

# DEPARTMENT OF BIOLOGY

## Department Objectives:

- To prepare teachers in subject matter and in methods for the teaching of biology and related subjects;
- To help meet the requirements of the general education program;
- To furnish adequate background in the biological sciences for pre-professional students and for others who require training in that area;
- To prepare students for graduate work and for research;
- To prepare students for careers which require general biological knowledge.

Students who plan to major in Biology should have a strong high school background in science (i.e., Biology, Chemistry, Physics and Math). Those who have had

1. 3 years of high school science including biology and chemistry and a minimum score of 20 on the ACT, or
2. who CLEP BIOL 103 may enroll in BIOL 105 or BIOL 106 which are applicable to General Studies requirements. Students not having this background should take BIOL 103.

**A minimum overall GPA of 2.5 in all courses counting towards a Biology major option is required for graduation.**

## Biology Major

Three options are available in this major:

1. Biology (<http://catalog.unk.edu/undergraduate/departments-programs/biology/biology-bs/>) - Bachelor of Science Degree
2. Biology Comprehensive (<http://catalog.unk.edu/undergraduate/departments-programs/biology/biology-comprehensive-bs/>) - Bachelor of Science Degree
  - General Emphasis
  - Wildlife Emphasis
  - Health Science Emphasis
3. Biology 7-12 Teaching Subject Endorsement (<http://catalog.unk.edu/undergraduate/departments-programs/biology/biology-7-12-teaching-subject-endorsement-bse/>) - Bachelor of Science in Education Degree

The minors in Biology (<http://catalog.unk.edu/undergraduate/departments-programs/biology/biology-minor/>) and Environmental Science (<http://catalog.unk.edu/undergraduate/departments-programs/biology/environmental-science-minor/>) are available for students pursuing majors in other disciplines.

The Department advises students in 2+2 programs in Agriculture and Natural Resources, which are completed in the College of Agriculture and Natural Resources at UNL. The Department also advises Pre-Veterinary Medicine (<http://catalog.unk.edu/undergraduate/departments-programs/biology/pre-veterinary-medicine/>) and Pre-Forestry students.

## Biology (BIOL)

### BIOL 102 – Environmental Biology 3 credit hours

This class is about life on Earth. As the human species continues to spectacularly succeed at living and using resources we have become a significant force on the planet. This class also explores that role and all that it could mean in positive and negative ways for ourselves and other species that share the planet with us.

### BIOL 103 – General Biology 4 credit hours

From subatomic particles to humans to ecosystems, how do biological systems function? In this course, we will learn about basic biological principles and concepts to understand the organization and function of living systems. The central themes in this course will be 1) integration of individual parts to create a functional whole; 2) evolution as a framework for understanding variation, diversity, and biological phenomena; 3) how scientific concepts originate, are validated, and are refined; and 4) application of scientific principles to issues that arise in modern-day life. A two-hour laboratory is required each week.

Additional Course Fee Required

### BIOL 105 – Biology I 4 credit hours

A study of plant and animal groups, their structure, relationships, ecology, classification and evolution. Two hours of laboratory each week. Students should have completed three years of high school science including biology and chemistry or a college science course.

Additional Course Fee Required

### BIOL 106 – Biology II 4 credit hours

A study of the organization and function of living systems, including development, metabolism, reproduction, inheritance, and the basics of biotechnology. Two hours of laboratory each week. Students should have completed three years of high school science including biology and chemistry or a college science course.

Additional Course Fee Required

### BIOL 109 – Classroom Biology 4 credit hours

Acquaints students with what science is and how science is performed. Students will use the scientific method to design and perform experiments, collect data, analyze results, and develop explanations. Basic biological principles including form and function, organization, and adaptation will be emphasized. A laboratory science course. Credit not to be applied to the Biology major or endorsement.

Additional Course Fee Required

### BIOL 110 – Introduction to Epidemiology 3 credit hours

An introductory survey of modern epidemiology including what epidemiology is, new discoveries, and how epidemiology affects our lives.

### BIOL 211 – Human Microbiology 4 credit hours

This course will cover basic microbiology with an emphasis on health-related topics and assumes no previous study of chemistry. The goal of the course is to primarily introduce allied health majors to the general characteristics of bacteria and viruses that will be helpful in understanding the transmission, virulence, and treatment of bacterial or viral diseases. This class will allow students to become familiar with some common infectious bacteria and viruses and the diseases they cause. The laboratory portion of the course will introduce students to the proper techniques and precautions for routine handling of bacteria and help students understand the basic structure of bacteria and what those features indicate about the bacteria. Lab work gives students an idea of how the bacteria from infections are identified through biochemical tests and how treatment options are determined. Two hour laboratory each week.

Additional Course Fee Required

**BIOL 213 – Introduction to Fish and Wildlife Management 2 credit hours**

Provides students with an understanding of curriculum and research requirements and career opportunities associated with the Wildlife emphasis of the Biology Major through a combination of in- and out-of-class activities. Students will also be introduced to fish and wildlife management issues and research.

**BIOL 215 – Human Physiology 4 credit hours**

This course provides an introduction to the systems of the human body and how they function. This is a one-semester human physiology course and is NOT intended to meet the health science program requirements for a two-semester class of Anatomy and Physiology. Course themes include: 1) the basic mechanisms underlying the physiology of the animal cell; 2) the organization and function of the major organ systems (nervous, muscular, endocrine, respiratory, cardiovascular, digestive, urinary, and reproductive) with an emphasis on uncovering structure-function relationships and the inter-relatedness of human body systems; and 3) the link between abnormal physiological processes and the incidence of rare or common human diseases. Students should have completed three years of high school science including biology and chemistry or a college science course.

Additional Course Fee Required

**BIOL 225 – Anatomy and Physiology 4 credit hours**

A study of the anatomy and physiology of the systems of the human body and how they function including cellular mechanisms and tissues, the skin, the skeletal system, the muscular system and the nervous system. Two hours of laboratory each week. This course is primarily intended for students planning to pursue training in one of the Health Programs. Biology majors would normally complete BIOL 215 Physiology (4 hours) but may complete BOTH BIOL 225 and BIOL 226 (8 hours) to meet the physiology requirement. Successful completion of a college-level biology or chemistry course is highly recommended.

Prerequisite: Sophomore standing

Additional Course Fee Required

**BIOL 226 – Anatomy and Physiology 4 credit hours**

A continuation of the study of the systems of the human body including the circulatory system and its components, the lymphatic system, the respiratory system, the digestive system, the urinary system, the endocrine glands and the reproductive system. Two hours of laboratory each week. Biology majors would normally complete BIOL 215 Physiology (4 hours) but may complete BOTH BIOL 225 and BIOL 226 (8 hours) to meet the physiology requirement.

Prerequisite: BIOL 225 or permission of instructor.

Additional Course Fee Required

**BIOL 231 – Research Methods I 3 credit hours**

This course will provide Biology students with easy-to-use guidance for laboratory and field studies, but in addition cover broader transferable skills. This includes where to find information, how to read and analyze scientific literature, the difference between scientific and other types of writing, ethics, and other transferable skills. Students will also put into practice what they are learning by practicing scientific writing and presentation.

Prerequisite: BIOL 105 and BIOL 106

**BIOL 280H – Special Topics 3 credit hours**

A General Studies course for Honors students. Interdisciplinary course that examines the connections between disciplines.

**BIOL 301 – Introduction to Soils 4 credit hours**

Introduction to soil development, morphology, distribution, chemistry, physics, classification, use, conservation, biology and pollution. Three hours of laboratory each week.

Prerequisite: One course in general chemistry or permission of instructor.  
Additional Course Fee Required

**BIOL 305 – BioStatistics 3 credit hours**

Course introduces descriptive and basic inferential statistics for application in analysis, evaluation, and design of biological experiments. Students learn fundamentals of statistical software.

Prerequisite: MATH 101 or above or MATH ACT score of 20 or above.

**BIOL 307 – Ecology 3 credit hours**

Ecology is the scientific study of interactions between organisms and their environment in a hierarchy of levels of organization: individuals, populations, communities, and ecosystems. Provides a comprehensive survey of general concepts that can stand alone or serve as preparation for advanced courses in ecology. Labs emphasize collection, analysis, and interpretation of data from ecological experiments and field studies to illustrate and complement lecture material. Examples are drawn from a broad range of organisms and systems.

Prerequisite: BIOL 105 and BIOL 305.

Additional Course Fee Required

**BIOL 309 – Cellular & Molecular Biology 4 credit hours**

This course deals with various types of cells- their structure, function and what they contribute to the functioning of the whole organism. The course will have three lectures (50 min each) and one laboratory (3 hr) every week.

Prerequisite: 8 hours of college Biology and CHEM 161 and CHEM 161L and either CHEM 250 and CHEM 250L or CHEM 361 and CHEM 361L or permission.

Additional Course Fee Required

**BIOL 311 – Bioethics 3 credit hours**

This course will explore the process of ethical decision making regarding historical events and recent advances in the Biological Sciences and Medicine. Topics will include death and dying; reproductive technologies; genetics; physician assisted suicide; cloning; abortion; human subjects in research; and accessibility to healthcare issues, which will consider vulnerable groups, racial bias, ethnic bias, age bias, and gender bias. The goal of the class is to acquaint you with Bioethics issues and enable you to make decisions and perform actions in an ethical manner in the fields of Biological Sciences and Medicine, while being cognizant of the populations being affected.

**BIOL 325 – Medical Terminology 1 credit hour**

This course is designed to assist students in health-related and life science programs to become familiar with complex terms and their derivation.

**BIOL 330 – Wildlife Conservation 3 credit hours**

Problems of wildlife conservation, particularly as they apply to Nebraska. This includes a brief look at wildlife management techniques, and the history, sociology, and politics of wildlife conservation. Three hours of laboratory each week.

Prerequisite: BIOL 307 or permission of instructor

Additional Course Fee Required

**BIOL 359 – Evolution 3 credit hours**

A study of the proposed mechanisms of Organic Evolution and how it serves as the unifying theme of Biology. Molecular, morphological and paleontological data will be emphasized.

Prerequisite: BIOL 105 and BIOL 106

**BIOL 360 – Genetics 4 credit hours**

Application based course covering the classical and molecular principles of inheritance. Concepts covered include various historical and mathematical concepts surrounding transmission, molecular, and population genetics. Three hours of lecture with a weekly three hour laboratory.

Prerequisite: BIOL 106 and BIOL 226 or BIOL 309 or BIOL 359  
Additional Course Fee Required

**BIOL 380 – Agronomy 3 credit hours**

A study of crop production covering such topics as environmental requirements, soil, cultural practices, growth and development, water relations and economics.

Prerequisite: BIOL 103 or BIOL 106 or permission of instructor.

**BIOL 401 – Principles of Immunology 4 credit hours**

In this course, we will cover basic and advanced principles of immunology. Topics to be covered include: 1. structural and functional aspects of the immune system, 2. structure and function of antigen receptors (TCR and BCR) and antibody molecules, 3. antigen-antibody interaction, 4. antigen recognition and response, 5. development of T and B cells, 6. disorders of the immune system including allergies and hypersensitivities, immunodeficiencies, tolerance, and autoimmunity, 7. immunobiology of tissue transplants, and 8. basic aspects of cancer and cancer therapy that relate to immunology. Laboratory required.

Prerequisite: BIOL 309 or CHEM 351  
Additional Course Fee Required

**BIOL 403 – Plant Physiology 3 credit hours**

Life processes of plants. Three hours of laboratory each week.

Prerequisite: BIOL 105 and one year of Chemistry or permission of instructor.

Additional Course Fee Required

**BIOL 404 – Developmental Biology 3 credit hours**

Principles of developmental processes with emphasis on the physiological and genetic events occurring during the growth and maturation of living organisms. Three hours of laboratory each week. Prior completion or concurrent enrollment in BIOL 360 is also recommended.

Prerequisite: 8 hours of BIOL 200 through 499 completed or permission of instructor

Additional Course Fee Required

**BIOL 405 – Range and Wildlife Management 3 credit hours**

Basic principles of range and pasture management for use by domestic livestock and wildlife will be taught. Course includes 3 hours of field or laboratory work each week.

Prerequisite: BIOL 307

Additional Course Fee Required

**BIOL 406 – Plant Ecology 3 credit hours**

Plants in relation to their environment. Three hours of laboratory or field work each week.

Prerequisite: BIOL 105 and BIOL 106 and BIOL 307 or permission of instructor

Additional Course Fee Required

**BIOL 409 – Biological Studies using GIS 3 credit hours**

This course is an introduction to many aspects of using Geographic Information Systems as a natural resources tool. The class introduces cartographic concepts, tools such as Global Positioning System tools, and natural resource databases at the state and federal levels. In addition to lectures and labs where the software and tools are used, students also have the opportunity to complete projects using GIS and data of their own choosing. The main objective of the class is to give students enough familiarity with GIS software, data resources, and project design to be able to effectively produce their own projects.

Prerequisite: BIOL 307

**BIOL 410 – Fire Ecology and Management in Grasslands 1 credit hour**

Familiarizes students with the role of fire as a major ecosystem process in grasslands and its use as a management tool.

**BIOL 416 – Plant Diversity and Evolution 4 credit hours**

Though the title of this course is "Diversity and Plant Evolution," we will focus primarily on the largest clade of plants: flowering plants. Flowering plants, or angiosperms, are the most conspicuous groups of organisms on Earth. The rise and diversification of angiosperms during the past ca. 140 million years has facilitated the co-diversification of many other branches on the tree of life, including (and perhaps especially) human beings. This course focuses on the relationships and evolution of flowering plants and will consist of two concurrent and occasionally intertwined paths: 1) We will use the textbook and lecture time to gain a solid intellectual understanding of flowering plant systematics and evolution, and 2) We will cover anatomy and characteristics of major plant groups in lab.

Prerequisite: BIOL 105 and BIOL 359 or permission of instructor.  
Additional Course Fee Required

**BIOL 417 – Mycology 3 credit hours**

A study of the fungi including taxonomy, growth, morphology, development, reproduction and economic importance. Three hours of laboratory or field work each week.

Prerequisite: 12 hours in Biology including BIOL 103 or BIOL 105 and CHEM 161 and STAT 241 or permission of instructor.  
Corequisite: BIOL 417L.

**BIOL 417L – Mycology Lab 1 credit hour****BIOL 418 – Plant Taxonomy 3 credit hours**

This class focuses on common plants of the central Nebraska region. Each week during the first 7-10 weeks of the semester we will go on field trips around Kearney and learn both names and salient features of various plants. As the weather cools down and the plants die back we will increasingly key plants out during indoor labs. The lecture component of this course compliments the lab portion and also focuses on Nebraska plants.

Prerequisite: BIOL 105 and BIOL 359 or permission of instructor  
Additional Course Fee Required

**BIOL 421 – Seminar in Biology 1 credit hour**

This course is an in-depth discussion of current topics in biology. Students will give presentations about a peer-reviewed primary literature article. Other activities include class discussions on how to structure parts of an oral presentation, as well as other assignments aimed at increasing the ability of the student to communicate biological topics in written and oral formats. Students are expected to read all journal articles presented and/or discussed and participate in class discussions.

Department Consent Required

Total Credits Allowed: 5.00

Prerequisite: BIOL 231

**BIOL 426 – Human Dimensions of Wildlife and Fisheries 3 credit hours**

Various approaches to understand humans' attitudes and behaviors toward wildlife, fisheries, and nature. The course is organized around three major sections: psychology, sociology, and economics.

**BIOL 430 – Special Topics in Biology 1-6 credit hours**

Topics are studied which are not assigned or covered in other courses in the department. The format of this course will vary depending on the topic, instructor and the needs of students. Topics include Botany, Fresh Water Biology, Vertebrate Biology, Invertebrate Biology, Nebraska Flora, Nebraska Fauna, Physiology, Geographic Information Systems  
Department Consent Required  
Total Credits Allowed: 8.00

**BIOL 431 – Research Methods II 1-3 credit hours**

Independent investigation of a biological problem, including a scientific write-up of the investigation and the results. Three hours of laboratory or field work each week for each hour of credit. Two hours credit required for a major or endorsement selecting this option.

Department Consent Required  
Total Credits Allowed: 3.00

Prerequisite: BIOL 231 and permission of instructor. Students must have a faculty member willing to mentor them on the research project.

**BIOL 431A – Research Methods IIA 1 credit hour**

As a transition from BIOL 231 to this course, students will finalize project methodology and independently collect data with minimal guidance from a faculty mentor. IRB and/or IACUC approval, if required, must be obtained prior to conducting research. Three hours of laboratory or field work each week for each hour of credit.

Prerequisite: BIOL 231  
Additional Course Fee Required

**BIOL 431B – Research Methods IIB 1 credit hour**

Students will analyze data collected in BIOL 431A for presentation as a manuscript, poster, and short talk. The manuscript and poster will be prepared in a manner consistent with respective submission to a professional journal in their field of study. The oral presentation will be presented at a formal departmental symposium. Three hours of work each week for each hour of credit.

Total Credits Allowed: 3.00  
Prerequisite: BIOL 431A  
Additional Course Fee Required

**BIOL 433 – Invertebrate Zoology 3 credit hours**

This course provides an introduction to the biology of specific phyla, classes, and orders of invertebrates with emphasis on classification, morphology, structure and function of their internal anatomy, ecology and evolution, and fundamental concepts characteristic of this diverse animal group. Laboratory stresses anatomy, natural history and ecology of invertebrates.

Prerequisite: BIOL 105 and BIOL 106  
Additional Course Fee Required

**BIOL 435 – Herpetology 3 credit hours**

The study of amphibians and reptiles, including evolution, systematics, morphology, physiology, reproduction, behavior, ecology, natural history and conservation. Three hours of laboratory or field work each week focusing on field techniques for censusing herpetofaunal diversity and identification of Nebraska species.

Prerequisite: BIOL 105 and BIOL 106 or permission of instructor.  
Additional Course Fee Required

**BIOL 440 – Infectious Diseases 3 credit hours**

This course focuses on the medical aspects of microbiology. The course will cover viruses, bacteria, fungi, and parasitic protists. We will study the mechanisms of infection, disease progression, and immune response.

Prerequisite: BIOL 211 or BIOL 400 or permission  
Additional Course Fee Required

**BIOL 442 – Wildlife and Fisheries Laws and Policies 3 credit hours**

Evolution of laws relating to fish and wildlife with a particular focus on major federal legislation, federal versus state jurisdiction, fishing and hunting rights, and other topics.

**BIOL 450 – Advanced Molecular Biology 4 credit hours**

The course is an in-depth discussion of the principles and techniques of modern molecular biology. Specifically, this course covers the central dogma processes (replication, transcription, and translation) as they occur in both prokaryotic and eukaryotic organisms. Students will be exposed to a number of techniques including isolating DNA, RNA, and proteins, polymerase chain reaction, gel electrophoresis, genetic cloning, flow cytometry, ELISA, and immunoblotting. This course will emphasize design and interpretation of scientific experiments specific to molecular biology in coursework completed in lecture and lab.

Prerequisite: BIOL 309  
Additional Course Fee Required

**BIOL 456 – Regional Field Study 1-4 credit hours**

This course is designed to introduce students to detailed biological studies of specific regions. Regions studied may vary depending upon instructor availability and student needs. Topics may include but are not limited to: Tropical and Marine Island Biology, Natural History of Nebraska, Natural History of the Southwest  
Department Consent Required  
Total Credits Allowed: 5.00

**BIOL 461 – Human Genetics 3 credit hours**

The course focuses on contemporary human genetics with emphases on genetic diseases. A study of the genetic basis and frequency of genetic defects in man and genetic counseling. Prior completion or concurrent enrollment in BIOL 360 is also recommended.

Prerequisite: 8 hours of BIOL 200 through BIOL499 or permission of the instructor.

**BIOL 462 – Animal Behavior 3 credit hours**

An introduction to the science of ethology. The course will examine behavior genetics, physiology of behavior, ecology of behavior, and the evolution of behavior. Three hours of laboratory each week.

Prerequisite: BIOL 105 and BIOL 231 and BIOL 307 or permission of instructor  
Additional Course Fee Required

**BIOL 463 – Clinically Oriented Gross Anatomy 4 credit hours**

Clinically Oriented Gross Anatomy includes human anatomy presented in a regional approach that utilizes a wide variety of imaging modalities and clinical correlations to understand gross anatomy. The sequence of the content has been adapted to correlate with the synchronous dissection of the human cadaver. Students will form dissection groups.

Prerequisite: BIOL 225 and BIOL 226 or permission of course coordinator

**BIOL 465 – Physiology 3 credit hours**

The structure and function of the systems of the vertebrate body. Three hours of laboratory each week.

Prerequisite: BIOL 105 or BIOL 106 and BIOL 309 and CHEM 161 and CHEM 161L and Organic Chemistry or permission of instructor  
Additional Course Fee Required

**BIOL 468 – Parasitology 2 credit hours**

The basic concepts of parasitology with emphasis on the major types of medically and economically important parasites (protozoa, helminthes, arthropods) will be covered, including life cycles, diagnosis, treatment, immunity, pathology, control, ecology, and evolution.

Prerequisite: BIOL 105 and BIOL 106.

Corequisite: BIOL 468L.

Additional Course Fee Required

**BIOL 468L – Parasitology Laboratory 1 credit hour**

Laboratory stresses identification of the various developmental stages of parasites.

Corequisite: BIOL 468.

**BIOL 470 – Insect Biology 3 credit hours**

An introduction to insects and related arthropods. Emphasis is placed on morphology, physiology, taxonomy and ecology of insects. Three hours of laboratory or field work each week.

Additional Course Fee Required

**BIOL 471 – Methods in Secondary Science Teaching 3 credit hours**

An examination of current developments in curricula, methods and materials. Should be completed prior to student teaching. Laboratory time arranged.

Prerequisite: Permission of instructor or admission to Teacher Education

Additional Course Fee Required

**BIOL 472 – Ichthyology 3 credit hours**

The study of fish with a focus on classification, anatomy, distribution, ecology, physiology and management of fishes. Three hours of laboratory or field work each week.

Prerequisite: BIOL 105 and BIOL 106 or permission of instructor.

Additional Course Fee Required

**BIOL 473 – Ornithology 3 credit hours**

The study of birds, including evolution, systematics, morphology, physiology, reproduction, behavior, ecology, natural history and conservation. Three hours of laboratory or field work each week with emphasis on field methods and identification of Nebraska species.

Prerequisite: BIOL 105 and BIOL 106 or permission of instructor.

Additional Course Fee Required

**BIOL 474 – Mammalogy 3 credit hours**

Introduction to mammals; ecology, classification, physiology, and behavior. Three-hour laboratory per week for preparation and identification of specimens.

Prerequisite: BIOL 105 or permission of instructor.

Additional Course Fee Required

**BIOL 475 – Internship in Biology 1-15 credit hours**

Internship is taken as part of the professional semester, and it emphasizes the professional development of the individual. Students may apply to participate in an internship to receive credit in their degree seeking programs. To sign up for internships, the internship must have clearly defined learning objectives, have an agreed upon number of contact hours which will coincide with the credit hours, and a letter of support from the internship supervisor. Students will be required to keep a weekly journal of their activities and will submit a written assignment at the end of the semester.

Total Credits Allowed: 15.00

Prerequisite: At least 12 hours of Biology and junior or senior standing and permission of instructor.

**BIOL 482 – Seminar in Molecular Biology 1 credit hour**

An in-depth discussion of current topics in molecular biology. Guest speakers, faculty and students will give presentations weekly. Some presentations will consist of the students reading an assigned paper followed by an oral presentation of its contents. Student participants are expected to read all journal articles presented, whether they are presenting or not. Molecular biology majors must obtain two hours credit to fulfill the requirements for the Molecular Biology Comprehensive major. Total Credits Allowed: 5.00

Prerequisite: BIOL 360 or permission of instructor

**BIOL 485 – Molecular Genetics 3 credit hours**

An in-depth study of gene structure and replication in prokaryotes and eukaryotes. Gene function in developing and differentiated cells will also be studied in detail.

Prerequisite: BIOL 360 or BIOL 461

**BIOL 499 – Research in Biology 1 credit hour**

Research is taken as part of the professional semester, and it emphasizes gaining research skills and experience. Students may apply to participate in a research experience to receive credit in their degree seeking programs. To sign up for research credits, the research experience must have clearly defined learning objectives, have an agreed upon number of contact hours which will coincide with the credit hours, and a letter of support from the research supervisor.