

# BIOL – BIOLOGY

## BIOL 020

### Biology 20

**5 Credits Weekly (6-0-0)**

Biology 20 is equivalent to Alberta Education's Biology 20. The course deals with major concepts of systems, equilibrium, energy and matter. The major topics include cell dynamics, cellular pathways, the biosphere, evolution and natural selection, cellular matter and energy flow, matter and energy exchange in ecosystems, and matter and energy exchange by the human organism.

*Prerequisites: SCIE 010 or equivalent.*

## BIOL 030

### Biology 30

**5 Credits Weekly (6-0-0)**

Biology 30 is equivalent to Alberta Education's Biology 30. The course concentrates on many aspects of the human body - its function and maintenance. The major topics include the nervous system, hormones and controls, reproduction and human development, cell division and classical genetics, heredity and molecular genetics, population dynamics and populations and communities.

*Prerequisites: BIOL 020 or equivalent.*

## 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. Emphasis is placed on understanding common experimental techniques used to study cellular processes. Students analyze aspects of cellular function through interpretation of data taken 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 gene structure, expression, and regulation. Gene regulatory mechanisms conserved across prokaryotes and eukaryotes are explored, as well as mechanisms that differ between them. Fundamental principles of experimental design and common molecular biology research techniques are examined in both the lecture and lab. In addition, students develop research skills in the lab through the completion of a term project that requires a range of molecular biology techniques along with the collection and analysis of data.

*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)**

Explore the cell structure, physiology, and metabolism of Bacteria, Archaea, and viruses. Investigate how these microbes interact with their environment and with humans through examples of economically- and medically-important microbes. Communicate information about microbes to both scientific and non-scientific audiences. In the lab, develop competency in key techniques common to microbiological research and diagnostic labs.

*Prerequisites:* Minimum grades of C- in BIOL 207 or BIOL 205, and in any 100-level CHEM (<https://calendar.macewan.ca/course-descriptions/chem/>) course.

**BIOL 212****Introduction to the Hidden Eukaryote Groups****3 Credits Weekly (3-3-0)**

Enter the complex hidden world of protists and fungi and discover the contentious history of the current classification of these ambiguous groups. You will gain an appreciation for the ecological and economic importance of these hidden eukaryotic groups and the way current research is changing our understanding of them. You will answer questions crucial to our understanding of these organisms by applying the scientific method and evaluating collected data. In the laboratory component, you will develop skills in working with protists and fungi, including microscopy, culturing, and identification.

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

**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 a selection of topical biotechnology applications such as, but not limited to, gene edited and genetically engineered food, reproductive biotechnologies, and biobanking. This course emphasizes a scientific understanding of these biotechnologies, and explores social, legal, and ethical perspectives that influence their applications. Contemporary issues are examined within a historical context. A Canadian perspective is 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 (p. 1), BOTN (<https://calendar.macewan.ca/course-descriptions/botn/>), or ZOOL (<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 oceans, which contain an amazing diversity of life. We now recognize that our oceans are no longer a vast, inexhaustible resource and play a vital role in the biosphere's health. 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 may include 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:* A 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. This course is not guaranteed to be offered every year.

*Prerequisites:* A minimum grade of C- in any two of BIOL 310, BIOL 312, BIOL 314, BIOL 316, BIOL 337, BIOL 365, BIOL 371, BOTN 405, or BIOL 422, and consent of the department.

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

Explore mechanisms responsible for embryo growth and development. Analyse primary literature related to animal development and improve your scientific communication skills. Topics covered in this course may include stem cells, aging, tissue regeneration, evolutionary developmental biology, and the effects of environmental and teratogenic factors 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)**

In this guided laboratory research project, students engage in authentic scientific inquiry. Theoretical knowledge of molecular and cellular biology techniques is applied 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 340, BIOL 300, BIOL 313, GENE 369, or GENE 370, one of which must have a lab, 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)**

In this course, you will read, discuss, and critically evaluate 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, provided the topics are sufficiently different.

*Prerequisites: A minimum grade of B- in 300-level course(s) from the Department of Biological Sciences that are 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.*