

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

Four options are available in this major:

1. Biology (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/biology/biology-bs>) - Bachelor of Science Degree
2. Biology Comprehensive (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/biology/biology-comprehensive-bs>) - Bachelor of Science Degree
 - General Emphasis
 - Wildlife Emphasis
 - Health Science Emphasis
3. Molecular Biology Comprehensive (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/biology/molecular-biology-comprehensive-bs>) - Bachelor of Science Degree
4. Biology 7-12 Teaching Subject Endorsement (<http://catalog.unk.edu/catalog-archive/2019-2020/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/catalog-archive/2019-2020/undergraduate/departments-programs/biology/biology-minor>) and Environmental Science (<http://catalog.unk.edu/catalog-archive/2019-2020/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/catalog-archive/2019-2020/undergraduate/departments-programs/biology/pre-veterinary-medicine>) and Pre-Forestry students.

Julie Shaffer, **Chair**

Professor: Kimberly Carlson, Keith Geluso, Julie Shaffer, Dawn Simon, Janet Steele, Paul Twigg

Associate Professor: Marc Albrecht, Nathaniel Bickford, Surabhi Chandra, Bryan Drew, Thomas Freeman, Mary Harner, Letitia Reichart, Melissa Wuellner

Assistant Professor: Joseph Dolence, Nicholas Hobbs, Brandon Luedtke, Austin Nuxoll, Dustin Ranglack

Senior Lecturer: Darby Carlson, Anne Cummings, Betty Jacques, Rick Simonson

Lecturer: Luke Fennessy

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 188 – GS Portal 3 credit hours

Students analyze critical issues confronting individuals and society in a global context as they pertain to the discipline in which the Portal course is taught. The Portal is intended to help students succeed in their university education by being mentored in process of thinking critically about important ideas and articulating their own conclusions. Students may take the Portal in any discipline, irrespective of their major or minor. Satisfies the General Studies Portal course requirement. Students may take their Portal course in any discipline. Students who transfer 24 or more hours of General Studies credit to UNK are exempt from taking a portal course.

Total Credits Allowed: 6.00

Prerequisite: First year freshman standing or sophomore standing only.

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 290 – 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 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

Population and community ecology; distribution and dispersal, population growth and regulation. Interpretation of ecological phenomena in laboratory, field and hypothetical systems. A laboratory or field exercise each week.

Prerequisite: BIOL 105 or permission of instructor

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 in regard to recent advances in the Biological Sciences and Medicine. The goal of the class is to acquaint you with Bioethical issues and enable you to make decisions and perform actions in an ethical manner in the fields of Biological Sciences and Medicine.

Prerequisite: Sophomore standing or higher or 8 hours of college Biology and Chemistry or permission of instructor.

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 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 290 or BIOL 309

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 388 – GS Capstone 3 credit hours

An interdisciplinary experience where students apply the knowledge, cognitive abilities, and communication skills they have gained from General Studies in designing and completing an original project or paper. Students employ methods and interpretive means of two or more disciplines to integrate knowledge and synthesize their results. Satisfies the General Studies capstone course requirement. Students may take their Capstone course in any discipline.

Prerequisite: Junior or senior level standing or within 6 hours of completing general studies requirements.

BIOL 388L – GS Capstone Lab 1 credit hour

Corequisite: BIOL 388

BIOL 401 – Principles of Immunology 4 credit hours

Topics to be covered include: 1) the structural and functional aspects of the immune system, 2) disorders of the immune system, 3) structure and function of antibody molecules, 4) immunobiology of tissue transplants, 5) basic aspects of cancer and cancer therapy that relate to immunology, 6) allergies, and 7) antigen-antibody interaction. Laboratory required. BIOL 360 strongly recommended.

Prerequisite: BIOL 211 or BIOL 400 and either BIOL 309 or CHEM 351 and CHEM 351L or permission of instructor.

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. Provides the opportunity for certification for prescribed burning and wildland firefighting at federal, state, or private agency levels.

BIOL 416 – Plant Diversity and Evolution 4 credit hours

Morphology of each group of the plant kingdom. Three hours of laboratory each week.

Prerequisite: BIOL 105 and BIOL 106 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

Classification and identification of vascular plants with emphasis on the prairies and plains. A family concept approach is utilized. Three hours of laboratory or field work each week.

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

BIOL 421 – Seminar in Field Studies 1 credit hour

An in-depth discussion of current topics in field biology. Presentations will be given weekly by guest speakers, faculty and students. Seminar is designed to help students analyze, understand and present current research within the field of Science, enhance critical thinking through question and answer sessions, and develop the skill set, both verbal and written, needed to present research and/or data in future careers.

Department Consent Required

Total Credits Allowed: 5.00

Prerequisite: BIOL 231

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: 6.00

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 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 4 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.

Three hours of laboratory will be required each week.

Prerequisite: BIOL 211 or BIOL 400 or permission

Additional Course Fee Required

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

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: 4.00

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

Students should have completed coursework related to the internship experience. This course involves practical experience and emphasizes the professional development of the individual student.

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