BIOLOGY (BIOL)

Each of the following courses has a 3 hour per week lab component unless otherwise noted. Students must pass both the laboratory and the lecture components of a course to pass the course. A minimum grade of C is required in all biology courses applied to the student's Biology Program.

A minimum grade of C is required for all BIOL prerequisites for 2000, 3000 and 4000-level BIOL courses.

BIOL 1211 Molecular and Cell Biology (formerly BIOL 1201)
3 credit hours
Prerequisite: Nova Scotia Grade 12 Biology or equivalent

Students are introduced to the principles of life at the cellular and molecular level. Major topics include the molecules that encode biological information, prokaryotic and eukaryotic cells, cell membranes and compartments, cell respiration, photosynthesis, transcription and translation, DNA replication and cell division, mutation, variation and inheritance.
Note: Credit will not be given for both BIOL 1211 and BIOL 1201.

BIOL 1212 Organismal and Ecological Biology (formerly BIOL 1202)
3 credit hours
Prerequisite: Nova Scotia Grade 12 Biology or equivalent

Students are introduced to the study of the principles and organization of life, including anatomy, form and function, physiology, life history and ecology. Topics include the origins of eukaryotic and multicellular life, plant structure and function, plant growth and reproduction, diversity of plants, and animals, themes of animal physiology, evolution, and population ecology.
Note: Credit will not be given for both BIOL 1212 and BIOL 1202.

BIOL 1213 Applications in Biology
3 credit hours
Prerequisite: Nova Scotia Grade 12 Biology or equivalent

This skills-based course introduces methods and approaches in biology labs. Students are introduced to core concepts and common methods in biological research including cell biology, molecular biology and ecology. This course is required for second-year BIOL courses and is normally taken concurrently with either BIOL 1211 or BIOL 1212.
Note: Credit in BIOL 1213 will not be given to students who have already completed BIOL 1201 or BIOL 1202.

BIOL 2307 Genetics
3 credit hours
Prerequisite: Both BIOL 1201 and BIOL 1202, or all three of BIOL 1211, BIOL 1212, and BIOL 1213

This course is an introduction to the major topics in classical, cellular and molecular genetics. Emphasis is placed on how genes are passed from generation to generation and how genes interact with one another. Topics include the environment that determines phenotype, the creation of genetic variation, mapping genes and mutations on chromosomes, and the practical application of this knowledge.

BIOL 2321 Cell Biology
3 credit hours
Prerequisite: Both of BIOL 1201 and BIOL 1202, or all three of BIOL 1211, BIOL 1212 and BIOL 1213

This course is an introduction to the eukaryotic cell with emphasis on the chemical and genetic basis of cellular activities and the division of the cell into membrane-bound and biochemically specialized compartments. The plasma membrane, cytosol, nucleus, cytoskeleton, Golgi apparatus, mitochondrion, chloroplasts and endoplasmic reticulum are considered.

BIOL 2324 Ecology
3 credit hours
Prerequisite: Both of BIOL 1201 and 1202, or all three of BIOL 1211, BIOL 1212 and BIOL 1213

Ecology is the study of interactions and relationships among organisms and their environment such as adaptations, competition and predation. Topics include the density, diversity and distribution of organisms, population dynamics, community relationships and structure, succession, and the flow of energy and matter through ecosystems.

BIOL 3004 Principles of Physiology
3 credit hours
Prerequisite: BIOL 2321

This course focuses on core concepts of physiology including membrane permeability and transport, levels of organization, cell signalling, causality, flow-down gradients and homeostasis. These principles are illustrated from the molecular to organ level, using detailed examples of the human nervous, excretory, digestive, endocrine and respiratory systems.

BIOL 3007 Forensic DNA Typing FRSC 3007
3 credit hours
Prerequisite: BIOL 2307

Students study all aspects of forensic DNA typing protocols and interpretation. Lectures focus on theory and laboratory sessions involve actual DNA typing, where students work with their own DNA. These skills are highly transferrable,and are applicable to the genetic analysis of populations in general.

BIOL 3020 Comparative Vertebrate Anatomy
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

Students examine vertebrates, with consideration of structural modifications for particular life styles. A comparative and evolutionary approach is taken in lectures. Laboratory instruction involves dissection of representative animals.

BIOL 3021 Integrative Vertebrate Physiology
3 credit hours
Prerequisite: BIOL 2321

Students study vertebrate physiology and physiological adaptations. Topics include the integration of the eleven organ systems and how they interact to maintain homeostasis. The physiology of vertebrates is compared as it pertains to their specific environment or success of the individual.

BIOL 3303 Plant Biology (formerly BIOL 2303)
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

Students are introduced to plant biology, with emphasis on angiosperm plant structure, reproduction and development, basic mechanisms of photosynthesis and respiration, plant nutrition, and growth regulation. Land plants are also studied from an evolutionary perspective, spanning from the first appearance of plants on land to the major groups present today.

BIOL 3308 Biostatistics
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

Students are introduced to the methods of graphing and analyzing quantitative data in the biological sciences with emphasis on practical applications of statistics in biology. Topics include descriptive statistics, normal and non-normal distributions, probability, correlation, regression, tests of significance such as analysis of variance, and sampling methods. **Note:** Students will not receive credit for both BIOL 3308 (formerly BIOL 2308) and any of MATH 1216, PSYC 2020, GEOG 3326, MGSC 2207, SOCI 3102, or CRIM 3102.

BIOL 3398 Microbiology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

This course is an introduction to the world of microorganisms, the means by which they are studied, and their role in human disease. Topics may include: the origin and discovery of microbial life, structure and function of prokaryotic cells, cell growth and development, and the role of bacteria, fungi, viruses and protozoa with respect to the development of human disease.

BIOL 3402 Population Genetics
3 credit hours
Prerequisite: BIOL 2307

Population genetics is the integration of mathematics with population biology, genetics, and evolution and allows researchers to quantitatively infer what is going on within and among populations based on genetic data. Students focus on developing a basic understanding of the main principles of population genetics and their application to real-word problems.

BIOL 3419 Molecular Biology
3 credit hours
Prerequisite: BIOL 2307

Students are introduced to the chemistry of genes, DNA, RNA, and protein structure. Topics include transcription, translation, the replication of DNA and RNA, and the organization of genes and genomes. Students will also learn basic molecular techniques.

BIOL 3423 Evolution
3 credit hours
Prerequisite: BIOL 2307

Students are exposed to evolution and the importance of evolutionary thinking in biology. Topics include evolutionary theory, how evolutionary processes have resulted in the diversity of life today, and how evolutionary thinking can inform their daily lives.

BIOL 3428 Applied Entomology (formerly BIOL 4428)
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

Insect ecology and the relationship of insects to humans are explored. Topics may include the identification of insect pest species and their impact on human activities, morphological and behavioural modifications for specific ecological roles, population dynamics, the history and use of chemical insecticides, the use of insects as natural and biological control agents and integrated pest management.

BIOL 3434 Communication and Defense
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 2000-level

This course explores the ecological interrelationships between plants and animals and the ways in which they use chemicals to communicate, attract mates, and protect themselves from predators. Topics include the chemical and morphological adaptations of insect defense, plant toxins and their effects on animals, insect and animal venoms, plant and fungal hallucinogens, hormonal and chemical interactions between plants and animals, animal pheromones, and plant allelopathy and its ecological importance.

BIOL 4002 Wildlife Forensics FRSC 4002
3 credit hours
Prerequisite: BIOL 2307

The goals of this course are for students to learn about the techniques involved in wildlife forensics, how the resulting data are interpreted, and how this information is used in a legal setting. Although many aspects of wildlife forensics are covered, there is a focus on DNA methods. Classes 3 hrs. and lab 3 hrs. a week

BIOL 4004 Advanced Biostatistics
3 credit hours
Prerequisite: BIOL 3308 or PSYC 2020 (formerly PSYC 2350)

This course provides students with the basic tools to design and conduct biological experiments. Topics include analysis of variance, regression, multivariate analysis, nonparametric methods, and model selection.

BIOL 4007 Bioinformatics and Genomics
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level and CSCI 1227

Students study practical methods of biological sequence analysis, including obtaining information from databases and comparing sequences to extract their functional and evolutionary information. Students can develop an understanding of current resources, as applied to the study of genomic DNA, gene expression, and the evolution of genes and proteins.

BIOL 4010 Biology of Cancer
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

Students study current models of the nature of cancer and how cancer arises in a multicellular body. Topics include the molecular mechanisms that control normal growth and development, including oncogenes, tumor suppressors, the cell cycle, cell death, and cell communication. Students explore how molecular mechanisms act inappropriately in cancer cells, and how this knowledge influences anti-cancer therapies.

BIOL 4100 Osteology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

Osseous tissue is a very dynamic and important connective tissue. Students examine bone anatomy and associated joints. Topics covered include embryological development, histology, response to mechanical loading history, fracture identification, repair and remodeling. Students are introduced to the immune response of bone, and evidence of congenital and metabolic diseases of vertebrates and humans.

BIOL 4404 Behavioral Ecology
3 credit hours
Prerequisite: BIOL 2324; and one of BIOL 3308 or PSYC 2020 (formerly PSYC 2350) or MATH 1216

Behavioural Ecology is the examination of how animals interact in their environment with emphasis on the adaptive value of behaviour. Topics include the life-history trade-offs, foraging theory, predation, competition, game theory, natural and sexual selection, mating systems, parental care, and communication. Independent research is conducted in labs.
Note: Students cannot receive credit for both BIOL 4404 and PSYC 4407.

BIOL 4407 Animal Athletic Performance
3 credit hours
Prerequisite: BIOL 2321

Students examine the genetic, biochemical, morphological, and physiological mechanisms underlying variation in athletic performance (e.g. running, swimming, jumping) among individuals, populations and species. This course will focus on the factors underlying evolutionary variation in exercise capacity and how ecological conditions can influence performance in a range of animal species, including humans.

BIOL 4408 Animal Developmental Biology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

The fundamental question of development is how differences arise between cells and tissues in the embryo. Students explore the major events leading to the formation of the embryo, and examine how various experimental manipulations help to define the mechanisms involved in generating different cell types and embryonic structures.

BIOL 4410 Plant Ecology
3 credit hours
Prerequisite: BIOL 3303 (formerly BIOL 2303) and BIOL 2324

Students focus on plant populations and communities by exploring species composition, diversity, and interactions in field or laboratory projects.

BIOL 4416 Fungal Biology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

This course is an introduction to the fungi and related microorganisms. Students study the morphology of representatives from each of the major taxonomic groups.

BIOL 4422 Conservation Biology
3 credit hours
Prerequisite: BIOL 2324

This course introduces students to how the principles of evolutionary-ecology can be applied to help us understand how human exploitation of natural resources affects biodiversity. Students characterize biodiversity and explore topics such as the biology of small populations, conservation genetics, ecological economics, and landscape ecology. In the lab students explore current topics in conservation biology through critiques, population modeling and independent research.

BIOL 4424 Diversity and Ecology of Fishes
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

This course is a study of the ecology of fishes, their classification, life history and global distribution. The laboratory portion of the course emphasizes study of representatives of world taxa and the fishes of Nova Scotia.

BIOL 4430 Ornithology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

Ornithology is the study of birds. Students examine the evolutionary history of birds, adaptations they have made for flight and for their particular niche, their behaviour, breeding systems and conservation. Nova Scotian species are identified through sight and song.

BIOL 4431 Herpetology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

Herpetology is the study of amphibians and reptiles. Topics include ecology, natural history, form and function of amphibians and reptiles with emphasis on Nova Scotia herpetofauna.

BIOL 4432 Medical and Veterinary Entomology
3 credit hours
Prerequisite: Six (6) credit hours in BIOL at the 3000-level

This course presents an introduction to the biology of insects and arthropods that cause disease in humans and domestic animals. Topics include the biology and behaviour of disease vectors and external parasites, the role of vectors in the transmission of disease organisms, life cycles of vector borne pathogens, and the mechanisms of vector and disease control.

BIOL 4448 Biology Field Course
3 credit hours
Prerequisite: BIOL 3308

The design and practice of biological study of communities under field conditions at selected sites in Nova Scotia. The main emphasis is on how ecologists document the abundance of organisms and quantify the structure of a community.
Note: Enrolment in this course is limited; and normally this course is held over 10-12 consecutive days and nights at an off-campus site.

BIOL 4500 Research Thesis
6 credit hours
Prerequisite: BIOL 3308 and honours standing

Each student will work with a research supervisor who guides them in the formulation of a research proposal, methods to be followed, and in the analysis and write-up of the research findings. The student submits a thesis and presents it orally.

BIOL 4549 Honours Seminar
6 credit hours
Prerequisite: honours standing.

Students receive training in such topics as biological experimental design, data analysis, figure preparation, manuscript writing, and the peer review process. Students focus on developing communication skills by presenting seminars, a poster, and attending faculty research talks.

BIOL 4876 - 4899 Directed Study in Biology
3 credit hours
Prerequisite: Permission of instructor on a directed studies form available from the Biology Chairperson.
These courses are intended to supplement the course offerings in biology and allow students to delve deeper into a subject of particular interest to them. Students must show some initiative and be willing to work independently.