

BIOLOGICAL SCIENCES (Updated May 2018v2)

Dr. Brett Serviss, Chair; Dr. Bray, Ms. Benjamin, Ms. Crain, Dr. Engman, Dr. Finley, Dr. Fuller, Mr. Leible, Ms. Martin, Ms. Smith, Dr. Tumlison

The mission of the Department of Biological Sciences is to offer a superior undergraduate education in biology. The structure of the program allows students substantial freedom to individualize their course of study, while still ensuring that each receives a broad exposure to fundamental areas in the field of biology, as well as solid foundations in chemistry and mathematics. The laboratory experiences offered by the department require that students develop competence in the use of modern biological techniques, and in the analysis, interpretation, and presentation of data.

The Department offers courses designated to meet the needs of students preparing for professional careers in industry, government, and education; and to provide a strong foundation for students preparing for graduate work. Courses that develop an understanding and appreciation of the living world as a part of a liberal education are provided for all students. Appropriate courses also are offered to meet requirements for pre-professional work in pre-medical, pre-dental, pre-pharmacy, pre-physical therapy, pre-veterinary, and other paramedical areas.

The ETS Major Field Test for Biology must be taken by graduating seniors with the score to appear on the student transcript.

Major Requirements for the Bachelor of Science Degree in Biology, General Biology and Pre-professional Option

Highly Recommended Courses:

BIO 1013	Introduction to Biology
BIO 1021	Introduction to Biology Laboratory
CHM 1034	General Chemistry for Non-Majors
CHM 1044	General Organic and Biochemistry for Non-Majors

Required Courses:

BIO 2104	General Botany
BIO 2114	General Zoology

Note: Biology majors are required to enroll in and successfully complete botany (BIO2104) and zoology (BIO2114) within their first four semesters at HSU. Students must meet with their faculty advisor to determine the schedule appropriate for them.

BIO 2094	Microbiology
BIO 3054	Genetics
BIO 3524	General Ecology
BIO 4214	Cell Biology

Choose one of the following:

BIO 3304	Plant Physiology
BIO 3314	Animal Physiology

Choose one of the following:

BIO 3084	Comparative Anatomy and Evolution of Vertebrates
BIO 3244	Comparative Morphology and Evolution of Plants

A minimum of two additional upper-level courses in biology must be selected. These may be from the courses listed above or others listed in the Henderson catalog. Two semesters of Human Anatomy and Physiology will satisfy one of these requirements. BIO 4251, BIO 4373, and BIO 4823 may not be used for this requirement.

Additional requirements:

CHM 1014, 1024 University Chemistry I and II (including laboratories)
CHM 3063, 3073 Organic Chemistry I and II
CHM 3051, 3131 Organic Chemistry I and II Laboratories
MTH 1243 College Algebra and STA 2054 Applied Biostatistics or STA 2323 Statistical Methods, or equivalent/more advanced courses, with departmental approval.
PHY 2034, 2044 General Physics I and II

Total hours required for a major in biology: general biology and pre-professional (68-71)

- Biology Courses: 38-40 Hours
- Physical Science and Mathematics Courses: 30-31 Hours
- Students must have a “C” grade or better in all courses in the major field and in the courses listed as “additional requirements.”
- The Department of Biological Sciences highly recommends that students achieve competence in the use of computers for word processing, graph and spreadsheet construction, and PowerPoint presentations before enrolling in upper-level courses. Students should consider enrolling in Introduction to Computers (CSC 2003) if their background in computer use is weak.

Major Requirements for the Bachelor of Science Degree in Biology, Wildlife and Field Biology Option**Highly Recommended Courses:**

BIO 1013 Introduction to Biology (majors section)

BIO 1021 Introduction to Biology Laboratory

Biology Core Courses (22 hrs):

BIO 2104 General Botany

BIO 2114 General Zoology

Note: Biology majors are required to enroll in and successfully complete botany (BIO2104) and zoology (BIO2114) within their first four semesters at HSU. Students must meet with their faculty advisor to determine the schedule appropriate for them.

BIO 3054 Genetics

BIO 4383 Wildlife Biology

BIO 4393 Wildlife Management Techniques

BIO 3524 General Ecology

Organismal Courses — Choose 3 of the following – must include one animal and one plant course (12 hrs):

BIO 3294 Plant Taxonomy

BIO 3404 Herpetology

BIO 4034 Ornithology

BIO 4074 Dendrology

BIO 4164 Entomology

BIO 4224 Ichthyology

BIO 4344 Phycology

BIO 4354 Mammalogy

Field Ecology — Choose 1 of the following (4 hrs):

BIO 2094 Microbiology

BIO 3494 Biogeography

BIO 4044 Neotropical Ecology
BIO 4204 Aquatic Ecology
BIO 4324 Tropical Marine Biology
BIO 4504 Behavioral Ecology

Organismal Anatomy — Choose 1 of the following (4 hrs):

BIO 3084 Comparative Anatomy and Evolution of Vertebrates
BIO 3244 Comparative Morphology and Evolution of Plants

Electives — Choose 1 of the following if not used above to fill another requirement (4 hrs):

BIO 2094 Microbiology
BIO 3084 Comparative Anatomy and Evolution of Vertebrates
BIO 3244 Comparative Morphology and Evolution of Plants
BIO 3294 Plant Taxonomy
BIO 3304 Plant Physiology
BIO 3314 Animal Physiology
BIO 3404 Herpetology
BIO 3494 Biogeography
BIO 3544, 3554 Human A&P (both required to count as 1 elective)
BIO 4034 Ornithology
BIO 4044 Neotropical Ecology
BIO 4074 Dendrology
BIO 4164 Entomology
BIO 4204 Aquatic Ecology
BIO 4224 Ichthyology
BIO 4324 Tropical Marine Biology
BIO 4344 Phycology
BIO 4354 Mammalogy
BIO 4504 Behavioral Ecology

Additional requirements:

Chemical Sciences (8 hrs):

CHM 1034 General Chemistry for Non-Majors
CHM 1044 General Organic and Biochemistry

Note: Higher level CHM course(s) accepted, with departmental approval

Physics and Quantitative Sciences (12-14 hrs):

MTH 1243 College Algebra or MTH 1273 Pre-calculus Mathematics
STA 2054 Applied Biostatistics or STA 2323 Statistical Methods

And choose 2 additional courses from MTH (higher than MTH 1243), STA (higher than STA 2054 or STA 2323), PHY (physics), or PHS (physical science)

Total hours required for a major in biology, wildlife and field biology option (62-67)

- Biology Courses: 42-44 Hours
- Physical Science and Mathematics Courses: 20-23 Hours
- Students must have a “C” grade or better in all courses in the major field and also in the courses listed as “additional requirements.”
- The biology department highly recommends that students achieve competence in the use of computers for word

Courses in Biology

BIO 1013 (BIOL1004) Introduction to Biology: A general education course. A study of basic biological concepts and principles. Offered as separate non-majors and majors sections. The department recommends that non-science majors avoid taking this class during their freshman year.

BIO 1021 (BIOL1004) Introduction to Biology Laboratory: Experiments are performed to demonstrate the principles covered in BIO 1013. Two hours per week. Prerequisite or corequisite: BIO 1013.

BIO 2094 (BIOL2004) Microbiology: A comprehensive study of microorganisms with emphasis on conceptual and applied microbiology. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisites: 4 hours of biology and 4 hours of chemistry. Biology majors must complete either BIO 2104 or 2114 prior to enrolling in this course.

BIO 2104. (BIOL1034) General Botany: The study of biological principles and concepts applied to plants. Three (3) hours of lecture and three (3) hours of laboratory per week.

BIO 2114 (BIOL1054) General Zoology: The study of animal relationships, with emphasis on principles, anatomy and ecology. Three (3) hours lecture and three (3) hours laboratory per week.

BIO 2174 Human Anatomy and Physiology I, (non-majors): A study of the structures and functions of human body systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.

BIO 2184 Human Anatomy and Physiology II, (non-majors): A continuation of BIO 2174. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021, BIO 2174 recommended.

BIO 2283 Environmental Science: A study of how ecosystems function in terms of nutrient cycles, energy flow, and population dynamics, with considerations of imbalances in various areas of human concern, such as agriculture, resource utilization, waste disposal, energy sources, and the human population.

BIO 2324/3324 (WI) Tropical Marine Biology: A field course emphasizing study of tropical marine animals and plants, with extensive study of the diverse organisms of reefs, mangroves, rocky shores and seagrass beds. Includes a field component in Belize. Prerequisites: Ability to swim and consent of instructor. This course satisfies the liberal arts core non-western culture requirement.

BIO 3054 (WI) Genetics: A study of transmission genetics followed by molecular genetics. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisite: BIO 2104 or 2114.

BIO 3084 Comparative Anatomy and Evolution of Vertebrates: Traces the evolutionary history of vertebrate animals through a comparative analysis of chordate anatomy with emphasis on the ten organ systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114.

BIO 3244 (WI) Comparative Morphology and Evolution of Plants: Traces the evolutionary history of the plant kingdom through a comparative study of the structure and life cycles of representatives of the major groups of plants. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisite: BIO 2104.

BIO 3294 Plant Taxonomy: A study of basic principles and concepts of plant identification, classification and nomenclature. Laboratory and field emphasis on the description and identification of representatives of major families of vascular plants. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2104.

BIO 3304 (WI) Plant Physiology: A study of plant processes including photosynthesis, carbohydrate metabolism, translocation, mineral nutrition, plant growth hormones, water relationships, and growth and development. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: BIO 2104; CHM 1014 and 1024.

BIO 3314 Animal Physiology: A study of the functions of animal systems with emphasis on the human. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: BIO 2114 and BIO 3544 or BIO 3084; CHM 1014, 1024.

BIO 3404 (WI) Herpetology: A comprehensive study of reptiles and amphibians with emphasis on specimens collected and studied in the field. Three (3) hours lecture and three (3) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO/GEO 3494 Biogeography: An in-depth study and evaluation of the factors affecting the geographic distribution of life on earth. Primary emphasis will be placed on climatic, geologic, and human influence. Dispersal mechanisms, speciation, biodiversity, and evolutionary history will also be investigated. Prerequisite: BIO 2104 and BIO 2114.

BIO 3524 (WI) General Ecology: A study of principles of ecosystem structure and dynamics including energy flow, biogeochemical cycling, community composition and succession, and the distribution and abundance of populations. Includes laboratory and field experiences with ecological problems. Two Saturday field trips required. Prerequisites: BIO 2104 and 2114.

BIO 3544 Human Anatomy and Physiology I (Majors): A study of the structures and functions of human body systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.

BIO 3554 Human Anatomy and Physiology II (Majors): A continuation of BIO 3544. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021, BIO 3544 recommended.

BIO 4034 Ornithology: Taxonomic, behavioral, and ecological aspects of birds occurring in the local fauna. Three (3) hours lecture and three (3) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4044 (WI) Neotropical Ecology: This course introduces students to the history, ecology, and evolution of ecosystems of the New World tropics, with emphasis on the natural history of the Galapagos Islands and mainland South America. Includes a strenuous and challenging 16 day component in Peru and Ecuador. One week is spent aboard ship in the Galapagos Archipelago. Also includes study of the Inca Empire, and aspects of Peruvian and Ecuadorian culture and history. Prerequisites: BIO 2104 and BIO 2114, ability to swim, and consent of the instructor. This course satisfies the liberal arts core physical education activity requirement and the non-western culture requirement.

BIO 4074 Dendrology: A study of woody plants of the local flora with emphasis on field identification, classification, and economic importance. Three (3) hours lecture and three (3) hours field or laboratory per week. Prerequisite: BIO 2104.

BIO 4164 (WI) Entomology: A study of morphology, taxonomy, and metamorphosis of insects and related arthropods. Prerequisite: BIO 2114.

BIO 4194 Animal Histology: The study of the microscopic anatomy and function of animal tissues with emphasis on the human. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisites: BIO 2114, CHM 1014, 1024, and either BIO 3544, 3084, or 3314.

BIO 4204 (WI) Aquatic Ecology: A study of the structure and function of freshwater ecosystems, with emphasis on the dynamics of their physical, chemical and biological components. Prerequisites: BIO 2114, CHM 1014 and 1024.

BIO 4214 (WI) Cell Biology: The molecular biology of the cell with emphasis on structure-function relationships. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: eight hours of biology and CHM 1014, 1024, or consent of the instructor.

BIO 4224 (WI) Ichthyology: A comprehensive study of freshwater fishes and their food with emphasis on taxonomy, ecology and management. Three (3) hours lecture and three (3) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4251 Biological Laboratory Techniques: *For majors only.* Experience is given in planning and assisting in laboratory courses. Prerequisite: Consent of department. May be repeated once.

BIO 4331-3 Independent Study: Study under the direct supervision of a faculty member. May be repeated. Requires chair's approval.

BIO 4344 Phycology: A study of the taxonomy, morphology, ecology, and economic importance of freshwater algae. Three (3) hours lecture and three (3) hours laboratory or field per week. Prerequisite: BIO 2104.

BIO 4354 (WI) Mammalogy: A study of the classification, ecology, natural history, economic importance, techniques and methods of collection, identification, and preservation of mammals. Three (3) hours lecture and three (3) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4371-3 Independent Research: Study of a contemporary biological problem under the direct supervision of a faculty member. A written scientific paper is required. Prerequisites: Twenty hours of biology and consent of the instructor. May not substitute for any core requirement. May be repeated once.

BIO 4383 Wildlife Biology: An introduction to the biological basis for management strategies relating to habitats and populations of wildlife. Topics may include ecological concepts of populations and ecosystems, wildlife habitat needs, population ecology, commercial and recreational uses (hunting and trapping), conservation biology, role of predators, animal behavior and management, and wildlife diseases. Prerequisite: BIO 2114.

BIO 4393 Wildlife Management Techniques: An applied examination of the techniques used in wildlife population management. Topics may include radio telemetry, animal capture and handling, animal surveys and monitoring, age, sex, and reproductive data collection, estimation of populations, assessment of habitat usage and needs in an ecological context, vegetation quantification, and mortality assessment. Prerequisite: BIO 2114.

BIO 4504 Behavioral Ecology: A study of how interactions with other organisms and the environment drive the evolution of adaptive behaviors. Behaviors that are manifest in the biology of animals such as life history, reproduction, resource acquisition, sociality, and survival will be examined. Prerequisite: BIO 3524.

BIO 4563 Biology of Cancer: A study of current concepts and characteristics of cancer, including cancer research and cancer treatment. This course will explore the cellular and molecular mechanisms underlying cancer development with the aim of understanding how changes in the normal growth and division processes lead to the formation of tumors. Topics include the natural history of cancer, oncogenes, tumor suppressors, cancer-causing viruses, epidemiology, health care policy and current therapeutic approaches to cancer treatment and prevention. Prerequisite: BIO3054.

Two-year plan for the rotation of offerings of classes in the biology department. Note: Core courses should be offered exactly per this schedule, except when faculty are on sabbatical; however, need may determine the offering schedule of some elective courses.

Even Years		
	Fall	BIO3554 Human Anatomy and Physiology II (Majors)
		BIO4251 Biology Lab Techniques
		BIO4331 Independent Study
		BIO4373 Independent Research
		BIO4504 Behavioral Ecology
	Spring	
	Core	
BIO1013	Introduction to Biology	
BIO2094	Microbiology	
BIO2104	General Botany	
BIO2114	General Zoology	
BIO3084	Comparative Anatomy & Evolution of Vertebrates	
BIO3314	Animal Physiology	
BIO4214	Cell Biology	
BIO4383	Wildlife Biology	
	Elective	
BIO2174	Human Anatomy and Physiology I (Non-majors)	
BIO3544	Human Anatomy and Physiology I (Majors)	
BIO4034	Ornithology	
BIO4074	Dendrology	
BIO4164	Entomology	
BIO4251	Biology Lab Techniques	
BIO4333	Directed Study	
BIO4354	Mammalogy	
BIO4373	Independent Research	
	Summer 1 (Odd)	
	Core	
BIO1013	Introduction to Biology	
BIO2094	Microbiology	
BIO2104	General Botany	
	Elective	
BIO2174	Human Anatomy and Physiology I (Non-majors)	
BIO3544	Human Anatomy and Physiology I (Majors)	
BIO4251	Biology Lab Techniques	
	Summer 2 (Odd)	
	Core	
BIO1013	Introduction to Biology	
BIO3054	Genetics	
	Elective	
BIO2184	Human Anatomy and Physiology II (Non-majors)	
BIO3324	Tropical Marine Biology (depending on need)	
BIO3554	Human Anatomy and Physiology II (Majors)	
BIO4044	Neotropical Ecology	
BIO4373	Independent Research	
BIO4331	Independent Study	

Odd Years

Fall

Core

BIO1013 Introduction to Biology
BIO2094 Microbiology
BIO2104 General Botany
BIO2114 General Zoology
BIO3084 Comparative Anatomy & Evolution of Vertebrates
BIO3304 Plant Physiology
BIO3314 Animal Physiology
BIO4214 Cell Biology
BIO4383 Wildlife Biology

Elective

BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)
BIO4133 Animal Histology
BIO4204 Aquatic Ecology
BIO4251 Biology Lab Techniques
BIO4331 Independent Study
BIO4344 Phycology
BIO4373 Independent Research

Spring

Core

BIO1013 Introduction to Biology
BIO2094 Microbiology
BIO2104 General Botany
BIO2114 General Zoology
BIO3054 Genetics
BIO3524 General Ecology
BIO4393 Wildlife Management Techniques

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3294 Plant Taxonomy
BIO3554 Human Anatomy and Physiology II (Majors)
BIO4224 Ichthyology
BIO4251 Biology Lab Techniques
BIO4331 Independent Study
BIO4373 Independent Research
BIO4563 Biology of Cancer

Summer 1 (Even)

Core

BIO1013 Introduction to Biology
BIO2094 Microbiology
BIO2104 General Botany

Elective

BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)
BIO4251 Biology Lab Techniques

Summer 2 (Even)

Core

BIO1013 Introduction to Biology
BIO3054 Genetics

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3324 Tropical Marine Biology (depending on need)
BIO3554 Human Anatomy and Physiology II (Majors)
BIO4044 Neotropical Ecology
BIO4373 Independent Research