

# BIOLOGICAL SCIENCES (BIOS)

## BIOS 100 | Nature of Life | 3 cr

Explores nature of living things and current developments in biology. Designed specifically for non-science majors; not for credit toward biological sciences major. Three-hour lecture or online.

**Prerequisites:** None.

**Offered:** Fall, Spring, Summer.

**Meets:** Natural Science: BIOS

## BIOS 101 | Bioscience | 4 cr

This course focuses on biochemistry, cell biology, genetics, and molecular biology. It is intended to provide a background upon which upper division courses will be built. Three-hour lecture; three-hour lab.

**Prerequisites:** MATH 111 or concurrent enrollment; placement into ENGL 100 or higher.

**Offered:** Fall, Spring.

**Meets:** Natural Science: BIOS

## BIOS 102 | Organismal Biology | 4 cr

A broad introduction to the diversity of life, recognizing functional similarities and dissimilarities as related to successful adaptation to the environment. It is intended to provide a background upon which upper division courses will be built. Three-hour lecture; three-hour lab.

**Prerequisites:** MATH 111 or concurrent enrollment; placement into ENGL 100 or higher.

**Offered:** Fall, Spring.

## BIOS 103 | Human Biology | 3 cr

A general course which covers basic information about the human body. Designed specifically for non-science majors; not for credit toward biological sciences major. 3-hour lecture.

**Prerequisites:** None.

**Offered:** Yearly.

**Meets:** Natural Science: BIOS

## BIOS 104 | Environmental Science: Biological Approach | 3 cr

The study of the associations between human populations, biodiversity, resources, technology, lifestyles and environmental crisis from a biological approach. Meets DPI content requirement in environmental education; not for credit toward biological sciences major.

**Prerequisites:** None.

**Offered:** Summer.

**Meets:** Natural Science: BIOS

## BIOS 105 | Human Physiology and Anatomy I | 5 cr

An integrated lecture/laboratory course using a system approach to understand structure and function of the human body. Topics include homeostasis, biological and chemical principles, tissues, skin, skeleton, muscles and digestion, and includes cat dissection and cadaver demonstration. Three-hour lecture; two-hour discussion; two-hour lab.

**Prerequisites:** None.

**Offered:** Fall, Spring.

## BIOS 106 | Human Physiology and Anatomy II | 5 cr

A continuation of BIOS 105; focusing on the nervous, immune, circulatory, respiratory, urinary, endocrine and reproductive systems. Not for credit toward biological sciences major. Three-hour lecture; two-hour discussion; two-hour lab.

**Prerequisites:** BIOS 105.

**Offered:** Fall, Spring.

## BIOS 109 | Biology of Aging | 3 cr

Introduces the process of human aging. Explains fundamental principles of human physiology and how it relates to successful aging. Includes student team presentations.

**Prerequisites:** None.

**Offered:** Spring.

**Meets:** Natural Science: BIOS

## BIOS 114 | Freshmen Seminar in Biological/Health Sciences | 1 cr

Overview of education, careers, and potential growth opportunities in health-related fields and biological sciences. Not for credit towards biological sciences major. Two-hour lecture.

**Prerequisites:** None.

**Offered:** Fall.

## BIOS 190 | Fundamentals of Human Nutrition | 2 cr

A study of requirements and functions of essential nutrients throughout life. Cultural influences on food habits and the basis for diet assessment will also be discussed. Recommended for UW-Milwaukee nursing students. Not for credit toward biological sciences major. Two-hour lecture.

**Prerequisites:** BIOS 106 and CHEM 215 or concurrent enrollment.

**Offered:** Spring.

## BIOS 202 | General Microbiology | 4 cr

Explores structure, growth, reproduction, and activities of microorganisms including medical applications. Covers isolation and propagation of bacteria. Not for credit toward biological sciences major/minor. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 105 or NURS 251; CHEM 102 and CHEM 104, or CHEM 115.

**Offered:** Fall.

## BIOS 207 | Research Process in Biology | 2 cr

Introduces the methods of scientific inquiry and the skills needed to be productive in a research environment. Fosters a dynamic perspective of science, where ongoing observation, experimentation and interpretation continuously shape understanding.

**Prerequisites:** BIOS 101 or BIOS 102; and consent of instructor.

**Offered:** Fall.

## BIOS 210 | Biostatistics | 4 cr

Introduces quantitative methods of scientific inference used in the analysis and design of biological observations and experiments. Topics include measurement, sampling, descriptive statistics, analysis of variance, correlation, regression, and analysis of frequencies. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 101, BIOS 102 and MATH 112, MATH 113 or equivalent.

**Offered:** Fall, Spring.

## BIOS 260 | General Genetics | 4 cr

Explains fundamental principles including transmission, molecular and population genetics. Introduces lab techniques for investigating organisms including microorganisms, plants, lower animals and humans. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 101, BIOS 102; BIOS 210 or concurrent registration and CHEM 102, CHEM 104.

**Offered:** Fall, Spring.

## BIOS 290 | Special Topics in Biological Sciences | 1-4 cr

Selected topics in the biological sciences. May repeat with different topic.

**Prerequisites:** Varies with topic.

**Offered:** Occasionally.

**BIOS 300 | Human Functional Anatomy | 4 cr**

Fundamental study of organization and structure of tissues, organs and systems of the human body and their relationship to function. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 101 and BIOS 102 or consent of instructor.

**Offered:** Fall, Spring.

**BIOS 301 | Cell Biology | 3 cr**

Studies cells and cellular organelles. Emphasizes the relationship between cellular and macromolecular structure and function. Three-hour lecture and one-hour discussion.

**Prerequisites:** BIOS 260, and CHEM 322, or concurrent registration.

**Offered:** Spring (odd years).

**BIOS 303 | Microbiology | 4 cr**

Advanced treatment of the structure, growth and activities of microorganisms including medical microbiology, microbial pathogenesis and environmental microbiology. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 260 or consent of instructor.

**Offered:** Spring.

**BIOS 305 | Principles of Ecology | 4 cr**

Introduces the relations of plants and animals to their organic and inorganic environments emphasizing phenomena and causes of distribution and abundance at the population and community levels. Includes a field-oriented laboratory. Three-hour lecture; three-hour lab; field trips. Cross-listed with: BIOS 505.

**Prerequisites:** BIOS 101, BIOS 102 and BIOS 210.

**Offered:** Fall (odd years).

**BIOS 307 | Biochemical Metabolism | 3 cr**

A study of the chemistry of biological systems with emphasis on metabolism and macromolecular biosynthesis. Three-hour lecture. Cross-listed with: CHEM 307.

**Prerequisites:** BIOS 101, BIOS 102 and CHEM 322 or consent of instructor.

**Offered:** Fall.

**BIOS 309 | Molecular Biology | 3 cr**

Study of DNA, RNA, and Proteins; the regulation or their synthesis; and the important roles they have in cells and organisms. Three-hour lecture/discussion. Cross-listed with: BIOS 509.

**Prerequisites:** BIOS 260; CHEM 322 or concurrent enrollment.

**Offered:** Spring.

**BIOS 311 | Parasitology | 4 cr**

Investigates the biology, ecology, classification, and significance of parasitic animals of humans and wildlife in Southeast Wisconsin. Includes host-parasite interactions, distribution of parasites throughout the world and examination of parasite life cycles and transmission. Three-hour lecture; three-hour laboratory.

**Prerequisites:** BIOS 101, BIOS 102; or consent of instructor.

**Offered:** Fall (odd years).

**BIOS 313 | Invertebrate Zoology | 4 cr**

Explores the diversity, distribution, ecology, and evolutionary relationships of nonchordate animals, emphasizing Arthropoda. Includes experimental research and field surveys. Three-hour lecture; Three-hour lab.

**Prerequisites:** BIOS 101, BIOS 102 and BIOS 210.

**Offered:** Fall (even years).

**BIOS 314 | Evolutionary Biology | 3 cr**

Introduces basic mechanisms of evolutionary change including population genetics and speciation. Considers evolutionary history including phylogenetic estimation, the fossil record, and biogeography. Three-hour lecture. Cross-listed with: BIOS 514.

**Prerequisites:** BIOS 101, BIOS 102, BIOS 260.

**Offered:** Spring.

**BIOS 317 | Developmental Biology | 3 cr**

Study of developmental anatomy and molecular mechanisms of development among representative vertebrate models from cleavage through organogenesis. Three-hour lecture.

**Prerequisites:** BIOS 101, BIOS 102; or consent of instructor.

**Offered:** Spring.

**BIOS 318 | Vertebrate Zoology | 4 cr**

An introduction to the biology of vertebrates with emphasis on structure, diversity, evolution, and distribution. Field trips. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 101, BIOS 102 or consent of instructor.

**Offered:** Fall.

**BIOS 324 | Botany | 4 cr**

Studies plants from the viewpoints of systematics, evolution, morphology and ecology. Field trips. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 101, BIOS 102.

**Offered:** Fall (even years).

**BIOS 329 | Paleontology | 3 cr**

Applies principles, practices, and procedures to important fossil invertebrate groups; generalized discussion of plants and vertebrates; elements of biostratigraphy; paleoenvironmental interpretations. Field trips. Two-hour lecture; two-hour lab. Cross-listed with: GEOS 309.

**Prerequisites:** GEOS 102 or BIOS 102.

**Offered:** Spring.

**BIOS 330 | Topics in Field Biology: | 3 cr**

A field-oriented course including topics such as ecology of major biomes, geographical and geological impact on organisms, aspects of plant/animal systematics. The course will focus on selected areas of interest in field biology. Field trips. Special fees required. One-hour lecture.

**Prerequisites:** BIOS 101, BIOS 102 or consent of instructor.

**Offered:** Occasionally.

**BIOS 333 | Restoration Ecology | 4 cr**

Explores the diversity, distribution, ecology, and evolutionary relationships of nonchordate animals, with an emphasis on Arthropoda. Includes experimental research and field surveys. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 102 or BIOS 104 or ENVS 101.

**Offered:** Occasionally.

**BIOS 336 | Conservation Biology | 3 cr**

Introduces biological and social aspects of conservation. Includes a history of conservation movement emphasizing modern techniques for monitoring and maintaining biological diversity. Focuses on applications to local and regional conservation problems. Three-hour lecture. Cross-listed with: BIOS 536.

**Prerequisites:** BIOS 102 or 104 or ENVS 101.

**Offered:** Occasionally.

**BIOS 340 | Animal Behavior | 4 cr**

Emphasizes the evolution and complexity of animal behaviors based on a variety of animal species from invertebrates to mammals. Three-hour lecture; three hour lab.

**Prerequisites:** BIOS 210.

**Offered:** Fall (even years).

**BIOS 341 | Mammalian Physiology | 3 cr**

Advanced treatment of major mammalian organ systems and their roles in homeostasis.

**Prerequisites:** BIOS 210, CHEM 321, or consent of instructor; BIOS 300 recommended.

**Offered:** Fall.

**BIOS 342 | Mammalian Physiology Laboratory | 1 cr**

Uses models, computer programs, and experiments to examine major mammalian organ systems and their role in homeostasis. Three-hour laboratory.

**Prerequisites:** BIOS 341, concurrent registration in BIOS 341, or consent of instructor.

**Offered:** Fall.

**BIOS 344 | Plant Physiology | 3 cr**

Examines plant growth, development and nutrition from the physiology point of view. Includes aspects of plants in food production, the environment and human health.

**Prerequisites:** BIOS 101, BIOS 102.

**Offered:** Occasionally.

**BIOS 351 | Virology | 3 cr**

Presents a broad overview of viruses and other subcellular infectious agents with respect to their molecular structure, diversity of chemical composition, taxonomy, and strategies of infection and replication. Bacteriophage, plant viruses, and animal viruses will be discussed. Special topics include biotechnological applications of viruses, the remodeling of their hosts by bacteriophage, defense against viral infection, and viruses and cancer.

**Prerequisites:** BIOS 260, CHEM 321, or consent of instructor.

**Offered:** Occasionally.

**BIOS 355 | Biology of Cancer | 3 cr**

Explores the genetic and molecular mechanisms underlying the broad disease of cancer. Three-hour lecture/discussion.

**Prerequisites:** BIOS 260, and CHEM 322 or concurrent registration.

**Offered:** Fall (even years).

**BIOS 390 | Special Topics in Biological Sciences | 1-4 cr**

Selected topics in the biological sciences. May repeat with different topic.

**Prerequisites:** Varies with topic.

**Offered:** Occasionally.

**BIOS 411 | Microbial Physiology and Diversity | 3 cr**

Explores diverse molecular mechanisms of microbial physiology. Topics include microbial regulation of gene expression, metabolism, behavior, symbiosis, and applications to biotechnology. Three-hour lecture/discussion.

**Cross-listed with:** BIOS 611.

**Prerequisites:** BIOS 303 or consent of instructor.

**BIOS 414 | Molecular Evolution | 3 cr**

Examines the evolution of nucleic acids and proteins. Five major topics: genetic variability; the causes of molecular evolution and the neutral theory; methods of detecting genetic variability; the use of molecular markers for estimating phylogeny; and the evolution of genome structure. Three-hour lecture/discussion.

**Cross-listed with:** BIOS 614.

**Prerequisites:** BIOS 309 or BIOS 314, or consent of instructor.

**Offered:** Occasionally.

**BIOS 435 | Experimental Methods/Biochemistry Laboratory | 2 cr**

Familiarization with the use of scientific instruments and techniques, and developing proficiency in the process of scientific investigation. This is a capstone course intended for Biological Sciences majors who have completed all 200-level core courses. Four-hour lab. Cross-listed with: CHEM 308.

**Prerequisites:** CHEM 322 and consent of instructor.

**Offered:** Fall, Spring.

**BIOS 436 | Conservation Biology Lab | 2 cr**

Provides a practical experience applying the theories from general ecology and conservation biology toward developing conservation strategies for species and communities. Cross-listed with: BIOS 636.

**Prerequisites:** BIOS 210; and BIOS 305 or BIOS 336; and consent of instructor.

**Offered:** Spring (odd years).

**BIOS 445 | Experimental Methods in Ecology and Evolution | 2 cr**

Provides a capstone experience in applied field and laboratory research. Includes sampling natural and experimental populations and ecological communities coupled with advanced statistical and analytical methods for ecology and evolution. Cross-listed with: BIOS 645.

**Prerequisites:** BIOS 101, BIOS 102, BIOS 210, BIOS 260 and consent of instructor.

**Offered:** Fall.

**BIOS 453 | Molecular Biology and Bioinformatics of Nucleic Acids | 4 cr**

Covers techniques and theory of nucleic acid isolation (DNA and RNA) and analysis including laboratory and computational methods. Includes common laboratory methods for isolating and characterizing nucleic acids. Eight hour lecture/lab. Cross-listed with: BIOS 653.

**Prerequisites:** BIOS 260, BIOS 309, and consent of instructor.

**Offered:** Fall.

**BIOS 455 | Protein Biochemistry and Bioinformatics | 4 cr**

Provides practical experience in protein expression, purification, and characterization with emphasis on enzymology and use of computer programming for development of relevant bioinformatics applications. Eight-hour lecture/lab. Requires lab fee. Cross-listed with: BIOS 655.

**Prerequisites:** BIOS 260, BIOS 309, and consent of instructor.

**Offered:** Spring.

**BIOS 489 | Molecular Biology and Bioinformatics Senior Project | 1 cr**

Students work independently on a project, applying skills and knowledge acquired from previous course work. Students submit a written report and give a public, oral presentation of their project. May be repeated for maximum of 2 credits.

**Prerequisites:** BIOS 453, BIOS 455; and consent of instructor.

**Offered:** Fall, Spring, Summer.

**BIOS 490 | Advanced Topics in Biological Sciences: | 1-4 cr**

Selected topics in the biological sciences.

**Prerequisites:** Varies with topic.

**Offered:** Occasionally.

**BIOS 494 | Internship | 1-3 cr**

Provides learning experiences in which a student works with a sponsoring organization in either the public or private sector under the joint guidance of a member of the sponsoring organization and a faculty member. Graded credit/no credit. Maximum of 3 credits may be used toward elective credit in the major.

**Prerequisites:** BIOS 210, 2.80 GPA, consent of instructor and department chair.

**Offered:** Fall, Spring, Summer.

**BIOS 495 | Senior Seminar | 1 cr**

Each participant presents several seminars involving literature search, synthesis of research data, and organization into an effective oral presentation.

**Prerequisites:** Senior standing; instructor consent.

**Offered:** Fall, Spring.

**BIOS 499 | Independent Study | 1-3 cr**

Student research performed under the supervision of a regular faculty member. A maximum of 3 credits can be used as electives towards the biological sciences major requirements.

**Prerequisites:** Consent of instructor and department chair; Junior standing and minimum 2.80 GPA in BIOS courses recommended.

**Offered:** Fall, Spring, Summer.

**BIOS 503 | Microbiology | 4 cr**

Advanced treatment of the structure, growth, and activities of microorganisms including medical microbiology, microbial pathogenesis and environmental microbiology. Three hour lecture; three-hour lab.

**Prerequisites:** BIOS 260.

**Offered:** Spring.

**BIOS 505 | Principles of Ecology | 4 cr**

Introduces the relations of plants and animals to their organic and inorganic environments emphasizing phenomena and causes of distribution and abundance at the population and community levels. Includes a field-oriented laboratory. Three-hour lecture; three-hour lab; field trips. Requires lab fees. Cross-listed with: BIOS 305.

**Prerequisites:** BIOS 101, BIOS 102 and BIOS 210.

**Offered:** Fall (odd years).

**BIOS 509 | Molecular Biology | 3 cr**

Regulation of DNA, RNA, and protein synthesis and the control of the synthesis of other macromolecules. Three-hour lecture/discussion.

**Cross-listed with:** BIOS 309.

**Prerequisites:** BIOS 260; CHEM 322 and consent of instructor.

**Offered:** Spring.

**BIOS 514 | Evolutionary Biology | 3 cr**

Introduces basic mechanisms of evolutionary change including population genetics and speciation. Considers evolutionary history including phylogenetic estimation, the fossil record, and biogeography. Three-hour lecture. Cross-listed with: BIOS 314.

**Prerequisites:** BIOS 101, BIOS 102, BIOS 260.

**Offered:** Spring.

**BIOS 536 | Conservation Biology | 3 cr**

Introduces biological and social aspects of conservation. Includes a history of conservation movement emphasizing modern techniques for monitoring and maintaining biological diversity. Focuses on applications to local and regional conservation problems. Three-hour lecture. Cross-listed with: BIOS 336.

**Prerequisites:** BIOS 102 or BIOS 104 or ENVS 101.

**Offered:** Occasionally.

**BIOS 611 | Microbial Physiology and Diversity | 3 cr**

Explores diverse molecular mechanisms of microbial physiology. Topics include microbial regulation of gene expression, metabolism, behavior, symbiosis, and applications to biotechnology. Three-hour lecture/discussion.

**Cross-listed with:** BIOS 411.

**Prerequisites:** BIOS 303 or consent of instructor.

**BIOS 612 | Biometry | 4 cr**

Covers statistical methods for ecological and evolutionary studies. Three-hour lecture; three-hour lab.

**Prerequisites:** BIOS 210 or equivalent; and consent of instructor.

**Offered:** Spring.

**BIOS 614 | Molecular Evolution | 3 cr**

Examines the evolution of nucleic acids and proteins. Five major topics: genetic variability; the causes of molecular evolution and the neutral theory; methods of detecting genetic variability; the use of molecular markers for estimating phylogeny; and the evolution of genome structure. Three-hour lecture/discussion.

**Cross-listed with:** BIOS 414.

**Prerequisites:** BIOS 309 or BIOS 314, or consent of instructor.

**Offered:** Occasionally.

**BIOS 636 | Conservation Biology Lab | 2 cr**

Provides a practical experience applying the theories from general ecology and conservation biology toward developing conservation strategies for species and communities. Cross-listed with: BIOS 436.

**Prerequisites:** BIOS 210 or BIOS 612; and BIOS 305 or BIOS 505 or BIOS 336; and consent of instructor.

**Offered:** Spring (odd years).

**BIOS 645 | Experimental Methods in Ecology and Evolution | 2 cr**

Provides a capstone experience in applied field and laboratory research. Includes sampling natural and experimental populations and ecological communities coupled with advanced statistical and analytical methods for ecology and evolution. Cross-listed with: BIOS 445.

**Prerequisites:** BIOS 101, BIOS 102, BIOS 210, BIOS 260 and consent of instructor.

**Offered:** Fall.

**BIOS 653 | Molecular Biology and Bioinformatics of Nucleic Acids | 4 cr**

Covers techniques and theory of nucleic acid isolation (DNA and RNA) and analysis including laboratory and computational methods. Includes common laboratory methods for isolating and characterizing nucleic acids. Eight-hour lecture/lab. Requires lab fee. Cross-listed with: BIOS 453.

**Prerequisites:** BIOS 260, BIOS 309, and consent of instructor.

**Offered:** Fall.

**BIOS 655 | Protein Biochemistry and Bioinformatics | 4 cr**

Provides practical experience in protein expression, purification, and characterization with emphasis on enzymology and use of computer programming for development of relevant bioinformatics applications. Not open to students with credit in BIOS 455. Eight-hour lecture/lab. Requires lab fee. Cross-listed with: BIOS 455.

**Prerequisites:** BIOS 260, BIOS 309, and consent of instructor.

**Offered:** Spring.

**BIOS 675 | Advanced Molecular Biology | 3 cr**

In-depth coverage of selected research topics in molecular biology, including DNA replication, transcription, translation, and other current topics. Three-hour lecture.

**Prerequisites:** BIOS 260, BIOS 309 or BIOS 509, and consent of instructor.

**Offered:** Yearly.

**BIOS 690 | Advanced Topics in Molecular Biology | 1-4 cr**

Selected advanced topics in the molecular biology.

**Prerequisites:** BIOS 260, BIOS 309 or BIOS 509; and consent of instructor.

**Offered:** Occasionally.

**BIOS 699 | Independent Study | 1-6 cr**

Advanced study performed under the supervision of a regular faculty member. Suitability as an elective for the masters of applied molecular biology is determined on a case-by-case basis by the MAMB program committee.

**Prerequisites:** Consent of instructor and department chair.

**Offered:** Fall, Spring.

**BIOS 711 | Thesis | 1-9 cr**

Dissertation for master of science in applied molecular biology. Graded on a credit/no-credit basis.

**Prerequisites:** Consent of instructor.

**Offered:** Fall, Spring.

**BIOS 731 | Graduate Seminar | 1 cr**

Examines research reports and special topics from recent literature in biological sciences. Graded on a credit/no-credit basis.

**Prerequisites:** Consent of instructor.

**Offered:** Fall, Spring.