

BIOLOGY (BIOL)

BIOL 201. Contemporary Topics in Life Science. (4 Credits)

This course provides students with a study of concepts generally applicable to living systems, including cell structure and function, genetics, heredity, evolution, systems of the human body, and a survey of living organisms. The course is organized around recent advances in science and presents culturally relevant issues and topics for consideration and discussion. Students will be exposed to scientific vocabulary and principles while also examining the history and culture surrounding specific and recent scientific discoveries. Focus will be placed on drawing students into application and integration of science and developing the ability to engage with scientific topics in the popular culture. Three lectures and three hours laboratory. This is a course for non-science majors. Cross-listed with CHEM 201. Additional course fee required: \$95.

Tags: SIP, SP

BIOL 241. Organization of Life: Genetics and Cell Biology. (4 Credits)

This course is a study of the basic organizational structure of living organisms, beginning with the chemical basis of life and its relationship to the higher levels of cellular organization. This course includes a systematic analysis of the roles of nucleic acids, proteins and lipids in the higher levels of biological organization. The mediation of life processes by gene expression, cell metabolism and signal transduction are considered in the context of prokaryotic populations and more complex multicellular organisms. Three lectures, three hours laboratory. Offered every Fall. Additional course fee required: \$95.

Tags: SP

BIOL 242. Diversity of Life: An Introduction to Zoology and Botany. (4 Credits)

This course introduces the biology and diversity of select groups of prokaryotes, fungi, protists, plants and animals. Topics include taxonomic diversity, structure, and introductory physiology at the organ and tissue level. An introduction to plant biology studies the structure, function, and development of plants as organisms and the diversity of algae, fungi, and plants. Three lectures, three hours laboratory. Offered every Spring (main campus) and every Summer (Wheaton College Science Station in South Dakota). Additional course fee required: \$95.

BIOL 304. Bioethics. (4 Credits)

See PHIL 304.

Tags: PI, SIP

BIOL 305. Environmental Ethics. (4 Credits)

An interdisciplinary consideration of environmental issues, exploring scientific understanding of these issues and the philosophical foundations and application of ethics to result in environmental stewardship in terms of personal and corporate responsibility. Completing a Scientific Practice (SP) course is strongly recommended.

Tags: PI, SIP

BIOL 311. Reproductive Biotechnology. (4 Credits)

This course provides an overview of various biomedical techniques that relate directly to the beginnings of human life and/or to reproductive choices or decisions. The techniques considered include various methods of birth control, different forms of assisted reproduction techniques, genetic testing, genetic engineering, and stem cell research and therapy. The course covers the basic biology of these techniques and also considers them from social, theological and ethical perspectives.

May not be applied towards the Biology major. Course is offered occasionally. Prerequisite: One Scientific Practice (SP) course.

Tags: SIP

BIOL 312. Contemporary Environmental Issues. (4 Credits)

An exploration of environmental issues considering the scientific details of environmental processes and problems, the social context of people depending on the environment and human responsibility to live sustainably and care for creation. May not be applied towards the Biology major. Course is offered occasionally. Prerequisite: One Scientific Practice (SP) course.

Tags: SIP

BIOL 318. Global Health. (4 Credits)

An interdisciplinary approach to understanding the global patterns of health and disease. Students in this course will describe and analyze how ecology, social class, race and gender impact the global burden of disease. Students will also consider how our Christian call to love our neighbor impacts our response to the disparities seen in the global burden of disease. It is strongly recommended to take a Scientific Practice (SP) course first.

Tags: GP, SIP

BIOL 319. Introduction to Environmental Ethics. (2 Credits)

An interdisciplinary consideration of ethical issues in the environmental sciences. May be applied toward the legacy general education nature requirement and the Biology major. Counts as upper division science requirement under legacy general education only. Course is offered occasionally. Prerequisite: One legacy general education science laboratory course.

BIOL 323. Introduction to Pharmacology. (4 Credits)

A study of chemicals that affect human physiological systems and the mechanisms by which these chemicals alter cellular and molecular pathways. Class sessions will include lectures, discussion, and student presentations. Course is offered occasionally. Prerequisites: BIOL 241 and CHEM 232.

BIOL 324. Microbiology. (4 Credits)

The study of the biology of microorganisms will emphasize aspects unique to bacteria and archaea, and a brief overview of viruses. Topics include microbial cell structure, metabolism, physiology, genetics, taxonomy, ecology and evolution. Laboratory exercises include techniques for detecting, isolating, cultivating, quantifying, and identifying bacteria. Three lectures, three hours laboratory. Prerequisite: BIOL 241. Additional course fee required: \$95.

BIOL 325. Immunology and Microbial Pathogenesis. (4 Credits)

This course is a study of the molecular and cellular interactions and principles of the vertebrate immune system. Topics include immune system development, humoral and cell-mediated immunity, and the immune system in health and diseases. In addition, immunization, immunodeficiency, autoimmunity and cancer immunology will be discussed. The application of immunology techniques in both basic research and clinical settings will be explored. The immune response to microbial pathogens (bacteria, viruses, parasites) will be integrated through both lecture and primary literature discussion. Class periods will involve lectures and discussion. Prerequisite: BIOL 241.

BIOL 326. Advanced Cellular and Molecular Biology. (4 Credits)

An in-depth study of the types and functions of molecules associated with cells and their effects on cellular structure and function. Topics include macromolecules, energy and catalysis, cellular membranes and transport, the extracellular matrix, organelles, the cytoskeleton, the cell cycle and cancer, and cellular differentiation. Lecture and three hours laboratory. Prerequisite: BIOL 241. Additional course fee required: \$95.

BIOL 327. Developmental Biology. (2 Credits)

A study of the development of form and function during embryogenesis. Consideration of the mechanisms of development will include basic morphological and biochemical changes and the molecular and cellular interactions that lead to these changes. Lecture and three hours laboratory. Prerequisite: BIOL 326. Additional course fee required: \$95.

BIOL 331. Human Anatomy and Physiology I. (4 Credits)

Examination of human musculoskeletal, nervous, endocrine, and cardiovascular systems with an emphasis on their structure, function, and integration. Three lectures, three hours laboratory. Prerequisite: BIOL 241 and BIOL 241L or CHEM 231 and CHEM 231L. Additional course fee required: \$150.

BIOL 332. Human Anatomy & Physiology II. (4 Credits)

Continuation of BIOL 331. Structure, function, and integration of structure and function within the human lymphatic, immune, respiratory, digestive, renal, and reproductive systems. Integration of systems is emphasized. Three lectures, three hours laboratory. Prerequisite: BIOL 331 and BIOL 331L. Additional course fee required: \$150.

BIOL 334. Parasitology. (2 Credits)

Includes classification and identification of major groups of endo- and ecto-parasites. Lifecycles and ecology of parasite transmission will be emphasized. Three lectures. Prerequisite: BIOL 242.

BIOL 335. Invertebrate Zoology. (4 Credits)

A study of the systematics, functional morphology, ecology and research with non-vertebrate organisms. Students are introduced to the amazing diversity of terrestrial and aquatic invertebrates. Field trips to local habitats in addition to the Field Museum and Shedd Aquarium are included. The purpose of this course is to introduce students to often overlooked organisms in the animal kingdom with the goal of cultivating a greater appreciation for this wonderful part of God's creation. Three lectures and three hours laboratory. Prerequisite: BIOL 242. Additional course fee required: \$95.

BIOL 336. Neurobiology of Health. (4 Credits)

A neuroscience course with three major units: the basics of neuroanatomy, neurophysiology, neuroimaging, and the stress response; several key cellular and systems-level circuits within the brain that regulate metabolism, immunity, pain, memory, sleep, and interoception; and behaviors (nutrition, exercise, meditation and prayer) that promote brain health. Class sessions will include lectures, discussions, and student presentations of current research. Prerequisite: BIOL 241 or NEUR 241.

BIOL 338. Economic Botany. (4 Credits)

Principles of plant biology (plant anatomy, biochemistry, physiology, genetics, taxonomy, and ecology) that relate to uses of plants for food, fodder, drugs and other chemicals, lumber, and other uses. Three lectures, three hours laboratory. Prerequisite: BIOL 241 and BIOL 242. Additional course fee required: \$95.

BIOL 339. Plant Physiology. (4 Credits)

Basic principles of plant physiology including photosynthesis, mineral nutrition, water economy, respiration, nitrogen and lipid metabolism, development, growth, and plant growth substances. Three lectures, three hours laboratory. Prerequisite: BIOL 241 and 242 and CHEM 232. Additional course fee required: \$95.

BIOL 342. Introduction to Bioinformatics. (2 Credits)

This course introduces students to bioinformatics tools and analysis methods. Upon completion of the course, students should be more comfortable working with the vast amounts of biomedical and genomic data and online tools that will be relevant to their work in the coming decades. Methods for sequencing DNA and the analysis and comparison of genome data, methods for examining the transcriptomic and proteomic profiles, as well as phylogeny, will be discussed. Implications of various types of bioinformatics data for markers of disease, genetic mechanisms, biosystematics, biodiversity, and ethics of biotechnology will be considered. Prerequisite: BIOL 241.

BIOL 343. Plant Taxonomy. (4 Credits)

Includes systems of classification, distinguishing characteristics of groups, observation, and classification of vascular plants of the Black Hills and environs. Offered during the summer at the Wheaton College Science Station in South Dakota. Course is offered occasionally. Prerequisite: BIOL 242.

BIOL 344. Conservation Biology. (4 Credits)

Conservation Biology is discipline that develops and uses scientific approaches to protect, maintain and restore the biological diversity of Earth's ecosystems. Students will be introduced to the conceptual and theoretical and practical foundations of conservation biology, including the ethical and theological motivations for the practice of the discipline. Specifically, the course will explore the importance of biodiversity, the causes of biodiversity decline, and the primary tools of mitigation such as reserve design, population viability analysis, sustainable harvest, and metapopulation models. Prerequisite: BIOL 351. Additional course fee required: \$20.

BIOL 345. Disease Ecology. (4 Credits)

An interdisciplinary approach to understanding the global ecological patterns and dynamics of disease. Students in this course will describe and analyze how ecology, social class, race, and gender impact the global burden of disease. Students will also consider how our Christian call to love our neighbor impacts our response to the disparities seen in the global burden of ecological stewardship and disease presence and transmission. Prerequisite: BIOL 241 or BIOL 242, and BIOL 351.

BIOL 346. Ecosystem Health. (4 Credits)

Ecosystem Health refers to the state or condition of the dynamic attributes of an ecosystem and the links of ecosystem functioning to human health. Students in this course will learn to assess the health of ecosystem components, processes and services including climate, soil, nutrient cycles, and species relationships, and evaluate the role of humans in changing these processes. Additionally, the course will investigate the relationship between ecosystem and human health through the discussion of topics ranging from sustainable agriculture, zoonotic disease emergence, pollution, and human population growth. Prerequisite: BIOL 351.

BIOL 347. Evolutionary Biology. (4 Credits)

This course will consider the basic principles, mechanisms, and patterns of evolutionary biology including a historical survey of related ideas. The course will also consider the historical and current relationship between evolutionary science and Christian faith. Prerequisite: BIOL 241, 242, and BIOL 351.

BIOL 348. Marine Biology. (4 Credits)

Study of the biology of marine organisms in the context of the geological and physical features of the ocean. Lectures, field trips, and learning snorkeling skills on campus are followed by a field trip to the Caribbean over spring break to apply these concepts to tropical marine environments. Additional fee assessed to cover travel and accommodation costs. Course is offered occasionally. Prerequisite: BIOL 242.

BIOL 349. Animal Behavior. (4 Credits)

This course is designed to help students gain a deeper understanding of the nature of animal behavior, spanning the animal kingdom from invertebrates to vertebrates: from bees to grasshoppers to fish to birds to primates. A comparative and integrative overview of how and why animals as diverse as insects and humans behave the way that they do, linking behaviors to the brain, genes, and hormones, as well as to the surrounding ecological and social environments. Three hours of lecture and three hours of lab will be offered. Prerequisite: BIOL 241. Additional course fee required: \$95.

BIOL 351. Ecology and Evolution. (4 Credits)

This course introduces the conceptual and theoretical foundations of ecology, animal behavior, and evolution. Students will be introduced to population and ecosystem processes as well as longer-term processes of change, including evolution. Evaluation of theories of species dynamics will be viewed in a Christian perspective. Three lectures, three-hour laboratory. Prerequisite: BIOL 241 or BIOL 242. Additional course fee required: \$95.

BIOL 356. Genetics. (4 Credits)

Molecular, cytogenetic, classical, and population concepts of plant, animal, and human genetics. Three lectures, three hours laboratory. Offered every Spring. Prerequisite: BIOL 241. Additional course fee required: \$95.

BIOL 372. Field Zoology. (3 Credits)

A course emphasizing observation and classification of Black Hills animals, with a concentration on insects, reptiles, birds, and mammals. Offered during the summer at the Wheaton College Science Station in South Dakota. Course is offered occasionally. Prerequisite: BIOL 242.

BIOL 382. Field Natural History. (4 Credits)

Introduction to basic field and lab methods used in field natural history. Includes the basic nomenclature of flora and fauna in terrestrial, as well as aquatic systems. Basic geologic processes are discussed, and the major rock formations of the Black Hills are identified in the field. The course also provides an overview of the history and philosophy of natural history. Offered during the summer at the Wheaton College Science Station in South Dakota.

BIOL 385. Special Topics in Biology. (2 Credits)

Seminars or courses in special areas offered at discretion of the department. Additional course fee required: \$95.

BIOL 386. Special Topics in Biology. (4 Credits)

Seminars or courses in special areas offered at discretion of the department.

BIOL 387. Special Topics in Biology. (2 Credits)

Seminars or courses in special areas offered at discretion of the department.

BIOL 388. Special Topics in Biology. (4 Credits)

Seminars or courses in special areas offered at discretion of the department.

BIOL 461. General Biochemistry. (4 Credits)

The chemical reaction mechanisms of life processes. The structure and function of biomolecules. Protein purification and characterization. Enzyme kinetics. Bioenergetics and the role of metabolic interconversions in energy production. Membrane transport, regulation, and compartmentation. Prerequisites: CHEM 342 or 241.

BIOL 495. Biological Research. (2 or 4 Credits)

Laboratory and/or library research conducted with a Wheaton College Biology faculty member or with a biologist at another institution (if pre-approved by the Biology Department). Through laboratory research, students hone skills in using proper lab technique, keeping a laboratory notebook, critical thinking and problem solving, and presenting their findings in oral and/or written format. In library research, students identify and obtain pertinent articles; read, analyze, and critique the articles; and synthesize information presented in the articles. Students must prepare a short research proposal in collaboration with the participating faculty member as a prerequisite for enrolling in the course. Lab fee \$100. Prerequisites: BIOL 241 and BIOL 242.

BIOL 496. Biology Internship. (2 or 4 Credits)

Students gain practical experience during a summer or semester in a biologically-related field. Student work is monitored and assessed by an on-site supervisor and a Biology faculty member. Prerequisites: Biology major with at least junior standing and pre-approval by the Biology Department Chair.

BIOL 497. Biology Research Seminar. (1 Credit)

A weekly seminar featuring presentations and discussions of current research in biology. Most seminars are presented by biologists from other institutions. In the student journal club sessions, students collaborate with faculty in the presentation of recently published articles. Graded Pass/Fail. May be taken up to twice for credit. Can be counted as credit toward the Biology major and is not included in the calculation of the limit of three non-lab courses that can be counted toward the Biology major. One hour per week. Prerequisites: Sophomore or higher standing, Consult current year's course offerings.

BIOL 499. Biology Honors Research and Seminar. (2 Credits)

Laboratory research conducted with a Biology faculty member, and a weekly seminar involving the critique of primary literature and listening to scientific research presentations. Prerequisite: Acceptance to the Biology Honors' Program. (lin)