0.5]	Directed Special Studies	
TSES 4001 [0.5]	Technology and Society: Risk	
TSES 4002 [0.5]	Technology and Society: Forecasting	
4. 1.0 credit in:		1.0
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.(	Honours Essay and Research Proposal	
or BIOL 4908 [1.(	Honours Research Thesis	
B. Credits Not Included in the Major CGPA (7.0 credits)		
5. 2.0 credits in:		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I Organic Chemistry II (See Note, below)	
6. 0.5 credit in:		0.5
MATH 1007 [0.5]	Elementary Calculus I	
7. 1.5 credits from:		1.5
COMP 1005 [0.5]	Introduction to Computer Science I	
COMP 1006 [0.5]	Introduction to Computer Science II	
MATH 1107 [0.5]	Linear Algebra I	
PHYS 1007 [0.5]	Elementary University Physics I	
or PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics	
PHYS 1008 [0.5]	Elementary University Physics II	
or PHYS 1004 [0	Introductory Electromagnetism and Wave Motion	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
8. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
9. 1.0 credit in free electives.		1.0
Total Credits		**20.0**

Biology and Earth Sciences
B.Sc. Combined Honours (20.0 credits)

A. Credits Included in the Major CGPA (12.0 credits)		
1. 1.5 credits in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 2001 [0.5]	Animals: Form and Function	
2. 1.0 credit in:		1.0
ERTH 1006 [0.5]	Exploring Planet Earth	
ERTH 1009 [0.5]	The Earth System Through Time	
3. 0.5 credit from:		0.5
BIOL 2600 [0.5]	Ecology	
BIOL 3605 [0.5]	Field Course I	
4. 3.5 credits in BIOL or BIOC, with at least 1.0 credit at the 3000-level and 1.0 credit at the 4000-level		3.5
5. 3.0 credits in:		3.0
ERTH 2102 [0.5]	Mineralogy to Petrology	
ERTH 2312 [0.5]	Paleontology	
ERTH 2314 [0.5]	Sedimentation and Stratigraphy	
ERTH 3111 [0.5]	Vertebrate Evolution: Mammals, Reptiles, and Birds	
ERTH 3112 [0.5]	Vertebrate Evolution: Fish and Amphibians	
ERTH 3113 [0.5]	Geology of Human Origins	
6. 0.5 credit from:		0.5
ERTH 3203 [0.5]	Sedimentology	
ERTH 3206 [0.5]	Sedimentary Depositional Systems	
7. 1.0 credit in ERTH at the 4000-level		1.0
8. 1.0 credit from:		1.0
BIOL 4905 [1.0]	Honours Workshop	
BIOL 4907 [1.0]	Honours Essay and Research Proposal	
BIOL 4908 [1.0]	Honours Research Thesis	
ERTH 4908 [1.0]	Honours Thesis	
ERTH 4909 [0.5]	Research in Earth Sciences (and 0.5 credit in ERTH at the 4000-level)	
B. Credits Not Included in the Major CGPA (8.0 credits)		
9. 1.0 credit in:		1.0
MATH 1007 [0.5]	Elementary Calculus I	
MATH 1107 [0.5]	Linear Algebra I	
10. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
11. 1.0 credit in:		1.0
PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I Elementary University Physics II	
12. 0.5 credit in:		0.5
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
13. 0.5 credit in:		0.5
COMP 1005 [0.5]	Introduction to Computer Science I	
14. 1.0 credit in Science Continuation courses		1.0
15. 2.0 credits in Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
16. 1.0 credit in free electives		1.0
Total Credits		**20.0**

Biology and Physics
B.Sc. Combined Honours (20.0 credits)

A. Credits Included in the Major CGPA (12.5 credits)		
1. 1.0 credit from:		1.0
PHYS 1001 [0.5] & PHYS 1002 [0.5]	Foundations of Physics I Foundations of Physics II (recommended)	
PHYS 1003 [0.5] & PHYS 1004 [0.5]	Introductory Mechanics and Thermodynamics Introductory Electromagnetism and Wave Motion	

PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I Elementary University Physics II (with an average grade of B- or higher)	
2. 3.5 credits in:		3.5
PHYS 2604 [0.5]	Modern Physics I	
PHYS 2202 [0.5]	Wave Motion and Optics	
PHYS 2305 [0.5]	Electricity and Magnetism	
PHYS 2401 [0.5]	Thermal Physics	
PHYS 3007 [0.5]	Third Year Physics Laboratory: Selected Experiments and Seminars	
PHYS 3207 [0.5]	Topics in Biophysics	
PHYS 3701 [0.5]	Elements of Quantum Mechanics	
3. 1.0 credit from:		1.0
PHYS 3308 [0.5]	Electromagnetism	
PHYS 3606 [0.5]	Modern Physics II	
PHYS 3802 [0.5]	Advanced Dynamics	
4. 1.0 credit from:		1.0
PHYS 3308 [0.5]	Electromagnetism	
PHYS 3606 [0.5]	Modern Physics II	
PHYS 3802 [0.5]	Advanced Dynamics	
PHYS 3807 [0.5]	Mathematical Physics I	
PHYS 4203 [0.5]	Physical Applications of Fourier Analysis	
PHYS 4409 [0.5]	Thermodynamics and Statistical Physics	
PHYS 4707 [0.5]	Introduction to Quantum Mechanics I	
5. 4.0 credits from:		4.0
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 3201 [0.5]	Cell Biology	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3305 [0.5]	Human and Comparative Physiology	
6. 1.0 credit from:		1.0
BIOL 3501 [0.5]	Biomechanics	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4202 [0.5]	Mutagenesis and DNA Repair	
BIOL 4301 [0.5]	Current Topics in Biotechnology	
BIOL 4306 [0.5]	Animal Neurophysiology	
BIOL 4309 [0.5]	Studies in Human Performance	
BIOL 4319 [0.5]	Studies in Exercise Physiology	
7. 1.0 credit from:		1.0
BIOL 4905 [1.0]	Honours Workshop	
BIOL 4907 [1.0]	Honours Essay and Research Proposal	
BIOL 4908 [1.0]	Honours Research Thesis	
PHYS 4909 [1.0]	Fourth-Year Project	
PHYS 4907 plus 0.5 credit 4000-level PHYS		
PHYS 4908 plus 0.5 credit 4000-level PHYS		
B. Credits Not Included in the Major CGPA (7.5 credits)		
8. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
9. 1.5 credits in:		1.5
MATH 1004 [0.5]	Calculus for Engineering or Physics	
MATH 1005 [0.5]	Differential Equations and Infinite Series for Engineering or Physics	
MATH 1104 [0.5]	Linear Algebra for Engineering or Science	
10. 2.0 credits in:		2.0
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
MATH 2004 [0.5]	Multivariable Calculus for Engineering or Physics	
MATH 3705 [0.5]	Mathematical Methods I	
MATH 3800 [0.5]	Mathematical Modeling and Computational Methods	
11. 0.5 credit in:		0.5
COMP 1005 [0.5]	Introduction to Computer Science I	
12. 2.0 credits in approved courses outside the faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
13. 0.5 credit in free electives		0.5
Total Credits		**20.0**

Neuroscience and Biology B.Sc. Combined Honours (20.0 credits)

A. Credits Included in the Major CGPA (14.5 credits)		
1. 5.5 credits in:		5.5
NEUR 1202 [0.5]	Neuroscience of Mental Health and Psychiatric Disease	
NEUR 1203 [0.5]	Neuroscience of Mental Health and Neurological Disease	
NEUR 2001 [0.5]	Introduction to Research Methods in Neuroscience	
NEUR 2002 [0.5]	Introduction to Statistics in Neuroscience	
NEUR 2201 [0.5]	Cellular and Molecular Neuroscience	
NEUR 2202 [0.5]	Neurodevelopment and Plasticity	
NEUR 3001 [0.5]	Data Analysis in Neuroscience I	
NEUR 3002 [0.5]	Data Analysis in Neuroscience II	
NEUR 3204 [0.5]	Neuropharmacology	
NEUR 3206 [0.5]	Sensory and Motor Neuroscience	
NEUR 3207 [0.5]	Systems Neuroscience	
2. 3.0 credits in:		3.0
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 3305 [0.5]	Human and Comparative Physiology	
3. 1.5 credits in BIOL or BIOC at the 3000 level or above		1.5
4. 1.0 credit from:		1.0
NEUR 3301 [0.5]	Genetics of Mental Health	

NEUR 3303 [0.5]	The Neuroscience of Consciousness	
NEUR 3304 [0.5]	Hormones and Behaviour	
NEUR 3401 [0.5]	Environmental Toxins and Mental Health	
NEUR 3402 [0.5]	Impact of Lifestyle and Social Interactions on Mental Health	
NEUR 3403 [0.5]	Stress and Mental Health	
NEUR 3501 [0.5]	Neurodegeneration and Aging	
NEUR 3502 [0.5]	Neurodevelopmental Determinants of Mental Health	
NEUR 4301 [0.5]	Neurobiology of Energy Homeostasis	
NEUR 4302 [0.5]	Sex and the Brain	
NEUR 4303 [0.5]	Indigenous Health & Mental Health	
NEUR 4305 [0.5]	Immune-Brain Interactions	
NEUR 4306 [0.5]	The Neural Basis of Addiction	
NEUR 4600 [0.5]	Advanced Lab in Neuroanatomy	
5. 2.0 credits from:		2.0
BIOC 4007 [0.5]	Membrane Biochemistry	
BIOL 2600 [0.5]	Ecology	
BIOL 2301 [0.5]	Biotechnology I	
BIOL 2303 [0.5]	Microbiology	
BIOL 3307 [0.5]	Advanced Human Anatomy and Physiology	
BIOL 3605 [0.5]	Field Course I	
BIOL 3609 [0.5]	Evolutionary Concepts	
BIOL 3802 [0.5]	Animal Behaviour	
BIOL 3804 [0.5]	Social Evolution	
BIOL 4306 [0.5]	Animal Neurophysiology	
BIOL 4317 [0.5]	Neuroethology: The Neural Basis of Animal Behaviour	
BIOL 4802 [0.5]	Advanced Animal Behaviour	
CHEM 2204 [0.5]	Organic Chemistry II	
6. 0.5 credit from:		0.5
NEUR 4200 [0.5]	Seminar on Current Advances in Neuroscience	
NEUR 4202 [0.5]	Seminar on Current Research in Neuroscience and Psychiatric Disease	
NEUR 4203 [0.5]	Seminar on Current Research in Neuroscience and Clinical Neurology	
7. 1.0 credit from:		1.0
NEUR 4905 [1.0]	Honours Workshop	
NEUR 4907 [1.0]	Honours Essay and Research Proposal	
NEUR 4908 [1.0]	Honours Research Thesis	
BIOL 4905 [1.0]	Honours Workshop	
BIOL 4907 [1.0]	Honours Essay and Research Proposal	
BIOL 4908 [1.0]	Honours Research Thesis	
B. Credits not included in the Major CGPA (5.5 credits)		
8. 1.0 credit in:		1.0
MATH 1007 [0.5]	Elementary Calculus I	
MATH 1107 [0.5]	Linear Algebra I	
9. 1.5 credits in:		1.5
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I & General Chemistry II	
CHEM 2203 [0.5]	Organic Chemistry I	
10. 1.0 credit in:		1.0
PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I & Elementary University Physics II	
11. 2.0 credits in approved courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000)		2.0
Total Credits		**20.0**

Biology
B.A. Honours (20.0 credits)

A. Credits included in the Major CGPA (8.0 credits)		
1. 1.5 credit in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
2. 2.5 credits from:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
or BIOL 2107 [0.5]	Fundamentals of Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
or BIOL 2201 [0.5]	Cell Biology and Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 0.5 credit from:		0.5
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 3306 [0.5]	Human Anatomy and Physiology	
4. 1.5 credit in BIOL at the 3000-level or higher		1.5
5. 1.0 credits in BIOL		1.0
6. 1.0 credit from:		1.0
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
B. Credits not included in the Major CGPA (12.0 credits)		
7. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I & General Chemistry II	
8. 1.0 credit in Science Faculty Electives at the 2000-level or higher, not in BIOL		1.0
9. 1.0 credit in Science Faculty Electives not in BIOL		1.0
10. 2.0 credits in approved courses at the 2000 level outside of the faculties of Science and Engineering and Design		2.0
11. 4.0 credits in approved courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000)		4.0
12. 1.0 credit at the 3000- or 4000-level		1.0
13. 2.0 credits in free electives.		2.0
Total Credits		**20.0**

Biology
B.A. (15.0 credits)

Note: some advanced Biology courses with laboratory components will not be available to students enrolling in the B.A. program.

A. Credits included in the Major CGPA (6.0 credits)		
1. 1.5 credit in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
2. 2.0 credits from:		2.0
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2107 [0.5]	Fundamentals of Genetics	
BIOL 2201 [0.5]	Cell Biology and Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 2.5 credits in BIOL		2.5
B. Credits not included in the Major CGPA (9.0 credits)		
4. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
5. 1.0 credit in Science Faculty Electives, not in BIOL		1.0
6. 4.0 credits in approved courses outside of the faculties of Science and Engineering and Design (but may include NSCI 1000)		4.0
7. 1.0 credit at the 2000-level or higher		1.0
8. 2.0 credits in free electives.		2.0
Total Credits		**15.0**

Biology
B.A. Combined Honours (20.0 credits)

A. Credits included in the Biology Major CGPA (7.0 credits)		
1. 1.5 credit in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
2. 2.5 credits from:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
or BIOL 2107 [0.5]	Fundamentals of Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
or BIOL 2201 [0.5]	Cell Biology and Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 2600 [0.5]	Ecology	
3. 1.0 credit in BIOL at the 3000-level or higher		1.0
4. 1.0 credit from:		1.0
BIOL 4905 [1.0]	Honours Workshop	
or BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	
or equivalent from the other Honours department		
5. 1.0 credits from BIOL		1.0
B. Additional Requirements (13.0 credits)		
6. 1.0 credit in:		1.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II	
7. 1.0 credit in Science Faculty Electives, not in BIOL, at the 2000-level or higher		1.0
8. 1.0 credit in Science Faculty Electives, not in BIOL		1.0
9. 7.0 credits in approved courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000), to include the requirements for the other discipline		7.0
10. 3.0 credits in free electives.		3.0
Total Credits		**20.0**

Biology and Humanities
B.Hum. Combined Honours (20.0 credits)

A. Credits Included in the Humanities CGPA:		
1. 4.0 credits in Humanities Core:		4.0
HUMS 1000 [1.0]	Foundational Myths and Histories	
HUMS 2000 [1.0]	Reason and Revelation	
HUMS 3000 [1.0]	Culture and Imagination	
HUMS 4000 [1.0]	Politics, Modernity and the Common Good	
2. 2.0 credits in:		2.0
HUMS 1200 [0.5]	Humanities and Classical Civilization	
HUMS 1300 [0.5]	Classical Literature and Its Reception	
HUMS 3200 [1.0]	European Literature	
3. 0.5 credit in:		0.5
RELI 1731 [0.5]	Religion and Culture	
4. 1.0 credits in:		1.0
HUMS 2101 [0.5]	Art from Antiquity to the Medieval World	
HUMS 2102 [0.5]	Modern European Art 1527-2000	
OR		
HUMS 3102 [0.5]	Western Music 1000-1850	
HUMS 3103 [0.5]	Western Music 1850-2000	
(See Note, below)		
5. 1.0 credit in:		1.0
RELI 2710 [1.0]	Maccabees to Muhammad	
6. 0.5 credit from:		0.5
HUMS 4901 [0.5]	Research Seminar: Antiquity to the Middle Ages	
HUMS 4902 [0.5]	Research Seminar: Renaissance to Enlightenment	
HUMS 4903 [0.5]	Research Seminar: Romanticism to the Present	
HUMS 4904 [0.5]	Research Seminar: Non-Western Traditions	
7. 3.0 credits at the 2000-level or above		3.0
B. Credits Included in the Biology CGPA:		
8. 1.5 credits in:		1.5
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 1105 [0.5]	Introduction to Biological Data	
9. 2.5 credits from:		2.5
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	

	or BIOL 2107 [0.5]	Fundamentals of Genetics
	BIOL 2200 [0.5]	Cellular Biochemistry
	or BIOL 2201 [0.5]	Cell Biology and Biochemistry
	BIOL 2303 [0.5]	Microbiology
	BIOL 2600 [0.5]	Ecology
10.	**1.0 credit in:**	1.0
	CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I General Chemistry II
11.	**3.0 credits in** BIOL or BIOC at the 3000-level or above	3.0
Total Credits		**20.0**

Note:

1. For Item 4 above, students who transfer into the B. Hum. may use up to 2.0 credits of any previously completed art and/or music courses (with the exception of advanced placement courses); students who study abroad may use up to 2.0 credits of art and/or music courses taken abroad; students enrolled in a Combined Honours in Humanities and Art History or Humanities and Music may substitute up to 1.0 credit of music or art from their combined discipline for the respective requirement or part thereof.

Minor in Biology (4.0 credits)

The Minor in Biology is available to students registered in degree programs other than those offered by the Department of Biology.

Students are required to present a Minor CGPA of 4.00 or higher at graduation in order to be awarded a Minor in Biology.

Requirements (4.0 credits)

1.	**1.0 credit in:**	1.0
	BIOL 1103 [0.5]	Foundations of Biology I
	BIOL 1104 [0.5]	Foundations of Biology II
2.	**1.0 credit from:**	1.0
	BIOL 1105 [0.5]	Introduction to Biological Data
	BIOL 1010 [0.5]	Biotechnology and Society
	BIOL 1902 [0.5]	Natural History
	BIOL 2001 [0.5]	Animals: Form and Function
	BIOL 2002 [0.5]	Plants: Form and Function
	BIOL 2005 [0.5]	Human Biology
	BIOL 2107 [0.5]	Fundamentals of Genetics
	BIOL 2201 [0.5]	Cell Biology and Biochemistry
	BIOL 2303 [0.5]	Microbiology
	BIOL 2903 [0.5]	Natural History and Ecology of Ontario
3.	**1.0 credit in** BIOL at the 2000-level or higher	1.0
4.	**1.0 credit in** BIOL at the 3000-level or higher	1.0
Total Credits		**4.0**

Co-operative Education

For more information about how to apply for the Co-op program and how the Co-op program works please visit the Co-op website.

All students participating in the Co-op program are governed by the Undergraduate Co-operative Education Policy.

Undergraduate Co-operative Education Policy

Admission Requirements

Students can apply to Co-op in one of two ways: directly from high school, or after beginning a degree program at Carleton.

If a student applies to a degree program with a Co-op option from high school, their university grades will be reviewed two terms to one year prior to their first work term to ensure they meet the academic requirements after their first or second year of study. The time at which the evaluation takes place depends on the program of study. Students will automatically receive an admission decision via their Carleton email account.

Students who did not request Co-op at the time they applied to Carleton can request Co-op after they begin their university studies. To view application instructions and deadlines, please visit carleton.ca/co-op.

To be admitted to Co-op, a student must successfully complete 5.0 or more credits that count towards their degree, meet the minimum CGPA requirement(s) for the student's Co-op option, and fulfil any specified course prerequisites. To see the unique admission and continuation requirements for each Co-op option, please refer to the specific degree programs listed in the Undergraduate Calendar.

Participation Requirements

COOP 1000

Once a student has been given admission or continuation confirmation to the co-op option s/he must complete and pass COOP 1000 (a mandatory online 0.0 credit course). Students will have access to this course a minimum of two terms prior to their first work term and will be notified when to register.

Communication with the Co-op Office

Students must maintain contact with the co-op office during their job search and while on a work term. All email communication will be conducted via the students' Carleton email account.

Employment

Although every effort is made to ensure a sufficient number of job postings for all students enrolled in the co-op option of their degree program, no guarantee of employment can be made. Carleton's co-op program operates a competitive job search process and is dependent upon current market conditions. Academic performance, skills, motivation, maturity, attitude and potential will determine whether a student is offered a job. It is the student's responsibility to actively conduct a job search in addition to participation in the job search process operated by the co-op office. Once a student accepts a co-op job offer (verbally or written), his/her job search will end and access to co-op jobs will be removed for that term. Students that do not successfully obtain a co-op work term are expected to continue with their academic studies. The

summer term is the exception to this rule. Students should also note that hiring priority is given to Canadian citizens for co-op positions in the Federal Government of Canada.

Registering in Co-op Courses

Students will be registered in a Co-op Work Term course while at work. The number of Co-op Work Term courses that a student is registered in is dependent upon the number of four-month work terms that a student accepts.

While on a co-op work term students may take a maximum of 0.5 credit throughout each four-month co-op work term. Courses must be scheduled outside of regular working hours.

Students must be registered as full-time before they begin their co-op job search. All co-op work terms must be completed before the beginning of the final academic term. Students may not finish their degree on a co-op work term.

Work Term Assessment and Evaluation

To obtain a Satisfactory grade for the co-op work term students must have:

1. A satisfactory work term evaluation by the co-op employer;
2. A satisfactory grade on the work term report.

Students must submit a work term report at the completion of each four-month work term. Reports are due on the 16th of April, August, and December and students are notified of due dates through their Carleton email account.

Workplace performance will be assessed by the workplace supervisor. Should a student receive an unsatisfactory rating from their co-op employer, an investigation by the co-op program manager will be undertaken. An unsatisfactory employer evaluation does not preclude a student from achieving an overall satisfactory rating for the work term.

Graduation with the Co-op Designation

In order to graduate with the co-op designation, students must satisfy all requirements for their degree program in addition to the requirements according to each co-op program (i.e. successful completion of three or four work terms).

Note: Participation in the co-op option will add up to one additional year for a student to complete their degree program.

Voluntary Withdrawal from the Co-op Option

Students may withdraw from the co-op option of their degree program during a study term ONLY. Students at work may not withdraw from the work term or the co-op option until s/he has completed the requirements of the work term.

Students are eligible to continue in their regular academic program provided that they meet the academic standards required for continuation.

Involuntary or Required Withdrawal from the Co-op Option

Students may be required to withdraw from the co-op option of their degree program for one or any of the following reasons:

1. Failure to achieve a grade of SAT in COOP 1000
2. Failure to pay all co-op related fees
3. Failure to actively participate in the job search process
4. Failure to attend all interviews for positions to which the student has applied
5. Declining more than one job offer during the job search process
6. Continuing a job search after accepting a co-op position
7. Dismissal from a work term by the co-op employer
8. Leaving a work term without approval by the Co-op manager
9. Receipt of an unsatisfactory work term evaluation
10. Submission of an unsatisfactory work term report

Standing and Appeals

The Co-op and Career Services office administers the regulations and procedures that are applicable to all co-op program options. All instances of a student's failure during a work term or other issues directly related to their participation in the co-op option will be reported to the academic department.

Any decision made by the Co-op and Career Services office can be appealed via the normal appeal process within the University.

International Students

All International Students are required to possess a Co-op Work Permit issued by Immigration, Refugees and Citizenship Canada before they can begin working. It is illegal to work in Canada without the proper authorization. Students will be provided with a letter of support to accompany their application. Students must submit their application for their permit before being permitted to view and apply for jobs on the Co-op Services database. Confirmation of a position will not be approved until a student can confirm they have received their permit. Students are advised to discuss the application process and requirements with the International Student Services Office.

B.Sc. Honours Biology, Bioinformatics: Co-op Admission and Continuation Requirements

- Maintain full-time status in each study term;
- Be eligible to work in Canada (for off-campus work);
- Have successfully completed COOP 1000 .

In addition to the following:

1. Registered as a full-time student in the B.Sc. Honours Biology or Bioinformatics program;
2. Successfully completed 5.0 or more credits;
3. Obtained an Overall CGPA of at least 6.50 and a Major CGPA of at least 8.00. These CGPAs must be maintained throughout the duration of the degree.

B.Sc. Honours Biology and Bioinformatics students must successfully complete three (3) work terms to obtain the Co-op Designation.

Work Term Course: BIOL 3999
Work/Study Pattern:

Year 1		Year 2		Year 3		Year 4		Year 5	
Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern
Fall	S	Fall	S	Fall	S	Fall	W	Fall	S
Winter	S	Winter	S	Winter	S	Winter	W	Winter	S
Summer		Summer	W	Summer	W	Summer	W		

B.Sc. Combined Honours Neuroscience and Biology

- Maintain full-time status in each study term;
- Be eligible to work in Canada (for off-campus work);
- Have successfully completed COOP 1000 .

In addition to the following:

1. Registered as a full-time student in the B.Sc. Combined Honours Neuroscience and Biology program;
2. Successfully completed 5.0 or more credits;
3. Obtained an Overall CGPA of at least 6.50 and a Major CGPA of at least 8.00. These CGPAs must be maintained throughout the duration of the degree.

B.Sc. Combined Honours Neuroscience and Biology students must successfully complete three (3) work terms to obtain the Co-op Designation.

Work Term Course: NEUR 3999, BIOL 3999

Work-Study Pattern:

Year 1		Year 2		Year 3		Year 4		Year 5	
Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern
Fall	S	Fall	S	Fall	S	Fall	W	Fall	S
Winter	S	Winter	S	Winter	S	Winter	W	Winter	S
Summer		Summer	W	Summer	W	Summer	W		

Legend
S: Study
W: Work

B.Sc. Regulations

The regulations presented in this section apply to all Bachelor of Science programs. In addition to the requirements presented here, students must satisfy the University regulations common to all undergraduate students including the process of Academic Continuation Evaluation (see the *Academic Regulations of the University* section of this Calendar).

Breadth Requirement for the B.Sc.

Students in a Bachelor of Science program must present the following credits at graduation:

1. 2.0 credits in Science Continuation courses not in the major discipline; **students completing a double major are considered to have completed this requirement providing they have 2.0 credits in Science Continuation courses in each of the two majors;**
2. 2.0 credits in courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000)

In most cases, the requirements for individual B.Sc. programs, as stated in this Calendar, contain these requirements, explicitly or implicitly.

Students admitted to B.Sc. programs by transfer from another institution must present at graduation (whether taken at Carleton or elsewhere):

1. 2.0 credits in courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000) if the student received fewer than 10.0 transfer credits; or,
2. 1.0 credit in courses outside of the faculties of Science and Engineering and Design (may include NSCI 1000) if the student received 10.0 or more transfer credits.

Declared and Undeclared Students

Degree students are considered "Undeclared" if they have been admitted to a degree, but have not yet selected and been accepted into a program within that degree. The status "Undeclared" is available only in the B.A. and B.Sc. degrees. Undeclared students must apply to enter a program upon or before completing 3.5 credits.

Change of Program within the B.Sc. Degree

To transfer to a program within the B.Sc. degree, applicants must normally be *Eligible to Continue* (EC) in the new program, by meeting the CGPA thresholds described in Section 3.1.9 of the *Academic Regulations of the University.*

Applications to declare or change programs within the B.Sc. degree must be made online through Carleton Central by completing a Change of Program Elements (COPE) application form within the published deadlines. Acceptance into a program, or into a program element or option, is subject to any enrolment limitations, and/or specific program, program element or option requirements as published in the relevant Calendar entry.

Minors, Concentrations, and Specializations

Students may add a Minor, Concentration, or Specialization by completing a Change of Program Elements (COPE) application form online through Carleton Central. Acceptance into a Minor, Concentration, or Specialization normally requires that the student be *Eligible to Continue* (EC) and is meeting the minimum CGPAs described in Section 3.1.9 of the *Academic Regulations of the University*, as well as being subject to any specific requirements of the intended Minor, Concentration, or Specialization as published in the relevant Calendar entry.

Experimental Science Requirement

Students in a B.Sc. degree program must present at graduation at least two full credits of Experimental Science chosen from two different departments or institutes from the list below:

Approved Experimental Science Courses
Biochemistry

BIOC 2200 [0.5]	Cellular Biochemistry
BIOC 4001 [0.5]	Methods in Biochemistry
BIOC 4201 [0.5]	Advanced Cell Culture and Tissue Engineering
Biology	
BIOL 1103 [0.5]	Foundations of Biology I
BIOL 1104 [0.5]	Foundations of Biology II
BIOL 2001 [0.5]	Animals: Form and Function
BIOL 2002 [0.5]	Plants: Form and Function
BIOL 2104 [0.5]	Introductory Genetics
BIOL 2200 [0.5]	Cellular Biochemistry
BIOL 2600 [0.5]	Ecology
Chemistry	
CHEM 1001 [0.5]	General Chemistry I
CHEM 1002 [0.5]	General Chemistry II
CHEM 2103 [0.5]	Physical Chemistry I
CHEM 2203 [0.5]	Organic Chemistry I
CHEM 2204 [0.5]	Organic Chemistry II
CHEM 2302 [0.5]	Analytical Chemistry I
CHEM 2303 [0.5]	Analytical Chemistry II
CHEM 2800 [0.5]	Foundations for Environmental Chemistry
Earth Sciences	
ERTH 1006 [0.5]	Exploring Planet Earth
ERTH 1009 [0.5]	The Earth System Through Time
ERTH 2102 [0.5]	Mineralogy to Petrology
ERTH 2404 [0.5]	Engineering Geoscience
ERTH 2802 [0.5]	Field Geology I
ERTH 3111 [0.5]	Vertebrate Evolution: Mammals, Reptiles, and Birds
ERTH 3112 [0.5]	Vertebrate Evolution: Fish and Amphibians
ERTH 3204 [0.5]	Mineral Deposits
ERTH 3205 [0.5]	Physical Hydrogeology
ERTH 3806 [0.5]	Structural Geology
Food Sciences	
FOOD 3001 [0.5]	Food Chemistry
FOOD 3002 [0.5]	Food Analysis
FOOD 3005 [0.5]	Food Microbiology
Geography	
GEOG 1010 [0.5]	Global Environmental Systems
GEOG 3108 [0.5]	Soil Properties
Neuroscience	
NEUR 3206 [0.5]	Sensory and Motor Neuroscience
NEUR 3207 [0.5]	Systems Neuroscience
NEUR 4600 [0.5]	Advanced Lab in Neuroanatomy
Physics	
PHYS 1001 [0.5]	Foundations of Physics I
PHYS 1002 [0.5]	Foundations of Physics II
PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics
PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion
PHYS 1007 [0.5]	Elementary University Physics I
PHYS 1008 [0.5]	Elementary University Physics II
PHYS 2202 [0.5]	Wave Motion and Optics
PHYS 2604 [0.5]	Modern Physics I
PHYS 3007 [0.5]	Third Year Physics Laboratory: Selected Experiments and Seminars
PHYS 3606 [0.5]	Modern Physics II
PHYS 3608 [0.5]	Modern Applied Physics

Course Categories for B.Sc. Programs

Science Geography Courses

GEOG 1010 [0.5]	Global Environmental Systems
GEOG 2006 [0.5]	Introduction to Quantitative Research
GEOG 2013 [0.5]	Weather and Water
GEOG 2014 [0.5]	The Earth's Surface
GEOG 3003 [0.5]	Quantitative Geography
GEOG 3010 [0.5]	Field Methods in Physical Geography
GEOG 3102 [0.5]	Geomorphology
GEOG 3103 [0.5]	Watershed Hydrology
GEOG 3104 [0.5]	Principles of Biogeography
GEOG 3105 [0.5]	Climate and Atmospheric Change
GEOG 3106 [0.5]	Aquatic Science and Management
GEOG 3108 [0.5]	Soil Properties
GEOG 4000 [0.5]	Field Studies
GEOG 4005 [0.5]	Directed Studies in Geography
GEOG 4013 [0.5]	Cold Region Hydrology
GEOG 4017 [0.5]	Global Biogeochemical Cycles
GEOG 4101 [0.5]	Two Million Years of Environmental Change
GEOG 4103 [0.5]	Water Resources Engineering
GEOG 4104 [0.5]	Microclimatology
GEOG 4108 [0.5]	Permafrost

Science Psychology Courses

PSYC 2001 [0.5]	Introduction to Research Methods in Psychology
PSYC 2002 [0.5]	Introduction to Statistics in Psychology
PSYC 2700 [0.5]	Introduction to Cognitive Psychology
PSYC 3000 [1.0]	Design and Analysis in Psychological Research
PSYC 3506 [0.5]	Cognitive Development
PSYC 3700 [1.0]	Cognition (Honours Seminar)
PSYC 3702 [0.5]	Perception
PSYC 2307 [0.5]	Human Neuropsychology I
PSYC 3307 [0.5]	Human Neuropsychology II

Science Continuation Courses

A course at the 2000 level or above may be used as a Science Continuation credit in a B.Sc. program if it is not in the student's major discipline, and is chosen from the following:

- BIOC (Biochemistry)
- BIOL (Biology) Biochemistry students may use BIOL 2005 only as a free elective.
- CHEM (Chemistry)
- COMP (Computer Science) A maximum of two half-credits at the 1000-level in COMP, excluding COMP 1001 may be used as Science Continuation credits.

ERTH (Earth Sciences), except ERTH 2415 which may be used only as a free elective for any B.Sc. program. Students in Earth Sciences programs may use ERTH 2401, ERTH 2402, and ERTH 2403 only as free electives.

Engineering. Students wishing to register in Engineering courses must obtain the permission of the Faculty of Engineering and Design.

ENSC (Environmental Science)

FOOD (Food Science and Nutrition)

GEOM (Geomatics)

HLTH (Health Sciences)

ISAP (Interdisciplinary Science Practice)

MATH (Mathematics)

NEUR (Neuroscience)

PHYS (Physics), except PHYS 2903

Science Geography Courses (see list above)

Science Psychology Courses (see list above)

STAT (Statistics)

TSES (Technology, Society, Environment) except TSES 2305. Biology students may use these courses only as free electives. Integrated Science and Environmental Science students may include these courses in their programs but may not count them as part of the Science Sequence.

Science Faculty Electives

Science Faculty Electives are courses at the 1000-4000 level chosen from:

BIOC (Biochemistry)

BIOL (Biology) Biology & Biochemistry students may use BIOL 1010 and BIOL 2005 only as free electives

CHEM (Chemistry) except CHEM 1003, CHEM 1004 and CHEM 1007

COMP (Computer Science) except COMP 1001

ERTH (Earth Sciences) except ERTH 1010, ERTH 1011 and ERTH 2415. Earth Sciences students may use ERTH 2401, ERTH 2402, and ERTH 2403 only as free electives.

Engineering

ENSC 2001

FOOD (Food Science and Nutrition)

GEOM (Geomatics)

HLTH (Health Science)

ISAP (Interdisciplinary Science Practice)

MATH (Mathematics)

NEUR (Neuroscience)

PHYS (Physics) except PHYS 1901, PHYS 1902, PHYS 1905, PHYS 2903

Science Geography (see list above)

Science Psychology (see list above)

STAT (Statistics)

TSES (Technology, Society, Environment) Biology students may use these courses only as free electives.

Advanced Science Faculty Electives

Advanced Science Faculty Electives are courses at the 2000-4000 level chosen from the Science Faculty Electives list above.

Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)

All courses offered by the Faculty of Arts and Social Sciences, the Faculty of Public Affairs, and the Sprott School of Business are approved as Arts or Social Sciences courses EXCEPT FOR: All Science Geography courses (see list above), all Geomatics (GEOM) courses, all Science Psychology courses (see list above). NSCI 1000 may be used as an Approved Course Outside the Faculties of Science and Engineering and Design.

Free Electives

Any course is allowable as a Free Elective providing it is not prohibited (see below). Students are expected to comply with prerequisite requirements and enrolment restrictions for all courses as published in this Calendar.

Courses Allowable Only as Free Electives in any B.Sc. Program

BIOL 4810 [0.5]	Education Research in Undergraduate Science
CHEM 1003 [0.5]	The Chemistry of Food, Health and Drugs
CHEM 1004 [0.5]	Drugs and the Human Body
CHEM 1007 [0.5]	Chemistry of Art and Artifacts
ERTH 1010 [0.5]	Our Dynamic Planet Earth
ERTH 1011 [0.5]	Evolution of the Earth
ERTH 2415 [0.5]	Natural Disasters
ISCI 1001 [0.5]	Introduction to the Environment
ISCI 2000 [0.5]	Natural Laws
ISCI 2002 [0.5]	Human Impacts on the Environment
MATH 0107 [0.5]	Algebra and Geometry
PHYS 1901 [0.5]	Planetary Astronomy
PHYS 1902 [0.5]	From our Star to the Cosmos
PHYS 1905 [0.5]	Physics Behind Everyday Life
PHYS 2903 [0.5]	Physics Towards the Future

Prohibited Courses

The following courses are not acceptable for credit in any B.Sc. program:

COMP 1001 [0.5]	Introduction to Computational Thinking for Arts and Social Science Students
MATH 0005 [0.5]	Precalculus: Functions and Graphs
MATH 0006 [0.5]	Precalculus: Trigonometric Functions and Complex Numbers
MATH 1009 [0.5]	Mathematics for Business
MATH 1119 [0.5]	Linear Algebra: with Applications to Business
MATH 1401 [0.5]	Elementary Mathematics for Economics I
MATH 1402 [0.5]	Elementary Mathematics for Economics II

B.A. Regulations

The regulations presented below apply to all Bachelor of Arts programs. In addition to the requirements presented here, students must satisfy the University regulations common to all undergraduate students including the process of Academic Continuation Evaluation (consult the *Academic Regulations of the University* section of this Calendar).

First-Year Seminars

B.A. degree students are strongly encouraged to include a First-Year Seminar (FYSM) during their first 4.0 credits of registration. Students are limited to 1.0 credit in FYSM and can only register in a FYSM while they have first-year standing in their B.A. program.

Breadth Requirement

Among the credits presented at graduation, students in both the B.A. and the B.A. Honours degrees and B.Co.M.S. are required to include 3.0 breadth credits, which must include 1.0 credit in three of the four breadth areas identified below. Credits that fulfil requirements in the Major, Minor, Concentration, Specialization, or Stream may also be used to fulfil the Breadth Requirement.

Students admitted with a completed university degree are exempt from breadth requirements.

Students in the following interdisciplinary programs are exempt from the B.A. breadth requirement.

- African Studies
- Criminology and Criminal Justice
- Environmental Studies
- Human Rights
- Human Rights and Social Justice

Breadth Area 1: Culture and Communication

American Sign Language, Art History, Art and Culture, Communication and Media Studies, Digital Humanities, English, Film Studies, French, Journalism, Media Production and Design, Music, and Languages (Arabic, English as a Second Language, German, Greek, Hebrew, Indigenous Languages, Italian, Japanese, Korean, Latin, Mandarin, Portuguese, Russian, Spanish)

Subject codes: ARAB, ARTH, ASLA, CHIN, COMS, DIGH, ENGL, ESLA, FILM, FINS, FREN, GERM, GREK, HEBR, ITAL, JAPA, JOUR, KORE, LANG, LATN, MPAD, MUSI, PORT, RUSS, SPAN

Breadth Area 2: Humanities

African Studies, Applied Linguistics and Discourse Studies, Archaeology, Canadian Studies, Child Studies, Classical Civilization, Critical Race Studies, Directed Interdisciplinary Studies, Disability Studies, Environmental and Climate Humanities, European and Russian Studies, History, Human Rights and Social Justice, Humanities, Indigenous Studies, Latin American and Caribbean Studies, Linguistics, Medieval and Early Modern Studies, Philosophy, Religion, Sexuality Studies, South Asian Studies, and Women's and Gender Studies.

Subject codes: AFRI, ALDS, ARCY, CDNS, CHST, CLCV, CRST, DBST, DIST, EACH, EURR, HIST, HRSJ, HUMR, HUMS, INDG, LACS, LING, MEMS, PHIL, RELI, SAST, SXST, WGST

Breadth Area 3: Science, Engineering, and Design

Architecture, Biology, Chemistry, Computer Science, Earth Sciences, Engineering, Environmental Science, Food Science and Nutrition, Health Sciences, Industrial Design, Information Resource Management, Information Technology (BIT), Information Technology (ITEC), Interactive Multimedia and Design, Mathematics, Neuroscience, Network Technology, Optical Systems and Sensors, Photonics, Statistics, Physics, and Technology, Society, Environment.

Subject codes: ACSE, AERO, ARCC, ARCH, ARCN, ARCS, ARCU, BIOC, BIOL, BIT, CHEM, CIVE, COMP, ECOR, ELEC, ENSC, ENVE, ERTH, FOOD, HLTH, IDES, IMD, IRM, ISCI, ISCS, ISYS, ITEC, MAAE, MATH, MECH, NET, NEUR, NSCI, OSS, PHYS, PLT, SREE, STAT, SYSC, TSES

Breadth Area 4: Social Sciences

Anthropology, Business, Cognitive Science, Criminology and Criminal Justice, Economics, Environmental Studies, Geography, Geomatics, Global and International Studies, Global Politics, Interdisciplinary Public Affairs, International Affairs, Law, Migration and Diaspora Studies, Political Management, Political Science, Psychology, Public Administration, Public Affairs and Policy Management, Social Work, Sociology/Anthropology, Sociology

Subject codes: ANTH, BUSI, CGSC, CRCJ, ECON, ENST, GEOG, GEOM, GINS, GPOL, INAF, IPAF, LAWS, MGDS, PADM, PAPM, POLM, PSCI, PSYC, SOCI, SOWK

Declared and Undeclared Students

Degree students are considered "Undeclared" if they have been admitted to a degree, but have not yet selected and been accepted into a program within that degree. The status "Undeclared" is available only in the B.A. and B.Sc. degrees. Undeclared students must apply to enter a program upon or before completing 3.5 credits.

Change of Program Within the B.A. Degree

To transfer to a program within the B.A. degree, applicants must normally be *Eligible to Continue* (EC) in the new program, by meeting the CGPA thresholds described in Section 3.1.9 of the *Academic Regulations of the University.*

Applications to declare or change programs within the B.A. degree online must be made online through Carleton Central by completing a Change of Program Elements (COPE) application form within the published deadlines. Acceptance into a program, or into a program element or option, is subject to any enrollment limitations, as well as specific program, program element, or option requirements as published in the relevant Calendar entry.

Minors, Concentrations, and Specializations

Students may add a Minor, Concentration, or Specialization by completing a Change of Program Elements (COPE) application form online through Carleton Central. Acceptance into a Minor, Concentration, or Specialization normally requires that the student be *Eligible to Continue* (EC) and is subject to any specific requirements of the intended Minor, Concentration, or Specialization as published in the relevant Calendar entry and in Section 3.1.9 of the *Academic Regulations of the University*.

Mention : français

Students registered in certain B.A. programs may earn the diploma notation *Mention : françai*s by completing

part of their program requirements in French, and by demonstrating knowledge of the history and culture of French Canada. The general requirements are listed below. For more specific details, consult the departmental program entries.

Students in a B.A. Honours program must present:

1. 1.0 credit in French language;
2. 1.0 credit devoted to the history and culture of French Canada;
3. 1.0 credit at the 2000- or 3000-level in the Honours discipline taken in French; and
4. 1.0 credit at the 4000-level in the Honours discipline taken in French.

Students in a B.A. program must present:

1. 1.0 credit in advanced French;
2. 1.0 credit devoted to the history and culture of French Canada;
3. 1.0 credit at the 2000- or 3000-level in the Major discipline taken in French.

Students in Combined Honours programs must fulfil the *Mention : françai*s requirement in both disciplines.

Courses taught in French (Items 3 and 4, above) may be taken at Carleton, at the University of Ottawa on the Exchange Agreement, or at a francophone university on a Letter of Permission. Students planning to take courses on exchange or on a Letter of Permission should take careful note of the residence requirement for a minimum number of Carleton courses in their programs. Consult the *Academic Regulations of the University* section of this Calendar for information regarding study on exchange or Letter of Permission.

Regulations

In addition program requirements described in this section, students must satisfy the Academic Regulations of the University, including the process of Academic Continuation Evaluation.

Students should consult the College and its website when planning their program and selecting courses.

Requirement for Full-Time Study

Students in the Humanities program must complete a minimum of 4.0 credits by the end of the summer session. The College may permit students to study abroad for a year while remaining registered in the program. For those students permitted to study abroad, Carleton credits commensurate to studies taken abroad will be determined by the College and awarded towards the student's degree. In exceptional circumstances (usually financial need or sickness) the College may also permit students to take a leave of absence for one year while remaining registered in the program.

Academic Continuation Evaluation for Bachelor of Humanities

Students in the Bachelor of Humanities degree follow the Academic Continuation Evaluation (ACE) regulations described in Section 3.2 of the *Academic Regulations of the University* with the following additions and amendments.

The Bachelor of Humanities degree defines an Overall CGPA and a Core CGPA.

HUMANITIES CORE COURSES

HUMS 1000 [1.0]	Foundational Myths and Histories
HUMS 2000 [1.0]	Reason and Revelation
HUMS 3000 [1.0]	Culture and Imagination
HUMS 4000 [1.0]	Politics, Modernity and the Common Good

At each ACE assessment, Bachelor of Humanities students are evaluated on the basis of their Overall CGPA. The Core CGPA is assessed only at the end of each winter term.

Students are *Eligible to Continue* (EC) if the Overall CGPA is at least 6.50 and the Core CGPA is at least 6.50.

A student who does not receive the status *Eligible to Continue* (EC) but who has an Overall CGPA of at least 6.00 and a Core CGPA of at least 6.00 is placed on *Academic Warning* (AW).

A student is required to leave the program with the decision *Continue in Alternate* (CA) if:

1. the student was on *Academic Warning* (AW) and does not achieve *Eligible to Continue* (EC) at the next ACE assessment,
   or
2. the student has an Overall CGPA of less than 6.00 or a Core CGPA of less than 6.00 when assessed.

Transfer from B.Hum. to B.J.Hum.

A student who has completed the first year of the B.Hum. and is *Eligible to Continue* (EC) may apply to transfer into the second year of the B.J. Hum. and will be accepted at the discretion of the School of Journalism and the College of Humanities, and must normally have an overall CGPA of 10.0 (A-) or higher. Transfers into higher years will not be considered.

Admissions Information

Admission requirements are based on the Ontario High School System. Prospective students can view the admission requirements through the Admissions website at admissions.carleton.ca. The overall average required for admission is determined each year on a program-by-program basis. Holding the minimum admission requirements only establishes eligibility for consideration; higher averages are required for admission to programs for which the demand for places by qualified applicants exceeds the number of places available. All programs have limited enrolment and admission is not guaranteed. Some programs may also require specific course prerequisites and prerequisite averages and/or supplementary admission portfolios. Consult admissions.carleton.ca for further details.

Note: If a course is listed as *recommended*, it is not mandatory for admission. Students who do not follow

the recommendations will not be disadvantaged in the admission process.

Degrees

- B.Sc. (Honours)
- B.Sc. (Major)
- B.Sc.

Admission Requirements

B. Sc. Honours

First Year

The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. For most programs including Biochemistry, Bioinformatics, Biotechnology, Chemistry, Combined Honours in Biology and Physics, Chemistry and Physics, Computational Biochemistry, Food Science, Nanoscience, Neuroscience and Biology, Neuroscience and Mental Health, and Psychology, the six 4U or M courses must include Advanced Functions, and two of Biology, Chemistry, Earth and Space Sciences, or Physics. (Calculus and Vectors is strongly recommended).

Specific Honours Admission Requirements
For the Honours programs in Earth Sciences, Environmental Science, Geomatics, Interdisciplinary Science and Practice, and Physical Geography, Calculus and Vectors may be substituted for Advanced Functions.

For the Honours programs in Physics and Applied Physics, and for double Honours in Mathematics and Physics, Calculus and Vectors is required in addition to Advanced Functions and one of 4U Physics, Chemistry, Biology, or Earth and Space Sciences. For all programs in Physics, 4U Physics is strongly recommended.

For Honours in Psychology, a 4U course in English is recommended.

For Honours in Environmental Science, a 4U course in Biology and Chemistry is recommended.

Advanced Standing

Applications for admission beyond first year will be assessed on their merits. Applicants must normally be *Eligible to Continue* in their year level, in addition to meeting the CGPA thresholds described in Section 3.1.9 of the Academic Regulations of the University. Advanced standing will be granted only for those subjects deemed appropriate for the program and stream selected.

B.Sc. Major and B.Sc.

First Year

The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. The six 4U or M courses must include Advanced Functions and two of Calculus and Vectors, Biology, Chemistry, Earth and Space Science, or Physics (Calculus and Vectors is strongly recommended). For the B.Sc. Major in Physics, 4U Physics is strongly recommended.

Advanced Standing

Applications for admission beyond first year will be assessed on their merits. Applicants must normally be *Eligible to Continue* (EC) in their year level. Advanced standing will be granted only for those subjects deemed appropriate for the program and stream selected.

Co-op Option

Direct Admission to the First Year of the Co-op Option
Applicants must:

1. meet the required overall admission cut-off average and prerequisite course average. These averages may be higher than the stated minimum requirements;
2. be registered as a full-time student in the Bachelor of Science Honours program;
3. be eligible to work in Canada (for off-campus work placements).

Note that meeting the above requirements only establishes eligibility for admission to the program. The prevailing job market may limit enrolment in the co-op option.

Note: continuation requirements for students previously admitted to the co-op option and admission requirements for the co-op option after beginning the program are described in the Co-operative Education Regulations section of this Calendar.

Admissions Information

Admission requirements are based on the Ontario High School System. Prospective students can view the admission requirements through the Admissions website at admissions.carleton.ca. The overall average required for admission is determined each year on a program-by-program basis. Holding the minimum admission requirements only establishes eligibility for consideration; higher averages are required for admission to programs for which the demand for places by qualified applicants exceeds the number of places available. All programs have limited enrolment and admission is not guaranteed. Some programs may also require specific course prerequisites and prerequisite averages and/or supplementary admission portfolios. Consult admissions.carleton.ca for further details.

Note: If a course is listed as *recommended*, it is not mandatory for admission. Students who do not follow the recommendations will not be disadvantaged in the admission process.

Admission Requirements

Degrees

- **Bachelor of Arts (B.A.) (Honours)**
- **Bachelor of Arts (B.A.)**

First Year

For B.A. and B.A. (Honours)
The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. The six 4U or M courses must include a 4U course in English (or *anglais*). Applicants submitting an English language test to satisfy the requirements of the English Language Proficiency section of this Calendar may use that test to also satisfy the 4U English prerequisite requirement.

Biology
For the major in Biology in the B.A. program, in addition to the 4U English, a 4U course in Chemistry is required. Advanced Functions, and Calculus and Vectors are recommended.

Criminology and Criminal Justice
Access to the CCJ B.A. degree is limited to students already registered in the CCJ B.A. Honours who apply to transfer, and to graduates of the Algonquin College Police Foundations program.

Advanced Standing

Applications for admission beyond first year will be assessed on their merits. Applicants must normally be Eligible to Continue in their year level, in addition to meeting the CGPA thresholds described in Section 3.1.9 of the Academic Regulations of the University. Advanced standing will be granted only for those subjects assessed as being appropriate for the program and the stream selected.

Co-op Option

Direct Admission to the 1st Year of the Co-op Option
Co-op is available for the following Majors in the B.A. (Honours) degree: Anthropology, English, Environmental Studies, European and Russian Studies, French, Geography, Geomatics, History, Law, Political Science, Psychology, Sociology.

Applicants must:

1. meet the required overall admission cut-off average and prerequisite course average. These averages may be higher than the stated minimum requirements;
2. be registered as a full-time student in the Bachelor of Arts Honours with one of the majors listed above;
3. be eligible to work in Canada (for off-campus work placements).

Meeting the above requirements only establishes eligibility for admission to the program. The prevailing job market may limit enrolment in the co-op option. Students should also note that hiring priority is given to Canadian citizens for co-op positions in the Public Service Commission.

Note: continuation requirements for students previously admitted to the co-op option and admission requirements for the co-op option after beginning the program are described in the Co-operative Education Regulations section of this Calendar.

Biology

For the major in Biology in the B.A. program, in addition to the 4U English, a 4U course in Chemistry is required. Advanced Functions and Calculus and Vectors are recommended.

Advanced Standing

B.A. and B.A. (Honours) Program

Applications for admission to the second or subsequent years will be assessed on their merits. Advanced standing will be granted only for those courses that are determined to be appropriate.

Direct Admission to the First Year of the Co-op Option

Co-op is available for the following Majors in the B.A. (Honours) degree: Anthropology, English, Environmental Studies, European, Russian, and Eurasian Studies, French, Geography, Geography with a Concentration in Physical Geography, Geomatics, History, Law, Political Science, Psychology, Sociology.

Applicants must:

1. meet the required overall admission cut-off average and prerequisite course average. These averages may be higher than the stated minimum requirements;
2. be registered as a full-time student in the Bachelor of Arts Honours with one of the majors listed above;
3. be eligible to work in Canada (for off-campus work placements).

Meeting the above requirements only establishes eligibility for admission to the program. The prevailing job market may limit enrolment in the co-op option. Students should also note that hiring priority is given to Canadian citizens for co-op positions in the Public Service Commission.

Note: continuation requirements for students previously admitted to the co-op option and admission requirements for the co-op option after beginning the program are described in the Co-operative Education Regulations section of this Calendar.

Biology (BIOL) Courses

BIOL 1010 [0.5 credit]
Biotechnology and Society
A course for students interested in the science behind recent advances in biotechnology. The different ways in which biotechnology is being applied in agriculture, health care, and the environment will be examined.
Preclusion: credit will not be given if taken concurrently with or after BIOL 2200 or BIOC 2200 or BIOL 2201. Students in Biology and Biochemistry programs may only take this course as a free elective.
Lectures three hours a week.

BIOL 1103 [0.5 credit]
Foundations of Biology I
A research-oriented course focusing on the scientific process of biological exploration at the cellular level. Topics include cell organization, metabolism, genetics, and reproduction.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 1003 (no longer offered).
Prerequisite(s): Ontario 4U/M in Biology (or equivalent), or Ontario 4U/M in Chemistry (or equivalent).
Lectures three hours a week, laboratory or tutorial three hours a week.

BIOL 1104 [0.5 credit]
Foundations of Biology II
A research-oriented course focusing on the scientific process of biological exploration at the macroscale. Topics include evolution, diversity of life, and ecological relationships.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 1004 (no longer offered).
Prerequisite(s): Ontario 4U/M in Biology (or equivalent) or BIOL 1103.
Lectures three hours a week, laboratory or tutorial three hours a week.

BIOL 1105 [0.5 credit]
Introduction to Biological Data
Formulation of biological research questions, development of hypotheses and predictions, design of experiments, collection and analysis of data, interpretation and presentation of results.
Lectures three hours a week.

BIOL 1902 [0.5 credit]
Natural History
A course designed primarily for students in non-biology programs to investigate the natural history of plants and animals, and the communities in which they occur. Particular attention is paid to the Ottawa region, but appropriate examples from other locales are also included.

Lectures three hours a week.

BIOL 2001 [0.5 credit]
Animals: Form and Function
An introduction to the diverse structures of animals (both invertebrates and vertebrates) in relationship to their functions, discussed within an evolutionary framework.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures three hours a week, laboratory or tutorial three hours a week.

BIOL 2002 [0.5 credit]
Plants: Form and Function
An introduction to the structure and development of higher plants (at cellular, morphological and organism levels) discussed in relation to their function.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures three hours a week, laboratory or tutorial three hours a week.

BIOL 2005 [0.5 credit]
Human Biology
A course for non-specialists interested in how the human body works. Topics will include biological molecules, cells, genetics, and various organ systems. Examples will be used to connect concepts taught in the course with general knowledge of human health and disease.
Prerequisite(s): BIOL 1003 or BIOL 1103 and (CHEM 1001 and CHEM 1002) or (CHEM 1005 and CHEM 1006).
Students in Biology and Biochemistry programs may only take this course as a free elective.
Lectures three hours a week.

BIOL 2104 [0.5 credit]
Introductory Genetics
Lecture/laboratory course on the mechanisms of inheritance and the nature of gene structure, composition and function, introducing both classical Mendelian genetics and modern molecular genetics. It is strongly recommended that this course be taken by Biology majors in their second year of study.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 2106 (no longer offered) and BIOL 2107. Credit for BIOL 2106 will only be given if taken before BIOL 2104.
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures three hours a week, laboratory or tutorial three hours a week.

BIOL 2107 [0.5 credit]
Fundamentals of Genetics
Mechanisms of inheritance and the nature of gene structure, composition and function, introducing both classical Mendelian genetics and modern molecular genetics.
Precludes additional credit for BIOL 2104 and BIOL 2106 (no longer offered).
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures three hours a week.

BIOL 2200 [0.5 credit]
Cellular Biochemistry
Cellular functions and their interrelationships. Introduction to thermodynamics, membrane structure and function, transport mechanisms, basic metabolic pathways, energy production and utilization, communications between cells. It is strongly recommended that Biology Majors and Honours students take this course in their second year of study.
Includes: Experiential Learning Activity
Also listed as BIOC 2200.
Precludes additional credit for BIOL 2201, CHEM 4401.
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104), (CHEM 1001 and CHEM 1002) or (CHEM 1005 and CHEM 1006).
Lectures three hours a week, laboratory or tutorial four hours a week.

BIOL 2201 [0.5 credit]
Cell Biology and Biochemistry
A study of the molecular, metabolic and structural organization of cells in relation to function. This course is recommended for students not taking upper year Biology laboratory courses for which BIOL/BIOC laboratories are prerequisites.
Precludes additional credit for BIOL 2200, BIOC 2200.
Prerequisite(s): (BIOL 1003 or BIOL 1103) and (CHEM 1002 or CHEM 1006).
Lectures three hours a week.

BIOL 2301 [0.5 credit]
Biotechnology I
An introductory course on the science, technology, entrepreneurial skills and business considerations related to biotechnology. The course will survey broadly across the disciplines of Biology, including applications in agriculture, health, environment and industry.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures and workshops three hours a week

BIOL 2303 [0.5 credit]
Microbiology
The biology of the bacteria, Archaea, Viruses and Protozoans, from the fundamentals of cell chemistry, molecular biology, structure and function, to their involvement in ecological and industrial processes and human disease.
Also listed as ENVE 2002.
Prerequisite(s): BIOL 1003 or BIOL 1103.
Lectures three hours a week.

BIOL 2600 [0.5 credit]
Ecology
The scientific study of interactions of living organisms and their environment, and how these affect the distribution and abundance of life. Topics include energy transformation and flow, nutrient cycling, population and community dynamics, human impacts on ecosystems, conservation issues. Laboratory includes field and computer exercises.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104).
Lectures three hours a week, laboratory or tutorial four hours a week.

BIOL 2903 [0.5 credit]
Natural History and Ecology of Ontario
Introduction to the remarkable diversity and ecological relationships of Ontario's flora and fauna, which are explored in a habitat context.
Precludes additional credit for BIOL 1903 (no longer offered).
Prerequisite(s): BIOL 1004 or BIOL 1104 or BIOL 1902.
Lectures three hours a week.

BIOL 3004 [0.5 credit]
Insect Diversity
Introductory course dealing with the taxonomic diversity, anatomy, behavior and physiology of insects, as well as their impacts on ecosystems, agriculture and animal and human health.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4601.
Prerequisite(s): BIOL 2001.
Lectures three hours a week.

BIOL 3008 [0.5 credit]
Bioinformatics
A practical exploration in the application of information technology to biochemistry and molecular biology. Insight into biological knowledge discovery via molecular structure and function prediction, comparative genomics and biological information management.
Includes: Experiential Learning Activity
Also listed as BIOC 3008, COMP 3308.
Prerequisite(s): BIOC 2200 or BIOL 2200, or BIOL 2201, or permission of the Department.
Lectures two hours a week, computer workshop three hours a week.

BIOL 3102 [0.5 credit]
Mycology
This introductory course will cover the morphology, physiology, life cycles, evolution, ecology and biotechnology of the fungi.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2104 or BIOL 2107.
Lectures three hours a week.

BIOL 3104 [0.5 credit]
Molecular Genetics
A lecture course dealing with modern advances in molecular genetics.
Prerequisite(s): BIOL 2104 or BIOL 2107 or permission of the Department.
Lectures three hours a week.

BIOL 3111 [0.5 credit]
Vertebrate Evolution: Mammals, Reptiles, and Birds
Evolution of mammals, reptiles and birds. Emphasis on surveying amniote diversity, and the origin of key amniote transformations, as evidenced by the fossil record.
Includes: Experiential Learning Activity
Also listed as ERTH 3111.
Prerequisite(s): BIOL 2001 or ERTH 1009, or permission of the department.
Lectures two hours a week and a laboratory three hours a week.

BIOL 3112 [0.5 credit]
Vertebrate Evolution: Fish and Amphibians
Evolution of fish and amphibians. Emphasis on surveying fish and amphibian diversity, and the origin of key transformations of these groups, as evidenced by the fossil record.
Includes: Experiential Learning Activity
Also listed as ERTH 3112.
Prerequisite(s): BIOL 2001 or ERTH 1009, or permission of the department.
Lectures two hours a week and a laboratory three hours a week.

BIOL 3201 [0.5 credit]
Cell Biology
A lecture and laboratory course on the structure, composition, and function of eukaryotic cells.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2104 and BIOL 2200/BIOC 2200, or permission of the Department.
Lectures three hours a week, laboratory four hours a week.

BIOL 3202 [0.5 credit]
Principles of Developmental Biology
Introduction to the underlying principles and mechanisms governing development in multicellular animals and plants. Differentiation, growth, morphogenesis, and patterning will be examined at the organismal, cellular, and molecular levels to provide a balanced view of developmental phenomena in key model organisms.
Prerequisite(s): BIOL 2104 or BIOL 2107 and one of BIOL 2001 or BIOL 2002, or permission of the Department.
Lectures three hours a week.

BIOL 3205 [0.5 credit]
Plant Biochemistry and Physiology
A lecture and laboratory course consisting of selected topics in metabolism and physiology of plants, including photosynthesis, nutrient uptake and transport, intermediary and secondary metabolism, germination, growth and development.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2002 and BIOL 2200/BIOC 2200, or permission of the Department.
Lectures three hours a week, laboratory four hours a week.

BIOL 3301 [0.5 credit]
Biotechnology II
An interdisciplinary course on interactions between science, invention and innovation in biotechnology. Case studies related to regional biotechnology opportunities; social and ethical issues impacting biotechnology.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2301, BIOL 2104 or BIOL 2107, and BIOL 2200/BIOC 2200 or BIOL 2201, or permission of the department.
Lectures and laboratory/workshops three hours a week

BIOL 3303 [0.5 credit]
Experimental Microbiology
Intensive training in laboratory techniques in microbiology, using bacteria and other microorganisms to demonstrate processes of cell growth, metabolism, gene expression, rapid evolution, gene transfer, microbial community dynamics and interactions with other organisms.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2104, BIOL 2200/BIOC 2200 and BIOL 2303, or permission of the Department.
Lecture/tutorial one and a half hours a week, laboratory four hours a week.

BIOL 3305 [0.5 credit]
Human and Comparative Physiology
The properties of physiological systems and components of humans and other animals with an emphasis on physical and chemical bases.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 3306.
Prerequisite(s): BIOL 2200/BIOC 2200 and BIOL 2001.
Lectures three hours a week, laboratory four hours a week.

BIOL 3306 [0.5 credit]
Human Anatomy and Physiology
The anatomy and physiology of the neuromuscular, cardiovascular, respiratory, and excretory systems of humans with comparison to other animals.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 3305.
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104), and (CHEM 1001 and CHEM 1002) or (CHEM 1005 and CHEM 1006), and third year standing.
Lectures three hours per week.

BIOL 3307 [0.5 credit]
Advanced Human Anatomy and Physiology
The anatomy and physiology of the endocrine, skeletal, digestive, immunological, and reproductive systems, with additional emphasis on the embryological origins of the major physiological systems.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 3305 or BIOL 3306.
Lectures three hours per week, workshop or laboratory four hours per week.

BIOL 3501 [0.5 credit]
Biomechanics
Properties of muscles, tendons, bones, joints and the co-ordinated use of these structures. Human and other animal locomotion and fitness, bird flight, especially the soaring of the vulture and the albatross, and animal migration are covered in detail.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104), and third-year standing.
Lectures three hours a week, workshop two hours a week.

BIOL 3601 [0.5 credit]
Ecosystems and Environmental Change
Exploration of the unique contribution of the ecosystem approach to ecology, and of early key literature in ecosystem ecology through to current work on global environmental change.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2600.
Lectures three hours a week, laboratory four hours a week in six sessions.

BIOL 3602 [0.5 credit]
Conservation Biology
The science of biology as applied to the problem of maintaining species diversity. Topics include: history of conservation biology, valuation of species, indices of biodiversity, extinction, conservation genetics, conservation planning in parks and reserves, landscape ecology and case studies of conservation problems.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2600 or permission of the Department.
Lectures three hours a week and laboratory/workshop three hours a week.

BIOL 3604 [0.5 credit]
Statistics for Biologists
Introduction to the analysis of biological data. Students analyze real biological data sets in weekly laboratory sessions. Methods introduced include simple linear, polynomial, and multiple regression analysis, analysis of variance, nonparametric tests, tests of independence and logistic regression analysis.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 1105 or STAT 2507.
Lectures one and one-half hours and laboratory two and one-half hours a week.

BIOL 3605 [0.5 credit]
Field Course I
An intensive study of living organisms under natural conditions. Credit is based on two weeks of full-time fieldwork with attendant assignments. Transportation and room and board costs are borne by the student. Ontario Universities Program in Field Biology; see offered modules for specific prerequisites.
Includes: Experiential Learning Activity
Also listed as NEUR 3203, for animal behaviour modules only.
Prerequisite(s): at least one course in BIOL beyond the 1000-level and written permission of the Department.
Students may take both BIOL 3605 and BIOL 3606 for credit, but neither may be used to repeat a particular module.
All day, approximately six days a week.

BIOL 3606 [0.5 credit]
Field Course II
An intensive study of living organisms under natural conditions. Credit is based on two weeks of full-time fieldwork with attendant assignments. Transportation and room and board costs are borne by the student. Ontario Universities Program in Field Biology; see offered modules for specific prerequisites.
Includes: Experiential Learning Activity
Prerequisite(s): at least one course in BIOL beyond the 1000-level and written permission of the Department.
Students may take both BIOL 3605 and BIOL 3606 for credit, but neither can be used to repeat a particular module.
All day, approximately six days a week.

BIOL 3608 [0.5 credit]
Principles of Biogeography
Contemporary and past controls on distribution of plants and animals at global, regional and local scales; significance of these distributions.
Includes: Experiential Learning Activity
Also listed as GEOG 3104.
Prerequisite(s): BIOL 2600 or GEOG 1010 or permission of the Department.
Lectures, laboratory, and fieldwork five hours a week.

BIOL 3609 [0.5 credit]
Evolutionary Concepts
Evolution is the change in population properties across generations. Genetic variation, mutation, selection, drift, gene flow, genome evolution, speciation, development, biodiversity, fossils, and macro-evolution.
Prerequisite(s): BIOL 2104 or BIOL 2107 or permission of the instructor.
Lectures three hours a week.

BIOL 3611 [0.5 credit]
Evolutionary Ecology
The term “adaptation” is meaningful only with respect to an ecological context. Ecological contexts lead to evolutionary outcomes such as diverse mating systems, ageing, sexual reproduction, sexual dimorphism, geographic variation, phenotypic plasticity, and diverse life histories.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4608.
Prerequisite(s): BIOL 2600.
Lectures three hours a week; one field trip.

BIOL 3612 [0.5 credit]
Computational Methods in Ecology and Evolution
Introduction to the development and use of computer programs to address biological problems. Topics include the development of programs to analyse ecological data, models of population dynamics, deterministic chaos, cellular automata, simulations of foraging behaviour and evolutionary computation.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2600 or permission of the Department.
Lectures two hours per week, workshop three hours per week.

BIOL 3801 [0.5 credit]
Plants and Herbivores
Exploration of the chemical, physiological, ecological and evolutionary interactions that underlie the relationship between plants and their insect herbivores.
Prerequisite(s): BIOL 2001 and BIOL 2002.
Lectures/seminars three hours a week.

BIOL 3802 [0.5 credit]
Animal Behaviour
Advanced study of animal behaviour including the environmental, genetic, and neural influences on behaviour. Topics such as predator-prey interactions, mating behaviour, migration, parental care and social interactions are interpreted in an evolutionary context.
Prerequisite(s): BIOL 2001 or BIOL 2600 or permission of the Department.
Lectures and workshop/tutorials three hours a week.

BIOL 3804 [0.5 credit]
Social Evolution
Diversity in social behaviour from evolutionary and ecological perspectives. Topics include ecological determinants of social living, social networks, social foraging, inclusive fitness, kin selection, altruism, cooperation, and mating systems and strategies.
Prerequisite(s): BIOL 2001 and BIOL 2600, or permission of the Department.
Lectures three hours a week.

BIOL 3901 [0.5 credit]
Research Proposal
The development of a competitive research proposal in consultation with an advisor.
Includes: Experiential Learning Activity
Prerequisite(s): third year standing in an Honours Biology program and permission of the Department.

BIOL 3902 [0.5 credit]
Special Topics in Biology I
Specific topics of current interest. Topics may vary from year to year.
Prerequisite(s): third-year standing in a Biology program or permission of the Department.
Lecture, seminars, or workshops three hours per week.

BIOL 3999 [0.0 credit]
Co-operative Work Term Report
Practical experience for students enrolled in the Co-operative Option. Students must receive satisfactory evaluations from their work term employer. Written reports describing the work term project will be required. Graded Sat or Uns.
Includes: Experiential Learning Activity
Prerequisite(s): registration in the Biology Co-operative Option and permission of the Department.

BIOL 4008 [0.5 credit]
Molecular Plant Development
Recent advances in plant development including molecular, biochemical, genomics, and proteomics studies.
Prerequisite(s): BIOL 2002 or permission of the Department.
Lectures three hours a week.

BIOL 4102 [0.5 credit]
Molecular Ecology
The interface of molecular biology, ecology and population biology. Topics include experimental design and a survey and critique of molecular genetic methods to study ecology.
Prerequisite(s): BIOL 2600 and (BIOL 2104 or BIOL 2107) or permission of the Department.
Lectures three hours a week.

BIOL 4103 [0.5 credit]
Population Genetics
Evolution of gene frequencies, including selection, mutation, genetic drift, inbreeding, gene flow, and population structure.
Prerequisite(s): BIOL 2104 or BIOL 2107 or permission of the Department. A course in statistics is highly recommended.
Lectures and seminars three hours a week.

BIOL 4104 [0.5 credit]
Evolutionary Genetics
An overview of the molecular evidence of evolution, speciation as well as the phylogenetic analysis of biological sequence data and biometrical traits.
Includes: Experiential Learning Activity
Prerequisite(s): (BIOL 2001 or BIOL 2002) and (BIOL 2104 or BIOL 2107) or permission of the Department. A course in statistics is recommended.
Lectures and computer lab three hours a week.

BIOL 4106 [0.5 credit]
Advances in Molecular Biology
Review of the application of high throughput approaches to research in molecular and cellular biology and biochemistry with an emphasis on gene function and human disease progression.
Prerequisite(s): BIOL 2303 and (BIOL 3104 or BIOL 3201 or BIOL 3303).
Lectures and seminars three hours a week.

BIOL 4109 [0.5 credit]
Laboratory Techniques in Molecular Genetics
This laboratory course provides practical familiarity with commonly used techniques in molecular genetics. The laboratory is suitable for students with a developing interest in problems of molecular and cellular biology and biochemistry.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2200/BIOC 2200 and BIOL 2303 and BIOL 3104 or permission of the Department.
Lecture/laboratory six hours a week in two sessions.

BIOL 4200 [0.5 credit]
Immunology
The organization and function of the immune system, including the anatomy of the immune system, the properties and behaviour of cells of the immune system, and the molecular and genetic bases of the immune response.
Also listed as BIOC 4200.
Prerequisite(s): BIOL 3201 or permission of the Department.
Lectures three hours a week.

BIOL 4201 [0.5 credit]
Advanced Cell Culture and Tissue Engineering
Theory and application of current techniques and developments in cell culture as applied to research questions in the field of stem cells and tissue engineering.
Includes: Experiential Learning Activity
Also listed as BIOC 4201.
Prerequisite(s): BIOL 3201 or permission of the Department.
Laboratory four hours per week, tutorial one hour a week. Labs require regular participation outside of the scheduled lab time to maintain cell cultures and set up or complete experiments.

BIOL 4202 [0.5 credit]
Mutagenesis and DNA Repair
A mechanistic study of mutagenesis and DNA repair. Topics include DNA structure perturbations, spontaneous and induced mutagenesis, the genetics and biochemistry of DNA repair and recombination, and the role of mutations in the development of genetic disease and cancer.
Also listed as BIOC 4202.
Prerequisite(s): BIOL 3104 and BIOL 2200/BIOC 2200 or permission of the Department.
Lectures and tutorial three hours a week.

BIOL 4203 [0.5 credit]
Evolution of Sex
The evolution of sex, including meiosis, syngamy, sex determination, sex chromosomes, and gender from organismal, genetic, and developmental perspectives; the origin, maintenance, function, and ubiquity of sex.
Prerequisite(s): BIOL 2104 or BIOL 2107.
Lectures three hours a week.

BIOL 4206 [0.5 credit]
Human Genetics
A survey of human genetic variation and mutation in a molecular genetics context. Topics may include molecular basis of diseases, chromosomal abnormalities, genomic imprinting, cancer genetics, genomics, gene mapping and gene therapy.
Prerequisite(s): BIOL 3104 or permission of the Department.
Lectures three hours a week.

BIOL 4207 [0.5 credit]
Advanced Embryology & Developmental Biology
A laboratory-based exploration of techniques and recent developments in the use of model embryological systems as applied to questions of development and human health.

Includes: Experiential Learning Activity
Prerequisite(s): BIOL 3201 or BIOL 3202 or permission of the Department.
Laboratory four hours per week, tutorial one hour a week. Labs require regular participation outside of the scheduled lab time to set up or complete experiments.

BIOL 4209 [0.5 credit]
Advanced Plant Physiology
An advanced course dealing with recent developments in selected topics of plant physiology.
Prerequisite(s): BIOL 3205 and CHEM 2203, CHEM 2204 or permission of the Department.
Lectures/discussion three hours a week.

BIOL 4300 [0.5 credit]
Applied Microbiology
Studies of the application of microorganisms. Topics may include: microbial communities, and agricultural, pharmaceutical, industrial and health sciences.
Prerequisite(s): (BIOL 2200/BIOC 2200 or BIOL 2201), BIOL 2303 and (BIOL 3104 or BIOL 3303) or permission of the Department.
Lectures and tutorial three hours a week.

BIOL 4301 [0.5 credit]
Current Topics in Biotechnology
Explorations of developing biotechnologies in areas such as microbial products, protein engineering, plant genetic engineering, environmental remediation, pharmaceuticals production and medical diagnostics and therapy.
Prerequisite(s): BIOL 3301 or permission of the department.
Lectures and tutorials four hours a week.

BIOL 4303 [0.5 credit]
Advances in Microbiology
Exploration of current microbiology including the molecular biology of infectious agents, use of model micro-organisms to study human cells and diseases, and functional genomics and proteomics. Special attention will be paid to the field's "big questions". Students will critically examine a number of research proposals.
Prerequisite(s): BIOL 2303 and (BIOL 3104 or BIOL 3303 or BIOC 3102) or permission of the Department.
Lectures three hours per week.

BIOL 4304 [0.5 credit]
Forensic Biology
An introduction to forensics that covers topics in molecular biology, biochemistry, genetics, population genetics and statistics as they relate to forensic biology. The course will describe the techniques used to identify body fluids and generate DNA profiles as well as the interpretation of forensic results.
Prerequisite(s): (BIOL 2104 or BIOL 2107) and (BIOL 2200/BIOC 2200 or BIOL 2201) or permission of the Department.
Lectures three hours a week.

BIOL 4306 [0.5 credit]
Animal Neurophysiology
A course dealing with recent advances made in particular areas of animal neurophysiology.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4305.
Prerequisite(s): BIOL 3305 or BIOL 3306, or permission of the Department.
Lectures two hours a week, workshops or laboratory four hours a week.

BIOL 4309 [0.5 credit]
Studies in Human Performance
Biomechanical underpinnings of human performance including the quantitative analysis of human motion in normal activities and in athletic performance. Students will learn modern motion capture methods. This course will require students to design and execute an independent project.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 3307 and fourth-year standing, or permission of the department.
Lecture three hours per week, workshop/labs three hours per week.

BIOL 4317 [0.5 credit]
Neuroethology: The Neural Basis of Animal Behaviour
Proximate mechanisms underlying animal behaviour. Focus on evolution of nervous systems in response to environmental selection pressures. Topics include: genetic and hormonal influences on behaviour (e.g. maternal care); unique sensory worlds (e.g. magnetic); various levels of neural integration, from simple reflexes to complex social behaviour.
Prerequisite(s): BIOL 3305 or BIOL 3306, or permission of the Department.
Lectures three hours a week.

BIOL 4318 [0.5 credit]
Adaptations to Extreme Environments
Lectures, discussions and student presentations will be used to examine adaptations of animals to extreme environments (e.g. desert) or lifestyles (e.g. diving), at the physiological, biochemical and molecular levels. Emphasis on becoming familiar with the current primary literature.
Prerequisite(s): BIOL 3305, or permission of the Department.
Lectures/workshops three hours a week.

BIOL 4319 [0.5 credit]
Studies in Exercise Physiology
Physiological mechanisms underlying human athletic performance. Exercise physiology and cardio-respiratory activity, metabolic regulation and musculoskeletal function. Practical experience will be gained in the workshop/laboratory based experimental sessions.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 3307 and fourth-year standing, or permission of the department.
Lectures two hours per week, workshop/labs three hours per week.

BIOL 4500 [0.5 credit]
The Biology of Birds
Introduction to ornithology, the study of birds; the evolution of birds, migration, geographic variation, adaptations for flight, feeding, reproduction; extinction and preservation.
Prerequisite(s): BIOL 2001 or permission of the department.
Lectures three hours per week.

BIOL 4501 [0.5 credit]
The Taxonomy of Birds
The taxonomy of birds and species identification are learned through the use of study skins in the lab. Field excursions allow first-hand study of various species. Participants must acquire a pair of binoculars and one of the recommended field guides.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2001 or permission of the department.
Laboratory/field excursions four hours per week.

BIOL 4502 [0.5 credit]
Herpetology
Herpetology is the study of amphibians and reptiles. The behaviours, physiological ecology, conservation and identification of amphibians and reptiles will be examined through lectures, seminars and hands-on activities.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2001.
Lectures or seminars three hours per week.

BIOL 4503 [0.5 credit]
Fish Ecology, Conservation and Management
Introduction to the diversity and environmental biology of the world's fishes. Applied issues in fisheries management, conservation, and aquaculture. Workshops expose students to techniques in fisheries science through hands-on demonstrations and field excursions.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2600 or permission of the Department.
Lectures/seminars two hours a week, plus labs/workshops two hours a week.

BIOL 4504 [0.5 credit]
Ecology of Freshwater Invertebrates
Overview of the diversity and ecology of freshwater invertebrates. Aquatic invertebrates from local bodies of water will be sampled and identified in the lab. Experiments on the ecology and behaviour of model species of freshwater invertebrates will also be conducted in the lab.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 2001 and BIOL 2600.
Seminar and lab four hours a week.

BIOL 4505 [0.5 credit]
Coral Reefs
Examining the diversity of life on coral reefs and their interactions across ecological scales, from the biochemistry of zooxanthellae symbiosis to landscape scale trophodynamics, reticulate evolution, and reef fisheries. Emphasis is on synthesis writing drawn from the current primary literature.
Prerequisite(s): BIOL 2600.
Lectures/seminars three hours a week

BIOL 4506 [0.5 credit]
Cactus Biology
Covers the cactus family over its entire range, including most of the western hemisphere, with discussion on their anatomy, physiology, ecology, evolution, and classification. Topics include how cacti are both typical flowering plants in some regards, and atypical in others.
Prerequisite(s): BIOL 2002.
Lectures/seminars three hours a week

BIOL 4507 [0.5 credit]
Ecological Parasitology
Key concepts in the ecological study of parasites and pathogens, underpinned by evolutionary thinking and relevant to fundamental and applied questions of co-evolution, disease ecology, epidemiology, emerging infectious diseases, environmental parasitology, evolutionary transitions, host species range, immunity, resistance, tolerance, transmission mode, and virulence.
Prerequisite(s): BIOL 2600 and one of the following: BIOL 3601, BIOL 3604, BIOL 3609, BIOL 3611, BIOL 3612, BIOL 3801, BIOL 3802, BIOL 3804.
Lectures or seminars 3 hours per week.

BIOL 4602 [0.5 credit]
Evolutionary Applications across Disciplines: From Medicine to Conservation
Evolutionary principles contributing to advancements across fields including medicine, agriculture, conservation, climate change, and engineering. Topics include evolution of virulence, causes of variation in human health, evolution of resistance to pesticides, interventions for recovery of species at risk, and biomimetic modeling in engineering and architecture.
Prerequisite(s): BIOL 1104 and third-year standing.
Lectures/workshops three hours per week.

BIOL 4603 [0.5 credit]
Insect Evolution and Biology
Major questions on the origin, evolution and adaptation of structures and physiology of terrestrial arthropods, especially insects.
Includes: Experiential Learning Activity
Prerequisite(s): BIOL 3004, or permission of the Department.
Lectures two hours a week, laboratory four hours a week.

BIOL 4604 [0.5 credit]
Landscape Ecology
Landscape ecology is the study of how landscape structure affects ecological processes and biodiversity. The focus of this course is on research methods and results in landscape ecology, with special emphasis on applications in forestry, agriculture, and species conservation.
Prerequisite(s): BIOL 2600 and (BIOL 3601 or BIOL 3602 or BIOL 3608) or permission of the Department.
Lecture three hours a week.

BIOL 4802 [0.5 credit]
Advanced Animal Behaviour
Contemporary issues in behavioural ecology. Topics may include the relevance of behavioural ecology to conservation biology, to new insights into human social behaviour, and will be selected through consultation between professor and students.
Prerequisite(s): BIOL 3802 or BIOL 3804, or permission of the Department.
Lectures or workshops three hours a week.

BIOL 4810 [0.5 credit]
Education Research in Undergraduate Science
Introduction to learning and teaching university science. The science of learning, evidence of effective teaching, and teaching methodologies. Professional ethics, constructivist learning, equity and inclusion. Discipline-Based Education Research (DBER). Students will conduct their own DBER research project.
Includes: Experiential Learning Activity
Prerequisite(s): 4th year standing, or permission of the department This course can only be used by science students as a free elective.
Also offered at the graduate level, with different requirements, as ISAP 5504, for which additional credit is precluded.
Seminar three hours per week, classroom-based research one hour per week.

BIOL 4901 [0.5 credit]
Directed Special Studies
Independent or group study, open to third- and fourth-year students to explore a particular topic, in consultation with a Faculty supervisor. May include directed reading, written assignments, tutorials, laboratory or field work.
Prerequisite(s): permission of the Department. Students normally may not offer more than 1.0 credit of Directed Special Studies in their program.

BIOL 4902 [0.5 credit]
Special Topics in Biology II
Specific topics of current interest. Topics may vary from year to year.
Prerequisite(s): fourth-year standing in a Biology program or permission of the Department.
Lecture, seminars, or workshops three hours per week.

BIOL 4905 [1.0 credit]
Honours Workshop
Students engage in biological topics of their choosing, an evidence-based synthesis developed and presented through multiple scientific communication methods (e.g., narrative review papers, media releases, infographics, and oral and poster presentations). Evaluation is based on written syntheses, course assignments, and a year-end presentation.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4907 and BIOL 4908.

Prerequisite(s): fourth-year standing in an Honours biology program and permission of the Department.
Workshops three hours per week.

BIOL 4907 [1.0 credit]
Honours Essay and Research Proposal
An independent critical review and research proposal, using library resources, under the direct supervision of a Faculty advisor. Evaluation is based on a written report and a poster presentation.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4905 and BIOL 4908.

Prerequisite(s): fourth-year standing in an Honours Biology program and permission of the Department.

BIOL 4908 [1.0 credit]
Honours Research Thesis
An independent research project undertaken in the field and/or the laboratory, under the direct supervision of a faculty adviser. Evaluation is based on a written thesis and a poster presentation.
Includes: Experiential Learning Activity
Precludes additional credit for BIOL 4905 and BIOL 4907.

Prerequisite(s): fourth-year standing in an Honours biology program with a minimum CGPA of 8.0 in the major or permission of the Department.