Nebraska Wesleyan University

Biology

Catalog

2013-2014

About the Program

Two degrees are offered in biology (B.S. and B.A.). The B.S. is more stringent in biology and supporting field requirements than the B.A. Both degrees prepare students for a variety of health career fields (including chiropractic medicine, dentistry, medicine, optometry, osteopathic medicine, podiatric medicine, pharmacy, physical therapy, physician assistant, and veterinary medicine) as well as non-health careers and graduate studies in ecology, animal behavior, evolutionary biology, immunology, reproductive biology, parasitology, botany, plant pathology, genetics, systematics, conservation biology, physiology, molecular biology, and biotechnology.

Students interested in medicine, dentistry, osteopathic medicine, veterinary medicine, and allied health professions should consult with the department chair for preprofessional requirements and a suggested program of study. Preprofessional programs are available in optometry, pharmacy, physical therapy, podiatry, and physician assistant. Students can also gain preparation for numerous graduate school programs in ecology, animal behavior, evolutionary biology, immunology, microbiology, reproductive biology, parasitology, botany, plant pathology, genetics, systematics, conservation biology, physiology, molecular biology, and biotechnology. Students who wish to meet Nebraska certification regulations for secondary teaching of biology should consult the current handbook of the education department.

Majors, Minors & Degrees

Majors

1. Biochemistry and Molecular Biology (B.S.)
2. Biology (B.A.)
3. Biology (B.S.)

Minors

1. Biology

Courses

BIO 001 Perspectives in Biological Science

4 hours

Designed for non-science majors, this general education course will examine the principles of biology within the context of the human experience and covers cell biology, physiology, genetics, evolution, ecology, and the interaction of humankind and the environment.

Three hours of lecture per week.

One 3-hour lab per week.

Not open to biology majors.

(Normally offered each semester.)

BIO 008 Microbiology

4 hours

An introductory study of the structure, physiology, and pathogenicity of microorganisms, with an emphasis on bacteria and viruses that cause infectious diseases in humans. Does not count toward a biology major.

Three lectures per week.

One 3-hour lab per week.

(Normally offered each spring semester.)

BIO 009 Human Anatomy and Physiology

4 hours

An introductory study of cellular physiology and tissues along with a comprehensive study of the integumentary skeletal, muscular, nervous systems, and special senses. Does not count toward a biology major.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): Sophomore standing or permission of the instructor.

(Normally offered each fall semester.)

BIO 010 Human Anatomy and Physiology

4 hours

An introductory study of the blood, cardiovascular lymphatic, respiratory, endocrine, digestive, urinary and reproductive systems in addition to metabolism, fluid and electrolyte balance and acid-base balance of the body. Does not count toward a biology major.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 009 Human Anatomy and Physiology or permission of the instructor.

(Normally offered each spring semester.)

BIO 050 General Biology of Plants

4 hours

An introductory course for biology majors that emphasizes general biological principles of biochemistry, cell biology, genetics, physiology, ecology, reproduction, evolution, and a survey of the diversity of plant life.

Three lectures per week.

One 3-hour lab per week.

(Normally offered each semester.)

BIO 060 General Biology of Animals

4 hours

An introductory course for biology majors that emphasizes general biological principles of population genetics and evolution, development, ecology, morphology, physiology, and the diversity of animal life. Students will complete written work including lab reports and scientific journal summaries.

Three lectures per week.

One 3-hour lab per week.

(Normally offered each semester.)

BIO 160 Cell Biology

4 hours

A course dealing with prokaryotic and eukaryotic cell structure and function emphasizing ultrastructure research, macromolecular synthesis, cell movement, and cell division.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 050 General Biology of Plants, BIO 060 General Biology of Animals, CHEM 051 Chemical Principles and CHEM 120 Organic Chemistry I .

(Normally offered each fall semester.)

BIO 170 Genetics

4 hours

A study of the principles and mechanisms of inheritance and variation, including an introduction to molecular and evolutionary genetics.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 050 General Biology of Plants, BIO 060 General Biology of Animals, CHEM 051 Chemical Principles and CHEM 120 Organic Chemistry I

(Normally offered each spring semester.)

BIO 190 Selected Topics

1 hours

A course designed to treat subject matter not covered in other departmental courses or to provide advanced study of subject matter introduced in other courses. The title, content, and credit hours will be determined by current mutual interests of faculty and students.

Prerequisite(s): To be determined.

BIO 200 An Introduction to Biomedical Ethics

2 hours

An introduction to the ethical issues raised by modern biological and medical research and clinical medicine. Case studies and readings will be used to present the following ethical issues: environmental ethics; patients' rights and physicians' responsibilities; abortion, euthanasia, and definitions of death; allocation of medical resources; humans as experimental subjects; behavioral technologies; genetic testing, screening, and manipulation; and reproductive technologies. Student participation will involve class discussions and oral and written presentations.

One 2-hour lecture/discussion session per week.

Prerequisite(s): Junior standing and at least 16 hours in biology coursework.

BIO 212 Behavioral Neuroscience

4 hours

See PSYCH 212 Behavioral Neuroscience.

BIO 213 Laboratory in Behavioral Neuroscience

1 hours

See PSYCH-213.

BIO 216 Medical Botany

3 hours

A systematic study of chemicals of plant and fungal origin that are used as poisons, hallucinogens, and pharmaceuticals in human health. This course will examine the compounds produced by plants that make medicinal effects possible and the biological mechanisms through which these effects take place in the human body. Ethnobotanical and herbal therapy perspectives in identifying new medicines will also be discussed.

Three lectures per week.

Prerequisite(s): BIO 050 General Biology of Plants and BIO 160 Cell Biology or permission of the instructor.

BIO 217 Medical Botany Lab

1 hours

Laboratory practice in seeding, growing, active ingredient extraction, and utilization of medicinal plants. Emphasis is placed on the survey and identification of important medicinal herb taxa. Students will complete a semester- long project focused on growing a medicinal plant and then isolating and testing extractions for biologic activity.

Prerequisite(s): BIO 050 General Biology of Plants and BIO 160 Cell Biology or permission of instructor.

Corequisite(s): BIO 216 Medical Botany.

BIO 218 Plant Taxonomy

4 hours

A study of the identification, nomenclature, and classification of plants with emphasis on vascular plants.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics or permission of the instructor.

BIO 219 Histology

4 hours

A study of the microscopic anatomy and functions of the mammalian tissues and organs with modern concepts of histophysiology and histogenesis.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

(Normally offered each spring semester.)

BIO 221 Ecology

4 hours

A study of the reciprocal relationships of living organisms and their environments with respect to individuals, populations, and communities.

Three lectures per week.

One 3-hour lab per week, including field and greenhouse work.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics or permission of the instructor.

(Normally offered each fall semester.)

BIO 222 Parasitology

4 hours

A study of morphology, taxonomy, and life histories of the parasitic forms in the animal kingdom and of the diseases caused by them. Special attention is given to parasites of humans.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

BIO 225 Plant Form and Function

4 hours

A study of the development, anatomy, and functionality of plant tissues, systems, and organs in representative members of the plant kingdom.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

BIO 228 Methods for Teaching Science in Middle and Secondary Schools

3 hours

See EDUC 228 Methods for Teaching Science in Middle and Secondary Schools.

BIO 244 Developmental Biology

4 hours

The study of the entire sequence of developmental changes and processes in animals from fertilization to death. The course will emphasize the principles and major mechanisms regulating morphogenesis and cellular differentiation, particularly during

embryonic development. In addition, methods used to study embryonic development will be explored. The laboratory introduces students to techniques and procedures for observing and manipulating animal embryos.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

BIO 246 Human and Comparative Anatomy

4 hours

A course dealing with the development and the structure of various system of vertebrates. Detailed dissection of the dogfish shark, the necturus, and the cat.

Three lectures per week.

Two 2-hour labs per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

(Normally offered each fall semester.)

BIO 250 Conservation Biology

4 hours

A course devoted to exploring issues related to biological diversity, including how biodiversity is measured, where it is found, its value, threats to it, and measure taken at the population and species level to conserve it. The course includes examining links between conservation and economics, law, and the social sciences. Case studies and discussions of local and global topics will encourage students to understand the varied threats to global biodiversity and the principles necessary to overcome them.

Three lectures/discussions per week.

One 3-hour lab per week.

Prerequisite(s): BIO 050 General Biology of Plants or BIO 060 General Biology of Animals and sophomore standing.

(Normally offered alternate springs.)

BIO 251 Tropical Biology of Costa Rica

3 hours

A field ecology course taught in Costa Rica. The purpose of the course is to immerse students in the biology of the rainforest. This is accomplished by students designing and performing scientific research projects, guided hikes, and focusing on particular organismal groups at locations such as Las Cruces Biological Station, a mid-elevation rain forest site. This immersion is supplemented by side trips to interesting locations such as Poas volcano, and a marine location such as Quepos/Manuel Antonio National Park for marine biology exposure and the opportunity for snorkeling or SCUBA (for those that are certified). Trips to Costa Rica typically last 11-14 days, but students meet with instructor for several weeks prior to trip and several weeks after trip, culminated with a poster presentation of their research.

Prerequisite(s): BIO 050 General Biology of Plants or BIO 060 General Biology of Animals or permission of the instructor.

BIO 252 Tropical Biology of Belize

3 hours

A field ecology course taught in the Central American nation of Belize. The course examines historical and current human land use patterns in Belize through visits to two Mayan ruins (i.e., Xunantunich and Caracol) that date from the Early Classic and Classic Mayan periods. Students spend several days in southern Belize living at the Las Cuevas Research Station located in the

Chiquibul Forest Reserve Tropical rain forest (TRF) structure and ecology is presented using lecture, field trips, and a student research project. The remainder of the course is spent on an island situated on the Belize Barrier Reef. Reef ecology, mangrove ecology, and other elements of marine biology are covered during this portion of the course. Morning and evening lectures are used to introduce and review concepts highlighted during daily field trips. Field trips at this location involve snorkeling and SCUBA diving trips to sites near Southwater Caye.

Prerequisite(s): BIO 050 General Biology of Plants or BIO 060 General Biology of Animals or permission of the instructor.

BIO 254 Applied Marine Biology

3 hours

A field marine biology course taught at a remote location in the Americas. The course is a continuation of the concepts presented in Biology 253 usually by focusing on a tropical coral reef ecosystem. Students gain an understanding of how to sample, monitor, and assess reef ecosystem health with particular attention paid to plankton biology. Mangrove biology and ecology are also covered during the course. Students are required to complete an independent research project of their design and choosing while in the field.

Prerequisite(s): PADI or SSI Open Water Diver SCUBA certification and BIO-253 (or permission of the instructor).

BIO 255 Principles of Marine Biology and Oceanography

2 hours

Two credit hour course focusing on basic concepts in marine biology. Topics discussed in this course include basic oceanography, plankton ecology, nekton biology, meiofauna, marine communities, and the impact of humans on marine systems. One lecture per week.

Prerequisite(s): BIO 050 General Biology of Plants or BIO 060 General Biology of Animals or permission of the instructor.

BIO 261 Evolution

3 hours

An introduction to the principle and mechanisms of evolution.

Three lectures per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

(Normally offered alternate fall semesters.)

BIO 262 Human and Comparative Physiology

4 hours

A comprehensive study of the functions of the animal body with emphasis on fundamental physiological processes and the experimental approach.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics.

Recommended: MATH 050 Pre-Calculus, PHYS 101 Principles of Physics I, or PHYS 111 General Physics I.

(Normally offered each spring semester.)

BIO 264 Animal Behavior

3 hours

The study of animal behavior from both the ethological and behavioral ecological perspectives. Broad topic areas include behavioral mechanisms, genetics of behavior, behavioral evolution, and behavioral adaptation.

Concurrent enrollment in BIO 265 Laboratory in Animal Behavior is encouraged.

Three lectures per week.

Prerequisite(s): BIO 060 General Biology of Animals and a minimum of sophomore standing.

BIO 265 Laboratory in Animal Behavior

1 hours

An introduction to hands-on behavioral experiments and the methodology for studying animal behavior in the field and in the laboratory.

One 3-hour lab per week.

Prerequisite(s): BIO 060 General Biology of Animals and minimum of sophomore standing.

Corequisite(s): BIO 264 Animal Behavior.

BIO 269 Microbiology

4 hours

A study of the classification, morphology, and physiology of microorganisms with special emphasis on bacteria and viruses.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology, BIO 170 Genetics, and CHEM 122 Analytical and Inorganic Chemistry.

(Normally offered each fall semester.)

BIO 270 Pathophysiology

3 hours

A survey of the mechanisms of diseases and fundamental disease processes of each organ system. Special topics related to the study of diseases will be assigned.

Prerequisite(s): BIO 009 Human Anatomy and Physiology, and BIO 010 Human Anatomy and Physiology, or BIO 246 Human and Comparative Anatomy and BIO 262 Human and Comparative Physiology, or permission of the instructor.

(Normally offered each semester.)

BIO 275 Immunology

3 hours

A study of the mammalian Immune system. Topics will include innate immunity, acquired (antibody and cell-mediated) immunity, common laboratory techniques, and medical immunology.

Prerequisite(s): BIO 160 Cell Biology.

Pre or corequisite(s): BIO 170 Genetics.

(Normally offered each spring semester.)

BIO 276 Laboratory in Immunology

1 hours

An introduction to common immunological procedures used in clinical and research settings, such as ELISA, western blotting, flow cytometry, and cell proliferation assays.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology.

Pre or corequisite(s): BIO 170 Genetics and BIO 275 Immunology are recommended but not required.

(Normally offered alternate spring semesters.)

BIO 281 Biochemistry

3 hours

A general introduction to the field of biochemistry involving a study of the chemistry of carbohydrates, lipids, nucleic acids, and proteins with attention given to metabolism, energetics, enzymology, role of cofactors, and biochemical control mechanisms.

Three lectures per week.

Prerequisite(s): BIO 160 Cell Biology, BIO 170 Genetics, and CHEM 122 Analytical and Inorganic Chemistry.

(Normally offered each fall semester.)

BIO 282 Biochemistry Laboratory

1 hours

An introduction to modern biochemical techniques. Students will be exposed to spectrophotometry, chromatography, electrophoresis, and protein and nucleic acid purification.

One 3-hour lab per week.

Pre or corequisite(s): BIO 281 Biochemistry.

BIO 283 Molecular Biology

4 hours

A study of the systems, mechanisms, and methods of molecular biology with a particular emphasis on the analysis of the genetic material--mutagenesis, replication, regulation, transcription, and translation--and its protein products and their biological function. Recombinant DNA and genetic engineering will be a major focus in the laboratory.

Three lectures per week.

One 3-hour lab per week.

Prerequisite(s): BIO 160 Cell Biology, BIO 170 Genetics, and CHEM 122 Analytical and Inorganic Chemistry.

BIO 290 Selected Topics

1 hours

A course designed to treat subject matter not covered in other departmental courses or to provide advanced study of subject matter introduced in other courses. The title, content, and credit hours will be determined by current mutual interests of faculty and students.

Prerequisite(s): BIO 160 Cell Biology and BIO 170 Genetics; additional requirements may be determined by the instructor.

BIO 291 Directed Readings

1hours

An opportunity for students, under the supervision of a faculty member, to pursue scientific literature not covered in other coursework.

Prerequisite(s): Major or minor in biology and permission of a faculty member in the Department of Biology.

(Normally offered each spring semester.)

BIO 295 Independent Study

1hours

Individual laboratory projects for qualified biology majors. Independent study may not duplicate courses described in the catalog.

Prerequisite(s): Approval of the department chair.

BIO 296 Special Projects

1-15 hours

Supervised work at the senior level on an appropriate project involving subject matter not included in any of the standard courses. Registration should designate the area of work. A formal project report is required.

Prerequisite(s): Approval of the department chair.

BIO 297 Biology Practicum

1-3 hours

A supervised field experience enabling observation and participation in a clinical or research setting relating to biology. Submission of a journal and/or written paper would follow at least 30 hours of field experience.

Pass/Fail only.

Prerequisite(s): Major or minor in biology, approval of the department chair, and approval of the coordinating clinic or laboratory.

BIO 298 Senior Thesis

1 hours

Individual library thesis projects for biology majors to meet senior comprehensive requirement. A research report in scientific format and a formal presentation of the thesis is required.

Prerequisite(s): Approval of the department chair.

BIO 299 Senior Research

1 hours

Individual laboratory or field research projects for qualified biology majors to meet senior comprehensive requirement. A research report in scientific format and a formal presentation of the research is required.

Prerequisite(s): Approval of the department chair.