



## **BIOLOGY MINOR**

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Students completing a Biochemistry Major may not also receive a Biology minor.

**\*\*Note that placement of experimental courses (marked with asterisks) within the minor is subject to change.**

In order to earn a Minor in Biology, students must earn a letter grade of C- or better in all minor courses needed. At least 50% of all Biology hours used to satisfy the minor (11-12) must be Westminster courses.

You can find the course descriptions for all courses required for this minor by clicking on the following links:

- [Biology Course Descriptions](#)

Student's Last Name

First Name

Middle Initial

Advisor

Date Minor Declared

Course #	Title of Course	Hours Required	Semester Completed	Grade
<b>Level I: Introductory Courses (8 hrs)</b>				
<i>This level must be completed before Level II</i>				
BIO 124/125	Biological Diversity	4		
BIO 114/115	Biological Processes	4		
<b>Level II: Intermediate Courses (8 hrs)</b>				
<i>Students take two of the following courses. At least 1 course from this group must be completed before Level III. The 2<sup>nd</sup> course must be completed by the end of the Junior year.</i>				
BIO 205	Ecology & Field Biology	4		
BIO 301	Genetics	4		
BIO 302	Human Anatomy	4		
BIO 322	Vertebrate Biology	4		
<b>Level III: Advanced Courses (6-8 hrs)</b>				
<i>Students take two of the following courses. Note: Some courses may have specific prerequisites from Level II.</i>				
BIO 204	Animal Behavior	4		
BIO 208	Functional Plant Morphology	4		
BIO 210	Biogeography	3		
BIO 303	Microbiology (BIO 114/115 & 124/125 prereqs)	4		
BIO 310	Environmental Toxicology	3		
BIO 314	Vertebrate Histology (Indep. Study only)	3-4		
BIO 315	Entomology	4		
BIO 318	Ornithology	4		
BIO 320/321	Biology in Belize (or equivalent)	4		
BIO 325	Molecular Cell Biology	4		
BIO 330	Virology (BIO 301 recommended)	3		
BIO 372	Developmental biology (BIO 301 prereq)	4		
BIO 404	Biochemistry (CHM 314/315 prereq, 324/325 coreq)	4		
BIO 415	Human Gross Anatomy (BIO 302 prereq)	4		
BIO 420	Physiology (BIO 302 or 322 prereq)	4		
BIO 450	Evolution (BIO 301 recommended)	4		
ENV 350	Conservation Biology	3		
<b>TOTAL HOURS FOR MINOR</b>		<b>22-24</b>		

If any substitutions or waivers of requirements are allowed, please list below and initial.

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## **BIO – Biology**

**BIO 114 Biological Processes** (3 hrs.). An introduction for the beginning student to fundamental organism and cellular processes such as molecular and Mendelian genetics and photosynthesis. Students must take this course in conjunction with BIO 115. This course is typically offered once per academic year in the fall semester. BIO 114/115 will satisfy the Scientific Inquiry (lab) Context in Tier II of New Foundations and the Natural Science Inquiry Theme of Breakthrough general education programs.

**BIO 115 Biological Processes Laboratory** (1 hr.). Students conduct laboratory exercises selected to reinforce and augment lecture topics in BIO 114. Students are involved in setting up and management of experiments and in analysis of collected data. Students must take this course in conjunction with BIO 114. This course is typically offered once per academic year in the fall semester. BIO 114/115 will satisfy the Scientific Inquiry (lab) Context in Tier II of New Foundations and the Natural Science Inquiry Theme of Breakthrough general education programs.

**BIO 124 Biodiversity** (3 hrs.). This course acquaints students with the major subdivisions of the living world. Anatomical, morphological and life cycle characteristics of representatives of the various phyla and classes are introduced and phyletic and functional interrelationships are stressed wherever feasible. Students must take this course in conjunction with BIO 125. This course is typically offered once per academic year in the spring semester. BIO 124/125 will satisfy the Scientific Inquiry (lab) Context in Tier II of New Foundations and the Natural Science Inquiry Theme of Breakthrough general education programs.

**BIO 125 Biodiversity Laboratory** (1 hr.) This is a survey laboratory and is intended to demonstrate the changes in complexity of form and structure in both plants and animals as evolutionary processes have shaped organisms through geological time. Students must take this course in conjunction with BIO 124. This course is typically offered once per academic year in the spring semester. BIO 124/125 will satisfy the Scientific Inquiry (lab) Context in Tier II of New Foundations and the Natural Science Inquiry Theme of Breakthrough general education programs.

**BIO 204 Animal Behavior** (4 hrs.) This course will introduce students to the field of animal behavior focusing on an evolutionary approach. We will examine both proximate and ultimate causes for why animals behave as they do. Topics range from how neural mechanisms control behavior to why

different types of mating systems have developed. This course focuses on how scientists study these areas. Students design and conduct experiments in animal behavior as part of the learning process. This course is typically offered every other academic year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 205 Ecology and Field Biology** (4 hrs.) This course is designed to familiarize the student with the concepts and principles of ecology as a science. A wide variety of organisms and groups of organisms are studied in relation to various environmental conditions. Short local field trips are used to acquaint students with collecting, census, and ecological measurement techniques and devices. This course is typically offered every academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 206 Laboratory Instruction Techniques** (1 hr.) This course is open to students who are qualified to serve as laboratory assistants in various biology courses. Students assist instructor in the laboratory and serve as mentors for students in course. This course is typically offered every semester during the academic year. Prerequisites: open by invitation to students who have earned an A or B average in NSC 108, BIO 124/125 (or BIO 100 General Biology I), or BIO 114/115.

**BIO 208 Functional Plant Morphology** (4 hrs.) This course is designed as an integrated study of the gross morphology, internal anatomy and physiology of vascular plants. Laboratory studies emphasize the interrelationships between plant form and function. This course is typically offered every other academic year in the spring semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 210 Biogeography** (3 hrs.) Biogeography is the study of the distribution of biodiversity over space and time. It aims to reveal where organisms live and at what abundance. It addresses the questions of which species, where and why (or why not). Biodiversity is viewed in light of historical factors, such as speciation and extinction, plate tectonics and glaciations, as well as in the light of current and future threats, including but not limited to climate change. This course is typically offered every other academic year. Prerequisites: BIO 124/125 and 114/115 for Biology and Environmental Science majors; NSC 108 and ENV 105 for non-majors.

**BIO 212 Research Methods in Biology and Environmental Sciences** (3 hrs.) Research methods will introduce you to tools and techniques used in the scientific research laboratory by offering a hands-on research experience allowing data collection, storage, and analysis. Topics include an examination of research types, design, and methodology, scientific communication, and data analysis. Prerequisites: BIO 114/115 and BIO 124/125 or CHM 114/115 and CHM 124/125. MAT 114 is recommended.

**BIO 301 Genetics** (4 hrs.) This course will be an introduction to and a survey of the science of genetics. Topics covered will include classical “Mendelian” genetics, population genetics, and modern molecular genetics. The laboratory will augment these approaches with traditional studies in fly genetics and current practices in molecular genetics. This course is typically offered once per academic year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 302 Human Anatomy** (4 hrs.) This class is designed for students who are preparing for careers in health-related clinical or research professions or have a deep interest in understanding how the human body works. You will learn about the human form at the gross anatomical level delivered as a regional approach typical of professional schools. In the laboratory, we will be using anatomical models, skeletons, radiographs, and dissection to enhance your understanding of anatomy. This course will challenge you to apply this information to real world clinical and pathological problems. This course is typically offered every academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 303 Microbiology** (4 hrs.) This course serves as an introduction to the structure, physiology, pathogenicity and ecology of microorganisms, particularly the bacteria and viruses. Laboratory work involves effective use of the microscope, staining procedures, handling of pure cultures, analysis of bacterial physiology and identification of unknown bacteria. This course is typically offered once each academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I), BIO 114/115.

**BIO 310 Environmental Toxicology** (3 hrs.) In this course, you will be introduced to the field of environmental toxicology from a biological perspective. We will discuss uptake of chemicals from the environment, biotransformation, and toxicity. We will examine a wide array of endpoints from cellular biomarkers to population-level effects in invertebrates and vertebrates, including humans.

Prerequisites: BIO 124/125 and BIO 114/115

**BIO 314 Vertebrate Histology** (2-4 hrs.) The aim of this course is to introduce students to the microscopic anatomy and histophysiology of vertebrates. Particular emphasis will be placed on the interrelation between structure and function. In addition, this course will teach students to become proficient in using the microscope to interpret fine structure. This course is typically offered as independent study. Prerequisite: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 315 Entomology** (4 hrs.) This course focuses on the biology of insects with the following three objectives: (1) An introduction to common methods used in the field of entomology. (2) The ability to identify many common insect orders and families, since it is impossible to understand something if you do not know what it is. Finally, (3) an introduction to the evolution, behavior, and ecology of this fascinating group. This course is typically offered every other academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 318 Ornithology** (4 hrs.) Ornithology is the study of avian biology (birds). The broad goals of this course will be to (1) introduce you to the evolution, behavior, and ecology of birds; and (2) provide you with the ability to identify many common bird species in the wild by sight, sound, behavior, and habitat. This course meets twice a week in a lecture/laboratory class setting. Several trips will be taken into the field to identify birds. Please note that on rare occasions, the class period may run 10-20 minutes longer to accommodate longer trips afield. This course typically is offered every other academic year in the spring semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 320 & 321: Biology in Belize** (4 hrs.) This course serves as an introduction to the natural history, geography, pre- and post-Columbian history, land-use patterns, and current political climate of Belize, Central America. Following a preparatory spring semester seminar (BIO 320), a three-week Summer Session course (BIO 321) will be taught in Belize where students will study the biota of the offshore caves, coral reefs, grassland savannas and neo-tropical jungles. Special attention will be paid to local land use and conservation issues and the effects of ecotourism on the local economy and relevant ecosystems. Prerequisites: Completion of at least two courses in biology or permission of the instructor.

**BIO 322 Vertebrate Biology** (4 hrs.) Vertebrate Biology takes a comparative approach to the study of the diversity of vertebrate life both extinct and extant. Anatomy, ecology, behavior, and evolutionary history will all be discussed as part of a broad introduction to the vertebrates. The dissection of representative species of the major vertebrate groups is the focus of the weekly laboratory. This course is typically offered every other academic year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 325 Molecular Cell Biology** (4 hrs.) This course is a study of eukaryotic cells at the molecular level. Topics include protein biosynthesis and trafficking, membrane structure and function, cellular, subcellular, and extracellular structure, and the cell cycle. The course correlates the cellular structures to their function within the cell. The laboratory is designed to complement these topics, with an emphasis on student self-design. This course is typically offered once every one-two academic years. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115. BIO 301 Recommended.

**BIO 328 Insects and Human Affairs** (3 hrs.) This course provides an introduction to insects and their interactions with humans. Human beings and insects will be compared with respect to both form and function, and students will learn to distinguish the major groups of insects. The course will examine the effects of insects on agriculture (both harmful and helpful), the impact of insects on the course of human history, and their representation in art, music, and literature. This course is typically offered every other academic year in the spring semester. BIO 328 will satisfy the Scientific Inquiry (non-lab) Context in Tier II of the General Education Program and the STEM and Society Explorative Cluster of Breakthrough general education program.

**BIO 330 Virology** (3 hrs.) This course will introduce students to the basic biology of viruses and then look at some contemporary issues that involve viruses. Topics covered will include the cellular and molecular mechanisms of virus reproduction including virus structure, virus-cell interactions, virus infection, oncogenes, and viral transformation of cells to cancer. We will also consider the evolution and ecology of viruses and the epidemiology of viral infections. Examples will be taken from bacterial, plant, and animal viruses, including newly emerging viruses. Contemporary topics will include the AIDS epidemic, emerging pathogens such as West Nile virus, bird flu, or Ebola virus, the renewed threat of smallpox, etc. Portions of the course will include student-led discussions of specialized topics of their choice. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115. BIO 301 recommended.

**BIO 335 Medical Terminology** (1 hr.) The course is designed to help students develop a vocabulary for accurately describing the human body and associated components, conditions, processes. This systematic approach to word building and term comprehension is based on the concept of: (1) word roots, (2) prefixes, and (3) suffixes primarily derived from Latin and Greek origins. This course is typically offered every academic year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I), BIO 114/115, and permission of instructor required.

**BIO 372 Developmental Biology** (4 hrs.) How does the fertilized egg transform into an organism? What changes over time lead to the specialized tissues and organs of animals? Developmental Biology is a survey of animal development, from sperm and unfertilized egg through embryonic development. Molecular, cellular, genetic, and organismal topics will be included. This course will complement your studies of genetics, cellular, animal, and human biology as we discuss how genotype becomes phenotype. The laboratory will include descriptive and experimental approaches. Typically offered every other year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I), BIO 114/115 and BIO 301 (Or with permission).

**BIO 398 Independent Research Projects** (1-4 hrs.) Students interested in independent reading or developing individual research projects may enroll in BIO 398 for variable credit. The faculty in the department strongly encourages students majoring in biology to develop and pursue at least one research project. This course is typically offered every semester during the academic year. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115, as well as permission of the department chair.

**BIO 404 Biochemistry** (4 hrs.) This course is an advanced survey course for students who expect to continue graduate study in biology or continue on to a professional career in a health-related field. Topics include a detailed study of the structure of biological molecules and the function of enzymes, followed by a survey of basic intermediary metabolism. The laboratory is a project-based laboratory incorporating many of the principles covered in lecture. This course is typically offered once each academic year in the spring semester. Prerequisites: CHM 314, 315, 324, and 325 (CHM 324 & 325 can be taken concurrently with BIO 404), BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115.

**BIO 415 Human Gross Anatomy** (4 hrs.) Students will complete a human dissection, as a team, with a minimum of 6 hours of contact per week. The dissection will be completed as it would in a medical school gross anatomy course, to include a complete regional dissection. Additionally, an assessment of the health of the donor will be completed. The students will be required to share their findings with the community and in other courses as appropriate. This course is typically offered once each academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I), BIO 114/115, and BIO 302 (Must have been taken at Westminster). The course is by application and consideration of faculty in the department, and requires instructor permission.

**BIO 420 Physiology** (4 hrs.) This class is designed for students who have a deep interest in understanding how the human body works. Physiological principles and examples will be geared towards humans, but in many instances are also applicable to other vertebrates. You will learn about how the human body functions at molecular, cellular and systems levels. This course will challenge you to apply this information to real world clinical and pathological problems. You will be expected to critically evaluate current scientific literature and discuss recent scientific findings with your fellow classmates. You will learn how to use physiological lab equipment and then conduct an independent research project. This course is typically offered once each academic year in the spring semester. Prerequisites: BIO 114/115, BIO 124/125 (or BIO 100 General Biology I) and BIO 302 or BIO 322 with a grade of C- or better.

**BIO 450 Evolution** (3 hrs.) Evolution is the unifying theory of biology. This course will examine Charles Darwin's theory of evolution by means of natural selection looking at the development of this theory and its modern applications. Topics will include the fundamental mechanisms for evolution, including those that are both adaptive and neutral with respect to the process of adaptation; human evolution; the origin and definition of a species; molecular evolution; the relationship between evolution and religion; and modern challenges, modifications, and support for this far-reaching theory. This course is typically offered every academic year in the fall semester. Prerequisites: BIO 124/125 (or BIO 100 General Biology I) and BIO 114/115, junior or senior status.