

Biology

Department of Biology equips students to work and lead in areas such as biotechnology, the health sciences, ecology, and environmental stewardship.

Becoming a student of our Biology program will allow you to engage your curiosity and use your degree to meaningfully contribute to society.

Emerging diseases, environmental sustainability, and genomics are just a few topics that you will investigate. At TWU, you will be prepared for a career in the health sciences, research, or education, with solid training in science and ethics from a Christian worldview.

Our biology faculty are experts in their fields who integrate research, love for teaching, and Christian faith in the classroom. As a biology student, you will have the opportunity to work with faculty on cutting-edge research in cell biology and genetics, ecology and environmental biology, and applied and medical microbiology. This valuable research experience, coupled with our rigorous curriculum, can lead you to high-profile medical, dental, veterinary, and graduate programs around the world.

Our small class sizes mean you receive more individual attention, as well as mentoring opportunities to work with faculty on research. We are committed to providing you with hands-on instruction at all year-levels, so you will be in the lab more—and sooner. As a biology student, you will have the opportunity to participate in travel studies courses, such as botany and ecology, in BC's Gulf Islands and Hawaii.

ID	COURSE	CREDITS
BIOL 101	<p>BIOL 101 - Genes and Society 2022-2023</p> <p>This course introduces students to modern concepts in biology and enables them to evaluate independently the potential benefits and risks of the biotechnological revolution and its implications for society. The topics give an understanding of the nature of the genetic material, as well as major technologies currently used in genetic engineering. Cloning and genetic engineering of microorganisms, plants, and animals are discussed. Students are made aware of the impact of various genetic engineering projects on their own lives and on society in general. Ethical, moral, and theological issues arising from genetic engineering are also discussed.</p>	3
BIOL 103	<p>BIOL 103 - Introduction to Biology I - Ecology and Biodiversity 2022-2023</p> <p>An introduction to basic concepts and connections in the study of life, with emphasis on ecology and adaptation of representative life forms. The major plant and animal groups are surveyed with emphasis on unifying elements and diversities. This course is designed for nonScience majors and, without BIOL 104 and 105, does not serve as a prerequisite for upper level biology courses.</p>	3
BIOL 104	<p>BIOL 104 - Introduction to Biology II - The Design of Life 2022-2023</p> <p>An introduction to the basic relationships governing the existence of all living organisms. The</p>	3

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	<p>anatomy and physiology at all levels from DNA to organ-systems are studied, looking at energy requirements, inheritance, reproduction, development, and adaptation of representative life forms. This course is designed for non-Science majors and, without BIOL 105, does not serve as a prerequisite for upper level biology courses.</p>	
BIOL 105	<p>BIOL 105 - Advanced Introduction to Biology 2022-2023</p> <p>This lecture course covers certain topics in biology that are foundational to modern biology. The course examines the chemistry of life, DNA, phylogeny, ecosystems, physiology, and biotechnology. This course is designed for students who have taken BIOL 103 and 104 and intend to take upper level biology courses.</p>	3
BIOL 113	<p>BIOL 113 - Principles of Biology I 2022-2023</p> <p>An introduction to the basic relationships governing the existence of all living organisms, with emphasis on ecology and adaptation of representative life forms. Consideration is given to classification and surveys of the major plant and animal groups with emphasis on unifying elements and diversities.</p>	3
BIOL 114	<p>BIOL 114 - Principles of Biology II 2022-2023</p> <p>An introduction to the basic relationships governing the existence of all living organisms. Consideration is given to the anatomy and physiology at all levels as these relate to the energy requirements, inheritance, reproduction, development, and adaptation of representative life forms.</p>	3
BIOL 200	<p>BIOL 200 - Biotechnology Practica II 2022-2023</p> <p>Biotechnology Practica II and III provide general and advanced intern experiences in industrial settings. BIOL 200 (2 sem. hrs.) is a requirement for entry to co-op placements and graduation. BIOL 300 (3 sem. hrs.) is additional intern experience providing exposure to advanced techniques and applications in biotechnology. The skills taught in each practicum vary depending on the industrial setting, but should include some of the following techniques: mammalian tissue culture; monoclonal antibody production including cell fusion; hybridoma screening by ELISA and immunoblotting; fermentation microbiology and the operation of large-scale fermentation systems; insect cell culture and use of Baculovirus expression vectors to produce recombinant proteins; downstream processing and the recovery and purification of proteins, carbohydrates, lipids; freezing, freeze-drying and preservation of microorganisms, animal viruses, cell lines and hybridomas; high throughput screening strategies, diagnostic testing; methods in bioinformatics; and quality control procedures.</p>	2
BIOL 212	<p>BIOL 212 - Biology of Vascular Plants 2022-2023</p> <p>An exploration of the role of plants as the basis for most ecosystems, and as valuable resources for agriculture, horticulture, forestry, biotechnology, and other areas of human concern. The study of vascular plants includes classification, development, physiology, ecology, and economic uses, with comparison of form, function, and significance. The course involves local field trips and</p>	3

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	laboratory studies.	
BIOL 214	<p>BIOL 214 - Biology of Non-vascular Plants 2022-2023</p> <p>An exploration of non-vascular plants and the important niches they occupy, particularly in aquatic or moist environments and in relation to human health. The course covers algae, fungi, lichens, and bryophytes including classification, development, physiology, and ecology. Applied aspects include productivity of freshwater and marine systems, commercial uses, mushroom culture, plant pathology, and environmental and human health. Firsthand experience of the organisms includes local field trips and laboratory studies</p>	3
BIOL 216	<p>BIOL 216 - Plant Environments 2022-2023</p> <p>The crucial role of plant ecology in shaping major habitats, including those in British Columbia, will be examined. A trip to Salt Spring Island will highlight the threatened Garry oak ecosystem and other features of interest. Field trips throughout the course will highlight the population dynamics and interrelationships of plant communities in natural habitats, agricultural crops and managed forests. Critical assessment of planetary stewardship will form a common theme across various issues in plant ecology.</p>	3
BIOL 223	<p>BIOL 223 - Cell Biology 2022-2023</p> <p>A study of the molecules and processes that determine cell structure and function, including how this information is derived from the wide range of visual and analytical tools available today. The course describes the chemical nature of cells and the structure and behaviour of cells in the context of tissues.</p>	3
BIOL 226	<p>BIOL 226 - Introduction to Evolutionary Theory 2022-2023</p> <p>An introduction to the basic concepts of evolution as an organizing theory in biology. Topics covered include: comparative genomics, sources of variation, natural selection, genetic drift, adaptation, sexual selection, kin selection, speciation and phylogenetics.</p>	3
BIOL 233	<p>BIOL 233 - Microbiology for Nurses 2022-2023</p> <p>A study of pathogenic microorganisms and the control of infectious diseases. Topics include (i) the biology of bacteria, viruses, fungi, protozoa, and helminths; (ii) immunity, immunology, and immunization; (iii) sterilization, disinfection, chemotherapeutic agents; and (iv) epidemiology and public health microbiology. This course is only open to nursing students.</p>	3
BIOL 241	<p>BIOL 241 - Human Anatomy & Physiology I 2022-2023</p> <p>An introductory course in human anatomy and physiology focusing on the structure and function of the cellular, histological, integumentary, skeleton, muscular, cardiovascular, respiratory and metabolic systems. Special attention will be given to the interaction of these systems in maintenance of homeostasis and adaptations during performance and disease conditions.</p>	3

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BIOL 242	<p>BIOL 242 - Human Anatomy and Physiology II 2022-2023</p> <p>An introductory course in human anatomy and physiology focusing on the structure and function of the nervous, digestive, renal, endocrine, and reproductive systems in addition to immunity and acid-base balance. Special attention will be given to the interaction of these systems in maintenance of homeostasis and adaptations.</p>	3
BIOL 262	<p>BIOL 262 - Marine Biology 2022-2023</p> <p>A study of the life history and distribution of marine organisms in several major habitat types, including soft sediment and rocky substrate communities. Emphasis is on field and laboratory work in a survey of common local marine plants and animals and their relationships. Includes field work in the Lower Mainland, Gulf Islands, and/or Vancouver Island.</p>	3
BIOL 281	<p>BIOL 281 - General Ecology 2022-2023</p> <p>A study of the structure and dynamics of ecosystems. Consideration of plant and animal populations in relation to physical, chemical, and biological factors affecting their interaction and productivity. Considerable laboratory time is devoted to the study of local ecosystems, field sampling techniques, and field trips to ecological research areas.</p>	3
BIOL 290	<p>BIOL 290 - Introduction to Biotechnology 2022-2023</p> <p>This course reviews the role of modern biotechnology in plant, animal, and marine biology, microbiology, agriculture, the pharmaceutical industry, and medicine. The course focuses on underlying technologies in biotechnology, how these technologies are implemented, together with public concerns and government guidelines and legislation.</p>	3
BIOL 300	<p>BIOL 300 - Biotechnology Practica III 2022-2023</p> <p>Biotechnology Practica II and III provide general and advanced intern experiences in industrial settings. BIOL 200 (2 sem. hrs.) is a requirement for entry to co-op placements and graduation. BIOL 300 (3 sem. hrs.) is additional intern experience providing exposure to advanced techniques and applications in biotechnology. The skills taught in each practicum vary depending on the industrial setting, but should include some of the following techniques: mammalian tissue culture; monoclonal antibody production including cell fusion; hybridoma screening by ELISA and immunoblotting; fermentation microbiology and the operation of large-scale fermentation systems; insect cell culture and use of Baculovirus expression vectors to produce recombinant proteins; downstream processing and the recovery and purification of proteins, carbohydrates, lipids; freezing, freeze-drying and preservation of microorganisms, animal viruses, cell lines and hybridomas; high throughput screening strategies, diagnostic testing; methods in bioinformatics; and quality control procedures.</p>	3
BIOL 302	<p>BIOL 302 - Lake Ecology and Management 2022-2023</p> <p>Field study of lakes and other freshwater systems with applications to planning and management. Includes an introduction to limnology and investigation of representative lakes, streams, and wetlands of the region and compares the North American Great Lakes with the other great lakes</p>	4

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	of the world and their stewardship.	
BIOL 308	BIOL 308 - Vertebrate Zoology 2022-2023 A comparative study of the vertebrate classes with special emphasis on the anatomy and physiology of representative forms. The significance of advances in the complexity of chordates is considered, as well as the impact of human activities on vertebrate population dynamics.	3
BIOL 311	BIOL 311 - Field Botany 2022-2023 Field and lab identification, systematics, natural history, and ecology of vascular plants as components of natural communities and their relationships to ecological features, including stratification, history, plant zonation, adaptation, and animal interactions are examined. Taxonomic relationships of plant families and higher groups are covered. Project or plant collection required.	4
BIOL 312	BIOL 312 - Advanced Biology of Vascular Plants 2022-2023 An exploration of the role of plants as the basis for most ecosystems, and as valuable resources for agriculture, horticulture, forestry, biotechnology, and other areas of human concern. The study of vascular plants includes classification, development, physiology, ecology, and economic uses, with comparison of form, function, and significance. The course involves local field trips and laboratory studies. Recent discoveries in plant biology are highlighted through the completion of a literature review.	3
BIOL 314	BIOL 314 - Advanced Biology of NonVascular Plants 2022-2023 An exploration of non-vascular plants and the important niches they occupy, particularly in aquatic or moist environments and in relation to human health. The course covers algae, fungi, lichens, and bryophytes including classification, development, physiology, and ecology. Applied aspects include productivity of freshwater and marine systems, commercial uses, mushroom culture, plant pathology and environmental and human health. Firsthand experience of the organisms includes local field trips and laboratory studies. Recent discoveries in plant biology are highlighted through the completion of a literature review.	3
BIOL 315	BIOL 315 - Plant Physiology 2022-2023 An inventory of basic plant mechanisms and plant development. Mechanisms include assimilation, transport, and utilization of water and mineral nutrients and the utilization and distribution of photoassimilates. Plant development includes cell division, tissue culture, meristems, and the role of hormones in plant morphogenesis. Experimental approaches and biotechnology applications of plant molecular biology are stressed.	3
BIOL 316	BIOL 316 - Plant Ecology 2022-2023 The crucial role of plant ecology in shaping major habitats, including those in British Columbia, will be examined. A trip to Salt Spring Island will highlight the threatened Garry oak ecosystem and	3

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	<p>other features of interest. Field trips throughout the course will highlight the population dynamics and interrelationships of plant communities in natural habitats, agricultural crops and managed forests. Critical assessment of planetary stewardship will form a common theme across various issues in plant ecology.</p>	
BIOL 318	<p>BIOL 318 - Tropical Botany 2022-2023</p> <p>As an exploration of the botanical riches of the tropics - focusing on the plant life of Hawaii - this course traces fundamentals of plant taxonomy, physiology, and ecology in relation to complexities of existence on the most isolated island chain in the world. Issues related to indigenous vegetation, including effects of introduced animals and plants, agriculture, and ethnobotany, are discussed. The course involves one week of lectures at Trinity Western and two weeks of lectures and field work in Hawaii.</p>	3
BIOL 321	<p>BIOL 321 - Animal Ecology 2022-2023</p> <p>Interrelationships between animals and their biotic and physical environments, emphasizing animal population dynamics in old growth pine forests and bogs. This field-intensive course centers on the ecology of northern Michigan fauna from a stewardship perspective. Included are individual student projects.</p>	4
BIOL 322	<p>BIOL 322 - Aquatic Biology 2022-2023</p> <p>Ecology, identification, systematics, culture, and care of aquatic plants and animals, and adaptations to freshwater environments as determined by direct investigation in lakes, ponds, bogs, marshes, streams, and in the laboratory. The course assesses human impacts on aquatic species and ecosystems, presents procedures for the stewardship of aquatic habitats, and introduces aquatic restoration ecology.</p>	4
BIOL 326	<p>BIOL 326 - Evolutionary Theory 2022-2023</p> <p>An in-depth survey of evolution as an organizing theory in biology, with emphasis on the primary scientific literature. Topics covered include comparative genomics, sources of variation, natural selection, genetic drift, adaptation, sexual selection, kin selection, kin selection, speciation and phylogenetics.</p>	3
BIOL 333	<p>BIOL 333 - Introduction to Medical Microbiology 2022-2023</p> <p>A study of pathogenic microorganisms and the control of infectious diseases. Topics include: (i) the biology of bacteria, viruses, fungi, protozoa, and helminths; (ii) infectious diseases of temperate and tropical climates; (iii) immunity, immunology, and immunization; (iv) sterilization, disinfection, chemotherapeutic agents; and (v) epidemiology and public health microbiology.</p>	3
BIOL 334	<p>BIOL 334 - Basic and Applied Microbiology 2022-2023</p> <p>An advanced study of topics in basic and applied microbiology. Topics include: (i) the structure, ultrastructure, and biochemical structure of prokaryotes, eukaryotes, and viruses; (ii) microbial</p>	3

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	biochemistry and physiology; (iii) microbial taxonomy and phylogeny; (iv) microbial ecology and agricultural microbiology; and (v) industrial microbiology and biotechnology.	
BIOL 336	<p>BIOL 336 - Immunology 2022-2023</p> <p>A lecture course covering current topics in immunology, including: the cellular basis of immunity, the molecular genetics of antibody diversity, the major histocompatibility complex, antigen recognition, lymphocyte development, the complement system, hypersensitivity reactions, and immunodeficiency diseases. The course provides an integrated view of the immune system and the immunologic response to disease.</p>	3
BIOL 340	<p>BIOL 340 - Developmental Biology 2022-2023</p> <p>This course studies animal development and its underlying causal principles including introductory reproductive biology, embryology, and developmental genetics.</p>	3
BIOL 343	<p>BIOL 343 - Human Histology 2022-2023</p> <p>A study of the normal microscopic anatomy of the various tissues and organs of the body with an emphasis on the relationship between structure and function. Special attention is given to the field of human histology with some discussion of the similarities and differences in animals. The laboratory component of the course involves the observation and discussion of representative tissue sections and provides a basic understanding of normal versus abnormal morphology.</p>	3
BIOL 344	<p>BIOL 344 - Environmental Physiology 2022-2023</p> <p>A survey of physiological adaptations of animals to different environments including environmental stress. These adaptations are examined at several levels of organization, from the molecular and biochemical to the function of organ systems and behaviour. Includes in-depth examination of both vertebrate and invertebrate examples.</p>	3
BIOL 345	<p>BIOL 345 - Vertebrate Physiology 2022-2023</p> <p>A course on the physiology of the various organ systems of humans and higher vertebrates. The course provides an integrated view of the organization and functioning of the different organ systems of the body and their role in maintaining homeostasis.</p>	3
BIOL 346	<p>BIOL 346 - Advanced Human Physiology 2022-2023</p> <p>Providing a deeper insight into mechanisms underlying a broad range of physiological phenomena, this course emphasizes the integration of the homeostatic mechanisms involving the various organ systems.</p>	3
BIOL 358	<p>BIOL 358 - Field Techniques in Wetlands 2022-2023</p> <p>A comprehensive overview of wetland ecosystem processes, values, legislation, and quantification. Students will learn to evaluate and quantify soils, hydrologic status, and vegetation in a variety of wetland ecosystems including bogs, emergent marshes, forested wetlands, and</p>	4

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	wetlands converted for agriculture, and to apply standard tools developed by the US Army Corps of Engineers and Michigan Department of Environmental Quality to assess wetland extent and habitat quality.	
BIOL 359	<p>BIOL 359 - Marine Mammals 2022-2023</p> <p>Biology, behavior, ecology, identification, and conservation of the marine mammals of the Pacific Northwest. This course examines habitats of marine mammals in Puget Sound and the Salish Sea, with special attention to diving physiology, social behavior, and communications of whales and seals. The course aims to develop a stewardship perspective rooted in biological principles and directed at the global conservation of marine mammals and their ecosystems. Special attention is given to their use by cultures of the region and the relation of such use to current controversies in management of marine mammals.</p>	4
BIOL 360	<p>BIOL 360 - Invertebrate Zoology 2022-2023</p> <p>A survey of the invertebrate phyla with particular reference to their phylogenetic relationships. Laboratories and field trips provide hands-on experience studying both terrestrial and marine invertebrates of the Pacific coastal region.</p>	3
BIOL 361	<p>BIOL 361 - Field Biology in Spring 2022-2023</p> <p>A field-based introduction to the natural history of northern Michigan and its plants and animals, including their field identification, field biology, behavior and landscape context, with a focus on spring activity of biological communities. This course provides prospective teachers and naturalists with an opportunity to investigate the natural history in this very active time of year.</p>	4
BIOL 362	<p>BIOL 362 - Marine Ecology 2022-2023</p> <p>A study of the ecological relationships of marine life in several major habitat types. Emphasis is on productivity, food webs, nutrient cycling, and community ecology. Ecosystem parameters are investigated through field and laboratory studies. Part of coursework takes place in the Lower Mainland, Gulf Islands, and/or Vancouver Island.</p>	3
BIOL 364	<p>BIOL 364 - Coral Reef Ecology 2022-2023</p> <p>A field course focusing on the systematics and ecology of tropical coral reef organisms. Plants, animals, and physical factors of a fringing coral reef are examined through snorkeling excursions and laboratory studies. One species is chosen for a detailed research project. Includes field course work in Hawaii.</p>	3
BIOL 365	<p>BIOL 365 - Insect Ecology of Streams, Forests, and Fields 2022-2023</p> <p>Life history, behavior, and ecology of terrestrial and aquatic insects and their roles in pollination, herbivory, predation, agroecosystems, disease and vector epidemiology, invasion ecology, soil ecology, biodiversity and freshwater ecology. Practical applications include study of Integrated Pest Management (IPM) approaches to reduce negative impacts of pest species in agricultural,</p>	4

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	structural, and medical settings while preserving biodiversity and ecosystem functionality.	
BIOL 367	<p>BIOL 367 - Conservation and Development in the Indian Tropics 2022-2023</p> <p>An introduction to the conservation, historical and ongoing development, and comparative analysis of coastal ecosystems, the plains and montane tropical ecosystems of the Western Ghats, an internationally recognized biodiversity hotspot containing multiple ecosystems stratified by altitudinal zonation. The course is taught on-site at a variety of ecosystem preserves and national parks. Topics include tropical ecosystem structure and function, adaptations of flora and fauna, biodiversity surveys, past and present human interactions with the landscape, and autecology of selected plant and animal species.</p>	4
BIOL 368	<p>BIOL 368 - Forest Ecology 2022-2023</p> <p>The Pacific Northwest is home to towering lowland temperate rain forests, montane forests on the slopes of the Cascades, and subalpine parkland near treeline in the Olympics. Join us as we study the abiotic environment, species interactions, and ecosystem processes in these contrasting forest ecosystems. Research approaches relevant to forest systems will be introduced. Quantitative skills including data collection, management, and basic analysis will be emphasized.</p>	4
BIOL 371	<p>BIOL 371 - Introduction to Genetics 2022-2023</p> <p>An introduction to the study of heredity. Emphasizes classic genetics of populations and individuals in viruses, bacteria, plants, and animals.</p>	3
BIOL 372	<p>BIOL 372 - Molecular Genetics 2022-2023</p> <p>This course considers modern developments and techniques in genetics, especially the basic and applied aspects of recombinant DNA technology.</p>	3
BIOL 384	<p>BIOL 384 - Principles of Biochemistry 2022-2023</p> <p>This course studies chemical structure, function, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. This class is continued as BIOL 386.</p>	3
BIOL 386	<p>BIOL 386 - Biosynthesis 2022-2023</p> <p>This course explores the modern understanding of the biochemical transfer of genetic information: DNA structure and synthesis, transcription and translation. This course also examines the regulatory mechanisms of gene control in prokaryotes and eukaryotes, as well as protein structure and function. The central theme of the course is to illustrate the significance of nucleic acid and protein biochemistry in modern biology.</p>	3
BIOL 390	<p>BIOL 390 - Biology & Christian Theology 2022-2023</p> <p>This course is designed to untangle some of the actual or perceived dissonance between issues of biological science and Christian theology. Six major topics are addressed: (1) models,</p>	3

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	<p>analogies, and metaphors in science and Christian theology; (2) scientific and religious investigations of the biosphere; (3) defining human nature; (4) defining non-human nature; (5) caring for the earth; and (6) the biomedical revolution. The common threads among these topics are the tension between Christian faith and the findings of basic and applied biology (biotechnology), and the call to action required in a faith-based view of creation. As well as speaking from their own disciplines and background, the course instructors take part in panel discussions at the end of each of the six units to foster discussion and dialogue on the issues. Student participation is encouraged by group projects that develop and present a position paper on an area that engenders dissonance between scientific and religious worldview perspectives.</p>	
BIOL 390A	<p>BIOL 390A - Directed Individual Study 2022-2023</p> <p>Field or laboratory study of a problem selected by the student in consultation with a professor, and presented as a written proposal in advance of the session in which the study is to be conducted. Normally, problems are outgrowths of previous coursework with a given professor at Au Sable.</p>	1, 2, 3, 4
BIOL 400	<p>BIOL 400 - Directed Studies in Biology 2022-2023</p> <p>Students are required to produce an outline of the topic to be studied in consultation with the instructor. A course of reading and/ or experimentation is pursued according to the approved outline. Assessment may be via examination and/or a final written report.</p>	3
BIOL 409	<p>BIOL 409 - Thesis Preparation 2022-2023</p> <p>Students will be required to choose a topic for their senior thesis (BIOL 409-410/GENV 409- 410) in consultation with an instructor. Selected readings and references pertinent to the topic will be assigned. A final written report will be presented consisting of a detailed thesis proposal and a review of the literature.</p>	1
BIOL 410	<p>BIOL 410 - Senior Thesis 2022-2023</p> <p>Research in a chosen area of biology or environmental studies with a final written report. Presentation of research findings will also be made by the student in a poster session.</p>	2
BIOL 411	<p>BIOL 411 - Senior Thesis 2022-2023</p> <p>In this course, students research a chosen area of biology and provide a final written report. Students present research findings in a seminar. This course option allows students with larger projects to gain extra credit.</p>	3
BIOL 423	<p>BIOL 423 - Advanced Cell and Molecular Biology 2022-2023</p> <p>A laboratory course emphasizing advanced techniques in cell biology, molecular biology, and developmental genetics. Topics include functional genomics, mobile genetic elements, somatic clonal analysis, molecular cloning, and epifluorescence/ confocal microscopy. This course is designed for students who are interested in a career in the life sciences and who wish to familiarize themselves with a number of applied laboratory techniques.</p>	3

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BIOL 433	<p>BIOL 433 - The Human Microbiome 2022-2023</p> <p>This course will focus on the human microbiome and the complex symbiotic relationships, exploring the impacts of those host-microbe interactions on physical and mental health. The course will also examine the current research tools and emerging applications within the field.</p>	3
BIOL 438	<p>BIOL 438 - Virology 2022-2023</p> <p>This course provides a basic understanding of some of the current topics in modern virology including the structure, classification, and replication of viruses, virus-cell interactions, diagnostic and research applications in virology, and the molecular biology of several important viruses causing disease in humans and animals. Special emphasis is given to viral pathogenesis making this course suitable for those pursuing careers in medicine or related fields.</p>	3
BIOL 440	<p>BIOL 440 - Developmental Neurobiology 2022-2023</p> <p>A study of the development of the nervous system in humans and invertebrate and vertebrate model organisms. Topics covered include neurogenesis, the development and cell biology of neurons and glia, developmental genetics, and nervous system defects arising from abnormal development.</p>	3
BIOL 450	<p>BIOL 450 - Neuroscience 2022-2023</p> <p>An advanced course in neuroscience which examines current research on the cellular organization of the brain as well as the role of physiological processes in human thought, emotions, and behaviour. Interactions between physiological and psychological processes are emphasized. Laboratory experiments focus on the basics of recording bioelectric potentials in invertebrates and humans.</p>	3
BIOL 470	<p>BIOL 470 - Introduction to Bioinformatics 2022-2023</p> <p>An overview of the interdisciplinary science of genomics, proteomics, and bioinformatics which applies the tools of information technology (computer hardware and software) to analyze biological data such as gene or protein sequences. This course examines the theory of bioinformatics as well as its practical application to biological problems using approaches such as BLAST searches, phylogenetics, and protein structure function analysis.</p>	3
BIOL 474	<p>BIOL 474 - Genetics and Cell Biology of Neoplasia 2022-2023</p> <p>A lecture course reviewing a wide range of topics related to cancer including the biology and immunology of tumor cells, chemical and viral carcinogenesis, oncogenes, genetic predisposition to cancer, and treatment strategies.</p>	3
BIOL 475	<p>BIOL 475 - Protein Structure and Function 2022-2023</p> <p>An in-depth study on protein biochemistry, with a focus on the relationship between protein structure and its corresponding function on a molecular and organismal scale. This course will also cover recent developments in protein research, including the use of proteomics in systems</p>	3

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	biology and medicine, particularly drug development.	
BIOL 484	<p>BIOL 484 - Applied Ecology 2022-2023</p> <p>An exploration of various practical applications of biology in environmental management, monitoring, and remediation. Topics include many important areas of concern such as wildlife management, fisheries, forestry, agriculture, water and air pollution, and protection of endangered ecosystems. Various biological approaches to these are considered, such as population modelling, ecophysiology, microbiology techniques, biomonitoring, ecosystem health, and biodiversity inventories. The implications of environmental ethics and the role of Christian environmental stewardship are discussed.</p>	3
BIOL 490	<p>BIOL 490 - Advanced Biotechnology 2022-2023</p> <p>This capstone course in biotechnology considers the theoretical and practical aspects of implementing biotechnology, paying particular attention to current issues including: (1) technology transfer and commercialization; (2) patent protection in biotechnology; (3) Good Laboratory Practices (GLP); (4) Good Manufacturing Practices (Food and Drug Regulations, 2002 edition); (5) Good Clinical Practices (GCP); (6) Research Ethics Board guidelines; (7) validation studies; (8) downstream processing and the recovery of purified products; (9) novel developments in methodology. The course includes a seminar series by industry and regulatory experts and site visits to local biotechnology companies to assess how they have implemented and overcome obstacles to production and quality control.</p>	3