

# 20240320 - BIOLOGICAL SCIENCES - BACHELOR OF SCIENCE

## Overview

In the Biological Sciences major, students study living organisms with emphasis placed on experiential learning through laboratories, field work, and research. The major is comprised of the Molecular/Cellular and Ecology/Diversity streams. A diversity of courses are available spanning genetics, biochemistry, cell biology, zoology, botany and ecology. Students graduate with a broad foundation of knowledge and skills, and the ability to apply, evaluate and communicate their understanding of the life sciences as scientists, educators, leaders, and engaged citizens.

### Contact Information

Department of Biological Sciences  
Room 6-118, City Centre Campus  
10700 - 104 Avenue  
Edmonton, AB T5J 4S2  
T: 780-633-3399

Arts and Science Academic Advising  
Room 6-211, City Centre Campus  
T: 780-497-4505  
E: [artsandscience@macewan.ca](mailto:artsandscience@macewan.ca)

## Bachelor of Science

*Faculty of Arts and Science*

[MacEwan.ca/Science \(http://MacEwan.ca/Science/\)](http://MacEwan.ca/Science/)

The Bachelor of Science (BSc) is a foundational general degree that provides broad and widely applicable knowledge and abilities rather than a niche specialization. This broad base equips graduates with generalist knowledge and skills that give the flexibility and agility so highly valued in a dynamic world economy. It also offers students a solid foundation to specialize in future employment or further schooling.

The degree provides a breadth of study across various Arts and Science disciplines and sets the foundation for later years. The major and minor areas of study allow students to focus and gain in-depth expertise in complementary or entirely disparate disciplines; there is a wide array of possible combinations. Finally, options enable students to explore courses outside their disciplines or even within their program, enhancing their diversity of learning. The small classes, close interaction between instructors and students, opportunities for individual study, and faculty with a strong focus on teaching are signature strengths of this program.

### General Program Information

The BSc requires students to complete 120 credits of non-duplicative coursework. The BSc emphasizes breadth and depth and has been designed for exceptional flexibility and customization. Students can complete a major and a minor, a double major, or a major and two minors. Students can choose a secondary major in an Arts or Science discipline, but the primary major must be in a Science discipline.

All newly admitted students enter the BSc program as "Undeclared." Undeclared means a student has not yet chosen their major(s) and minor(s). Students may declare at any time after being accepted to the

BSc, and typically, they declare after completing a minimum of 45 credits. The Arts and Science Academic Advising Office will send information about majors and minors via email and newsletters; please contact the Advising Office if you require further assistance with this decision.

### Science Disciplines

Discipline	Major	Minor	Honours
Applied Statistics	●	-	●
Biological Sciences	●	●	●
Chemistry	●	●	-
Computer Science	●	●	-
Earth and Planetary Sciences	-	●	-
Environmental Sciences	-	●	-
Mathematics	●	●	●
Mathematical Sciences	●	-	-
Planetary Physics	-	●	-
Physical Sciences	●	-	-
Physics	-	●	-
Psychology	●	●	●
Statistics	-	●	-

### Arts Disciplines

Discipline	Major	Minor
Anthropology	●	●
Classics		●
Creative Writing		●
Economics	●	●
English	●	●
Film Minor for Arts and Science		●
French		●
Gender Studies		●
History	●	●
Philosophy	●	●
Political Science	●	●
Sociology	●	●
Spanish		●

### Out of Faculty Minors

Discipline	Minor
Accounting Minor for Arts and Science	●
Arts and Cultural Management	●
Business Law	●
Business Studies	●

Digital Experience Design	●
Finance Minor for Arts and Science	●
Human Resources Minor for Arts and Science	●
Marketing Minor for Arts and Science	●

## Laddering a Diploma into the Bachelor of Science

Students with an accredited diploma can ladder into the Bachelor of Science (BSc) and use some of their diploma coursework towards their degree requirements. If you have questions about the diploma laddering process, please visit [www.macewan.ca/bscstudent](http://www.macewan.ca/bscstudent) or contact [artsandscience@macewan.ca](mailto:artsandscience@macewan.ca).

## Preparing for Professional Studies

Students intending to enter professional programs at other universities can take their pre-professional programs in the Faculty of Arts and Science at MacEwan University. The university offers the first and second years of several pre-professional programs, including chiropractic medicine, dental hygiene, dentistry, medical laboratory science, medicine, optometry, pharmacy, and veterinary medicine. All courses in these pre-professional programs are credit courses, and, as such, they may apply to the degrees offered by MacEwan University.

Students are advised to consult the admissions requirements for the universities and programs of their choice and to select their MacEwan University courses accordingly. Completing pre-professional courses at MacEwan University does not guarantee admission to the subsequent professional program. Each professional program requires a separate application, and entry is competitive, not automatic.

## Degree Requirements

### Breadth Requirements

All Bachelor of Science degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for the major(s), minor(s), Honours, or options. BIOL, CHEM, EASC, or PHYS courses must include a laboratory component.

Breadth Element	Description	Credits
Biological or Earth and Planetary Sciences	BIOL or EASC (not including BIOL 101, BIOL 102, or BIOL 103)	6
Chemistry or Physics	CHEM or PHYS	6
English	ENGL 102 and 3 credits in university English (not including ENGL 111, ENGL 108, or ENGL 211)	6
Humanities	CLAS, COMP, HIST, HUMN, PHIL or a language other than English	6
Mathematical Sciences	One of MATH 114, MATH 120, or MATH 125, and 3 credits in MATH, STAT, or CMPT (not including MATH 160, MATH 170, or CMPT 104)	6
Social Sciences	ANTH, ECON, GEND, LING, POLS, PSYC, or SOCI	6

### Bachelor of Science Degree

Program Element	Description	Credits
Primary Major	The Science major will range from 42 to 60 credits with a minimum 36 credits taken at the senior-level. <sup>1</sup>	42-60
Secondary Major or Minor(s)	Students have the option of completing a second Science or Arts major, or one or two minors. Minor courses must be completed at the senior-level. <sup>1</sup>	18-60
Options	Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses	Up to 60
	<b>Total Degree Credits Including Breadth</b>	<b>120</b>

1

Multi-disciplinary majors consist of 60-72 junior- and senior-level credits. Students majoring in mathematical or physical sciences may pursue a minor but are not required to do so.

## Bachelor of Science Honours

Program Element	Description	Credits
Minimum Honours Requirements	Honours requirements are determined by each discipline.	63
Option Courses, Non-Compulsory Honours Courses, and/or a Minor	Students have the option of completing a minor from outside of the Honours discipline. Some disciplines may require a minor.	57
	Total Degree Credits Including Breadth	120

The minimum passing grade for a course at MacEwan University is a D unless otherwise noted next to the appropriate course in the program of study. In the Faculty of Arts and Science, students typically require a minimum grade of C- to use a course as a prerequisite. Please check course descriptions for more information.

## Cross-Faculty Course Recognitions

Cross-Faculty course recognition represents an agreement between programs within MacEwan University and consists of a number of approved courses that have the potential to be recognized within another degree. These courses are not considered transfers or equivalents as the original course will show within a student's transcript and their Academic Planning and Progress Report (APPR). How the courses listed below might be used within a student's degree are determined by the student's program of study. They are dependent on a number of factors including year of declaration, year of completion, and individual program requirements.

Out-of-Faculty Course	Course Recognition	Course Used For
ACUP 117	ARTOP 1XX	Options; fulfills Humanities Breadth
ACUP 209	SCIOP 2XX	Options
ACUP 220, ACUP 303, and ACUP 304 (must complete all three courses)	COSL 200 (6 credits)	Options
ACUP 320	SCIOP 3XX	Options
AGAD 300	COSL 300	Options
AGAD 435	WINL 300	Options
ARTE 104	ARTOP 1XX	Options; fulfills Humanities Breadth
ARTE 214	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 224	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 234	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 304	ARTOP 3XX	Options; fulfills Humanities Breadth
ARTE 314	ARTOP 3XX	Options; fulfills Humanities Breadth
ARTE 324	ARTOP 3XX	Options; fulfills Humanities Breadth

CORR 102	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 104	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 110	SOCI 225	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 120	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 202	ARTOP 2XX	Options
CORR 208	ARTOP 2XX	Options
CORR 214	COSL 200	Options
CORR 218	SOCI 321	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 224	COSL 200	Options
CYCW 100	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
CYCW 108 and CYCW 112	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 115	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 114	ARTOP 1XX	Options
CYCW 201	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
CYCW 204	COSL 200	Options
CYCW 205	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 206	ARTOP 2XX	Options
CYCW 208	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 211	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 302	ARTOP 3XX	Options; fulfills Social Science Breadth

CYCW 303	ARTOP 3XX	Options; fulfills Social Science Breadth	ECCS 425	SOCI 4XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 339	ARTOP 3XX	Options; fulfills Social Science Breadth	ECDV 160	ARTOP 1XX	Options
CYCW 340	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth	ECDV 220	COSL 200	Options
CYCW 350	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth	ECDV 255	ARTOP 2XX	Options
CYCW 360	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth	ECDV 260	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 361	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth	ECDV 270	COSL 270	Options
CYCW 466	ARTOP 4XX	Options	ECDV 280	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
DESN 270	ARTOP 2XX	Options; fulfills Humanities Breadth	FNCE 301	ECON 3XX	Options or Economics program requirements; fulfills Social Science Breadth
DESN 271	ARTOP 2XX	Options; fulfills Humanities Breadth	HAPR 101	SCIOP 1XX	Options
ECCS 110	PSYC 1XX	Options or Psychology program requirements; fulfills Social Science Breadth	HAPR 104	ARTOP 1XX	Options
ECCS 115	ARTOP 1XX	Options	HAPR 114	WINL 200	Options
ECCS 160	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth	HAPR 201	ARTOP 2XX	Options
ECCS 180	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science breadth	HAPR 212	WINL 200	Options
ECCS 220	COSL 200	Options	HEED 110	ARTOP 1XX	Options
ECCS 255	ARTOP 2XX	Options	HEED 120	SCIOP 1XX	Options
ECCS 260	SOCI 2XX	Options or Psychology program requirements; fulfills Social Science Breadth	HLSC 104	SCIOP 1XX	Options
ECCS 270	COSL 200	Options	HLSC 105	SCIOP 1XX	Options
ECCS 310	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth	HLSC 120	BIOL 1XX	Options or Biological Sciences program requirements
ECCS 355	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth	HLSC 124	BIOL 1XX	Options or Biological Sciences program requirements
ECCS 360	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth	HLSC 126	BIOL 1XX	Options or Biological Sciences program requirements
			HLSC 128	BIOL 2XX	Options or Biological Sciences program requirements
			HLST 150	SCIOP 1XX	Options
			HLST 210	ARTOP 2XX	Options
			HLST 290	SCIOP 1XX	Options
			INFM 101	ARTOP 1XX	Options
			INFM 202	ARTOP 2XX	Options
			INFM 208	ARTOP 2XX	Options
			INFM 209	ARTOP 2XX	Options
			INFM 210	ARTOP 2XX	Options
			INFM 260	COSL 200	Options
			INTA 210	ARTOP 2XX	Options; fulfills Humanities Breadth
			INTA 362	ARTOP 3XX	Options
			MTST 120	BIOL 1XX	Options or Biological Sciences program requirements

MTST 122	BIOL 1XX	Options or Biological Sciences program requirements
MTST 125	BIOL 1XX	Options or Biological Sciences program requirements
MTST 126	BIOL 1XX	Options or Biological Sciences program requirements
MTST 161, MTST 162, MTST 260, MTST 261, MTST 262	COSL 200	Options
MUSC 104	ARTOP 1XX	Options
MUSC 123	ARTOP 1XX	Options; fulfills Social Science Breadth
MUSC 124	ARTOP 1XX	Options; fulfills Social Science Breadth
PEDS 100	BIOL 1XX	Options or Biological Sciences program requirements
PEDS 101	BIOL 1XX	Options or Biological Sciences program requirements
PEDS 103	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 109	SCIOP 1XX	Options
PEDS 200	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 203	SCIOP 2XX	Options
PEDS 206	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 207	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 209	ARTOP 2XX	Options
PEDS 240	SCIOP 1XX	Options
PERL 104	ARTOP 1XX	Options
PERL 204	ARTOP 2XX	Options
PERL 207	ARTOP 2XX	Options
PSSC 102	ARTOP 1XX	Options
PSSC 112	ARTOP 1XX	Options
PSSC 121	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
PSSC 203	ARTOP 2XX	Options
PSSC 204	ARTOP 2XX	Options
PSSC 212	ARTOP 2XX	Options
PSSC 252	ARTOP 2XX	Options
PSSC 253	ARTOP 2XX	Options
PSSC 272	COSL 200	Options
PSSC 273	COSL 200	Options

SOWK 101	ARTOP 1XX	Options; fulfills Humanities Breadth
SOWK 111	ARTOP 1XX	Options
SOWK 112	ARTOP 1XX	Options
SOWK 203	ARTOP 2XX	Options
SOWK 204	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
TAST 101	ARTOP 1XX	Options
TAST 129 and TAST 130	COSL 200	Options
THAR 240	ARTOP 2XX	Options
THAS 101	ARTOP 1XX	Options
THAS 102	SCIOP 1XX	Options
THAS 115	ARTOP 1XX	Options
THAS 203	COSL 200	Options
THAS 210	COSL 200	Options
THAS 211	COSL 200	Options
THAS 214	COSL 200	Options
THAS 222	ARTOP 2XX	Options
THPR 205	ARTOP 2XX	Options; fulfills Humanities Breadth
THPR 206	ARTOP 2XX	Options; fulfills Humanities Breadth
THPR 214	COSL 200	Options
THPR 224	COSL 200	Options

## Biological Sciences Requirements

### Biological Sciences Major

### Biological Sciences Honours

### Biological Sciences Minor

### Biological Sciences Major

The Bachelor of Science (BSc) in Biological Sciences program requires students to complete 120 credits of non-duplicative coursework. In addition to the Biological Sciences Major, students will complete one of the following:

- one minor,
- two minors, or
- a secondary Science major

Students are required to complete option courses as well as the major(s) and minor(s). All BSc degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for the major(s), minor(s), or options.

The Biological Sciences major is 42 to 60 credits with a minimum of 36 senior-level credits. Students must complete a minimum of 18 biological sciences credits at the 300- or 400-level with a minimum of six credits at the 400-level.

Students major in Biological Sciences have the option of completing the General Biological Sciences Major, the Molecular/Cellular Stream, or the Ecology and Diversity Stream.

The Biology major is a competitive major. Students must complete BIOL 107 and BIOL 108 with no grade lower than C-. Students must also have completed a minimum of one of BIOL 207 or BIOL 208 with no grade lower than C-, and be registered in the remaining course during the winter term when declarations close. A number of seats may be available to students who complete one of BIOL 207 or BIOL 208 and another 200-level biological science (BIOL, BICM, BOTN, or ZOOL) with minimum grades of C-. Students will submit their declaration by January 15. Students who apply will be ranked by their admissions GPA, which is calculated using their most recent 24 credits of university-level coursework, without breaking up a term. Applicants with the highest GPA will be admitted to the program first until no seats remain. Students will be notified of the success or denial of their application to the Biological Sciences major no later than February 1.

**Note:** Students majoring in Biological Sciences are required to complete CHEM 101, CHEM 102, and STAT 151. These courses can be used to fulfill the Breadth Requirements.

### Bachelor of Science - Biological Sciences Major

Code	Title	Credits
<b>Specific Major Requirements</b>		
BIOL 107	Introduction to Cell Biology	3
BIOL 108	Introduction to Evolution	3
BIOL 207	Principles of Genetics	3
BIOL 208	Principles of Ecology	3
<b>General Biological Sciences Major Requirements</b>		
Choose 30 to 48 credits from junior- or senior-level biological sciences - BICM, BIOL, BOTN, GENE, or ZOOL. Students can also use SCIE 201 to fulfill the general major requirements.		30-48
<b>Secondary Major or Minor(s)</b>		
Students have the option of completing a second Science major, or 18-60 one or two minors. Minor courses must be completed at the senior-level.		
<b>Options</b>		
Students can complete up to 18 credits in out-of-faculty options, with 8-60 no more than 3 credits in physical activity (PACT) courses.		
<b>Total Credits</b>		<b>120</b>

### Bachelor of Science - Biological Sciences Major, Molecular and Cellular Stream

Code	Title	Credits
<b>Specific Major Requirements</b>		
BIOL 107	Introduction to Cell Biology	3
BIOL 108	Introduction to Evolution	3
BIOL 207	Principles of Genetics	3
BIOL 208	Principles of Ecology	3
<b>Molecular and Cellular Stream Requirements <sup>1</sup></b>		
Choose 30 credits from the following:		30
BICM 200	Introductory Biochemistry	
BICM 310	Intermediary Metabolism	
BICM 340	Structure and Function of Biological Molecules	
BICM 450	Biochemistry of Viruses	
BIOL 201	Eukaryotic Cellular Biology I	
BIOL 205	Principles of Molecular Biology	
BIOL 211	Introduction to Microbiology	
BIOL 300	Eukaryotic Cellular Biology II	

BIOL 313	Animal Developmental Biology
BIOL 315	History of Biology
BIOL 317	Biotechnology and Society
BIOL 321	Mechanisms of Evolution
BIOL 323	Introduction to Population Genetics
BIOL 337	Biostatistics and Research Design
BIOL 413	Current Topics in Animal Developmental Biology
BIOL 421	Techniques in Molecular and Cellular Biology
BIOL 430	Pathobiology: The Cellular Basis of Disease
BIOL 492	Field Placement
BIOL 495	Special Topics
BIOL 498	Advanced Independent Study
GENE 369	Genetic Analysis of Bacteria
GENE 370	Genetic Analysis of Eukaryotes
GENE 400	Genome Organization
GENE 404	Investigations into Gene Regulation
GENE 418	Human Genetics
ZOOL 241	Animal Physiology I: Homeostasis
ZOOL 242	Animal Physiology II: Intercellular Communication

Choose up to 18 credits from junior- or senior-level biological sciences - BICM, BIOL, BOTN, GENE, or ZOOL. Students can also use SCIE 201 to fulfill the general major requirements.

### Secondary Major or Minor(s)

Students have the option of completing a second Science major, or 18-60 one or two minors. Minor courses must be completed at the senior-level.

### Options

Students can complete up to 18 credits in out-of-faculty options, with 0-60 no more than 3 credits in physical activity (PACT) courses.

**Total Credits** **120**

1

Students can use BICM 320 and/or BICM 330 to fulfill the Molecular/Cellular Stream Requirements.

### Bachelor of Science - Biological Sciences Major, Ecology and Diversity Stream

Code	Title	Credits
<b>Specific Major Requirements</b>		
BIOL 107	Introduction to Cell Biology	3
BIOL 108	Introduction to Evolution	3
BIOL 207	Principles of Genetics	3
BIOL 208	Principles of Ecology	3
<b>Ecology and Diversity Requirements</b>		
Choose 30 credits from the following:		30
BIOL 310	Freshwater Ecology	
BIOL 312	Terrestrial Ecology	
BIOL 314	Population Ecology	
BIOL 315	History of Biology	
BIOL 316	Community Ecology	
BIOL 321	Mechanisms of Evolution	
BIOL 323	Introduction to Population Genetics	
BIOL 337	Biostatistics and Research Design	
BIOL 361	Marine Biology	
BIOL 365	Tropical Rainforest Ecology	

BIOL 367	Conservation Biology
BIOL 371	Animal Behaviour
BIOL 410	Techniques in Field Ecology
BIOL 414	Invasion Ecology and Management
BIOL 422	Methods in Experimental Ecology
BIOL 467	Advanced Conservation Biology
BIOL 477	Contemporary Issues in Freshwater Ecology
BIOL 492	Field Placement
BIOL 495	Special Topics
BIOL 498	Advanced Independent Study
BOTN 205	Fundamentals of Plant Biology
BOTN 405	Plant Behaviour and its Applications
ZOOL 224	Vertebrate Adaptations and Evolution
ZOOL 241	Animal Physiology I: Homeostasis
ZOOL 242	Animal Physiology II: Intercellular Communication
ZOOL 250	Invertebrate Zoology
ZOOL 324	Comparative Anatomy of the Vertebrates
ZOOL 400	Aquatic Vertebrates
ZOOL 401	Terrestrial Vertebrates
ZOOL 325	Entomology
ZOOL 452	Principles of Parasitism

Choose up to 18 credits from junior- or senior-level biological sciences - BICM, BIOL, BOTN, GENE, or ZOOL. Students can also use SCIE 201 to fulfill the general major requirements.

#### Secondary Major or Minor(s)

Students have the option of completing a second Science major, or 18-60 one or two minors. Minor courses must be completed at the senior-level.

#### Options

Students can complete up to 18 credits in out-of-faculty options, with 0-60 no more than 3 credits in physical activity (PACT) courses.

**Total Credits** **120**

## Biological Sciences Honours

The Bachelor of Science (BSc) Biological Sciences Honours degree program requires students to complete 120 credits of non-duplicative coursework. The Biological Sciences Honours program is comprised of 63 to 84 credits. Students choose the Molecular Cellular Honours Stream or the Ecology and Diversity Honours Stream.

Students have the option of completing a minor within the requirements of the Biological Sciences Honours program. Minors are comprised of 18 senior-level credits.

For admittance/acceptance into Biological Sciences Honours, students must present the following:

1. Completion of a minimum of 45 university-level credits applicable to the program of study, with a GPA of 3.0 or higher
2. 24 of the 45 credits must have been completed in the last 12 months
3. A minimum of six biological sciences credits completed at the senior-level
4. A minimum GPA of 3.3 across all junior- and senior-level biological sciences courses (BICM, BIOL, BOTN, GENE, or ZOOL)

Students accepted and enrolled in the Biological Sciences Honours program must maintain a minimum overall GPA of 3.0. As well, students

must maintain a minimum GPA of 3.3 across all junior- and senior-level biological sciences courses for each 12 consecutive months following acceptance into the Honours program. Failure to maintain a 3.3 Honours GPA will result in the student's program status reverting to a BSc Biological Sciences Major.

All BSc degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for Honours, minor(s), or options.

**Note:** Biological Sciences Honours are required to complete BIOL 207, BIOL 208, CHEM 101, CHEM 102, and STAT 151 prior to applying for the Honours program. A minimum grade of B- in BIOL 399 is required to progress in the Honours program.

### Bachelor of Science - Biological Sciences, Molecular and Cellular Honours Stream

Code	Title	Credits
<b>Specific Honours Requirements</b>		
BIOL 107	Introduction to Cell Biology	3
BIOL 108	Introduction to Evolution	3
BIOL 207	Principles of Genetics	3
BIOL 208	Principles of Ecology	3
CHEM 261	Organic Chemistry I	3
BICM 200	Introductory Biochemistry	3
BIOL 321	Mechanisms of Evolution	3
BIOL 337	Biostatistics and Research Design	3
BIOL 399	Honours Proposal	3
BIOL 499A	Honours Thesis I	3
BIOL 499B	Honours Thesis II	3

### Molecular and Cellular Honours Stream Requirements <sup>1</sup>

Choose 30 credits from the following with a minimum of 6 credits at the 400-level: 30

BICM 310	Intermediary Metabolism
BICM 340	Structure and Function of Biological Molecules
BICM 450	Biochemistry of Viruses
BIOL 201	Eukaryotic Cellular Biology I
BIOL 205	Principles of Molecular Biology
BIOL 211	Introduction to Microbiology
BIOL 300	Eukaryotic Cellular Biology II
BIOL 313	Animal Developmental Biology
BIOL 315	History of Biology
BIOL 317	Biotechnology and Society
BIOL 323	Introduction to Population Genetics
BIOL 413	Current Topics in Animal Developmental Biology
BIOL 421	Techniques in Molecular and Cellular Biology
BIOL 430	Pathobiology: The Cellular Basis of Disease
BIOL 492	Field Placement
BIOL 495	Special Topics
GENE 369	Genetic Analysis of Bacteria
GENE 370	Genetic Analysis of Eukaryotes
GENE 400	Genome Organization
GENE 404	Investigations into Gene Regulation
GENE 418	Human Genetics
ZOOL 241	Animal Physiology I: Homeostasis
ZOOL 242	Animal Physiology II: Intercellular Communication

Choose up to 21 credits from junior- or senior-level biological sciences - BICM, BIOL, BOTN, GENE, or ZOOL. Students can also use SCIE 201 to fulfill the general Honours requirements.

#### Option Courses and/or Minor

Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses.

**Total Credits** 120

1

Students can use BICM 320 and/or BICM 330 to fulfill the Molecular/Cellular Stream Requirements.

### Bachelor of Science - Biological Sciences, Ecology and Diversity Honours Stream

Code	Title	Credits
<b>Specific Honours Requirements</b>		
BIOL 107	Introduction to Cell Biology	3
BIOL 108	Introduction to Evolution	3
BIOL 207	Principles of Genetics	3
BIOL 208	Principles of Ecology	3
CHEM 261	Organic Chemistry I	3
BICM 200	Introductory Biochemistry	3
BIOL 321	Mechanisms of Evolution	3
BIOL 337	Biostatistics and Research Design	3
BIOL 399	Honours Proposal	3
BIOL 499A	Honours Thesis I	3
BIOL 499B	Honours Thesis II	3

#### Ecology and Diversity Honours Stream Requirements

Choose 30 credits from the following with a minimum of 6 credits at the 400-level: 30

BIOL 310	Freshwater Ecology	
BIOL 312	Terrestrial Ecology	
BIOL 314	Population Ecology	
BIOL 315	History of Biology	
BIOL 316	Community Ecology	
BIOL 323	Introduction to Population Genetics	
BIOL 361	Marine Biology	
BIOL 365	Tropical Rainforest Ecology	
BIOL 367	Conservation Biology	
BIOL 371	Animal Behaviour	
BIOL 410	Techniques in Field Ecology	
BIOL 414	Invasion Ecology and Management	
BIOL 422	Methods in Experimental Ecology	
BIOL 467	Advanced Conservation Biology	
BIOL 477	Contemporary Issues in Freshwater Ecology	
BIOL 492	Field Placement	
BIOL 495	Special Topics	
BOTN 205	Fundamentals of Plant Biology	
BOTN 405	Plant Behaviour and its Applications	
ZOOL 224	Vertebrate Adaptations and Evolution	
ZOOL 241	Animal Physiology I: Homeostasis	
ZOOL 242	Animal Physiology II: Intercellular Communication	
ZOOL 250	Invertebrate Zoology	
ZOOL 324	Comparative Anatomy of the Vertebrates	

ZOOL 325	Entomology	
ZOOL 400	Aquatic Vertebrates	
ZOOL 401	Terrestrial Vertebrates	
ZOOL 452	Principles of Parasitism	

Choose up to 21 credits from junior- or senior-level biological sciences - BICM, BIOL, BOTN, GENE, or ZOOL. Students can also use SCIE 201 to fulfill the general Honours requirements.

#### Option Courses and/or a Minor

Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses.

**Total Credits** 120

### Biological Sciences Minor

The Biological Sciences Minor requires 18 senior-level biological sciences credits (BICM, BIOL, BOTN, GENE, or ZOOL) with a minimum of six credits at the 300- or 400-level.

**Note:** Junior-level BIOL 107 and BIOL 108 are required. Both BIOL 207 and BIOL 208 may be taken for credit.

Code	Title	Credits
<b>Specific Minor Requirements</b>		
BIOL 207	Principles of Genetics	3
or BIOL 208	Principles of Ecology	

#### General Minor Requirements

Choose 15 credits from senior-level biological sciences - BICM, BIOL, BOTN, GENE, and ZOOL 15

**Total Credits** 18

### Degree Regulations

Students are strongly encouraged to seek advice from the faculty advisors about program planning.

#### Academic Residency - Credit Requirements

In addition to the academic residency requirements of the University, upon admission to the Bachelor of Science (BSc), students must complete at MacEwan University:

- A minimum of 24 credits at the senior-level in the major discipline, with 12 of those senior credits completed at the 300- or 400-level. All 400-level requirements are to be completed at MacEwan University.
- If applicable, a minimum of nine credits in a minor at the senior-level, with at least three of those credits completed at the 300- or 400-level.

Students with a previous MacEwan University credential are required to complete a minimum of 45 credits upon admission to the BSc.

Students who hold a baccalaureate degree from another post-secondary institution must complete a minimum of 60 additional MacEwan University credits applicable to the BSc. Forty-five of these credits must be completed while the students is enrolled in the BSc. This credit requirement applies to students who began their studies at MacEwan University and completed a credential at another institution.

Students who interrupt their program and who must apply for readmission to the program will be required to comply with any new regulations upon resumption of their studies.



## Breadth Requirements

Courses taken to fulfil the major, minor, or option requirements can also be used to satisfy breadth requirements.

## Declaration of a Major and Minor

Students are advised to declare a primary major and minor, or primary major and a secondary major, or a major and two minors by the time they have completed 45 credits. Primary majors are selected from Science disciplines and consist of 42 to 60 junior- and senior-level credits; secondary majors can be from an Science or Arts discipline. Multi-disciplinary majors consist of 60-72 junior- and senior-level credits. Except for students in an Honours program, a maximum of 60 credits may be completed from any one discipline for credit towards the degree. A major and minor cannot be in the same discipline and students may not declare more than one out-of-faculty minor. Students can re-declare their major(s) and/or minor(s) if required.

For students completing multiple majors or minors, the Faculty cannot guarantee a schedule of classes that will permit students to complete their degree in eight consecutive fall and winter semesters. Furthermore, depending on the configuration of the student's degree, meeting the requirements for the degree may require the completion of more than 120 credits for graduation. Students are strongly encouraged to consult with an academic advisor in the Faculty of Arts and Science Advising Office and a discipline advisor in their major and minor prior to this declaration. Students majoring in mathematical or physical sciences may pursue a minor but are not required to do so.

## Restricted Enrolment Courses

The Faculty of Arts and Science strives to accommodate all students wishing to enrol in a given course when it is appropriate to their program: however, classes in some courses must, for academic reasons, be restricted in size. If such a course is found to be oversubscribed, priority in registration will be given to those students whose programs may require it (e.g., majors, Honours, and/or minors) and then to other students as space permits.

## Graduation Grade Point Average

As part of the Graduation Grade Point Average regulation above, Bachelor of Science students must obtain an overall GGPA of 2.0 or higher, with a minimum GPA of 2.0 on all courses credited toward the major(s) and a minimum GPA of 2.0 on all courses credited toward the minor(s).

## Graduation Requirements

Graduation requirements are governed by the date on which a student declares their major(s) and minor(s). Students who declare their major(s) and minor(s) on or before the published deadline are bound by the requirements of the current academic year. Those students who declare after this date are bound by the programs of study and degree requirements of the upcoming academic year as published in the MacEwan Academic Calendar.

## Junior - and Senior-Level Courses

Courses numbered from 100 to 199 are considered junior-level and courses numbered from 200 to 499 are considered senior-level.

## Major or Minor 300- and 400- Level Requirements

The 300- and 400-level requirements in the major or minor cannot consist solely of project, field placement, and/or individual study courses.

## Maximum Independent Courses

The maximum number of credits for independent work (project, field placement, and/or individual study courses) excluding the Honours Thesis, is 15 credits. Specific disciplines may have further restrictions.

## Maximum Junior-Level Courses

A maximum of 48 credits at the 100-level are permitted in completion of the B.Sc. degree. Additional courses at the 100-level are extra to the 120 credits required to complete the B.Sc. degree and will not be counted toward fulfilment of graduation requirements.

## Minimum Science Courses

Students are required to complete successfully a minimum of 72 total credits from Science courses.

## Minimum Passing Grade

A minimum grade of D or credit CR is required for all Science degree courses unless otherwise noted next to the appropriate course in the program of study.

## Minimum Transfer Grade for Credit

A minimum grade of D is required on any transfer credit granted for the program. Unless otherwise stated, Arts and Science courses require a minimum grade of C- when the course is used as a prerequisite. Transfer credit decisions made by the university are final and cannot be appealed.

## Out-of-Faculty Options Requirements

Students may take a maximum of 18 credits from courses offered by a MacEwan University Faculty or School other than Arts and Science. Students completing an out-of-faculty minor or laddering students who have met the minor requirements with a MacEwan University diploma must complete their degree requirements from courses offered within the Faculty of Arts and Science or from the list of *Cross-Faculty Course Recognitions* in the Academic Calendar. Courses deemed as *Cross-Faculty Course Recognitions* are used to fulfill in-Faculty courses within the BSc and do not count as out-of-Faculty options.

## Progression of Studies

Students are responsible for ensuring they meet the prerequisite and/or co-requisite requirements as noted on all courses that may fulfill Bachelor of Science program requirements.

## Honours Regulations

### Overall Requirements

The Honours program of study consists of 63 to 84 credits as determined by the discipline. Students in the Honours program may choose to complete a minor outside of the Honours discipline. Some disciplines may require a minor.

### Acceptance to Honours

For consideration of admittance/acceptance into Honours, students must present a minimum of 45 university-level credits applicable to the program of study, with a GPA of 3.0 or higher. They must complete 24 of the 45 credits in the last 12 months; however, exceptions to this rule may occur with the approval of the Honours discipline advisor. Individual departments may have additional requirements noted in their program of study.

## Course Load

Students accepted into an Honours program must complete 24-credits in each twelve consecutive months they are in the program. Exceptions to this rule may occur with the approval of the Honours discipline advisor.

## Grade Point Average

Students accepted and enrolled in the Science Honours program must maintain a minimum overall GPA of 3.0 across all courses in the degree. As well, students must maintain a minimum GPA of 3.3 across a set of courses designated by each discipline for each twelve consecutive months following acceptance into the Honours program. Failure to do so will result in the student's program status reverting to BSc with a major in the previous Honours discipline.

## Graduation Grade Point Average

In order to graduate, students must obtain an overall GGPA of 3.0 or higher, with a minimum GPA of 3.3 on all courses credited toward the Honours program of study.

## Program Learning Outcomes

### Faculty of Arts and Science Degree-Level Learning Outcomes

*Thinking about knowledge is at the core of University education and learning within the Faculty of Arts and Science. Students develop capacities to "think-through" - to practice wonder, reflection, and engage in thoughtful inquiry and dialogue. Thinking-through involves questioning beyond the confines of one's immediate personal, social, and disciplinary surroundings. First, knowledge is acquired and understood. Learning moves beyond acquiring information and data to a formally disciplined manner of thinking about knowledge. Next, knowledge is interrogated by asking and answering questions, distinguishing between opinion and knowledge, and developing tools to assess reasons and evidence. Finally, knowledge is synthesized as students develop coherent arguments, and link ideas together beyond what is immediately apparent. Learning is a lifelong creative process of discovery and action that happens beyond the classroom and the degree. Our graduates interact with and contribute to their community by integrating and applying the research and communication skills and ways of knowing developed through their education. Learning outcomes capture the observable knowledge, skills, and abilities graduates acquire that are the foundation of learning.*

Graduates will demonstrate their ability to "think-through" by:

- i. Analysing puzzles, problems, concepts, and theories.
- ii. Conceptualizing questions based on disciplinary knowledge.
- iii. Evaluating knowledge within and across disciplines in ways that acknowledge historical, cultural, and social contexts.

Graduates will demonstrate research and scholarship skills by:

- iv. Applying appropriate research skills and ethical principles.
- v. Interpreting results appreciating the value and limits of conclusions.
- vi. Recognizing how research involves an ongoing process of reflection, dialogue, and reassessment.

Graduates will demonstrate diverse skills for communication by:

- vii. Conveying complex ideas coherently in a variety of formats.
- viii. Appraising information in ways that consider context and audience.

- ix. Interpreting the ideas and arguments of others in ways that reflect their knowledge, judgement, and comprehension.

Graduates will demonstrate durable skills necessary for learning beyond their degree by:

- x. Collaborating with diverse groups.
- xi. Examining different perspectives and challenging biases and preconceptions.
- xii. Exploring the continuous impact and limitations of disciplinary knowledge and expertise.

## Biological Sciences Major Learning Outcomes

1. Independently acquire and integrate biological knowledge
  - Master an understanding of biological systems in terms of:
    - evolutionary processes and outcomes;
    - the transmission, exchange, and expression of information;
    - connections between structure and function;
    - transformation and manipulation of energy and matter;
    - diversity;
    - relationships between biotic and abiotic elements at a micro and macro level.
  - Incorporate new information into an existing biological knowledge framework.
  - Locate and critically evaluate information, literature, and data.
2. Evaluate biological research
  - Assess the scientific method and its limitations.
  - Distinguish between elements of experimental design including research questions/objectives, hypotheses, methodology, data and results, and conclusions.
  - Appraise the limits of data and results in explaining biological phenomena and how to communicate these limits when formulating conclusions.
  - Describe the peer review process for academic publication.
3. Demonstrate competency in standard lab and/or field techniques
  - Perform basic lab/field skills from both streams and deploy a breadth of skills in their stream of focus.
  - Utilize data management techniques and technological tools.
4. Apply biological knowledge
  - Evaluate knowledge gaps and their relationship to biological problems.
  - Propose and apply methodology to test hypotheses, collect, analyse, and interpret data.
  - Employ disciplinary principles to develop solutions to biological problems.
5. Effectively communicate biological concepts using a variety of media
  - Produce effective written and oral communication employing a scientific vocabulary.
  - Correctly cite and reference sources.
  - Differentiate between the formats in which scientists disseminate knowledge.
  - Appraise audiences and tailor communication accordingly.
6. Engage in professional conduct
  - Work collaboratively and engage in peer review.
  - Recognize ethical challenges and the importance of scientific integrity.

- Describe the role of biologists in society and reflect on their responsibilities and limitations as experts.

## Student Plan

- The student plan provides a suggested course sequence with the minimum number of credits required for the major
- The suggested course sequence depends on course availability, the student's schedule, and the student's choice of minor(s) or secondary major
- It is highly recommended that students complete their Breadth Requirements by the end of year 2

### General Biological Sciences Major

Year 1	Credits
BIOL 107	3
BIOL 108	3
CHEM 101	3
CHEM 102	3
STAT 151	3
ENGL 102	3
Breadth Requirements	12
	<b>30</b>

Year 2	Credits
BIOL 205 <sup>1</sup>	3
BIOL 207	3
BIOL 208	3
Choose 3 credits (1 course) from senior-level BICM, BIOL, BOTN, GENE, or ZOO, or SCIE 201	3
Breadth, Option, Minor(s), or Primary or Secondary Major Requirements	18
	<b>30</b>

Year 3	Credits
Choose 6 credits (2 courses) from senior-level BICM, BIOL, BOTN, GENE, or ZOO, or SCIE 201	6
Choose 6 credits (2 courses) from senior-level BICM, BIOL, BOTN, GENE, or ZOO at the 300- or 400-level	6
Options, Minor(s), or Primary or Secondary Major Requirements	18
	<b>30</b>

Year 4	Credits
Choose 6 credits (2 courses) from senior-level BICM, BIOL, BOTN, GENE, or ZOO, or SCIE 201	6
Choose 6 credits (2 courses) from senior-level BICM, BIOL, BOTN, GENE, or ZOO at the 400-level	6
Options, Minor(s), or Primary or Secondary Major Requirements	18
	<b>30</b>

**Total Credits 120**

1

BIOL 205 is not a required course but is a prerequisite for many 300- and 400-level Biological Science courses (BIOL 300, BIOL 313, BIOL 421, GENE 369, and GENE 370), and students are encouraged to take it early in their program.

### Biological Sciences Major, Molecular Cellular Stream

Year 1	Credits
BIOL 107	3
BIOL 108	3
CHEM 101	3
CHEM 102	3
STAT 151	3
ENGL 102	3
Breadth Requirements	12
	<b>30</b>

Year 2	Credits
BIOL 205 <sup>1</sup>	3
BIOL 207	3
BIOL 208	3
Choose 3 credits (1 course) from the following:	3
BICM 200 <sup>2</sup>	
BIOL 201	
BIOL 211	
ZOO 241	
ZOO 242	
Breadth, Option, Minor(s), or Primary or Secondary Major Requirements	18
	<b>30</b>

Year 3	Credits
Choose 18 credits (6 courses) from the following:	18
BICM 310	
BICM 340	
BIOL 300	
BIOL 313	
BIOL 315	
BIOL 317	
BIOL 321	
BIOL 323	
BIOL 337	
GENE 369	
GENE 370	
Options, Minor(s), or Primary or Secondary Major Requirements	12
	<b>30</b>

Year 4	Credits
Choose 6 credits (2 courses) from the following:	6
BICM 450	
BIOL 413	

BIOL 421	
BIOL 430	
BIOL 492	
BIOL 495	
BIOL 498	
GENE 400	
GENE 404	
GENE 418	
Options, Minor(s), or Primary or Secondary Major Requirements	24
	<b>30</b>

**Total Credits 120**

1

BIOL 205 is not a required course but is a prerequisite for many 300- and 400-level Biological Science courses (BIOL 300, BIOL 313, BIOL 421, GENE 369, and GENE 370), and students are encouraged to take it early in their program.

2

CHEM 261 is a prerequisite for BICM 200.

**Biological Sciences Major, Ecology and Diversity Stream**

Year 1	Credits
BIOL 107	3
BIOL 108	3
CHEM 101	3
CHEM 102	3
STAT 151	3
ENGL 102	3
Breadth Requirements	12
	<b>30</b>

**Year 2 Credits**

BIOL 207	3
BIOL 208	3
Choose 6 credits (2 courses) from the following:	6
BOTN 205	
ZOO 224	
ZOO 241	
ZOO 242	
ZOO 250	
Breadth, Option, Minor(s), or Primary or Secondary Major Requirements	18
	<b>30</b>

**Year 3 Credits**

Choose 18 credits (6 courses) from the following:	18
BIOL 310	
BIOL 312	
BIOL 314	
BIOL 315	
BIOL 316	
BIOL 321	

BIOL 323	
BIOL 337	
BIOL 361	
BIOL 365	
BIOL 367	
BIOL 371	
ZOO 324	
ZOO 325	
Options, Minor(s), or Primary or Secondary Major Requirements	12
	<b>30</b>

**Year 4 Credits**

Choose 6 credits (2 courses) from  
the following: 6

BIOL 410	
BIOL 414	
BIOL 422	
BIOL 467	
BIOL 477	
BIOL 492	
BIOL 495	
BIOL 498	
BOTN 405	
ZOO 400	
ZOO 401	
ZOO 452	
Options, Minor(s), or Primary or Secondary Major Requirements	24
	<b>30</b>

**Total Credits 120****Expected Course Offerings**

Following is a list of expected course offerings for fall 2024 and winter 2025. We will update the list with expected courses scheduled for fall 2025 and winter 2026 in February 2024. While some might change, students can be assured that required courses will be available.

**Fall 2024**

BICM 200	Introductory Biochemistry
BICM 340	Structure and Function of Biological Molecules
BIOL 101	Current Issues in Human Biology
BIOL 102	Nutrition and the Body
BIOL 103	Humans and Their Environment
BIOL 107	Introduction to Cell Biology
BIOL 108	Introduction to Evolution
BIOL 201	Eukaryotic Cellular Biology I
BIOL 205	Principles of Molecular Biology
BIOL 207	Principles of Genetics
BIOL 208	Principles of Ecology
BIOL 211	Introduction to Microbiology
BIOL 312	Terrestrial Ecology
BIOL 313	Animal Developmental Biology
BIOL 315	History of Biology

BIOL 321	Mechanisms of Evolution
BIOL 323	Introduction to Population Genetics
BIOL 337	Biostatistics and Research Design
BIOL 367	Conservation Biology
BIOL 371	Animal Behaviour
BIOL 421	Techniques in Molecular and Cellular Biology
BIOL 422	Methods in Experimental Ecology
BIOL 430	Pathobiology: The Cellular Basis of Disease
BIOL 495	Special Topics
BOTN 205	Fundamentals of Plant Biology
GENE 369	Genetic Analysis of Bacteria
GENE 370	Genetic Analysis of Eukaryotes
GENE 404	Investigations into Gene Regulation
ZOOL 224	Vertebrate Adaptations and Evolution
ZOOL 241	Animal Physiology I: Homeostasis
ZOOL 325	Entomology
ZOOL 400	Aquatic Vertebrates

**Winter 2025**

BICM 200	Introductory Biochemistry
BICM 310	Intermediary Metabolism
BIOL 101	Current Issues in Human Biology
BIOL 102	Nutrition and the Body
BIOL 103	Humans and Their Environment
BIOL 107	Introduction to Cell Biology
BIOL 108	Introduction to Evolution
BIOL 201	Eukaryotic Cellular Biology I
BIOL 205	Principles of Molecular Biology
BIOL 207	Principles of Genetics
BIOL 208	Principles of Ecology
BIOL 211	Introduction to Microbiology
BIOL 300	Eukaryotic Cellular Biology II
BIOL 315	History of Biology
BIOL 316	Community Ecology
BIOL 317	Biotechnology and Society
BIOL 321	Mechanisms of Evolution
BIOL 323	Introduction to Population Genetics
BIOL 337	Biostatistics and Research Design
BIOL 361	Marine Biology
BIOL 399	Honours Proposal
BIOL 413	Current Topics in Animal Developmental Biology
BIOL 467	Advanced Conservation Biology
BIOL 477	Contemporary Issues in Freshwater Ecology
BOTN 405	Plant Behaviour and its Applications
GENE 369	Genetic Analysis of Bacteria
GENE 370	Genetic Analysis of Eukaryotes
GENE 400	Genome Organization
GENE 418	Human Genetics
ZOOL 242	Animal Physiology II: Intercellular Communication
ZOOL 250	Invertebrate Zoology
ZOOL 324	Comparative Anatomy of the Vertebrates
ZOOL 401	Terrestrial Vertebrates

## Admission Requirements

Applicants may be admitted to one of the following:

### Regular Admission

*To be evaluated through the Office of the University Registrar*

Applicants must have a minimum overall average of 65 percent, with no course grade lower than 50 percent, in the following high school courses:

1. ELA 30-1
2. Mathematics 30-1
3. Two of Biology 30, Chemistry 30, Mathematics 31, Physics 30, or Computing Science-Advanced Career and Technology Studies (5 credits)
4. One subject from Group A, B, C or D

#### Notes:

- A maximum of one Group D subject may be presented. Group D subjects used for admission must be 5-credit or any credit combination of at least 5 credits (e.g., two 3-credit subjects).

Applicants with nine to 23 university-level credits must also present a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale. Applicants with 24 or more university-level credits will be considered under Previous Post-Secondary Work.

### Mature Admission

*To be evaluated through the Office of the University Registrar*

Applicants must be Canadian Applicants, 20 years of age or older, and have been out of full-time high school at least one year by the beginning of the intake term. Applicants must have a minimum overall average of 60 percent, with no course grade lower than 50 percent, in the following high school courses:

1. ELA 30-1
2. Mathematics 30-1
3. Two of Biology 30, Chemistry 30, Mathematics 31, Physics 30, or Computing Science-Advanced Level Career and Technology Studies (5 credits)

Applicants with nine to 23 university-level credits must also present a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale. Applicants with 24 or more university-level credits will be considered under Previous Post-Secondary Work.

### Previous Post-Secondary Work

*To be evaluated through the Office of the University Registrar*

Admission in this category does not imply or guarantee the transfer of any coursework and/or credential unless a block transfer agreement (internal or external) is in effect and published in the calendar by the Office of the University Registrar. In addition, transfer of coursework does not imply or guarantee that an applicant will be admitted.

Applicants must have successfully completed the following:

- A minimum of 24 university-level credits, from a recognized institution, with a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale.

- The required mathematics and science courses listed under the Regular or Mature Admission category.

## Additional Admission Criteria

All applicants must meet the following:

### 1. English Language Proficiency

*To be evaluated through the Office of the University Registrar*

#### Applicable to All Admission Categories

All applicants must meet an acceptable level of English language proficiency. We will require official documents such as high school or post-secondary transcripts or proof of successful completion of standardized language evaluation. Full details are available in MacEwan University's academic calendar or online at [MacEwan.ca/ELP/](http://MacEwan.ca/ELP/) (<http://MacEwan.ca/ELP/>).

### 2. Other Admission Criteria

*To be evaluated through the Office of the University Registrar*

#### Applicable to All Admission Categories

Applicants who have been assigned two unsatisfactory academic records within the past five years will not be considered for admission or re-admission to the program until a minimum three years from the date of the assignment of the last unsatisfactory academic record. For the purpose of admission or re-admission, an unsatisfactory record is defined as a transcript with the notation 'required to withdraw' or equivalent.

## Biological Sciences Courses

### Biochemistry

#### BICM 200

##### Introductory Biochemistry

**3 Credits Weekly (3-0-0)**

Biochemistry is the study of the chemistry of life. This course introduces students to the complexities of the cellular environment and its impact on the chemical reactions that occur in the cell. Structural and functional aspects of proteins and nucleic acids are examined. The course also introduces intermediary metabolism, focusing on carbohydrate metabolism. Emphasis is on the free energy changes that govern metabolic pathways, and their regulation and integration.

*Prerequisites: Minimum grades of C- in BIOL 107 and CHEM 261.*

#### BICM 310

##### Intermediary Metabolism

**3 Credits Weekly (3-0-0)**

This course explores the principles of intermediary metabolism, the chemical reactions by which organisms store and generate energy required for life. Topics include bioenergetics, as well as molecular mechanisms of regulation and integration of carbohydrate and lipid metabolism. Selected examples are used to illustrate how imbalances in metabolic pathways can lead to disease.

*Prerequisites: Minimum grades of C- in BICM 200, CHEM 102, and CHEM 263.*

**BICM 340****Structure and Function of Biological Molecules****3 Credits Weekly (3-3-0)**

Underlying the great diversity of living organisms is the unity of biochemistry - we are all made of the same biological molecules: proteins, lipids, carbohydrates and nucleic acids. In this course students will develop a fundamental understanding of the structural principles of biological molecules and connect it to the wide range of functions that are essential to life. Experimental methods used to study proteins, carbohydrates and nucleic acids will be introduced and applied in the laboratory.

*Prerequisites: Minimum grades of C- in BICM 200 and CHEM 263.*

**BICM 450****Biochemistry of Viruses****3 Credits Weekly (3-0-0)**

Viruses are the ultimate parasites. Possessing only the minimal components that they need to reproduce, they use ingenious biochemical trickery to invade a host cell and commandeer its biological functions in order to complete their infectious cycle. While the best-known viruses are agents of disease, they have also enabled the discovery of many biological phenomena and leading to development of medical and technological applications. In this course we will explore the structure and function of viruses, delving into some of the latest advances in our understanding of virus biochemistry.

*Prerequisites: A minimum grade of C- in BICM 320, BICM 330, or BICM 340, plus a minimum grade of C- in one additional course from the following list: BICM 310, BICM 320, BICM 330, BIOL 300, BIOL 313, GENE 369, GENE 370.*

**Biology****BIOL 101****Current Issues in Human Biology****3 Credits Weekly (3-0-0)**

This course explores "hot topics" in biology. Topics may include genetics, biotechnology, human diseases, immunology, and vaccines. Students evaluate valid and non-valid sources of information and build the skills to apply this knowledge in everyday life. Note: This course cannot be taken for credit if credit has already been obtained in BIOL 207 or BIOL 208.

**BIOL 102****Nutrition and the Body****3 Credits Weekly (3-0-0)**

Misinformation about diet is ubiquitous in popular culture. This course teaches the skills to evaluate valid and non-valid sources of nutritional information. The course explores food selection, metabolism, nutrients, and impacts of diet on health. Note: Students who have completed BIOL 207 or BIOL 208 will not be permitted to enrol in BIOL 102 without permission from the department.

**BIOL 103****Humans and Their Environment****3 Credits Weekly (3-0-0)**

This course provides an overview of global and local environmental issues that have accompanied human population growth. The course will explore examples of where critical actions are required to resolve environmental issues. Case studies compare environmental issues across countries. Note: This course cannot be taken for credit if credit has already been obtained in BIOL 207 or BIOL 208.

**BIOL 107****Introduction to Cell Biology****3 Credits Weekly (3-3-0)**

Enter the tiny and wonderful world of cells to gain a deeper understanding of how organisms work. Learn how in the smallest unit of life, the structure of each component is optimized to perform its unique function. Explore how cells obtain and use energy to power the processes of life. Examine how genetic information is safely stored, used, and copied by the cell. Delve into the scientific stories that led to the discovery of this knowledge and how it applies to the everyday lives of all organisms. Develop lab skills that will enable you to apply the scientific method to answer biological questions.

*Prerequisites: Biology 30 and Chemistry 30.*

**BIOL 108****Introduction to Evolution****3 Credits Weekly (3-3-0)**

From the dawn of life, the planet and its organisms have been shaped by Darwinian evolution. Discover the processes of evolution and how biologists classify taxonomic groups of organisms, apply the scientific method, and observe the living world. Experience the many adaptations of organisms that have led to the amazing biological diversity of life on Earth.

*Prerequisites: Biology 30.*

**BIOL 201****Eukaryotic Cellular Biology I****3 Credits Weekly (3-0-0)**

This course studies eukaryotic cellular processes including protein targeting and transport, secretion and endocytosis, and cellular signaling pathways. Common experimental techniques used to study cellular processes are discussed. Students dissect aspects of cellular function by interpreting examples of data from primary literature.

*Prerequisites: Minimum grades of C- in BIOL 107 and in any 100-level CHEM (<https://calendar.macewan.ca/course-descriptions/chem/>).*

**BIOL 205****Principles of Molecular Biology****3 Credits Weekly (3-3-0)**

This course develops an understanding of molecular mechanisms for the propagation and expression of the genome in both prokaryotic and eukaryotic systems. The application of modern molecular biological techniques to the study of gene structure, function and regulation is emphasized. Basic techniques in molecular biology, data collection, and data analysis are fundamental to the laboratory component.

*Prerequisites: A minimum grade of C- in BIOL 107.*

**BIOL 207****Principles of Genetics****3 Credits Weekly (3-3-0)**

This course introduces principles of inheritance and explores the relationship between genotype and phenotype. Topics include the structure and replication of DNA, mutation, simple inheritance, genetic linkage, and gene interactions. Key historical experiments and the scientists responsible for them are discussed. The laboratory provides opportunity to investigate genetic principles using a variety of model organisms.

*Prerequisites: A minimum grade of C- in BIOL 107.*

**BIOL 208****Principles of Ecology****3 Credits Weekly (3-3-0)**

Examine interactions between organisms and their environment at the individual, population, community, and ecosystem levels. Discover how ecologists solve biological problems, apply the scientific method, and disseminate knowledge. In the laboratory, collect, analyze, interpret, and communicate ecological data.

*Prerequisites: Minimum grades of C- in BIOL 108 and STAT 151.*

**BIOL 211****Introduction to Microbiology****3 Credits Weekly (3-3-0)**

This course introduces the cell structure, physiology, and metabolism of microorganisms. Students investigate how microbes interact with their environment and with humans through examples of economically- and medically-important microbes. The ability to communicate this information to a non-scientific audience is developed through written work. Laboratory projects develop competency in key techniques common to microbiological research and diagnostic labs.

*Prerequisites: Minimum grades of C- in BIOL 207 and in any 100-level CHEM (<https://calendar.macewan.ca/course-descriptions/chem/>) course.*

**BIOL 300****Eukaryotic Cellular Biology II****3 Credits Weekly (3-3-0)**

Students apply cell biology techniques to analyze eukaryotic cell function. A theoretical understanding of these techniques is used to discuss topics including cellular differentiation, the cytoskeleton, cell cycle regulation, tissue formation, and cancer mechanisms. Practical competency in techniques is developed in relevant laboratory projects. Students evaluate their own experimental results as well as data within primary literature and communicate their findings in both written and oral form.

*Prerequisites: Minimum grades of C- in BIOL 201 and BIOL 205.*

**BIOL 310****Freshwater Ecology****3 Credits Weekly (3-3-0)**

This course explores a range of freshwater ecosystems including lakes, rivers, groundwater, and a spectrum of wetland types with emphasis on Alberta environments. An examination of the physical and chemical aspects of water and nutrients is conducted. Adaptations and ecological roles of microbes, fungi, plants, and higher organisms are discussed. Critical abiotic and biotic interactions are considered. Laboratory and field activities introduce common techniques for collecting, studying, and measuring organisms and ecological processes in freshwater systems.

*Prerequisites: A minimum grade of C- in BIOL 208.*

**BIOL 312****Terrestrial Ecology****3 Credits Weekly (3-3-0)**

This course examines the abiotic and biotic interactions that contribute to the structure and functioning of terrestrial ecosystems and landscapes. Principles of ecosystem and landscape ecology will be discussed. Topics include: soils, energy and nutrient cycling, plant productivity, climate patterns and impacts, and causes and consequences of landscape structure. Discussions will emphasize, but not be limited to, Alberta environments. The laboratory focuses on a range of techniques used in studying and measuring ecological processes in terrestrial systems, and the critical evaluation, analysis and effective communication of ecological information.

*Prerequisites: A minimum grade of C- in BIOL 208.*

**BIOL 313****Animal Developmental Biology****3 Credits Weekly (3-3-0)**

Students explore how molecular and cellular mechanisms drive the embryonic development of vertebrate and invertebrate animals. Topics include differential gene regulation, intercellular communication, and morphogenesis related to development. Laboratory activities allow students to observe embryos and manipulate animal developmental processes.

*Prerequisites: Minimum grades of C- in BIOL 201 and BIOL 205.*

**BIOL 314****Population Ecology****3 Credits Weekly (3-3-0)**

This course examines the central principles of population ecology and current practical applications in this field. Topics include population structure, dynamics, and modelling, as well as foraging theory, interspecific interactions and applications to species harvesting, control, and conservation. The lab focuses on quantitative techniques used to model population parameters and solve ecological problems.

*Prerequisites: Minimum grades of C- in BIOL 208 and in any one of MATH 114, MATH 120, or MATH 125.*

**BIOL 315****History of Biology****3 Credits Weekly (3-0-1)**

This course traces the scientific foundations of biological discovery from the ancient Greeks to the present. The course presents the origins and evolution of modern concepts in biology and introduces students to the people that were largely responsible for these ideas. The course involves a major written component, critical evaluation of biological literature, an oral presentation, and peer work. Students are expected to actively participate in class discussions. Note: This course is intended for students in their 3rd year of study.

*Prerequisites: Minimum grades of C- in two 200-level or higher Biological Sciences courses, of which one must be BIOL 207 or BIOL 208.*

**BIOL 316****Community Ecology****3 Credits Weekly (3-3-0)**

Students explore the patterns and processes determining the structure, function and dynamics of ecological communities. Topics include ecological interaction networks, species coexistence, community succession and stability, metacommunities, causes and consequences of biodiversity variation, and applications related to resource management, restoration, conservation, and community-level responses to global environmental change. The laboratory focuses on quantitative techniques commonly used to describe and model community dynamics in space and time.

*Prerequisites: Minimum grades of C- in BIOL 208 and in any one of MATH 114, MATH 120, or MATH 125.*

**BIOL 317****Biotechnology and Society****3 Credits Weekly (3-0-1)**

Students examine topical biotechnology applications such as, but not limited to, gene edited and genetically engineered food, de-extinction, biobanking, and prenatal genetic testing. This course emphasizes a scientific understanding of these applications, while considering social, legal, and ethical perspectives that influence their use. Contemporary issues are examined within a historical context. A Canadian perspective will be emphasized within the global context.

*Prerequisites: Minimum grades of C- in BIOL 207 and BIOL 208.*



**BIOL 321****Mechanisms of Evolution****3 Credits Weekly (3-0-0)**

This course examines the major principles of biological evolution including micro- and macroevolutionary processes. Students gain a fundamental understanding of phylogeny and systematics, genetic variation at the individual and population level, natural selection, adaptation, coevolution, speciation, and extinction.

*Prerequisites: Minimum grades of C- in BIOL 108 and BIOL 207.*

**BIOL 323****Introduction to Population Genetics****3 Credits Weekly (3-0-0)**

Population genetics explores patterns of genetic variation within and between populations, and the evolutionary forces behind this variation. Examine the history of the field of population genetics and apply basic algebra to determine how populations evolve. Utilize population genetics concepts to explore topics such as conservation biology and ancient DNA. Then compare how the mechanisms of evolution, including natural selection, gene flow, and genetic drift apply to populations, and discuss ethical issues related to the interpretation of such data. Develop bioinformatic skills for the analyses of genetic data.

*Prerequisites: Minimum grades of C- in BIOL 207 and BIOL 208.*

**BIOL 337****Biostatistics and Research Design****3 Credits Weekly (3-3-0)**

Statistics is a cornerstone of biological research. This course introduces students to the methods used in experimental design, data collection, organization, analysis, and presentation of biological data. Evaluation of different sampling designs and the benefits and limitations of various data types for testing biological hypotheses are discussed. A variety of statistical tests are compared and contrasted. Laboratory activities include developing effective means of data collection and understanding how databases, spreadsheets, and statistical software are used in data analysis, including the presentation of results.

*Prerequisites: Minimum grades of C- in STAT 151 and in any 200-level BICM (<https://calendar.macewan.ca/course-descriptions/bicm/>), BIOL (<https://calendar.macewan.ca/course-descriptions/biol/>), BOTN (<https://calendar.macewan.ca/course-descriptions/botn/>), or ZOO (<https://calendar.macewan.ca/course-descriptions/zool/>).*

**BIOL 361****Marine Biology****3 Credits Weekly (3-3-0)**

Over 70% of our planet is covered by ocean. If you can imagine a life form, it likely exists in the oceans. We now recognize our oceans are no longer a vast inexhaustible resource and play a vital role in the health of the biosphere. This course explores the organisms and their adaptations to habitats from the deep sea to open ocean to intertidal habitats. Students will design research proposals to address knowledge gaps and debate human impacts on the oceans. This course includes an optional field trip to a coastal area.

*Prerequisites: A minimum grade of C- in BIOL 208.*

**BIOL 365****Tropical Rainforest Ecology****3 Credits Total (20-70-0)**

This course provides an introduction to the biodiversity and ecology of organisms found in the world's most biologically rich ecosystem, the tropical rainforest. The physical and biotic forces that contribute to this incredible diversity are investigated, and the most serious threats to the conservation of the tropical rainforest ecosystem are explored. The course includes a field trip to the Tiputini Biodiversity Station in the lowland rainforest of eastern Ecuador, a visit to a high-elevation cloud forest in the Andes, and travel to other biological and cultural sites in Ecuador.

*Prerequisites: Minimum grade of C- in BIOL 208 and consent of the department.*

**BIOL 367****Conservation Biology****3 Credits Weekly (3-0-0)**

This course introduces the principles of conservation biology with an emphasis on ecological processes operating at population, community, and ecosystem levels. Threats to biological diversity, ranging from species introductions to habitat destruction are explored ranging from the design of protected areas through conservation legislation. Challenges in applying conservation strategies, such as ethical, economic, political, legal, cultural, and societal concerns, are examined.

*Prerequisites: A minimum grade of C- in BIOL 208.*

**BIOL 371****Animal Behaviour****3 Credits Weekly (3-3-0)**

This course provides students with an evolutionary and ecological approach to the general question of "how and why animals behave as they do." The primary focus is on the structural and functional processes that shape a variety of behaviours. Students will differentiate between proximate and ultimate explanations of behaviour and create testable hypotheses for each.

*Prerequisites: A minimum grade of C- in BIOL 208 or in PSYC 358 and with consent of the department.*

**BIOL 399****Honours Proposal****3 Credits Total (0-0-60)**

In collaboration with a faculty mentor, the student develops a proposal for their Honours research project. In seminar, students evaluate primary literature through discussion of experimental design across a range of biological disciplines. Note: This course is restricted to students enrolled in the Biological Sciences Honours program. Consent of the department is required to enrol.

**BIOL 410****Techniques in Field Ecology****3 Credits Weekly (0-6-0)**

This course provides students with experience in designing an ecological research project and collecting biological information in a field setting. Students gain skills in a range of field techniques and research design methods commonly used to study various biota in terrestrial, freshwater, and/or wetland ecosystems. Students collect, analyze, and communicate field data using various methods, critically evaluate the field techniques, and design and carry out an independent research project culminating in a final scientific paper. Note: This course may be taken up to two times, provided the course topic is different.

*Prerequisites: A minimum grade of C- in any two of BOTN 305, BIOL 310, BIOL 312, BIOL 314, BIOL 316, BIOL 337, BIOL 365, or BIOL 371, and consent of the department.*

**BIOL 413****Current Topics in Animal Developmental Biology****3 Credits Weekly (3-0-0)**

Students explore primary literature related to mechanisms that determine the growth and development of embryos. Emphasis is placed on regulation of processes that establish the animal body plan. Topics may include evolutionary developmental biology, tissue regeneration, and environmental and/or teratogenic influences on embryo development.

*Prerequisites: A minimum grade of C- in BIOL 313.*

**BIOL 414****Invasion Ecology and Management****3 Credits Weekly (3-0-0)**

Biological invasions are increasing in frequency worldwide and are a leading cause of global biological change, with significant impacts on ecosystem function, economic resources, and human health. In this course, students synthesize and communicate their ecological knowledge as they explore the causes, consequences, prevention, and management of biological invasions in aquatic and terrestrial ecosystems. Research approaches in invasion ecology through critical analyses of primary literature will be emphasized; discussion will emphasize local invasive species.

*Prerequisites: Minimum grades of C- in any two of BIOL 310, BIOL 312, BIOL 314, BIOL 316, BIOL 323, BIOL 365, BIOL 367, BIOL 371, or BOTN 405.*

**BIOL 421****Techniques in Molecular and Cellular Biology****3 Credits Weekly (0-6-0)**

This is a guided laboratory research project in which students engage in scientific inquiry. The theory and application of techniques in molecular and cellular biology are used to develop and test hypotheses in a collaborative research environment. An emphasis on scientific writing allows students to communicate their analyses of experimental results. Note: Course projects vary and are announced prior to registration. The course may be taken up to two times, provided the course project is different.

*Prerequisites: Minimum grades of B- in BIOL 205 and in any two of BICM 310, BICM 320, BICM 330, BIOL 300, BIOL 313, GENE 369, or GENE 370, or consent of the department.*

**BIOL 422****Methods in Experimental Ecology****3 Credits Weekly (0-6-0)**

Through guided field- and/or lab- based research projects, students will engage in independent scientific inquiry. Students deepen their understanding of ecological theory through the application of ecological research methods. Emphasis is placed on the collection, analysis, and presentation of quantitative data. Note: Course projects vary and are announced prior to registration. This course may be taken up to two times, provided the course projects are different.

*Prerequisites: Minimum grades of B- in BIOL 208 and BIOL 337, and at least one of BIOL 310, BIOL 312, BIOL 314, BIOL 316, BIOL 365, BIOL 367, or BIOL 371.*

**BIOL 430****Pathobiology: The Cellular Basis of Disease****3 Credits Weekly (3-0-0)**

This course investigates pathological changes to cells and tissues as they manifest in human disease. Selected disease therapies are explored. Students review, analyze, critique, and discuss topics from the primary literature related to the cellular mechanisms that drive disease pathogenesis. Oral presentation, peer review, and group work skills are emphasized. The specific cellular processes examined change based on student interest and recent topics of importance within the field. Note: BICM 320 recommended.

*Prerequisites: A minimum grade of C- in BIOL 300.*

**BIOL 467****Advanced Conservation Biology****3 Credits Weekly (3-0-0)**

Effective conservation requires a strong knowledge of general ecology and the biology of target species for biodiversity management. However, conservation is also influenced by ethical values, cultural traditions, political and legal constraints, historical context, and other aspects of how humans relate to and connect with the natural world. This course will explore these different aspects of conservation biology and how they influence decision making. This course will primarily focus on conservation in Canada.

*Prerequisites: A minimum grade of C- in BIOL 367.*

**BIOL 477****Contemporary Issues in Freshwater Ecology****3 Credits Weekly (0-0-3)**

This seminar course engages students on contemporary issues surrounding freshwater ecology as related to research, policy and practice, environmental issues, and the effects of these on society. Students will explore critical ecological concepts through reviews of the relevant scientific literature, examination of case studies, in-depth discussions with peers and experts, development of presentations on specific topics, and writing associated review/synthesis papers. Guest speakers and media will round out the curriculum.

*Prerequisites: Minimum grades of C- in BIOL 337 and two of BIOL 310, BIOL 312, BIOL 314, or BIOL 316.*

**BIOL 492****Field Placement****3 Credits Total (0-0-45)**

This course provides students with experience in a professional setting where they develop skills and engage in professional conduct. Students will reflect on the roles and responsibilities of biologists in society, as well as on ethical challenges relevant to the placement. Students will communicate regularly with their faculty mentor. Enrolment is dependent on availability of appropriate field placements and a faculty member willing to act as a mentor.

*Prerequisites: A minimum grade of C- in at least one 300-level Biological Sciences course; specific prerequisites may be required according to the field placement and with consent of the department.*

**BIOL 495****Special Topics****3 Credits Weekly (0-0-3)**

This course involves reading, discussing and critically evaluating current research on specialized topics of interest to senior students in Biological Sciences. Topics covered vary with the interests of students and faculty. Students should consult with faculty members in the Department of Biological Sciences for details regarding current offerings. Note: This course is intended for students in the final year of their degree. This course may be taken up to two times.

*Prerequisites: Minimum grade of B- in 300-level BIOL (<https://calendar.macewan.ca/course-descriptions/biol/>) relevant to the special topic.*

**BIOL 498****Advanced Independent Study****3 Credits Total (0-0-72)**

In this course, students plan, conduct, and communicate the results of an independent research project in Biological Sciences under the direction of a faculty supervisor. Registration is contingent on the student having made prior arrangements with a faculty member willing to supervise the research. Note: This course is intended for students in the final year of their degree. This course may be taken up to two times for credit.

*Prerequisites: A minimum grade of B- in at least one 300-level Biological Sciences course; faculty mentors may require specific prerequisites according to the project needs.*

**BIOL 499A****Honours Thesis I****3 Credits Total (0-0-72)**

In this course, students develop research skills by conducting an independent research project in collaboration with a faculty mentor. This work will culminate in an Honours Thesis and public presentation. Students complete BIOL 499A and 499B in consecutive terms.

*Prerequisites: A minimum grade of B- in BIOL 399.*

**BIOL 499B****Honours Thesis II****3 Credits Total (0-0-72)**

In this course students develop research skills by conducting an independent research project in collaboration with a faculty mentor. This work will culminate in an Honours Thesis and public presentation. Students complete BIOL 499A and 499B in consecutive terms.

*Prerequisites: A minimum grade of B- in BIOL 399.*

**Botany****BOTN 205****Fundamentals of Plant Biology****3 Credits Weekly (3-3-0)**

This course gives a broad introduction to the fascinating field of plant biology. It covers the basics of plant taxonomy as applied to areas such as pharmaceutical sciences and ecological monitoring and management. Further, the course provides an overview of how adaptations to the terrestrial environment shaped the evolution of plants. The link between anatomy, morphology and function of specific organs will be examined in seed plants. We will discuss how the history of botany has shaped our knowledge of plants, and how current research is changing our understanding of plants as complex and responsive organisms. In the laboratory component, the student will gain skills in plant ID, standard herbarium techniques and descriptive analysis of plant morphology as well as in applying the scientific method to answer simple questions in plant biology.

*Prerequisites: Minimum grades of C- in BIOL 108 and BIOL 107.*

**BOTN 405****Plant Behaviour and its Applications****3 Credits Weekly (3-3-0)**

Over the past decade, it has become clear that plants are able to sense and respond to environmental cues, interact with other organisms, and make decisions about how to optimize growth, all of which can be described as behavioural responses. This course provides insight into the physiological mechanisms that allow for plant sensory responses and interactions with other organisms. We will explore how this understanding of plant behaviour can be applied in a variety of contexts such as pharmaceutical sciences, bio-remediation, reclamation, and pest- and pathogen-management in agriculture and forestry. The laboratory employs experimental techniques used in studying plant growth responses to answer specific research questions.

*Prerequisites: Minimum grades of C- in BOTN 205, and in one of BIOL 312, BIOL 314, BIOL 316, BIOL 321 or BIOL 337.*

**Genetics****GENE 369****Genetic Analysis of Bacteria****3 Credits Weekly (3-0-1)**

This course explores the role of bacteria and bacteriophages in the development of molecular genetics. Major topics include mechanisms of genetic exchange and genome plasticity in bacteria, and the replication processes of bacteriophages. Students propose experimental strategies to solve problems related to these topic areas and analyze data. Seminars develop the ability to critically analyze scientific literature through discussion of current and historical research papers.

*Prerequisites: Minimum grades of C- in BIOL 205 and BIOL 207.*

**GENE 370****Genetic Analysis of Eukaryotes****3 Credits Weekly (3-1-0)**

Students explore strategies, involving both genetic approaches and molecular methods, utilized in the dissection of biological processes in eukaryotic model systems. Forward and reverse genetic approaches are evaluated for their contribution to our understanding of the complex relationship between genotype and phenotype. The laboratory provides students the opportunity to develop skills employed in the genetic analysis of eukaryotes.

*Prerequisites: Minimum grades of C- in BIOL 205 and BIOL 207.*

**GENE 400****Genome Organization****3 Credits Weekly (3-3-0)**

This course is an introduction to the field of genomics and explores the use of high-throughput approaches to examine the organization and expression of genetic material. Emphasis is placed on techniques employed in genomic analysis and their application to current biological questions.

*Prerequisites: Minimum grades of C- in GENE 369 and GENE 370.*

**GENE 404****Investigations into Gene Regulation****3 Credits Weekly (3-0-1)**

Students investigate mechanisms of gene regulation in prokaryotes and eukaryotes through a critical analysis of primary literature. Transcriptional, post-transcriptional, translational, post-translational and epigenetic regulatory mechanisms are explored. Students demonstrate their understanding through oral and written analyses.

*Prerequisites: Minimum grades of C- in GENE 369 and GENE 370.*

**GENE 418****Human Genetics****3 Credits Weekly (3-0-1)**

This course examines the principles and methods of genetics as they relate to humans as individuals and in populations. Approaches used in the identification and analysis of Mendelian, complex, and chromosomal disorders are investigated with the contextual emphasis on the relationship between basic science and human disease. The relevance of advances in these areas of human genetics to the diagnosis and treatment of genetic diseases is explored.

*Prerequisites: A minimum grade of C- in GENE 370.*

**Zoology****ZOOL 224****Vertebrate Adaptations and Evolution****3 Credits Weekly (3-3-0)**

This course provides a comprehensive introduction to the diversity of vertebrates using an evolutionary approach. Morphological, physiological, and behavioural adaptations related to the life of vertebrates in aquatic and terrestrial habitats are emphasized. Students employ the principles of systematics and taxonomy in the classification of vertebrates.

*Prerequisites: A minimum grade of C- in BIOL 108.*

**ZOOL 241****Animal Physiology I: Homeostasis****3 Credits Weekly (3-0-1)**

This course examines physiological systems that regulate the internal conditions of animals. Emphasis is placed on mechanisms that regulate water and ions, respiratory gases, and temperature in relation to the external environment. Physiological systems from both invertebrates and vertebrates are studied.

*Prerequisites: A minimum grade of C- in BIOL 107.*

**ZOOL 242****Animal Physiology II: Intercellular Communication****3 Credits Weekly (3-0-1)**

This course examines the physiological systems of animals that involve intercellular communication. Focus is on the endocrine, neural, sensory, motor, and immune systems of invertebrate and vertebrate animals.

*Prerequisites: A minimum grade of C- in BIOL 107.*

**ZOOL 250****Invertebrate Zoology****3 Credits Weekly (3-3-0)**

This course explores the evolution and ecological roles of invertebrate animals. The diversity of ecological niches, behaviours, and life histories of invertebrates are related to functional anatomy. In the laboratory, students explore the diversity and functional anatomy of invertebrates using live and preserved specimens. The course includes an optional field trip to a coastal area.

*Prerequisites: A minimum grade of C- in BIOL 108.*

**ZOOL 324****Comparative Anatomy of the Vertebrates****3 Credits Weekly (3-3-0)**

This course provides a comparative survey of the anatomy of vertebrates emphasizing evolutionary trends and anatomical adaptations for life in aquatic and terrestrial habitats. Special emphasis is placed on fish and mammals. The laboratory develops advanced dissection skills.

**ZOOL 325****Entomology****3 Credits Weekly (3-3-0)**

Insects are the most successful animals on Earth. This course examines their evolutionary history and adaptations that have led to their success. Insect behaviour is examined as it relates to morphology, lifecycle, and ecology to explain how insects can be dominant in diverse ecological situations. The economic, medical, scientific and cultural impact of insects is surveyed. The laboratory emphasizes methods of collecting, preserving, and identifying insect groups.

*Prerequisites: A minimum grade of C- in ZOOL 250.*

**ZOOL 400****Aquatic Vertebrates****3 Credits Weekly (3-3-0)**

This course examines the evolution and natural history of fish, amphibians, birds, reptiles, and mammals in aquatic environments. Topics include behavioural, morphological, and physiological adaptations. Students summarize, interpret, and present scientific literature. The laboratory focuses on biodiversity, fecundity, locomotion, and molecular systematics with emphasis on native species of Alberta.

*Prerequisites: Minimum grades of C- in ZOOL 224 and one of BIOL 310, BIOL 361, BIOL 367, or ZOOL 324.*

**ZOOL 401****Terrestrial Vertebrates****3 Credits Weekly (3-3-0)**

This course examines the evolution and natural history of amphibians, birds, reptiles, and mammals in terrestrial environments. Topics include behavioural, morphological, and physiological adaptations. Students summarize, interpret, and present scientific literature on ecological and environmental issues of terrestrial vertebrates. The laboratory focuses on native species of Alberta.

*Prerequisites: Minimum grades of C- in ZOOL 224 and one of BIOL 312, BIOL 367, or ZOOL 324.*

**ZOOL 452****Principles of Parasitism****3 Credits Weekly (3-3-0)**

Using an ecological approach, this course examines the relationships between parasites and their animal hosts. The structural and physiological adaptations used by parasites to successfully complete their life cycles are discussed, as well as host defensive strategies. Examples of human parasitic infections are explored. The laboratory emphasizes parasite morphology, life cycles, behaviour, systematics, and evolution.

*Prerequisites: A minimum grade of C- in ZOOL 250.*