Nebraska Wesleyan University

Biology

Catalog

2020-2021

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 medicine, optometry, osteopathic medicine, dentistry, pharmacy, physical therapy, veterinary medicine, chiropractic medicine, podiatry, and physician assistant) 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, wildlife biology, physiology, molecular biology, and bioinformatics.

Students interested in majoring in biology should arrange a visit with the department chair to discuss their program of study. Students who wish to meet Nebraska certification regulations for secondary teaching of biology should consult the current handbook of the education department.

Department Learning Outcomes

Biology majors will have **knowledge** of the:

1. characteristics of life and species diversity
2. structure and function of biomolecules
3. cellular structures and functions
4. genetic basis of life
5. principles of evolution
6. structure, function, and development of organisms
7. interactions between organisms and their environment
8. ethical dimensions of biological discoveries
9. scientific terminology

Biology majors will have the **ability** to:

1. read, interpret, and write papers in the format used by biologists
2. interpret and generate statistical analyses and graphs
3. locate scientific articles or journals in their field of choice
4. generate hypotheses and experimental designs to test scientific questions
5. present their knowledge to others, both orally and in writing

Majors, Minors & Degrees

Majors

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

Minors

1. Biology

Courses

BIO 1010 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. Course content will be offered in a variety of formats including but not limited to: lectures in person or online; laboratory experience; group activities and discussion-based activities. Does not count toward a biology major.

(Normally offered at least once per academic year.)

Archway Curriculum: Foundational Literacies: Scientific Investigations: Natural Science Laboratory

BIO 1080 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 1090 Introduction to Human Anatomy and Physiology I

3 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.
Pre or Corequisite(s): BIO 1090L Introduction to Human Anatomy and Physiology I Laboratory.
(Normally offered each fall semester.)

BIO 1090L Introduction to Human Anatomy and Physiology I Laboratory

1 hour

Laboratory experiments and investigative exercises supporting BIO 1090 Introduction to Human Anatomy and Physiology I.
Pre or Corequisite(s): BIO 1090.

BIO 1100 Introduction to Human Anatomy and Physiology II

3 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.
Prerequisite(s): BIO 1090 Introduction to Human Anatomy and Physiology I or permission of the instructor.
Pre or Corequisite(s): BIO 1100L Introduction to Human Anatomy and Physiology II Lab.
(Normally offered each spring semester.)

BIO 1100L Introduction to Human Anatomy and Physiology II Lab

1 hour

Laboratory experiments and investigative exercises supporting BIO 1100 Introduction to Human Anatomy and Physiology II.
Pre or Corequisite(s): BIO 1100.

BIO 1300 Introduction to Environmental Science

4 hours

An introduction to environmental science and scientific methodology using the environment as the system of study. The goals are to help the student develop a better understanding of the environment, gain insight into human-caused problems found in nature, explore the relationships of humanity with the environment, and provide practical experience in performing scientific measurements and experiments.
Three lectures per week.
One 3-hour lab per week.
Does not count toward a biology major.

Archway Curriculum: Foundational Literacies: Scientific Investigations: Natural Science Laboratory
Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread

BIO 1400FYW Introduction to Biological Inquiry

4 hours

This course is designed for biology majors and replaces traditional introductory biology courses. The overarching goal is to introduce students to collegiate biology by teaching them how to carry out scientific research. Across all sections of this course, students will pose scientific questions, design and critique experiments, run those experiments, evaluate experimental outcomes, and communicate those outcomes. Within this framework of investigative inquiry, students will learn introductory content that will not only be meaningful for the current course, but will allow for a smoother transition to their sophomore year. Content areas include ecology, genetics, evolution, biodiversity, reproduction, development, and cellular/molecular mechanisms.
Course fluidly transitions between lecture and lab with an equivalency to 3 lecture hours and 3 laboratory hours per week. No P/F.
Pre or corequisite(s): CHEM 1110 Chemical Principles I ; or prerequisite of CHEM 1100 Prep Chemistry.
(Multiple sections normally offered each semester.)

Archway Curriculum: First-Year Curriculum: First-Year Writing
Archway Curriculum: Foundational Literacies: Scientific Investigations: Natural Science Laboratory

BIO 1900 Selected Topics

1-4 hours

A topical course designed to investigate relevant subject matter not included in any standard courses. The title and the content will be determined by current mutual interests of students and faculty. This course may be offered to meet a requirement for a major only by approval of the department chair.

BIO 1950 Independent Study

1-4 hours

This is a research course. The student initially meets with the department chair to select a study topic and review research methods. At this time the student will be assigned a faculty resource person to guide his or her work and assist in an advisory capacity. A copy of the student's work is filed in the archives for the department. Independent study may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the department chair.

Archway Curriculum: Essential Connections: Experiential Learning: Exploratory

BIO 1960 Special Projects

1-15 hours

Supervised individual projects for students on topics selected by the student in consultation with the instructor. Special Projects may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the instructor.

BIO 1970 Internship

1-8 hours

This course allows students to participate in an academic internship.
Pass/Fail only.
Prerequisite(s): Permission of the department chair.

BIO 2200 Genetics and Cell Biology

4 hours

This course emphasizes molecular mechanisms associated with intracellular structures, metabolism, genetic information transfer, heredity, and evolution in prokaryotic and eukaryotic organisms.
Three lectures per week with one three-hour lab per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, CHEM 1110 Chemical Principles I , CHEM 2100 Organic Chemistry I .
(Normally offered each semester.)

BIO 2300 Ecology and Evolution

4 hours

An introduction to the interaction of life with the environment at the molecular, organismal through ecosystem levels, highlighting the major factors influencing evolutionary change. Topics include genetic and phenotypic variation, natural selection, adaptation, speciation, symbiosis and populations dynamics especially in light of human interference, and ecosystem structure and function. Where possible, principles of evolution and ecology will be integrated.
Three lectures per week.
One 3-hour lab per week, including field, laboratory and greenhouse work.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, CHEM 1110 Chemical Principles I and CHEM 2100 Organic Chemistry I .
(Normally offered each semester.)

Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread

BIO 2900 Selected Topics

1-5 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 2950 Independent Study

1-4 hours

This is a research course. The student initially meets with the department chair to select a study topic and review research methods. At this time the student will be assigned a faculty resource person to guide his or her work and assist in an advisory capacity. A copy of the student's work is filed in the archives for the department. Independent study may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the department chair.

Archway Curriculum: Essential Connections: Experiential Learning: Exploratory

BIO 2960 Special Projects

1-15 hours

Supervised individual projects for students on topics selected by the student in consultation with the instructor. Special Projects may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the instructor.

BIO 2970 Internship

1 hour

This course allows students to participate in an academic internship.
Pass/Fail only.
Prerequisite(s): Permission of the department chair.

Archway Curriculum: Essential Connections: Experiential Learning: Exploratory

BIO 2980 Practicum

1 hour

A supervised experience in which students participate in a clinical or research setting, assist in preparation of materials for teaching labs, or engage in other practical applications of their biology coursework. Requirements include: submission of learning objectives, journal, reflection paper, and oral presentation. Thirty hours of field experience per credit hour. May be taken for one credit hours. Pass/Fail only.

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

Archway Curriculum: Essential Connections: Experiential Learning: Exploratory

BIO 3000 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. No P/F.
Prerequisite(s): Junior standing and at least 16 hours in biology coursework.

Archway Curriculum: Essential Connections: Discourse Instructive
Archway Curriculum: Integrative Core: Human Health and Disease Thread

BIO 3160 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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution or permission of the instructor.
(Normally offered alternate spring semesters.)

Archway Curriculum: Integrative Core: Human Health and Disease Thread
Archway Curriculum: Essential Connections: Writing Instructive

BIO 3170 Medical Botany Lab

1 hour

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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, and BIO 2300 Ecology and Evolution or permission of instructor.
Corequisite(s): BIO 3160 Medical Botany.
(Normally offered alternate spring semesters.)

Archway Curriculum: Integrative Core: Human Health and Disease Thread

BIO 3180 Plant Taxonomy

4 hours

A study of the identification, nomenclature, and classification of plants with emphasis on flowering plants.
Three lectures per week.
One 3-hour lab per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution or permission of the instructor.
(Normally offered alternate fall semesters.)

BIO 3200 Advanced Human Anatomy and Physiology I

4 hours

This course is the first of a two-semester sequence anatomy and physiology for pre-health students that emphasizes the structure and function of the human body. It includes the study of homeostasis, tissues, and the integumentary, skeletal, muscular, and nervous systems in addition to the special senses.
Three lectures per week.
One 3-hour lab per week.
Prerequisite(s): CHEM 1110 Chemical Principles I and sophomore standing.
(Normally offered each fall semester.)

BIO 3210 Advanced Human Anatomy and Physiology II

4 hours

Human Anatomy and Physiology is the study of structure and functions of the human body. This course will cover the topics of blood, the cardiovascular, lymphatic, respiratory, endocrine, digestive, renal and reproductive systems as well as nutrition and metabolism, acid-base, fluid, and electrolyte balance, and human development.
Three lectures per week.
One 3-hour lab per week.
Prerequisite(s): CHEM 1110 Chemical Principles I and sophomore standing.
(Normally offered each spring semester.)

BIO 3220 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. No P/F.
Three lectures per week.
One 3-hour lab per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution.

BIO 3280 Methods for Teaching Science in Middle and Secondary Schools

3 hours

See EDUC 3280 Methods for Teaching Science in 7-12.

BIO 3440 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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution.

BIO 3500 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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution and sophomore standing or instructor permission.
(Normally offered alternate springs.)
Note: Environmental Studies Minors are encouraged to register; please contact the instructor.

Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread
Archway Curriculum: Essential Connections: Discourse Instructive

BIO 3510 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 1400FYW Introduction to Biological Inquiry or permission of the instructor.
(Normally offered every other Winter Term.)

Archway Curriculum: Essential Connections: Experiential Learning: Intensive
Archway Curriculum: Essential Connections: Diversity Instructive: Global

BIO 3520 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 a research station. 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 trips to sites near Southwater Caye.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry or permission of the instructor.

Archway Curriculum: Essential Connections: Diversity Instructive: Global
Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 3530 Principles of Marine Biology and Oceanography

3 hours

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. Three meetings per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry or permission of the instructor.
(Normally offered in the spring of even-numbered years.)

Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread

BIO 3540 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 BIO 3530 Principles of Marine Biology and Oceanography 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 3530 Principles of Marine Biology and Oceanography (or permission of the instructor).
(Normally offered in summer of even-numbered years.)

Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 3550 Tropical Ecosystems

3 hours

A course highlighting the ecology of tropical ecosystems. Students will read and discuss current literature on recent advancements in the subject area.

Prerequisite: BIO 2300 Ecology and Evolution or BIO-2600 or permission of the instructor.

Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread

BIO 3640 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 3650 Laboratory in Animal Behavior is encouraged.
Three lectures per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, and BIO 2300 Ecology and Evolution and a minimum of sophomore standing.
(Normally offered alternate fall semesters.)

Archway Curriculum: Essential Connections: Discourse Instructive

BIO 3650 Laboratory in Animal Behavior

1 hour

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.
Corequisite(s): BIO 3640 Animal Behavior.
(Normally offered alternate fall semesters.)

BIO 3690 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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, and BIO 2300 Ecology and Evolution and CHEM 2110 Organic Chemistry II: Synthesis and Mechanisms.
(Normally offered each fall semester.)

BIO 3720 Physiological Ecology

4 hours

This is a course about animal and plant function - about "how organisms work". It is a physiology course taught from a somewhat ecological and evolutionary perspective. The course will address physiological topics from the following perspectives: comparative, ecological, environmental, evolutionary, integrative, and organismal. It will to some extent address molecular and cellular mechanisms, but at the same time it will emphasize the organismal, ecological, and evolutionary significance of physiological function. The course will take a holistic view of physiological mechanisms and emphasize organismal interactions with the environment (ecology) and their evolutionary significance. This course will combine information from physiology with that of physical and chemical processes with structure in order to understand how animals evolved their functional characteristics and how they stay alive in the face of constantly changing internal and external environments.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution.
(Normally offered alternate spring semesters.)

BIO 3800 Molecular Genetics

3 hours

A study of the systems, mechanisms, and methods of molecular genetics 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/genetic engineering and other modern technologies will be discussed.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, CHEM 1110 Chemical Principles I , and CHEM 2100 Organic Chemistry I .
(Normally offered alternate spring semesters.)

Archway Curriculum: Essential Connections: Discourse Instructive

BIO 3850 Molecular Genetics Lab

1 hour

A laboratory course that focuses on modern methods and instrumentation used in molecular genetics- based research. Students will gain experience through extensive research projects involving recombinant DNA technology, gene expression, DNA sequencing and bioinformatics/genomics.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, CHEM 1110 Chemical Principles I .
Corequisite(s): BIO 3800 Molecular Genetics.
(Normally offered alternate spring semesters.)

BIO 3900 Selected Topics

1-4 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 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution; additional requirements may be

determined by the instructor.

BIO 3910 Directed Readings

1-2 hours

An opportunity for students, under the supervision of a faculty member, to pursue scientific literature not covered in other coursework. No P/F.
Prerequisite(s): Major or minor in biology and permission of a faculty member in the Department of Biology.
(Normally offered each semester.)

BIO 3950 Independent Study

1-4 hours

Individual laboratory projects for qualified biology majors. Independent study may not duplicate courses described in the catalog. No P/F.
Prerequisite(s): Approval of the department chair.

Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 3960 Special Projects

1-15 hours

Supervised individual projects for students on topics selected by the student in consultation with the instructor. Special Projects may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the instructor.

BIO 3970 Internship

2-3 hours

A supervised field experience enabling observation and participation in a clinical or research setting relating to biology. Requirements include: submission of a learning plan, journal, reflection paper, and oral presentation. Thirty hours of field experience per credit hour. May be taken for two or three credit hours.
Pass/Fail only.
Prerequisite(s): Major or minor in biology, approval of the department chair, and approval of the coordinating clinic or laboratory.

Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 3980 Practicum

2-3 hours

A supervised field experience enabling observation and participation in a clinical or research setting relating to Biology. Requirements include: submission of a learning plan, journal, reflection paper, and oral presentation. Thirty hours of field experience per credit hour. May be taken for two or three credit hours. Pass/Fail only.

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

Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 4190 Histology

4 hours

A study of the microscopic anatomy and functions of the mammalian tissues and organs with modern concepts of histophysiology and histogenesis. No P/F.
Three lectures per week.
One 3-hour lab per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and

Evolution.
(Normally offered alternate spring semesters.)

BIO 4210 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 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution or permission of the instructor.
(Normally offered alternate fall semesters.)

Archway Curriculum: Integrative Core: Humans in the Natural Environment Thread
Archway Curriculum: Essential Connections: Writing Instructive

BIO 4480 Vertebrate Zoology

4 hours

A course for biology majors that emphasizes the natural history, evolution, ecology, morphology, anatomy, physiology, and diversity of both extant and extinct vertebrate groups. Emphasis will be on species found in Nebraska. Students will learn to identify specimens, dissect selected specimens, and investigate current topics in vertebrate zoology through oral presentations and at least one review paper.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology, and BIO 2300 Ecology and Evolution.
(Normally offered alternate fall semesters.)

Archway Curriculum: Essential Connections: Speaking Instructive

BIO 4610 Evolution

4 hours

An introduction to the principle and mechanisms of evolution.
Three lectures and one laboratory per week.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry, BIO 2200 Genetics and Cell Biology and BIO 2300 Ecology and Evolution.
(Normally offered alternate fall semesters.)

Archway Curriculum: Essential Connections: Discourse Instructive

BIO 4700 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 1090 Introduction to Human Anatomy and Physiology I and BIO 1100 Introduction to Human Anatomy and Physiology II, or BIO 3200 Advanced Human Anatomy and Physiology I and BIO 3210 Advanced Human Anatomy and Physiology II, or permission of the instructor.
(Normally offered each semester.)

Archway Curriculum: Integrative Core: Human Health and Disease Thread

BIO 4750 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. No P/F.
Prerequisite(s): BIO 1400FYW Introduction to Biological Inquiry and BIO 2200 Genetics and Cell Biology.

Pre or corequisite(s): BIO 2300 Ecology and Evolution.
(Normally offered each spring semester.)

Archway Curriculum: Integrative Core: Human Health and Disease Thread

BIO 4760 Laboratory in Immunology

1 hour

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 1400FYW Introduction to Biological Inquiry and BIO 2200 Genetics and Cell Biology.
Pre or corequisite(s): BIO 2300 Ecology and Evolution and BIO 4750 Immunology are recommended but not required.
(Normally offered alternate spring semesters.)

BIO 4900 Selected Topics

1-4 hours

A topical course designed to investigate relevant subject matter not included in any standard courses. The title and the content will be determined by current mutual interests of students and faculty. This course may be offered to meet a requirement for a major only by approval of the department chair.

BIO 4910 Directed Readings

1-6 hours

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

BIO 4950 Independent Study

1-4 hours

This is a research course. The student initially meets with the department chair to select a study topic and review research methods. At this time the student will be assigned a faculty resource person to guide his or her work and assist in an advisory capacity. A copy of the student's work is filed in the archives for the department. Independent study may not duplicate courses described in the catalog.
Prerequisite(s): Senior standing or permission of the department chair.

Archway Curriculum: Essential Connections: Experiential Learning: Intensive

BIO 4960 Special Projects

1-15 hours

Supervised individual projects for students on topics selected by the student in consultation with the instructor. Special Projects may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the instructor.

BIO 4970 Internship

1-8 hours

This course allows students to participate in an academic internship.
Pass/Fail only.
Prerequisite(s): Permission of the department chair.

BIO 4980A Senior Thesis

1 hour

Biology majors will perform individual library thesis projects to meet the senior comprehensive requirement. A research report in scientific format and a formal presentation of the thesis is required. Biology majors will begin the process by asking a scientific question, gathering peer-reviewed published evidence, analyzing the evidence, supporting/rejecting their hypothesis and writing a formal thesis paper. The first draft of the thesis paper is required at the completion of the course. In addition, Biology majors will orally present various components of their thesis during the course. No P/F.
Prerequisite(s): Senior standing.
(Normally offered each fall semester.)

BIO 4980B Senior Thesis

1 hour

Biology majors will perform individual library thesis projects to meet the senior comprehensive requirement. A research report in scientific format and a formal presentation of the thesis is required. Biology majors will complete the final version of their thesis paper and give a formal presentation of their thesis work at the Nebraska Wesleyan University Research Symposium or at a biology department seminar, or at the discretion of the instructor. No P/F.
Completion of both BIO 4980A and BIO 4980B will allow students to earn both Writing Instructive and Speaking Instructive credit.
Prerequisite: Senior standing and completion of BIO 4980A Senior Thesis (or in some instances, concurrent enrollment in BIO 4980A).
(Normally offered each spring semester.)

Archway Curriculum: Essential Connections: Writing Instructive
Archway Curriculum: Essential Connections: Speaking Instructive

BIO 4990A Senior Research

1 hour

Biology majors will perform individual laboratory or field research projects to meet the senior comprehensive requirement. A research report in scientific format and a formal presentation of the research is required. Biology majors will begin the process of writing the scientific paper under the supervision of a biology faculty mentor and will complete the first draft of the research paper by the end of the course. In addition to writing the research paper, biology majors will orally present different components of their research project. No P/F.
Prerequisite(s): Senior standing.
(Normally offered each fall semester.)

BIO 4990B Senior Research

1 hour

Biology majors will perform individual laboratory or field research projects to meet the senior comprehensive requirement. A research report in scientific format and a formal presentation of the research is required. Biology majors will complete the final version of their research paper and give a formal presentation of their research at the Nebraska Academy of Sciences Annual conference, another scientific meeting, or at the discretion of the instructor. No P/F.
Completion of both BIO 4990A and BIO 4990B will allow students to earn both Writing Instructive and Speaking Instructive credit.
Prerequisite: Senior standing and completion of BIO 4990A Senior Research (or in some instances, concurrent enrollment in BIO 4990A).
(Normally offered each spring semester.)

Archway Curriculum: Essential Connections: Writing Instructive
Archway Curriculum: Essential Connections: Speaking Instructive

BIO 5900 Selected Topics: Biology

3 hours

This graduate-level course is designed to give students the opportunity for in-depth study of a Biology- based concept. Topics will consist of a highly specialized area of study or revolve around issues or recent trends and innovations related to the field of biology.